Tajikistan – Pilot Programme for Climate Resilience

Sustainable Land Management (SLM) Technologies and Approaches

October 2011






Tajikistan – Pilot Programme for Climate Resilience (PPCR), Phase 1
Component A5 on Agriculture & Sustainable Land Management

Universität Bern
CDE Centre for Development and Environment

WOCAT
World Overview of Conservation Approaches and Technologies

CAMPkuhiston
NGO for sustainable mountain development

UCA
University of Central Asia

TECHNOLOGIES	1. Agroforestry
	2. Land Productivity Enhancement
	3. Cross-slope measures: onsite protection
	4. Cross-slope measures: offsite protection
	5. Indirect SLM measures
	6. Water Harvesting
	7. Irrigation Infrastructure Management
	8. Improved Grazing Land
	9. Planted and Natural Forest
	10. Tree Belts
APPROACHES	11. SLM Planning
	12. Individual and Community Initiatives
	13. Government Partnership
	14. User Associations
	15. Financial Support
	16. Knowledge Transfer

WOCAT TOOLS

WOCAT (World Overview of Conservation Approaches and Technologies) is an established global network of Soil and Water Conservation (SWC) specialists, contributing to sustainable land management (SLM). All WOCAT tools can be accessed through the WOCAT web-page: http://www.wocat.net/

Case Study Assessment: Questionnaires on SLM Technologies and Approaches

WOCAT has developed questionnaires to analyse and evaluate SLM at the local level:

- **Questionnaires on SLM Technologies (QT):** addresses the following questions: what are the specifications of the Technology, and where is it used (natural and human environment), what impact does it have.
- **Questionnaires on SLM Approaches (QA):** addresses the questions of how implementation was achieved and who achieved it.

The questionnaires on SLM technologies and SLM approaches provide the main pillar of the **local/ study site documentation** of WOCAT. The questionnaires have been continuously developed and improved over the last 15 years.

English Questionnaires

- TechQuestE.pdf (pdf, 432kb): http://www.wocat.net/fileadmin/user_upload/documents/QT_and_QA/TechQuestE.pdf
- AppQuestE.pdf (pdf, 158kb): http://www.wocat.net/fileadmin/user_upload/documents/QT_and_QA/AppQuestE.pdf
- CategorisationSystem.pdf (pdf, 87kb): http://www.wocat.net/fileadmin/user_upload/documents/QT_and_QA/CategorisationSystem.pdf

Russian Questionnaires

- TechQuestRU.pdf (pdf, 848kb): http://www.wocat.net/fileadmin/user_upload/documents/QT_and_QA/TechQuestRU.pdf
- ApprQuestRU.pdf (pdf, 494kb): http://www.wocat.net/fileadmin/user_upload/documents/QT_and_QA/ApprQuestRU.pdf

Database

After the questionnaires on SLM Technologies and Approaches have been filled in the data can be entered into the global online WOCAT databases. The databases are available in English and Russian language.

Database on SLM Approaches: The database on SLM Approaches is newly developed and is online available on this link http://cdewocat.unibe.ch/wocatQA/

Database on SLM Technologies: The new online database on SLM Technologies is available now for data entry and is online available on this link http://cdewocat.unibe.ch/wocatQT/

WOCAT case studies

October 2011

Sustainable Land Management Technologies

QT ID	Corresp. QA ID	Contributor	Organisation	Title
1. Agroforestry				
TAJ003e	TAJ003	Sanginboy R. Sanginov	Tajik Soil Institute / NCCR North-South	Orchard-based agroforestry
TAJ004e	TAJ004	Murod Ergashev	Tajik Soil Institute / NCCR North-South	Conversion of grazing land to fruit and fodder plots
TAJ007e	TAJ005	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Orchard-based agroforestry (intercropping)
TAJ008e	TAJ005	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Orchard-based agroforestry (establishment of orchard)
TAJ111e	TAJ020	Gulniso Nekushoeva	Tajik Soil Institute	Planting of fruit trees to increase slope stabilization
TAJ113e	TAJ018	Firdavs Faizulloev	UNDP (CACILM)	Rehabilitation of poor soils through agroforestry
TAJ365e	na	Pjotr M. Sosin	Tajik Soil Institute / PALM	Conversion of stony slopes into an irrigated apricot orchard
TAJ370e	TAJ037	Habib Kamolidinov	GITEC/ADB/DMC Rural Development Project	Integrated Technologies for Household Plots
TAJ390e	na	Mizrob Amirbekov	AKDN - MSDSP	Tree nurseries to test trees species adapted to local climate
2. Land Productivity Enhancement				
TAJ109e	TAJ018	Firdavs Faizulloev	UNDP (CACILM)	Pest management with pheromone insect traps
TAJ350e	TAJ034	Rustam Qalandarov	Youth Ecological Center	Solar greenhouses
TAJ375e	TAJ034	Rustam Qalandarov	Youth Ecological Center	Vertical growing of potatoes in pits, by the gradual addition of further layers of soil
TAJ380e	TAJ034	Rustam Qalandarov	Youth Ecological Center	Phytopesticides
TAJ393e	na	Mizrob Amirbekov	AKDN - MSDSP	Passive solar greenhouses for winter commercial vegetable production
3. Cross-slope measures: onsite protection				
TAJ005e	TAJ005	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Terrace with tree barrier
TAJ006e	TAJ006	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Buffer strip on steep sloping cropland
TAJ010e	na	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Drainage ditches in steep sloping cropland
TAJ362e	TAJ029	Manuchehr Rakhmatdzhonov	Welthungerhilfe / German Agro Action	Gradual development of bench terraces from the contour ditches

4. Cross-slope measures: offsite protection				
TAJ353e	na	Giuseppe Bonati	CESVI	Landslide prevention with drainage trenches lined with fast growing trees
TAJ356e	TAJ022	Daler Domullojonoev	Welthungerhilfe / German Agro Action	Infilling of gullies with vegetative structures
TAJ403e	na	German Kust	World Bank - CAWMP	Strengthening of the river banks with stones and gabions
5. Indirect SLM measures				
TAJ102e	TAJ031	Roziya Kirgizbekova	GIZ (CACILM)	Reduce pressure from forest resources by improved thermal insulation in private houses
TAJ354e	na	Daler Domullojonoev	Welthungerhilfe / German Agro Action	Energy efficiency measures to increase the application of organic fertilizers
TAJ402e	na	German Kust	World Bank - CAWMP	Beekeeping in uplands
TAJ551e	TAJ026	Shane Stevenson	CAMP Kuhiston	Two Room Stove
6. Water Harvesting				
TAJ104e	na	Daler Domullojonoev	Welthungerhilfe / German Agro Action	Roof top rain water harvesting stored in polythene lined earth retention tank
TAJ348e	na	Sady Odinashoev	NCCR North-South, CDE, University of Bern	Roof top rain water harvesting - concrete tank
TAJ399e	na	Giuseppe Bonati	CESVI	Natural spring catchment protection
7. Irrigation Infrastructure Management				
TAJ107e	na	Aslam Quadamov	Pamir Biological Institute / MSDSP	Irrigation of orchards by using low cost drip irrigation technique
TAJ108e	na	Pjotr M. Sosin	Tajik Soil Institute	Bottle irrigation of newly planted orchard
TAJ112e	na	Firdavs Faizulloev	UNDP (CACILM)	Rehabilitation of iron water gates to improve distribution of irrigation water
TAJ371e	na	Davlabek Davlatov	CAMP Kuhiston	Cascading rock irrigation channel
TAJ372e	TAJ034	Rustam Qalandarov	Youth Ecological Center	Drip irrigation using polyethylene sheeting and intermittent cloth strips
TAJ394e	na	Mizrob Amirbekov	AKDN - MSDSP	Spiral water pumps
TAJ397e	na	Sady Odinashoev	NCCR North-South, CDE, University of Bern	Water wheel pump system
TAJ398e	na	Sady Odinashoev	NCCR North-South, CDE, University of Bern	A woollen water retention bed installed under the roots of a tree irrigated by a pipe feed.

8. Improved Grazing Management				
TAJ009e	na	Erik Buehlmann	CDE, University of Bern	Perennial herbaceous fodder plants for intact canopy cover
TAJ100e	TAJ013	Sady Odinashoev	Caritas	Rotational grazing supported by additional water points
TAJ103e	na	Gulniso Nekushoeva	Tajik Soil Institute / PALM	Growing of fodder crops on steep slopes in arid highlands
TAJ368e	na	Safarov Tuychiboy	Worldbank / Ministry of Agriculture	Rehabilitation of grazing areas through planting of Izen perennial shrubs
9. Planted and Natural Forest				
TAJ114e	na	Firdavs Faizulloev	UNDP (CACILM)	Saxaul plantation for stabilization of sandy soils
TAJ342e	na	Gulniso Nekushoeva	Tajik Soil Institute / PALM	Planting poplar trees in the flood plain of high mountain river areas
TAJ366e	TAJ015	Roziya Kirgizbekova	GIZ (CACILM)	Establishment of living sea buckthorn fences for the protection of reforestation sites
10. Tree Belts				
TAJ106e	na	Aslam Quadamov	Pamir Biological Institute	Wind forest strips for land protection against wind erosion on sandy soils
TAJ110e	na	Firdavs Faizulloev	UNDP (CACILM)	Shelterbelts with Russian Silverberry for the protection of irrigated fields
TAJ376e	na	Habib Kamolidinov	GITEC/ADB/DMC Rural Development Project	Integrated stone wall and poplar tree perimeter fencing

Sustainable Land Management Approaches

QA ID	Corresp. QT ID	Contributor	Organisation	Title
11. SLM Planning				
TAJ020e	na	Shane Stevenson	CAMP Kuhiston	SLM Technologies For Natural Disaster Risk Mitigation
TAJ026e	na	Mirzo Pochoev, Shane Stevenson	CAMP Kuhiston	Participatory cost benefit analysis for Energy Efficiency Measures
TAJ045e	Na	Nandita Jain	World Bank - CAWMP	Eligibility Criteria and Environmental Planning Tools for SLM
TAJ046e	na	Nandita Jain	World Bank - CAWMP	Village-level participatory planning for sustainable agriculture and land management
TAJ047e	na	Nandita Jain	World Bank - CAWMP	Sub-district (Jamoat) level support for sustainable land management

12. Individual and Community Initiatives				
TAJ003e	TAJ003	Sanginboy Sanginov	Tajik Soil Institute	Transition from centralized regime to local initiative
TAJ004e	TAJ104	Murod Ergashev	Tajik Soil Institute	Farmer innovation and self-help group
TAJ005e	TAJ008	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Voluntary labour assistance
TAJ006e	TAJ006	Erik Buehlmann	NCCR North-South, CDE, University of Bern	Joint land user initiative
TAJ029e	TAJ362	Manucher Rakhmatdzhonov	Welthungerhilfe / German Agro Action	Facilitation of micro-watershed management for farmers
13. Government Partnership				
TAJ015e	TAJ366	Roziya Kirgizbekova	GIZ (CACILM)	Joint forest management
TAJ022e	TAJ356	Daler Domullojonoev	Welthungerhilfe / German Agro Action	Village school participation and involvement
TAJ025e	na	Firdavs Faizulloev	UNDP (CACILM)	Tugai forest management through village committees
TAJ038e	na	Sa'dy Odinashoev	NCCR North-South, CDE, University of Bern	Implementation through the government's women's affair officers
14. User Associations				
TAJ013e	TAJ100	Sady Odinashoev	Caritas	Livestock committee at village level
TAJ024e	na	Sady Odinashoev	NCCR North-South, CDE, University of Bern	District wheat Seed Association
TAJ036e	na	Lisa Gampp	Caritas	Public Women's Organization Zamzam ' enhancing income for poor women through income generating activities
TAJ040e	na	Mizrob Amirbekov	AKDN - MSDSP	Facilitation of community-based pasture management initiatives
15. Financial Support				
TAJ030e	na	Roziya Kirgizbekova	GIZ (CACILM)	Saving Book Approach
TAJ031e	TAJ102	Roziya Kirgizbekova	GIZ (CACILM)	Access to thermal insulation through micro loans
TAJ044e	na	Nandita Jain	World Bank - CAWMP	SLM small grant allocation mechanisms
16. Knowledge Transfer				
TAJ018e	TAJ113, TAJ109	Firdavs Faizulloev	UNDP (CACILM)	Farmer field schools
TAJ037e	TAJ370	Habib Kamolidinov	GITEC/ADB/DMC Rural Development Project	Enhancement of existing self SLM technologies into demonstration sites
TAJ043e	na	Weissen Hugo	TAFF / GIZ-PSD	Technical Assistance Groups (TAG)

Sustainable land management technologies / Технологии устойчивого управления земельными ресурсами

ID Код	Title Название	Location / Место-нахождение	Link Ссылка
1. Agroforestry / Агролесоводство			
TAJ003e **TAJ003r**	Orchard-based agroforestry Агролесоводство на основе сада	Faizabad Файзабад	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=297 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=576
TAJ004e **TAJ004r**	Conversion of grazing land to fruit and fodder plots Переход от пастбищных земель на фруктовые и кормовые участки	Varzob Варзоб	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=167 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=560
TAJ007e **TAJ007r**	Orchard-based Agroforesty (intercropping) Агролесоводство на основе сада (совмещение культур)	Faizabad Файзабад	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=261 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=563
TAJ008e **TAJ008r**	Orchard-based Agroforestry (establishment of orchard) Агролестничество на основе садов (создание садов)	Faizabad Файзабад	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=260 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=565
TAJ111e **TAJ111r**	Planting of fruit trees to increase slope stabilization Посадка фруктовых деревьев для увеличения стабилизации склона	Nurobod Нуробод	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=271 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=582
TAJ113e **TAJ113r**	Rehabilitation of poor soils through agroforestry Восстановление бедной почвы через агролесничество	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=346 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=585
TAJ365e **TAJ365r**	Conversion of stony slopes into an irrigated apricot orchard Освоение сильно каменистых склоновых земель под орошаемый абрикосовый сад.	Vanj Ванж	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=392 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=365
TAJ370e **TAJ370r**	Integrated Technologies for Household Plots Интеграция технологий в приусадебные участки	Varzob Варзоб	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=370 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=592
TAJ390e **TAJ390r**	Tree nurseries to test trees species adapted to local climate Лесопитомник для проверки приживаемости некоторых видов деревьев к местным климатическим условиям	Vanj Ванж	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=390 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=573
2. Land Productivity Enhancement / Повышение продуктивности земли			
TAJ109e **TAJ109r**	Pest management with pheromone insect traps Борьба с сельскохозяйственными насекомыми- вредителями с помощью феромоновых ловушек	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=311 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=535
TAJ350e **TAJ350r**	Solar greenhouses Солнечные теплицы	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=404 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=350
TAJ375e **TAJ375r**	Vertical growing of potatoes in pits, by the gradual addition of further layers of soil Выращивание картофеля в лунке	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=406 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=375
TAJ380e **TAJ380r**	Phytopesticides Фитопестициды	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=407 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=380
TAJ393e **TAJ393r**	Passive solar greenhouses for winter commercial vegetable production Пассивная теплица с солнечным обогревом для выращивания овощей в зимнее время в коммерческих целях	Shugnan Шугнан	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=393 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=584

3. Cross-slope measures: onsite protection / Возделывание склонов: защита на участке			
TAJ005e **TAJ005r**	Terrace with tree barrier Терраса с барьером из деревьев	RRS РРП	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=232 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=542
TAJ006e **TAJ006r**	Buffer strip on steep sloping cropland Буферная полоса пахотных земель, расположенных на крутых склонах	RRS РРП	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=178 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=561
TAJ010e **TAJ010r**	Drainage ditches in steep sloping cropland Дренажные канавы на крутых склонах пахотных земель	RRS РРП	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=258 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=572
TAJ362e **TAJ362r**	Gradual development of bench terraces from the contour ditches Постепенное развитие ступенчатых террас благодаря контурным дренажным канавам	Baljuvon Балжувон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=362 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=580
4. Cross-slope measures: offsite protection / Возделывание склонов: защита за пределами участка			
TAJ353e **TAJ353r**	Landslide prevention with drainage trenches lined with fast growing trees Предотвращение оползня путем использования дренажных траншей с высаженными быстрорастущими деревьями	Khovaling Ховалинг	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=353 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=564
TAJ356e **TAJ356r**	Infilling of gullies with vegetative structures Заполнение оврагов растительными структурами	Khovaling Ховалинг	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=356 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=590
TAJ403e **TAJ403r**	Strengthening of the river banks with stones and gabions Укрепление берегов рек с помощью камней и габионов	Tajikobod Таджикобод	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=516 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=403
5. Indirect SLM measures / Косвенные мероприятия по УУЗР			
TAJ102e **TAJ102r**	Reduce pressure from forest resources by improved thermal insulation in private houses Снижение давления на лесные ресурсы посредством улучшения теплоизоляции частных домов	GBAO/ ГБАО	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=184 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=536
TAJ354e **TAJ354r**	Energy efficiency measures to increase the application of organic fertilizers Эффективность использования энергии с целью увеличения применения органических удобрений	Temurmalik Темурмалик	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=354 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=577
TAJ402e **TAJ402r**	Beekeeping in uplands Пчеловодство в горных районах	Zarafshan, Surkhob, Vanj/ Заравшан, Сурхоб, Ванж	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=515 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=402
TAJ551e **TAJ551r**	Two Room Stove Двух камерная печка	Nurobod Нурobod	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=551 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=567
6. Water Harvesting / Сбор поверхностного стока для орошения			
TAJ104e **TAJ104r**	Roof top rain water harvesting stored in polythene lined earth retention tank Сбор дождевой воды с крыш и ее хранение в земляном резервуаре, покрытый полиэтиленом	Temurmalik Baljuvon Темурмалик Балжувон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=298 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=578
TAJ348e **TAJ348r**	Roof top rain water harvesting - concrete tank Система сбора дождевой воды с крыш с использованием - бетонной цистерны	Boshkengash Бошкенгаш	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=348 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=593
TAJ399e **TAJ399r**	Natural spring catchment protection Защита естественных водоприемников родника	Khovaling Ховалинг	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=399 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=587
7. Irrigation Infrastructure Management / Управление ирригационной инфраструктурой			
TAJ107e **TAJ107r**	Irrigation of orchards by using low cost drip irrigation technique Ирригация садов с использование недорогой технологии капельного	Shugnan Шугнан	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=306 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=581

	орошения		
TAJ108e **TAJ108r**	Bottle irrigation of newly planted orchard Полив молодого сада бутылочным способом	Nurabad Нурабад	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=391 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=307
TAJ112e **TAJ112r**	Rehabilitation of iron water gates to improve distribution of irrigation water Реабилитация гидротехнических затворов для улучшения подачи оросительной воды	Kabodian Кабодиан	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=345 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=583
TAJ371e **TAJ371r**	Cascading rock irrigation channel Каскадирование ирригационных каналов горной породой	Veshab Вешаб	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=371 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=566
TAJ372e **TAJ372r**	Drip irrigation using polyethylene sheeting and intermittent cloth strips Капельное орошение посредством использования полиэтиленовой пленки	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=405 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=372
TAJ394e **TAJ394r**	Spiral water pumps Спиральные водяные насосы	Roshtkalah, Ishkashim, Vanj, Rushnan/ Рошткалах, Искашим, Ванж, Рушнан	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=394 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=570
TAJ397e **TAJ397r**	Water wheel pump system Насосная станция с водоподъемным колесом	Sughd Сугд	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=397
TAJ398e **TAJ398r**	A woollen water retention bed installed under the roots of a tree irrigated by a pipe feed. Шерстяное основание водоудержания, уложенное под корнями деревьев, орошаемых подводящей трубой	Penjakent, Toshmunor/ Пенжакент, Тошмунор	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=398 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=588
8. Improved Grazing Management / Улучшение пастбищных угодий			
TAJ009e **TAJ009r**	Perennial herbaceous fodder plants for intact canopy cover Многолетние травянистые кормовые культуры для нетронутого лесного покрова	RRS/ РРП	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=569
TAJ100e **TAJ100r**	Rotational grazing supported by additional water points Ротация пастбищ, поддерживаемая дополнительными точками водопоя	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=148 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=574
TAJ103e **TAJ103r**	Growing of fodder crops on steep slopes in arid highlands Выращивание кормовых культур на крутых склонах засушливого высокогорья	Shugnan,Vankala/ Шугнан/Ванкала	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=297 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=576
TAJ368e **TAJ368r**	Rehabilitation of grazing areas through planting of Izen perennial shrubs Восстановление пастбищных угодий посредством семян многолетнего кустарника	Dangara / Дангара	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=534 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=368
9. Planted and Natural Forest / Искусственные и естественные леса			
TAJ114e **TAJ114r**	Saxaul plantation for stabilization of sandy soils Посев саксаула для стабилизации песчаных почв	Khatlon/ Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=347 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=540
TAJ342e **TAJ342r**	Planting poplar trees in the flood plain of high mountain river areas Создание тополиных лесов в поймах высокогорных рек	Shugnan, Vankala/ Шугнан/Ванкала	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=342 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=558
TAJ366e **TAJ366r**	Establishment of living sea buckthorn fences for the protection of reforestation sites Создание живых изгородей из облепихи для защиты участков лесовосстановления	Ishkashim, Roshkala, Shugnan/ Ишкашим Рошкала, Шугнан	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=366 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=529

10. Tree Belts / Лесные полосы			
TAJ106e **TAJ106r**	Wind forest strips for land protection against wind erosion on sandy soils Создание лесных полезащитных полос для защиты от ветровой эрозии на песчано-галечниковых массивах	Ishkashim/ Ишкашим	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=305 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=579
TAJ110e **TAJ110r**	Shelterbelts with Russian Silverberry for the protection of irrigated fields Защитная полоса из лоха (Elaeagnus) для защиты орошаемых полей	Khatlon/ Хатлон	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=319 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=553
TAJ376e **TAJ376r**	Integrated stone wall and poplar tree perimeter fencing Создание ограждений из каменных стен и насаждений тополя по периметру участка	Cent.District/ Центральный район РТ	http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=English&qt_id=376 http://cdewocat.unibe.ch/wocatQT/qt_summary.php?lang=Russian&qt_id=568

Sustainable Land Management Approaches / Подходы устойчивого управления земельными ресурсами

ID Код	Title Название	Location Место-нахож-дение	Link Ссылка
1. SLM Planning / Планирование УУЗР			
TAJ020e **TAJ020r**	Selection of SLM Technologies for Natural Disaster Risk Mitigation Выбор технологий УУЗР для снижения риска возникновения стихийных бедствий	RRS, Nurabad/ РРП, Нурабад	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=294 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=368
TAJ026e **TAJ026r**	Participatory cost benefit analysis for Energy Efficiency Measures Совместный анализ экономической эффективности мероприятий по обеспечению энергосбережения	RRS, Nurabad/ РРП, Нурobод/	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=309 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=372
TAJ045e **TAJ045r**	Eligibility Criteria and Environmental Planning Tools for SLM Квалификационные критерии и инструменты экологического планирования для УЗУ	Sughd, RRS, Khatlon, GBAO / Сугд, РРП, Хатлон, ГБАО	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=333 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=363
TAJ046e **TAJ046r**	Village-level participatory planning for sustainable agriculture and land management Привлечение сельских жителей к совместному планированию мероприятий, направленных на обеспечение устойчивого развития сельского хозяйства и эффективного управления земельными ресурсами	Sughd, Khatlon/ Сугд, Хатлон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=334 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=378
TAJ047e **TAJ047r**	Sub-district (Jamoat) level support for sustainable land management Субрайонная (на уровне джамоата) поддержка устойчивого управления землей	Sughd, Khatlon, RSS, GBAO/ Сугд, Хатлон, РРП, ГБАО	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=335 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=364

2. Individual and Community Initiatives / Индивидуальные и общинные инициативы			
TAJ003e **TAJ003r**	Transition from centralized regime to local initiative Переход от централизованного режима к местной инициативе	Faizabad Файзабад	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=73 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=346
TAJ004e **TAJ004r**	Farmer innovation and self-help group Группа фермеров новаторов и взаимопомощи	Varzob Варзоб	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=72 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=349
TAJ005e **TAJ005r**	Voluntary labour assistance Добровольная поддержка в форме предоставления трудовых услуг	Faizabad Файзабад	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=71 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=352
TAJ006e **TAJ006r**	Joint land user initiative Совместная инициатива землепользователей	Faizabad Файзабад	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=70 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=354
TAJ029e **TAJ029r**	Facilitation of micro-watershed management for farmers Оказание помощи фермерам в управлении небольшими водоразделами	Khatlon, Baljuvon/ Хатлон, Балжувон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=313 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=370
3. Government Partnership / Партнерство с Правительством			
TAJ015e **TAJ015r**	Joint forest management Совместное управление лесами	GBAO / ГБАО	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=272 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=366
TAJ022e **TAJ022r**	Village school participation and involvement Создание сельских школ для фермеров и поддержка	Khatlon, Khovaling/ Катлон, Ховалинг	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=288 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=369
TAJ025e **TAJ025r**	Tugai forest management through village committees Управление тугайными лесами через сельские комитеты	Khatlon Хатлон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=308 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=371
TAJ038e **TAJ038r**	Implementation through the government's women's affair officers Реализация инициатив государственными организациями, занимающимися проблемами женщин	Khatlon/ Хатлон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=325 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=359

4. User Associations / Ассоциации пользователей			
TAJ013e **TAJ013r**	Livestock committee at village level Животноводческий комитет на уровне села	Khatlon/ Хатлон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=269 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=355
TAJ024e **TAJ024r**	District wheat Seed Association Районная Семеноводческая Ассоциация производителей Пшеницы	Khatlon/ Хатлон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=307 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=370
TAJ036e **TAJ036r**	Public Women's Organization Zamzam ' enhancing income for poor women through income generating activities Общественная женская организация «Замзам» - повышение дохода сельских женщин посредством деятельности по генерированию дохода	Khatlon/ Хатлон	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=323 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=356
TAJ040e **TAJ040r**	Facilitation of community-based pasture management initiatives Содействие реализации инициатив в области коллективного управления пастбищами (на общинном уровне)	Jirgatol/ Джиргиталь	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=328 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=360
5. Financial Support / Финансовая поддержка			
TAJ030e **TAJ030r**	Saving Book Approach Подход «Сберегательная книжка»	GBAO/ ГБАО	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=314 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=351
TAJ031e **TAJ031r**	Access to thermal insulation through micro loans Предоставление микрокредитов частным домохозяйствам для обеспечения доступа к термоизоляции	GBAO/ ГБАО	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=315 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=350
TAJ044e **TAJ044r**	SLM small grant allocation mechanisms Механизмы выделения малых грантов на поддержку УУЗР	Sughd, Khatlon, GBAO/ Сугд,хатлон,ГБАО	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=332 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=362
6. Knowledge Transfer / Передача знаний			
TAJ018e **TAJ018r**	Farmer field schools Фермерские полевые школы	Khatlon, Shaartuz/ Хатлон, Шаартуз	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=292 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=367
TAJ037e **TAJ037r**	Enhancement of existing self SLM technologies into demonstration sites Расширение существующих технологий по УУЗР через демонстрационные участки	RRP, Varzob/ РРП, Варзоб,	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=322 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=358
TAJ043e **TAJ043r**	Technical Assistance Groups (TAG) Группы технической поддержки (ГТП)	Khatlon, Soghd, RSS/ Хатлон, Согд, РРП	http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=english&selected_id=331 http://cdewocat.unibe.ch/wocatQA/SummaryApproach.php?selected_language=Russian&selected_id=361

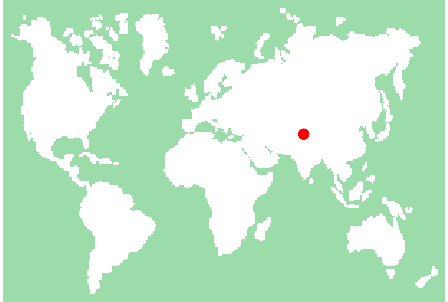
left: Typical examples of apple trees intercropped with wheat. Alignment of the trees is often a compromise between wind direction, slope and shape of plot. (Photo: Hanspeter Liniger)
right: Typical examples of apple trees intercropped with wheat. Alignment of the trees is often a compromise between wind direction, slope and shape of plot. (Photo: Hanspeter Liniger)

Orchard-based agroforestry

Tajikistan – Swiss National Centre for Competence in Research (NCCR) North-South

An agroforestry system where legumes and cereals are planted in fruit orchards, giving simultaneous production and conservation benefits.

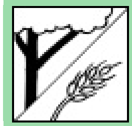
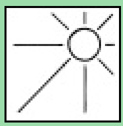
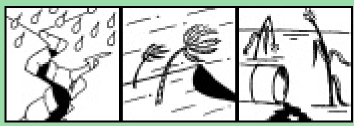
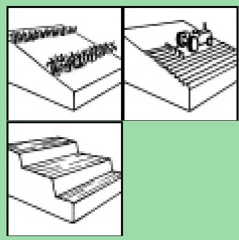
In the Faizabad region, Tajikistan, an area which is characterised by hilly topography, and deep but highly erodible loess soils, farmers traditionally cultivate beans and wheat in combination with fruit trees. This was a rather unsystematic agroforestry system, and during Soviet times (in the 1980s) fruit production was intensified. Pure-stand orchards were established: the land was leveled and on slopes exceeding 20%, terraces were constructed mechanically. The density of trees was increased, and the little space remaining between was used for hay production. Annual cropping was stopped. After the Soviet era, farmers reduced the number of trees, allowing room for inter-cropping. They also established new orchards according to this same pattern. Those who farm rented land merely inter crop wheat, whereas the few farmers who own their land, rotate crops with two years of wheat, followed by one of legumes (beans or lucerne). Crops are grown both for home consumption and sale. The density of apples was reduced by expanding the spacing from approx 5 m to 10 m between rows, and from 2 m to 4 m within rows. Along each row of trees a 2-3 m strip of grass was left to grow. The layout of fruit trees in lines is a compromise between being along the contour, and against the prevailing wind. After harvesting of the fruit, between August and October, farmers sow their annual crops.
This agroforestry system provides protection against strong winds, heavy rains and flooding. Soil erosion (by water) has been reduced due to improved soil cover by the inter cropping, and through leaf litter, which is left to decompose on the ground. Furthermore, after harvesting, about three quarters of the crop residues are left on the field as mulch. The remainder is used as fodder. Soil organic matter within the current agroforestry system is considerably higher than in the surrounding grazing areas. Soil fertility has improved also: beans can fix 60-80 kg/ha/year of nitrogen. Compared with other crops, wheat provides the best erosion protection. Since the lateral rooting system of the apple trees reaches only 1-1.5 m from the trunk, competition for nutrients is not a major problem. Neither is there a problem with shade, since during the crop establishment period the trees have lost their leaves. In order to increase production, farmers plan to apply supplementary irrigation where possible.



Location: Tajikistan, Faizabad
Region: Faizabad
Technology area: 45 km^2
Conservation measure: agronomic, vegetative, structural
Stage of intervention: prevention of land degradation
Origin: Land user -
Climate: semi-arid
WOCAT database reference: TAJ003e
Related approach: Transition from centralised regime to local initiative (TAJ03)
Compiled by: Sanginboy Sanginov, Tajik Soil Institute
Date: 17th Jan 2011 updated 11th Jul 2011

Classification

Land use problems: Most of the rains fall in late autumn and early spring, and the rains coincide with very strong winds. The topsoil is therefore exposed to erosion during this period if left uncovered, and without a windbreak. A particular problem during the soviet period was that the intensive orchard system meant annual food crops were left out of the production system: soil cover was reduced and there was less food.

Land use	Climate	Degradation	Conservation measure
			
Agroforestry Rainfed	semi-arid	Chemical soil deterioration: fertility decline and reduced organic matter content, Soil erosion by wind: loss of topsoil, Soil erosion by water: gully erosion, Soil erosion by water: loss of topsoil / surface erosion	vegetative, agronomic, structural

Stage of intervention

- [x] Prevention
- [ ] Mitigation / Reduction
- [ ] Rehabilitation

Origin

- [x] Land user's initiative
- [ ] Experiments / Research
- [ ] Externally introduced

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main technical functions:
- improvement of ground cover
- increase in nutrient availability (supply, recycling)
- reduction in wind speed
- improvement of soil fertility (with crop rotation incl. Beans+lucerne)

Secondary technical functions:
- control of concentrated runoff: retain / trap
- reduction of slope angle
- improvement of subsoil structure (hardpan)
- water harvesting / increase water supply
- retain/trap concentrated runoff (prevention of gully erosion)

Environment

Natural Environment

Average annual rainfall (mm)

- [ ] > 4000 mm
- [ ] 3000-4000 mm
- [ ] 2000-3000 mm
- [ ] 1500-2000 mm
- [ ] 1000-1500 mm
- [ ] 750-1000 mm
- [x] 500-750 mm
- [ ] 250-500 mm
- [ ] < 250 mm

Altitude (m a.s.l.)

- [ ] > 4000
- [ ] 3000-4000
- [ ] 2500-3000
- [ ] 2000-2500
- [ ] 1500-2000
- [x] 1000-1500
- [ ] 500-1000
- [ ] 100-500
- [ ] <100

Landform

- [ ] plateau / plains
- [ ] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [x] footslopes
- [ ] valley floors

Slope (%)

- [ ] flat
- [ ] gentle
- [ ] moderate
- [ ] rolling
- [x] hilly
- [x] steep
- [ ] very steep

Soil depth (cm)

- [ ] 0-20
- [ ] 20-50
- [ ] 50-80
- [x] 80-120
- [ ] >120

Growing season(s): 270 days (October-June)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

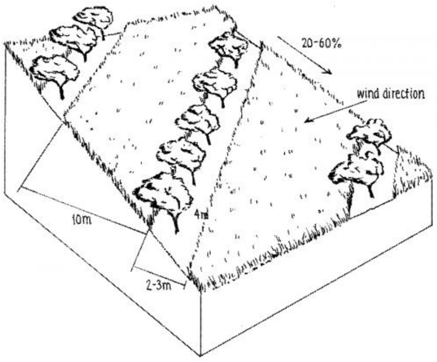
Human Environment

Mixed land per household (ha)

	<0.5
	0.5-1
	1-2
	2-5

Land ownership: state
Land use rights: leased

Importance of off-farm income: > 50% of all income: trade and business; young men often migrate to Russia (seasonally or for several years) to search for jobs
Access to service and infrastructure:
Market orientation: mixed (subsistence and commercial)



Technical drawing
Fruit trees intercropped with wheat (or beans): note the fruit trees are aligned in a 'compromise' position between the direction of the prevailing wind and the slope. (Mats Gurtner)

Implementation activities, inputs and costs

Establishment activities

- Planting of fruit orchard
- Planting of fruit tree saplings by hand
- Thinning: doubling the spacing between trees (by farmers, after Soviet period)
- 1. Levelling of steep land into terraces with graders
- Planting of fruit orchards

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	60.00	100%
Equipment		
- machine use	120.00	100%
- tools	10.00	100%
Agricultural		
- seedlings	250.00	100%
- fertilizer	50.00	100%
- biocides	30.00	100%
- pesticides (kg)	30.00	100%
TOTAL	**550.00**	**100.00%**

Maintenance /recurrent activities

- Applying organic manure for crops and trees
- Chemical fertiliser application to crops
- Disc ploughing and harrowing
- Pest management with chemicals
- Ploughing to depth of 25–30 cm for annual crops
- Fertilization and pest control
- Harvesting: wheat is the only crop that is harvested mechanistically if tractor and fuel are available.
- Mulching of trees
- Ploughing of land and planting crops.
- Pruning of trees.

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	45.00	100%
Equipment		
- animal traction	10.00	100%
- tools	10.00	100%
Agricultural		
- seeds	30.00	100%
- fertilizer	50.00	100%
- compost/manure	10.00	100%
- pesticides (kg)	5.00	100%
Other		
- Pruning	40.00	100%
- Mulching	10.00	100%
TOTAL	**210.00**	**100.00%**

Remarks: Cost calculation refers to farmers who established new agroforestry plots (without receiving any incentives). These are farmers who have rented land from state farms. However, conversion of Soviet orchards is more common than the establishment of new agroforestry plots (information on costs not available).

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased crop yield	+ trees hinder farm operations
+++ increased fodder production	+ difficult to apply pesticides using machinery
++ increased wood production	+ pruning is important
++ increased farm income	

Socio-cultural benefits	Socio-cultural disadvantages
+ community institution strengthening	+ not good management on state farms
+ knowledge conflict mitigation	

Ecological benefits	Ecological disadvantages
+++ improved soil cover	
+++ increased soil organic matter below ground C	
++ increased soil moisture	
++ improved excess water drainage	
++ reduced wind velocity	
++ reduced soil loss	
++ increase nutrient use efficiency	
++ increase water use efficiency	
++ biodiversity enhancement	

Off-site benefits	Off-site disadvantages
++ reduced downstream flooding	
++ increased stream flow in dry season	
++ reduced groundwater river pollution	
++ reduced wind transported sediments	

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption: There is strong trend towards (growing) spontaneous adoption of the technology. Adoption rate is high: 3,500 households in the region, who rented the orchards, have converted them themselves without any incentives.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Easy to convert orchards →Land reform from state to private ownership
2) Helps provide employment (mainly self- employment, partial employment of additional labourers) and increased self-sufficiency. With the cultivation of wheat, some farmers can solve their food problems and do not need an off-farm income.
3) Improvement of soil fertility and soil organic matter content →Use all the crop residue and leaves of trees as cover (mulch).
4) Considerable reduction of soil erosion →Adopt cover crop and rotate with other legumes and minimum tillage system.
5) Wider spacing between the rows of trees (to 10 m) is best for the agroforestry →Remaining orchards with the original Soviet spacing of 5m between the rows should be thinned.

Weaknesses and →how to overcome

Specialists' opinion:

1) The irrigation system established during Soviet times required high maintenance. → Control of water flow within the orchard using cutoff drains and drainage ditches.
2) Lines of trees which are planted up and down the slope to provide wind. → Compromise in layout design (see description)
3) Orchards managed by state farms are often not well looked after. →Renting of land and awarding landholder certificates leads to improved management

Contact person: Sanginboy Sanginov, Tajik Soil Institute, 21A, Rudaki Ave., Dushanbe 734025, sanginov@yahoo.com

left: Agroforestry plot surrounded by overgrazed and heavily degraded grazing land; note also fenced plot with grass plot for hay making above the plot. (Photo: Hanspeter Liniger)
right: Narrow terraces, each with a water retention ditch, for fruit trees (note grape vine in the foreground). (Photo: Bettina Wolfgramm)

Conversion of grazing land to fruit and fodder plots

Tajikistan – Tajik Soil Institute, NCCR North South

Fencing part of an overgrazed hillside, combined with terracing, manuring and supplementary irrigation for grape, fruit and grass production.

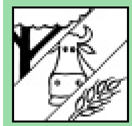
In the Varzob valley of Tajikistan, slopes of around 30% are used communally, and are heavily overgrazed. This has led to a reduction in vegetation cover, to soil compaction, and to severe sheet and rill erosion. In 1982, one innovative land user began to set up half a hectare vineyard/fruit plot with intensive grass/fodder production for cut-and-carry and also a separate section above for hay making - by his own initiative. By the application of various conservation measures, within five years an area exposed to severe water erosion was converted into an area of sustainable use. Fodder and fruits are now flourishing and the natural resources of soil and water are conserved more effectively.
The start of the process was fencing of the plot to keep out animals. Scrap metal and other materials from a machinery depot were used to build a 1.5 m high fence. To harvest and hold runoff water from the hillside for grapes and fruit trees, narrow backsloping terraces were constructed, each with a water retention ditch along the contour. During the initial phase, the terraces did not harvest enough water for establishment of the seedlings. So water for supplementary irrigation was carried to the plot by donkeys in old inner tubes from car tires. Manure is applied to the plot to improve soil fertility. The manure is collected on the high pastures where the herders graze their animals during summer. The total amount of manure applied to the plot so far amounts to about 3 t/ha over 20 years.
The establishment of such a plot is very demanding in terms of manpower. However within 5-6 years the system becomes self-sustaining and the productivity of the land is improved several times over. Following this positive experience, other households in the area have adopted the technology spontaneously, and today about 15 ha of degraded grazing land in the Varzob valley have been converted into productive fruit gardens.
For the innovator, his most valuable fruits are grapes, followed by apricots, almonds and plums. He has also successfully grown mulberry, pomegranate and cherry trees. Not all the seedlings survive: the farmer considers a 40% survival rate of grape vines to be reasonable. The fruit harvest is mainly used for home consumption. However, in a good year the table grapes and apricots are sold on the market. The hay harvest, from naturally regenerated grasses and fodder plants between the fruits amounts on average to 0.2 t/ha/year. The pruned branches from the vines are collected and used as firewood.

Location: Khagatai, Varzob,
Technology area: 0.15 km^2
Conservation measure: agronomic, vegetative, structural, management
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Experiments -
Climate: subhumid
WOCAT database reference: TAJ004e
Related approach: Farmer innovation and self-help group (TAJ04)
Compiled by: Murod Ergashev, CAMP- Central Asian Mountain Partnership Program
Date: 18th Jan 2011 updated 11th Jul 2011

Classification

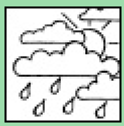
Land use problems: shortage of cultivable land on the gentle slopes next to the rivers - low yield of natural pastures due to overgrazing - heavy erosion taking place near residential areas

Land use



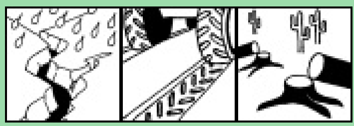
Agro-silvopastoralism
Full irrigation

Climate



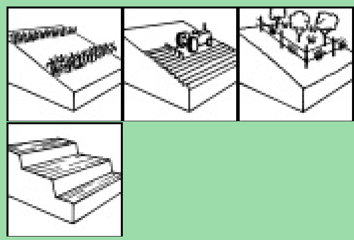
subhumid

Degradation



Biological degradation: reduction of vegetation cover, Physical soil deterioration: compaction, Soil erosion by water: loss of topsoil / surface erosion

Conservation measure



Vegetation/soil cover, Tree and shrub cover, Change of land use type

Stage of intervention

- ☐ Prevention
- ☐ Mitigation / Reduction
- ■ Rehabilitation

Origin

- ☐ Land user's initiative
- ■ Experiments / Research
- ☐ Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: medium

Main causes of land degradation:

Main technical functions:
- improvement of ground cover
- increase in organic matter
- increase in nutrient availability (supply, recycling)
- retain/trap dispersed runoff
- increase in soil fertility

Secondary technical functions:
- reduction of slope angle
- water harvesting / increase water supply
- reduction in wind speed
- retain/trap concentrated runoff (prevention of gully erosion)

Environment

Natural Environment

Average annual rainfall (mm)

- ☐ > 4000 mm
- ☐ 3000-4000 mm
- ☐ 2000-3000 mm
- ☐ 1500-2000 mm
- ☐ 1000-1500 mm
- ■ 750-1000 mm
- ☐ 500-750 mm
- ☐ 250-500 mm
- ☐ < 250 mm

Altitude (m a.s.l.)

- ☐ > 4000
- ☐ 3000-4000
- ☐ 2500-3000
- ☐ 2000-2500
- ☐ 1500-2000
- ■ 1000-1500
- ☐ 500-1000
- ☐ 100-500
- ☐ <100

Landform

- ☐ plateau / plains
- ☐ ridges
- ■ mountain slopes
- ☐ hill slopes
- ☐ footslopes
- ☐ valley floors

Slope (%)

- ☐ flat
- ☐ gentle
- ☐ moderate
- ☐ rolling
- ■ hilly
- ☐ steep
- ☐ very steep

Soil depth (cm)

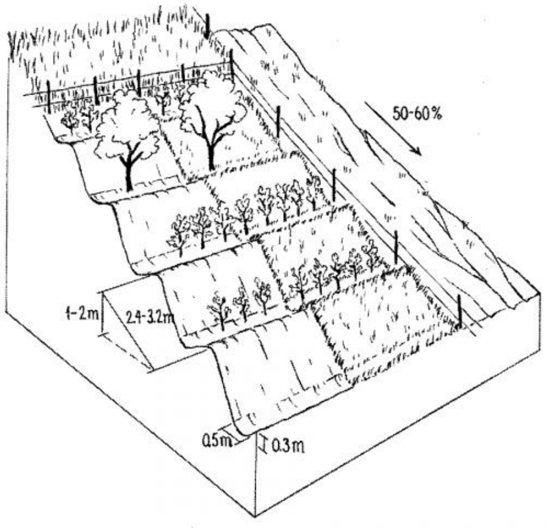
- ■ 0-20
- ☐ 20-50
- ☐ 50-80
- ☐ 80-120
- ☐ >120

Growing season(s): 210 days (March-October)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Human Environment

Land ownership: state
Land use rights: communal (organised)
Importance of off-farm income: 10-50% of all income: 50% of the families' total income comes from three sons working in Moscow

Access to service and infrastructure:
Market orientation: subsistence (self-supply)



Technical drawing

The fenced-off agroforestry system comprising fruit trees and cereals grown on a steep hillside. Terracing is crucial for water conservation. Grass cover (right) is established for fodder production and simultaneous soil conservation. Note the adjacent plot for haymaking (above) and degraded rangeland outside the protected area (right). (Mats Gurtner)

Implementation activities, inputs and costs

Establishment activities

- Planting of vines and fruit tree seedlings (apricot, plums, almonds)
- Fencing of an area of 0.5 ha using waste material from a machinery depot.
- Construction of backward sloping bench terraces.

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	600.00	100%
Equipment		
- machine use	50.00	100%
- animal traction	200.00	100%
Construction material		
- tools (shovels, hoes)		%
- scrap metal		%
Agricultural		
- seedlings	40.00	100%
- grape vines	1500.00	100%
- manure (kg)	300.00	100%
TOTAL	**2690.00**	**100.00%**

Maintenance/recurrent activities

- Harvesting of fruits and fodder: transport of the yield to the house by donkey
- Irrigation of new seedlings.
- Irrigation (old inner tubes filled with water carried to the plot by donkeys). - In summer: 5 litres of water per tree, per week.
- Manuring: applied at first to the newly planted vines/trees only, with restricted availability. During the second half of the establishment phase also applied elsewhere within the plot
- Manuring, when replacing grapes or trees that had died.
- Grapes and trees pruned
- Vines and trees that fail are replaced.
- Repairs to the fence

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	180.00	100%
Agricultural		
- seedlings	20.00	100%
- grape vines	150.00	100%
- manure (kg)	20.00	100%
TOTAL	**370.00**	**100.00%**

Remarks: Labour cost per day is US$2. The fence constructed by the farmer was free because he utilised scrap from a machinery depot. Note that the total length of fencing is relatively less for a larger plot. In the villages, almost no money changes hands: there is a barter system between the farmers. Even salaries are often paid in terms of fruits, wood or free rent of land. Costs were calculated per ha.

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increase in fruit production
++ increase in production of high quality fodder
+ increased wood production
+ increased farm income

Production and socio-economic disadvantages

+++ labour constraints:
+ increased input constraints

Socio-cultural benefits

+++ knowledge conflict mitigation
+ community institution strengthening

Socio-cultural disadvantages

++ socio cultural conflicts

Ecological benefits

+++ increased soil moisture
+++ improved excess water drainage
+++ improved soil cover
+++ reduced soil loss
+++ increase in soil fertility
++ biodiversity enhancement

Ecological disadvantages

Off-site benefits

++ reduced transported sediments
+ educed flooding of the road at the bottom of the slope

Off-site disadvantages

+ increased risk of landslides due to water harvesting

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	negative	positive
Maintenance/recurrent	negative	very positive

Acceptance/adoption:

2% of land user families have implemented the technology voluntary.
There is moderate trend towards (growing) spontaneous adoption of the technology. Adoption was spontaneous in all cases and there are signs of further spread.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Rehabilitation of degraded areas: reduced soil erosion and increased productivity →Complement manure inputs by using other fertilisers.
2) Production increase: good fruit yields →Introduce low input demanding crops
3) Diversification: different kinds of fruit trees growing on the plot →Other trees (nuts for example) and annual crops such as wheat might also be suitable for this area.
4) Income generation.

Weaknesses and →how to overcome

Specialists' opinion:

1) Bringing water for supplementary irrigation to the orchard is very labour intensive →An irrigation supply system could be installed (irrigation channels, water tank). But so far this is too expensive, and it is questionable whether irrigation could be installed and maintained sustainably
2) Not all tree species can grow in these dry conditions (for example apple trees will not survive without regular irrigation or watering) →irrigation water required (see above).
3) Difficulty in establishment of the young vines in the well developed grass →Remove or cut down grass and herbaceous plants around the vines at least until they have been well established.
4) Generally high manual labour input →Difficult to reduce labour inputs.

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NCCR North South, 131, Rudaki Ave., apt. 31 Dushanbe 734003, www.nccr-central-asia.org.

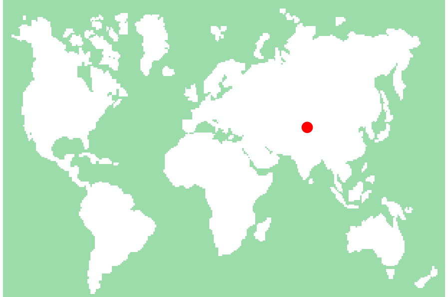
left: Intercropping of wheat in an existing apricot orchard (Photo: Erik Bühlmann)
right: Overview of SWC field (Photo: Erik Bühlmann)

Orchard-based Agroforestry (intercropping)

Tajikistan – NCCR North-South

Intercropping of wheat in an existing orchard that was established during the Soviet period.

The technology involves intercropping wheat in an existing apricot orchard, that was established during soviet times to increase farm production, by integrating different resources in an environment protected from soil erosion. The intercropped area is ploughed by tractor. In general, farmers do not practice crop rotation since they usually allocate cereal production to the most fertile field plots of their farm. Along the trees aligned on contour, a three metre wide grass strip is left uncultivated to control runoff, and to protect the ground from splash erosion. Spacing between rows is 13 metres, which allows unhindered farm operations. Most orchards in Faizabad Rayon were established during Soviet times. Tree rows were planted close together in order to obtain maximum yields from the orchard monoculture systems. Some of the tree rows were removed, allowing more space for intercropping.
The technology is applied in existing orchards which generally range between 10-25% in gradient. In existing orchards, intercropping alone is relatively cost intensive. Harvesting two crops at a time increases overall farm production and improves food security since harvests of intercropped food crops are found to be more reliable than those on exposed annual cropland. However, many orchards are still owned by state farms which usually do not practice intercropping. Since management of fruit trees require considerable labour and material inputs (e.g. chemicals for pest/disease control as well as fertilisers) which often cannot be met by farmers, yields of fruit trees have declined after the privatisation of these areas. Furthermore, farmers often lack knowledge of appropriate orchard management techniques and miss opportunities to gradually replace old trees by new seedlings.



Location: Faizabad Rayon
Region: RRS
Technology area: 1 - 10 km2
Conservation measure: agronomic
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user -
Climate: subhumid
WOCAT database reference: TAJ007e
Related approach: not documented
Compiled by: Erik Bühlmann, CDE Centre for Development and Environment
Date: 08th Mar 2011 updated 12th Jul 2011

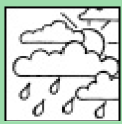
Classification

Land use problems: fertility decline, soil erosion and washing downslope of seeds before they can sprout severe water erosion (rills and gullies) and subsequent fertility decline on cropland and overgrazed pastures

Land use

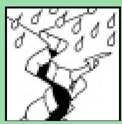
Annual cropping
Agroforestry
Rainfed

Climate



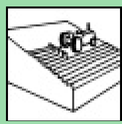
subhumid

Degradation



Soil erosion by water: loss of topsoil / surface erosion

Conservation measure



Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land user's initiative
- Experiments / Research
- Externally introduced

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main technical functions:
- control of dispersed runoff: impede / retard
- control of concentrated runoff: impede / retard
- reduction of slope length

Secondary technical functions:
- increase of infiltration
- increase / maintain water stored in soil

Environment

Natural Environment

Average annual rainfall (mm)

- > 4000 mm
- 3000-4000 mm
- 2000-3000 mm
- 1500-2000 mm
- 1000-1500 mm
- 750-1000 mm
- 500-750 mm
- 250-500 mm
- < 250 mm

Altitude (m a.s.l.)

- > 4000
- 3000-4000
- 2500-3000
- 2000-2500
- 1500-2000
- 1000-1500
- 500-1000
- 100-500
- <100

Landform

- plateau / plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Slope (%)

- flat
- gentle
- moderate
- rolling
- hilly
- steep
- very steep

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): days ()
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

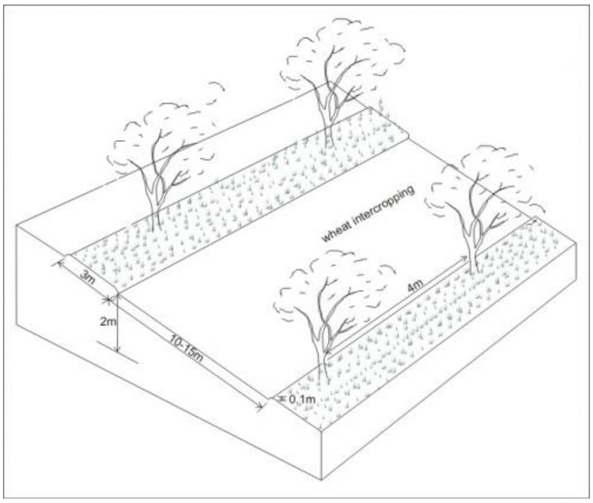
Human Environment

Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15

Land ownership: state
Land use rights: leased
Relative level of wealth: average - 75% of land users; owns 70% of the total land area

Importance of off-farm income: > 50% of all income: In general, all farmers (including those applying SWC technologies) are highly dependent on off-farm income, which in most cases is earned in Russia either by themselves or by their relatives.
Market orientation: subsistence (self-supply)
Mechanization: manual labour



Technical drawing

Intercropping of wheat between apricot trees aligned on contour (Erik Bühlmann)

Implementation activities, inputs and costs

Establishment activities

- acquiring land use rights for existing orchard lands from local authorities
- establishment of apricot orchard by state enterprise
- thinning and clearing of tree rows

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Equipment		
- tools	25.00	100%
Other		
- labour (thinning/clearing of t	6.00	100%
TOTAL	**31.00**	**100.00%**

Maintenance/recurrent activities

- applying of fertiliser
- disc ploughing (area for intercropping)
- harvesting
- sowing (winter wheat)
- applying manure for fruit trees
- cutting of grass strip
- pruning of fruit trees
- removal of twigs affected by insects/diseases

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Equipment		
- machine use	20.00	100%
Agricultural		
- seeds	30.00	100%
- fertilizer	50.00	100%
- compost/manure	40.00	100%
Labour		
- labour (sowing and weeding)	18.00	100%
- labour (pruning of fruit trees	45.00	100%
- labour (cutting of twiggs affe	15.00	100%
TOTAL	**218.00**	**100.00%**

Remarks: The number of trees influences costs considerably, since orchard management is labour and input intensive per hectare (with the described spacing of trees and tree rows)

WOCAT

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased crop yield
+++ increased farm income

Production and socio-economic disadvantages

+++ increased input constraints
++ reduced fruit production
+ decreasing fruit yields
+ hindered farm operations

Socio-cultural benefits

Socio-cultural disadvantages

Ecological benefits

Ecological disadvantages

++ increased soil erosion locally

Off-site benefits

Off-site disadvantages

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption:

100% of land user families have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology. In general, there is a growing demand for orchard land for intercropping. However, a considerable amount of orchards are still managed by state farms which usually do not maintain intercropping systems.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) low costs for establishment (intercropping only)
2) wheat production with very little soil erosion
3) intercropping can improve food security of low income families

Land users' opinion:

1) two harvests at a time - increase in farm production
2) good wheat harvests in intercropping systems

Weaknesses and →how to overcome

Specialists' opinion:

1) productive orchard systems require considerable amounts of recurrent inputs (e.g. chemicals for pest/disease control, fertiliser) which locals often cannot afford
2) in comparison to orchards with an intact grass cover, intercropping of sparsely growing plant species increases the risk of soil erosion →avoiding intercropping of sparsely growing crops in vulnerable intercropping systems; improving ground cover by mulching
3) intercropped wheat hinders maintenance activities of fruit trees

Land users' opinion:

1) yield of fruit trees insufficient because required inputs are not affordable
2) Insufficient yields of intercropped plants because of shadow of old/large fruit trees →gradually replace old trees by new seedlings
3) orchard systems vulnerable to pests, late frost and strong winds

Contact person: Wolfgramm, Bettina, NCCR North-South, CDE University of Bern, Hallerstrasse 10, CH-3012, Bern, Switzerland, e-mail: bettina.wolfgramm@cde.unibe.ch, www.north-south.unibe.ch

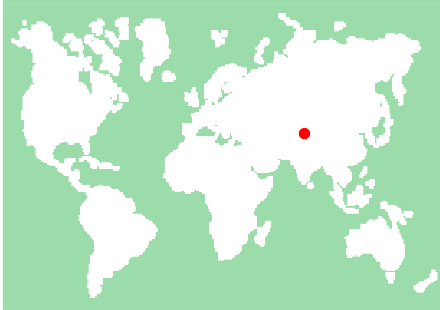
left: Overview of a SWC field and next to it, degraded pasture and a haymaking field. Similar gullies and rills were on the cropland as well, prior to establishment of the orchard (Photo: Erik Bühlmann)
right: Irrigated orchard system established on severely degraded cropland (Photo: Erik Bühlmann)

Orchard-based Agroforestry (establishment of orchard)

Tajikistan - NCCR North-South, Tajik Soil Institute

Establishment of an orchard intercropping system on severely degraded cropland.

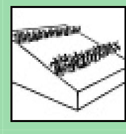
A fruit orchard (consisting of apples, apricots, cherries, pears and nut trees) was established on degraded cropland. Intercropping of annual crops such as wheat, flax, chick peas and vegetables as well as perennial herbaceous fodder plants (alfalfa and esparcet) were planted after the first year of the establishment of the orchard. Only the onion plot is rotated systematically since the farmer stated that fertility declines due to heavy soil losses resulting from over irrigation. Spacing of tree rows varies between 8-10m; the intercropping system is cultivated using a tractor. Fruit trees are aligned in the direction of the slope to facilitate irrigation. At the top of the field, an irrigation channel (40cm wide, 15cm deep) stabilised with aligned poplar trees directs water onto the orchard system. During the rainy season the channel serves as a cut-off drain, protecting the land from water running on. Along the trees, a 2.5 m wide grass strip protects the ground from splash erosion.
The orchard system was established to increase farm production by integrating different resources, while simultaneously conserving soil and water resources and preventing development of gullies. Prior to tree planting, the area had been leveled with a bulldozer to restore the severely degraded cropland. The bought seedlings were planted in hand-dug pits. During summer, the orchard system is watered three days per week; manure is applied around the fruit trees on an annual basis. Pruning of the trees is done in early spring. Due to irrigation, the grass strips can be harvested twice a year for haymaking. Farming two crops at a time means gross farm production could be considerably increased, which is the reason why the farmer considered the technology successful. However, establishment and maintenance of the technology is cost intensive and, in this case study, was only affordable due to the farmer's off-farm income. Since the tree rows are aligned up and down the slope, soil erosion is solely reduced by the capability of the irrigation channel (and aligned tree barrier) to prevent the system from runon. Planting tree rows on the gradient would increase the technologies potential to reduce soil loss.



Location: RRS
Region: Faizabad Rayon
Technology area: 0.1 - 1 km2
Conservation measure: vegetative
Stage of intervention: prevention of land degradation
Origin: Experiments -
Climate: subhumid
WOCAT database reference: TAJ008e
Related approach: Voluntary Labour Assistance (TAJ05)
Compiled by: Erik Bühlmann, CDE Centre for Development and Environment
Date: 08th Mar 2011 updated 11th Jul 2011

Classification

Land use problems: severe water erosion (gullies and rills) and subsequent decline in fertility on cropland and on overgrazed pastures.

Land use	Climate	Degradation	Conservation measure
			
Annual cropping Agroforestry Full irrigation	subhumid	Soil erosion by water: gully erosion	Structural

Stage of intervention

- ■ Prevention
- ▒ Mitigation / Reduction
- □ Rehabilitation

Origin

- □ Land user's initiative
- ■ Experiments / Research
- □ Externally introduced

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:

Main technical functions:
- control of concentrated runoff: drain / divert
- improvement of ground cover
- stabilisation of soil (eg by tree roots against landslides)

Secondary technical functions:
- control of raindrop splash
- increase in organic matter

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- □ 1000-1500 mm
- ■ 750-1000 mm
- □ 500-750 mm
- □ 250-500 mm
- □ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- ▒ 1500-2000
- ■ 1000-1500
- □ 500-1000
- □ 100-500
- □ <100

Landform

- □ plateau / plains
- □ ridges
- □ mountain slopes
- ■ hill slopes
- □ footslopes
- ▒ valley floors

Slope (%)

- □ flat
- □ gentle
- □ moderate
- ▒ rolling
- ■ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- □ 20-50
- □ 50-80
- □ 80-120
- ■ >120

Growing season(s): 210 days (March - August)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

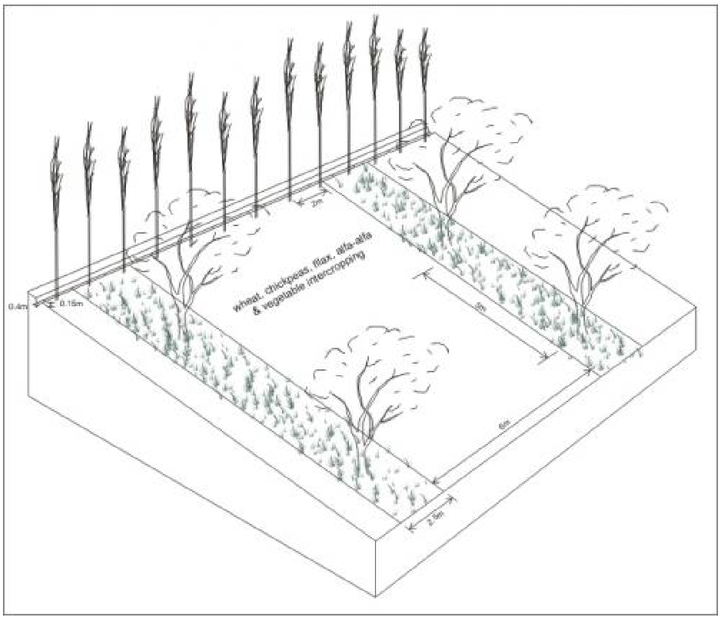
Human Environment

Cropland per household (ha)

- □ <0.5
- □ 0.5-1
- ■ 1-2
- ▒ 2-5
- □ 5-15

Land ownership: state
Land use rights: leased
Relative level of wealth: average - 75% of land users; owns 70% of the total land area
Importance of off-farm income: > 50% of all income: In general, all farmers (including those applying SWC technologies) are highly dependent on off-farm incomes, which in most cases is earned in Russia, either by themselves or by their relatives.

Market orientation: subsistence (self-supply)
Mechanization: manual labour



Technical drawing

Irrigated orchard system with intercropping; irrigation channel (stabilised by aligned poplar trees) also acts as a cut-off drain to prevent runon. (Erik Bühlmann)

Implementation activities, inputs and costs

Establishment activities

- acquiring tree seedlings on market or at Sovkhoz
- digging of pits
- planting seedlings in pits
- sowing of esparcet and alfalfa (grass strips) to get intact grass cover
- digging of irrigation channel
- land leveling and filling up of gullies

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Equipment		
- tools	25.00	100%
- labour (land levelling)	150.00	100%
Construction material		
Agricultural		
- seedlings	250.00	100%
- cutting poplar trees	0.00	100%
Labour		
- labour (land levelling)	45.00	100%
TOTAL	**470.00**	**100.00%**

Maintenance/recurrent activities

- applying manure around fruit trees
- applying of mineral fertilisers
- ploughing of area between tree rows (disc plough)
- weeding
- application of manure
- application of pesticides
- cutting of grass (haymaking)
- periodical irrigation (3x a week)
- pruning of fruit trees
- clearing of irrigation channel/cut-off drain from washed in soil
-

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Equipment		
- labour (ploughing of area for	20.00	100%
Agricultural		
- seeds	30.00	100%
- fertilizer	50.00	100%
- biocides	10.00	100%
- compost/manure	40.00	100%
Labour		
- labour (sowing and weeding)	18.00	100%
- labour (pruning of fruit trees	30.00	100%
- Labour(spraying trees with bio	12.00	100%
TOTAL	**210.00**	**100.00%**

Remarks: Number of trees planted: since their establishment and maintenance requires considerable financial and labour inputs; expenditures for tree seedlings bought from the market: N.B. if nursing the trees is completed by land user himself, establishment costs can be halved.
Costs were calculated per one ha field plot (with a projected 200 fruit trees/ha)

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased crop yield	++ moderate fruit yields
+++ increased farm income	+ loss of land
	+ hindered farm operations

Socio-cultural benefits	Socio-cultural disadvantages
++ knowledge conflict mitigation	++ socio cultural conflicts

Ecological benefits	Ecological disadvantages
+++ prevention of land from gullies and large rills	
++ improved soil cover	
++ reduced soil loss	
+ increased soil moisture	
+ improved excess water drainage	
+ reduced wind velocity	

Off-site benefits	Off-site disadvantages
+ reduced downstream flooding	

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	very positive
Maintenance/recurrent	positive	very positive

Acceptance/adoption:

100% of land user families (20 families; 100% of area) have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and → how to sustain/improve

Specialists' opinion:

1) increases soil fertility → consequent mulching would increase the organic matter content of the soil, and hence soil fertility
2) orchard system is protected from runon
3) effectively prevents formation of gullies and large rills
4) significant increases in gross farm production
5) effective way of rehabilitating bad lands

Land users' opinion:

1) increase in overall farm income
2) prevention of gully and large rill erosion

Weaknesses and → how to overcome

Specialists' opinion:

1) high establishment and maintenance costs → if nursing of tree seedlings is carried out by the land user himself, establishment costs can be reduced
2) does not prevent soil erosion, soil losses especially where irrigated → By planting tree rows on gradient (not up and down the slope)
3) management of orchard systems requires considerable inputs which often cannot be afforded by poor people

Land users' opinion:

1) fruit trees vulnerable to pests, frost and strong winds

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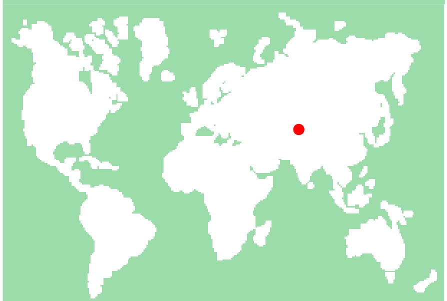
Bettina Wolfgramm, NCCR North-South, CDE University of Bern, Hallerstrasse 10, CH-3012, Bern, Switzerland, e-mail: bettina.wolfgramm@cde.unibe.ch, www. north-south.unibe.ch.

left: Planting of fruit trees on a steep slope above the village settlement. (Photo: S. Stevenson)
right: Planting of fruit tree with contour irrigation channels. (Photo: Shane Stevenson)

Planting of fruit trees to increase slope stabilisation.
Tajikistan - Tajik Soil Institute



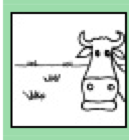
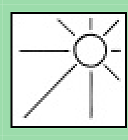
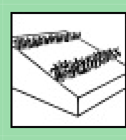
<u>Location</u>: Tajikistan,
<u>Region</u>: Nurobod
<u>Technology area</u>: 0.1 km^2
<u>Conservation measure</u>: vegetative
<u>Stage of intervention</u>: mitigation / reduction of land degradation, rehabilitation / reclamation of denuded land
<u>Origin</u>: Externally - recent (<10 years ago)
<u>Land use</u>: Grazing land: Extensive grazing land (before), Forests / woodlands: Plantations, afforestations (after)
<u>Climate</u>: semi-arid, temperate
<u>WOCAT database reference</u>: TAJ111e
<u>Related approach</u>: Selection of SLM Technologies for Natural Disaster Risk Mitigation (TAJ020)
<u>Compiled by</u>: Gulniso Nekushoeva, Tajik Academy of Agricultural Sciences
<u>Date</u>: 16th Mar 2011 updated 11th Jul 2011

Planting fruit tree orchards to increase the stability of the steep loess soil slopes.

This technology involved the planting of several varieties of native fruit trees to help stabilise steep loess mountain slopes. Seven species of fruit tree were planted in seven different locations, in two watersheds within the district of Nurobod in Tajikistan. The locations were chosen as a result of a natural disaster workshop that identified the areas most susceptible to landslides. In consultation with the Institute of Horticulture a fruit tree planting scheme was devised and using project money the identified area was enclosed with a wire perimeter fence. The fruit trees were planted along irrigation contours running at shallow angles parallel to the slope.
The best locations for planting the fruit trees were decided via a participatory community workshop on natural disaster risk management. During the workshop the community identified areas around the village that were considered high risk. A fruit tree planting scheme was implemented in these areas to help stabilise the slopes, reduce surface water run off and top soil erosion, and reduce the risk of landslides. As the trees grew they were intercropped with wheat and espercet. Several 'at risk' areas were identified within these workshops, therefore the project team had to assess the areas for suitability, Two of the main criteria used included; the access to water and if there was sufficient depth of top soil to sustain a fruit orchard. Once the area was decided upon, a Memorandum of Understanding (MoU) was signed with the particular land user. It was made clear to the community that the land was chosen based upon the decisions from the workshop and not because of any form of favouritism towards the land user. The MoU stated that the land user was responsible for the planting and upkeep of the orchards. The Horticultural Institute devised a planting a scheme based upon the location and soil type. The implementation activities occurred in early spring. A continuous wire fence was erected around the area, and the fruit trees were planted at five metre intervals along a dug contour irrigation ditch. One kilo of organic fertiliser was applied to each tree and later in the season they were sprayed with pesticides.
Nurobod district is a mountainous area, with large tributaries flowing into the Vasht river. There are mass erosion processes at work, causing gullies and washing away of top soil. The previous civil war, compounded by harsh winters resulted in extensive clearance of the surrounding vegetation for fuel. These areas have became further degraded by over grazing on the remaining grass lands. The local population suffers from high levels of labour migration of young men to Russia and resulting in a drain of knowledge and able bodied workers. This leaves the remaining families particularly vulnerable in this specific climate.

Classification

Land use problems: The land has become unusable, it was used as pasture land but every year it seems to be getting worse. The steep loess slopes are devoid of vegetation, therefore the land is prone to washing away of top soil, gulley formation, and potential landslides.

Land use	Climate	Degradation	Conservation measure
			
Extensive grazing land Grazing land: Extensive grazing land (before) Forests / woodlands: Plantations, afforestations (after) Mixed rainfed - irrigated	semi-arid, temperate	Soil erosion by water: mass movements / landslides, Soil erosion by water: gully erosion, Soil erosion by water: loss of topsoil / surface erosion	Tree and shrub cover

Stage of intervention

- ▒ Prevention
- ■ Mitigation / Reduction
- ■ Rehabilitation

Origin

- □ Land user's initiative
- □ Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: low
Land user: low

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use
Indirect causes: war and conflicts

Main technical functions:
- improvement of ground cover

Secondary technical functions:
- control of dispersed runoff: retain / trap
- control of dispersed runoff: impede / retard
- spatial arrangement and diversification of land use

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- ■ 1000-1500 mm
- □ 750-1000 mm
- □ 500-750 mm
- □ 250-500 mm
- □ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- □ 1500-2000
- ■ 1000-1500
- □ 500-1000
- □ 100-500
- □ <100

Landform

- □ plateau / plains
- □ ridges
- ■ mountain slopes
- □ hill slopes
- □ footslopes
- □ valley floors

Slope (%)

- □ flat
- □ gentle
- □ moderate
- □ rolling
- □ hilly
- ■ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- □ 20-50
- □ 50-80
- □ 80-120
- ■ >120

Growing season(s): 200 days (March - October)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: medium

Soil water storage capacity: high
Ground water table: 5 - 50 m
Availability of surface water:
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: Not known
Sensitive to climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), droughts / dry spells, increase in pests

If sensitive, what modifications were made / are possible: The technology initially used 7 species of trees. However after a while it became apparent that the peach trees were more sensitive to heavy rainfall which occurred especially in the spring, and therefore when the orchards were expanded peach trees were not planted again. Land owners have also planted espercet and wheat between the trees to help further stabilise the slopes.

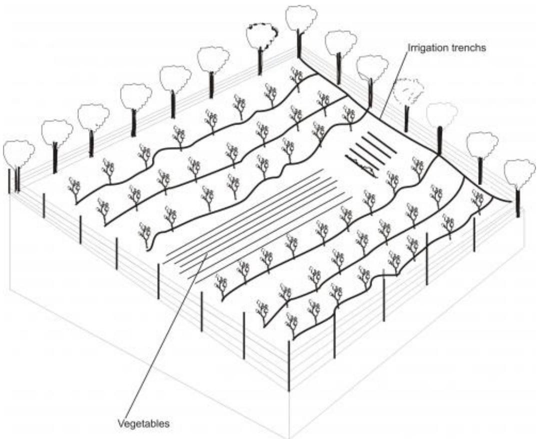
Human Environment

Grazing land per household (ha)

- <0.5 (selected)
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500

Land user: Individual / household, Small scale land users, common / average land users, mixed
Population density: 10-50 persons/km2
Annual population growth: 2% - 3%
Land ownership: state, individual, not titled
Land use rights: communal (organised) (All land in Tajikistan is owned by the state, user rights are defined here by the local government.)
Water use rights: (All land in Tajikistan is owned by the state, user rights are defined here by the local government.)
Relative level of wealth: poor - 45% of land users; owns 15% of the total land area

Importance of off-farm income: > 50% of all income: Most households in this district receive remittances from abroad.
Access to service and infrastructure: low: health, education, technical assistance, employment, market, energy, roads & transport, drinking water and sanitation, financial services
Market orientation: subsistence (self-supply)
Livestock density: 1-10 LU /km2



Technical drawing

The drawing shows a perimeter fence enclosing terraces of fruit trees. The trees are irrigated through a contour trench running at a shallow angle perpendicular to the slope. The land users have taken the opportunity to optimise the cultivated land by planting perennial and wheat crops between the rows of trees. (Pjotr M. Sosin)

Implementation activities, inputs and costs

Establishment activities

- Erection of fence
- Planting of fruit trees.

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	377.00	100%
Equipment		
- tools	26.60	0%
Construction material		
- metal fence and posts	1066.00	0%
Agricultural		
- seedlings	800.00	0%
- compost/manure	50.00	100%
TOTAL	**2319.60**	**40.00%**

Maintenance/recurrent activities

- Pruning and tree care

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	55.00	100%
TOTAL	**55.00**	**100.00%**

Remarks: The main issue was the procurement of the fruit trees from a reliable credible source. Since the start of the project, land users purchased trees from local tree nurseries but the trees were of poor quality and some already had signs of disease. The scarcity of natural resources, and the lack of controlled grazing means that wire fencing had to be used, This could only be purchased outside of the district and thus incurred high transport costs. The costs were calculated at 2010 prices for 400 trees planted over 1 h.a.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased wood production +++ increased farm income +++ increased product diversification +++ New skills in fruit tree cultivation ++ diversification of income sources	

Socio-cultural benefits	Socio-cultural disadvantages
+++ improved food security self sufficiency +++ improved community knowledge of fruit tree cultivation ++ knowledge conflict mitigation ++ improved health	

Ecological benefits	Ecological disadvantages
+++ reduced surface runoff +++ reduced hazard towards adverse events ++ increased nutrient cycling recharge ++ increased beneficial species	

Contribution to human well-being/livelihoods

++ Training on fruit tree cultivation was provided for the community in conjunction with the implementation of the planting of the trees, to help improve the fruit yields in the community and the health of the trees.

Benefits/costs according to land user

It can take 3-12 years before the fruits can be harvested, depending upon the variety. The trees will require more care and attention in the first few years to ensure their long term survival.

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	positive
Maintenance/recurrent	negative	slightly positive

Acceptance/adoption:

100% of land user families (7 families; 100% of area) have implemented the technology with external material support. All seven families implemented the technology. There is no trend towards (growing) spontaneous adoption of the technology. Nothing has been physically monitored but there was lively discussion in the community about expanding the planting areas.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) It helped stabilise the soil and reduce the risk of mudslides. →Other identified areas could be planted with trees.
2) It helped to reduce the rates of surface water top soil erosion. →The area of land could be extended.
3) The fencing helped protect the technology from grazing livestock. →The fruit trees within the fence can be intercropped with perennial grasses or other crops.
4) It provides long term food and potential income for the land user.

Land users' opinion:

1) It has made efficient use of the land that was previously used for grazing of livestock.
2) I have planted espercet in within the fence line, to improve my fodder production.
3) I learnt how to care for the trees in the training provided. →Further ongoing professional support for the land user would be beneficial.

Weaknesses and →how to overcome

Specialists' opinion:

1) The areas identified to be stabilised do not always have access to water and therefore the technology is limited. →Piped irrigation and drip irrigation techniques could be applied.
2) The land owner does not have any returns on the initial investment for a minimum of three years. Also they will have to pay tax on the land after three years. Some trees will not produce fruits for up to 12yrs. →Loans or subsidies could be provided to the land user over this initial period of time.

Land users' opinion:

1) There are tree diseases in the district, which may spread to the fruit trees and many locals cannot afford the pesticides required to help prevent these. →Pesticides could be provided by larger farms or cooperatives could be set up.
2) The livestock broke through the fence and ate some of the saplings. →In some instances double fencing may be required.

Contact person: Nekushoeva, Gulniso, Tajik Soil Institute, Rudaki ave., 21a, Dushanbe 734025, gulniso@mail.ru

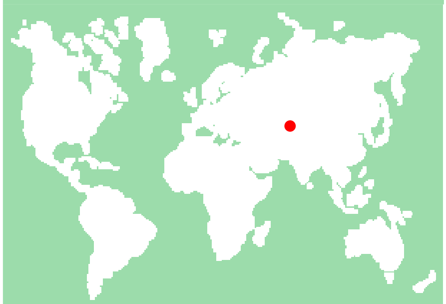
Rehabilitation of poor soils through agroforestry

left: Plastic sheets to maintain soil humidity around melon crops (Photo: Julie Zähringer)
right: Agroforestry plot on formerly denuded land in a highly arid environment (Photo: Julie Zähringer)

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

An agroforestry system with peach, plum, sweet cherry and persimmon trees was established on a plot of land, with poor soil quality.

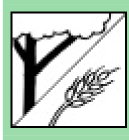
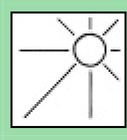
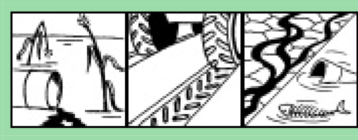
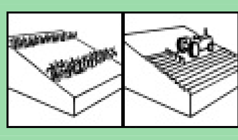
In the arid environment of Kabodion, large areas that had been irrigated during the Soviet times were abandoned after independence, and the irrigation facilities were neglected. Soils were highly degraded due to the long periods they had been without proper irrigation. On an area of abandoned land with poor quality soil covering about 6 ha UNDP supported one family (Dehkan) to establish an agroforestry plot, by covering the costs of tree seedlings.
The aim of the technology was to improve agricultural production through a combination of measures such as improving soil fertility, increasing soil humidity by covering the soil with plastic sheets and preventing excess water drainage, and protection through a shelterbelt. Resilience to adverse climatic events is enhanced by increasing product diversification with a number of different tree, vegetable and crop species being planted.
First, the soil had to be washed to reduce the high salt content. Plum, peach, sweet cherry and persimmon tree seedlings were planted in lines with intercropping of potatoes, watermelon, beans and wheat in between. The seedlings were purchased from the Kabodion nursery. Labour was provided in the form of "hashar" or voluntary neighbourhood help. On the windward side of the field, a shelterbelt consisting of White Poplar (Populus alba) trees was established to protect the field from wind erosion and to reduce evapotranspiration. In order to improve soil structure annual crop rotations were practiced. Every 4 years 40 tones of cow dung are spread out per ha of land. The application of organic manure constitutes an important cost factor for the farmer, as 40 tons of manure costs about 180 to 220 USD. To improve soil humidity and to enable early planting for watermelons, seeds are planted under a tight plastic film with irrigation water fed underneath the sheet. As soon as the seedlings emerge a hole is made in the plastic to create space for the plants. Irrigation is applied only sparingly to prevent a new rise in salinity in the soil. The plot is situated on a gentle slope which facilitated the establishment of a drainage system by digging a trench at the foot of the field to absorb excess water. The farmer was able to cover the costs of this initial investment himself using the revenues from the first harvest. At the foot of this field, salt tolerant Russian Olive (*Elaeagnus angustifolia*) trees were planted to promote bio-drainage to help prepare the adjacent land for conversion to agroforestry at a later stage. The knowledge that was necessary for the establishment of the system was gained by the farmer through attending the farmer field schools (see approach TAJ018).
This technology is suitable for other arid environments, and the economic benefits are high compared to the establishment and maintenance costs. When this was realized by the neighbouring farmers they replicated the technology on an area of land that was actually three times larger.



Location: Khudokulov Jamoat
Region: Khatlon, Kabodion
Technology area: 0.06 km^2
Conservation measure: agronomic, vegetative
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Externally - recent (<10 years ago)
Land use: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before), Mixed: Agroforestry (after)
Climate: arid, temperate
WOCAT database reference: TAJ113e
Related approach: Farmer Field Schools (TAJ018)
Compiled by: Firdavs Faizulloev, UNDP Tajikistan
Date: 26th Apr 2011 updated 07th Jul 2011

Classification

Land use problems: salinity, waterlogging, low soil fertility, low agricultural production degradation of vegetation cover, loss of topsoil through wind erosion, poor access to irrigation water

Land use	Climate	Degradation	Conservation measure
			
Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before) Mixed: Agroforestry (after) Full irrigation	arid, temperate	Water degradation: aridification, Chemical soil deterioration: fertility decline and reduced organic matter content, Chemical soil deterioration: salinisation / alkalinisation, Physical soil deterioration: waterlogging	Vegetation/soil cover, Organic matter / soil fertility, Soil surface treatment, Tree and shrub cover

Stage of intervention

- [ ] Prevention
- [ ] Mitigation / Reduction
- [x] Rehabilitation

Origin

- [ ] Land user's initiative
- [ ] Experiments / Research
- [x] Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management
Direct causes - Natural: droughts
Indirect causes: inputs and infrastructure, education, access to knowledge and support services, governance / institutional

Main technical functions:
- control of concentrated runoff: drain / divert
- improvement of ground cover
- increase in organic matter
- increase in nutrient availability
- increase of infiltration
- reduction in wind speed

Secondary technical functions:
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Environment

Natural Environment

Average annual rainfall (mm)

- [ ] > 4000 mm
- [ ] 3000-4000 mm
- [ ] 2000-3000 mm
- [ ] 1500-2000 mm
- [ ] 1000-1500 mm
- [ ] 750-1000 mm
- [ ] 500-750 mm
- [ ] 250-500 mm
- [x] < 250 mm

Altitude (m a.s.l.)

- [ ] > 4000
- [ ] 3000-4000
- [ ] 2500-3000
- [ ] 2000-2500
- [ ] 1500-2000
- [ ] 1000-1500
- [ ] 500-1000
- [x] 100-500
- [ ] <100

Landform

- [x] plateau / plains
- [ ] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Slope (%)

- [x] flat
- [ ] gentle
- [ ] moderate
- [ ] rolling
- [ ] hilly
- [ ] steep
- [ ] very steep

Soil depth (cm)

- [x] 0-20
- [ ] 20-50
- [ ] 50-80
- [ ] 80-120
- [ ] >120

Growing season(s): 240 days (October - May (winter wheat))
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: poor (eg sealing /crusting)

Soil water storage capacity: low
Ground water table: <5 m
Availability of surface water: poor / none
Water quality: for agricultural use only
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, decreasing length of growing period
Sensitive to climatic extremes: floods, droughts / dry spells

Human Environment

Mixed land per household (ha)

	<0.5
	0.5-1
	1-2
	2-5
■	5-15
	15-50
	50-100
	100-500
	500-1,000
	1,000-10,000
	>10,000

Land user: Individual / household, medium scale land users, common / average land users
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: individual (family Dehkan farm)
Water use rights: (family Dehkan farm)
Relative level of wealth:

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: employment, energy, drinking water and sanitation, financial services; moderate: health, education, market, roads & transport; high: technical assistance
Market orientation: mixed (subsistence and commercial)

Implementation activities, inputs and costs

Establishment activities

- Planting of tree seedlings in field and along boundary
- Digging up irrigation ditch at the foot of the field

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	222.00	100%
Equipment		
- machine use	274.00	100%
Construction material		
Agricultural		
- seedlings	590.00	0%
TOTAL	**1086.00**	**67.00%**

Maintenance/recurrent activities

- Annual crop rotation
- Application of organic manure
- Cover soil around crops with plastic cover
- Tillage
- Continuous daily irrigation for tree seedlings

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	922.00	100%
Equipment		
- plastic sheet for soil cover	1.20	100%
Construction material		
Agricultural		
- compost/manure	55.00	100%
TOTAL	**978.20**	**100.00%**

Remarks:
The cost of the tree seedlings is the most determinate factor. Labour costs are high if labour has to be paid, however, in this case labour is provided free by the farmer.
Costs were calculated per ha. Labour costs for irrigation of tree seedlings were calculated assuming that one person has to irrigate daily during 6 months of the year and were included under annual recurring costs.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased crop yield +++ increased fodder production +++ increased production area +++ increased product diversification ++ reduced risk of production failure	

Socio-cultural benefits	Socio-cultural disadvantages
++ knowledge conflict mitigation ++ improved food security self sufficiency ++ improved health	+ socio cultural conflicts

Ecological benefits	Ecological disadvantages
+++ improved excess water drainage +++ reduced salinity ++ increased soil moisture ++ reduced evaporation ++ reduced wind velocity ++ improved soil cover ++ increased nutrient cycling recharge ++ increased soil organic matter below ground C ++ reduced soil compaction + increased biomass above ground C + increased plant diversity	

Contribution to human well-being/livelihoods

+++ Farmer does not need to migrate to Russia anymore to find work, and could afford to buy a house.

Benefits/costs according to land user

In the beginning the farmer was not sure about the short-term benefits, but he confirmed that even after just two years he received eight times more than what he invested initially.

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption: 100% of land user families (1 families; 100% of area) have implemented the technology with external material support.
There is strong trend towards (growing) spontaneous adoption of the technology. Already 10 other farmers, who noticed the success of this plot, have adopted this technology themselves.

Concluding statements

Strengths and → how to sustain/improve

Specialists' opinion:

1) Greatly increased income opportunity in an arid environment → disseminate knowledge to other farmers in the region
2) Diversified system and therefore reduced risk of production failure

Land users' opinion:

1) Improved livelihood as revenues are greater than those gained as a seasonal worker in Russia and enough capital produced to buy own house
2) Feeling confident about the future
3) Improved yields → continue with application of organic manure, soil cover with plastic sheets, crop rotation, integrated pest management etc.

Weaknesses and → how to overcome

Land users' opinion:

1) Increased conflicts as land users who used to cultivate this land before and gave up would now like to have the land back

Contact person: Faizulloev, Firdavs. UNDP, Area Manager, Shaartuz Area Office, 2 Ziyodaliev Street, Shaartuz, Tajikistan, e-mail: firdavs.faizulloev@undp.org, phone: (992-918) 79 52 78

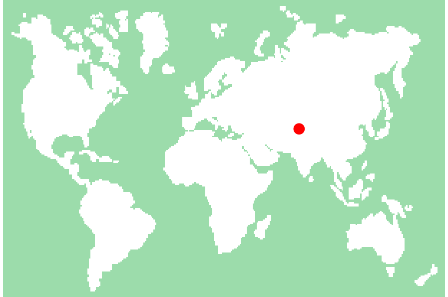
Conversion of stony slopes into an irrigated apricot orchard

Tajikistan - Tajik Soil Institute / Sustainable Land Management in the High Pamir and Pamir-Alai Mountains (PALM)

Conversion of a stony plot of land into an apricot orchard and use for production of fodder.

Before the technology was applied, this stony slope was used as a low-productive pasture. First of all, the area was cleaned of stones. The removed stones were used for construction of a fence around the plot. An irrigation canal was built along the upper border of the plot. An irrigation trench was dug across the slope. No planting of this stony surface was carried out. Apricot trees were planted along the drainage ditches. Perennial herbaceous fodder plants such as alfalfa and esparzet were intercropped in the apricot orchard.
The purpose of the technology is to increase productivity of these stony slopes with the use of irrigation, and intercropping with perennial herbaceous fodder plants in the apricot orchard.
Removing stones from the plot, construction of a fence, construction of an irrigation canal, construction of drainage ditches across the plot, planting trees, ploughing the intercropped area, and planting perennial fodder plants.
The plot is located in an arid zone, and 60% of the surface is covered with stones. Vegetation cover mostly consists of ephemers which have a short growing period. The land is used as summer, low productive pastures.

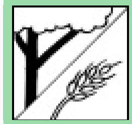
left: General view of the apricot orchard (Photo: Bettina Wolfgramm)
right: Sheaves of esparzet in apricot orchard (Photo: Sosin Pjotr)



Location: Jovid, Vanj
Region: GBAO
Technology area: 0.2 km^2
Conservation measure: vegetative
Origin: Experiments - 10-50 years ago
Land use: Grazing land: Extensive grazing land (before), Mixed: Agroforestry (after)
Climate: arid, subtropics
WOCAT database reference: TAJ365e
Related approach: not documented
Compiled by: Pjotr M Sosin, Tajik Academy of Agricultural Sciences
Date: 12th May 2011 updated 11th Jul 2011

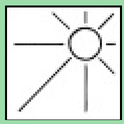
Classification

Land use



Grazing land: Extensive grazing land (before)
Mixed: Agroforestry (after)
Full irrigation

Climate

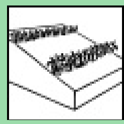


arid, subtropics

Degradation

Soil erosion by water: loss of topsoil / surface erosion

Conservation measure



Tree and shrub cover, Grasses and perennial herbaceous plants

Stage of intervention

- [ ] Prevention
- [ ] Mitigation /
- [x] ction
- [ ] Rehabilitation

Origin

- [ ] Land user's initiative
- [x] xperiments / Research: 10-50 years ago
- [ ] Externally introduced

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: overgrazing
Direct causes - Natural: droughts
Indirect causes: population pressure

Main technical functions:
- improvement of ground cover

Secondary technical functions:
- increase in organic matter

Environment

Natural Environment

Average annual rainfall (mm)

- [ ] > 4000 mm
- [ ] 3000-4000 mm
- [ ] 2000-3000 mm
- [ ] 1500-2000 mm
- [ ] 1000-1500 mm
- [ ] 750-1000 mm
- [ ] 500-750 mm
- [ ] 250-500 mm
- [x] < 250 mm

Altitude (m a.s.l.)

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Landform

- [ ] plateau / plains
- [ ] ridges
- [x] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Slope (%)

- [ ] flat
- [ ] gentle
- [ ] moderate
- [ ] rolling
- [x] hilly
- [ ] steep
- [ ] very steep

Soil depth (cm)

- [ ] 0-20
- [ ] 20-50
- [x] 50-80
- [ ] 80-120
- [ ] >120

Growing season(s): days ()
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: good

Soil water storage capacity: medium
Ground water table: %gt;50 m
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: heavy rainfall events (intensities and amount)

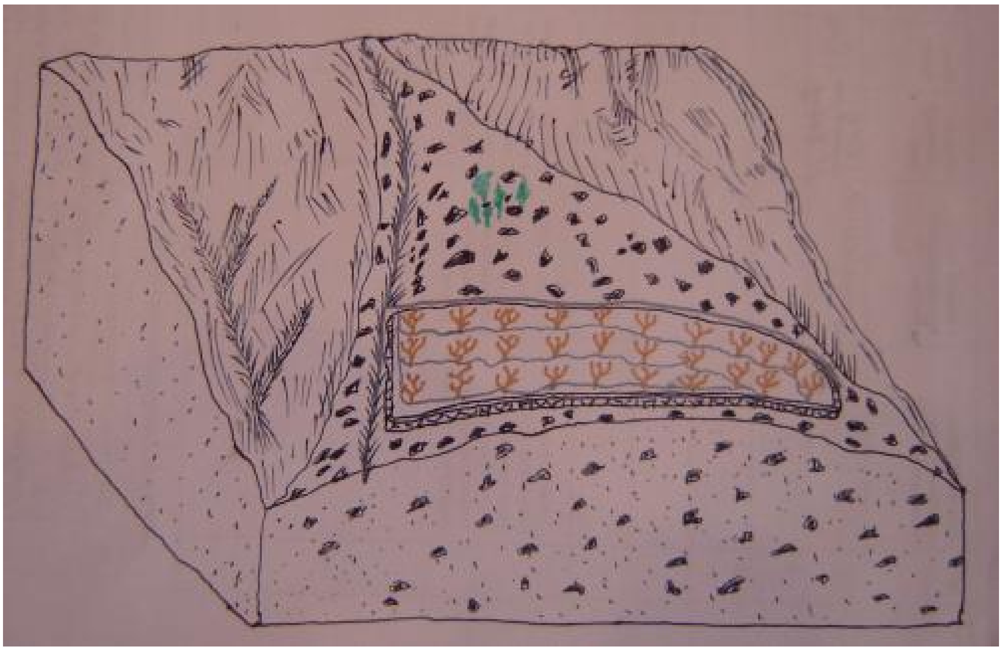
Human Environment

Mixed land per household (ha)

	<0.5
	0.5-1
	1-2
■	2-5
	5-15
	15-50
	50-100

Land user: Individual / household, Small scale land users, disadvantaged land users, mixed
Population density: 10-50 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: leased (The land belongs to the state and the land users rented this plot.)
Water use rights: (The land belongs to the state and the land users rented this plot.)
Relative level of wealth: average - % of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: low: technical assistance, employment, energy, financial services; moderate: health, roads & transport, drinking water and sanitation; high: education



Technical drawing

Location of apricot orchard on the slope (Sosin Pjotr)

Implementation activities, inputs and costs

Establishment activities

- Construction of fence
- Construction of irrigation canal
- Planting seedlings
- Purchase of seedlings
- Removing stones from an area of 20 ha

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	78.00	100%
Equipment		
- Removing stones	597.00	30%
- Fence	500.00	30%
- Irrigation canal	335.00	10%
Construction material		
Agricultural		
- seeds	114.00	10%
- seedlings	355.00	0%
TOTAL	**1979.00**	**23.00%**

Maintenance/recurrent activities

No maintenance activities documented

No costs documented

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased fodder production
++ increased farm income

Production and socio-economic disadvantages

+ increased demand for irrigation water
+ increased economic inequity

Socio-cultural benefits

++ improved food security self sufficiency
+ improved situation of disadvantaged groups

Socio-cultural disadvantages

+ loss of recreational opportunities

Ecological benefits

+++ increased soil moisture
+++ reduced surface runoff
+++ increased biomass above ground C
+ increased soil organic matter below ground C
+ increased maintained habitat diversity

Ecological disadvantages

+ increased competition

Off-site benefits

Off-site disadvantages

Contribution to human well-being/livelihoods

++

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	negative	positive
Maintenance/recurrent	slightly negative	very positive

Acceptance/adoption: At the moment this technology is not being widely adopted due to lack of finances by other land users in the region.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) No engineering structures are needed

2) No additional materials and equipment are used

3) Local material is used for fencing

Weaknesses and →how to overcome

Specialists' opinion:

1) Technology's effectiveness depends on availability of irrigation water →Implement water-saving technology

Contact person: Sosin, Pjotr, Tajik Soil Institute, 21A, Rudaki Ave., Dushanbe 734025, psosin46@mail.ru

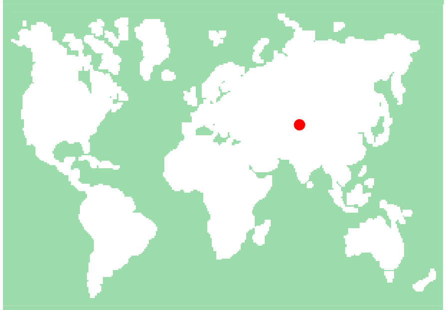
left: Photo shows the enclosure with homestead at top, lucerne (bright green) on upper slope, fruit trees (mid slope) and stone piles at the bottom of the slope. Strong contrast in vegetation cover and lessened erosion inside. (Photo: Des McGarry and Habib Kamolidi)
right: Photo is taken inside the enclosure – showing lucerne (fodder), orchard trees and vegetable garden (right hand edge). (Photo: Des McGarry)

Integrated Technologies for Household Plots

Tajikistan - GITEC/ADB/GEF/DMC Rural Development Project

A fenced enclosure transformed with stone clearing and a small scale irrigation system, to grow a wide range of perennial, annual and orchard crops, beekeeping and small scale animal production.

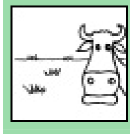
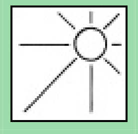
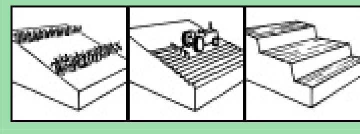
A small area of previously severely eroded land, almost devoid of vegetation was transformed through the building a perimeter fence, supplying a simple irrigation system and the planting of a diverse range of crops to provide a rich, integrated farming system. Activities then completed on this area included: orchard planting, perennial fodder crops (Lucerne), garden vegetables, bee keeping for honey production and small scale animal rearing.
The farmer clearly stated that his prime, initial purpose in taking over this "ruined and abandoned land" was to improve and better guarantee the quality of his family's lifestyle through enhanced and assured food and fodder production. He also recognised the potential for future profit through sale of his excess produce to market. Currently, the family has almost no need to buy food (and fodder) from nearby markets, apart from flour for bread making. This is a large cost saving. In hindsight, the farmer sees that he has dramatically improved land quality within the enclosure through mitigating erosion and increasing year-round vegetation cover.
The family (Emomali is the family name) first occupied this land in 1984. The first task was tree planting – a variety of orchard trees – on 0.1 ha of the current enclosure. This was fenced using abandoned wire and metal supports from old Russian factories. After nine family members left (to work in Dushanbe) the land user expanded the fence to the current 0.2 ha and continued to plant trees. He continued the stone removal through the 1990s and even up until the present day. Lucerne and vegetable gardens were initiated in the 1990s and continue to be enriched as required. Fodder, tree and vegetable production gives an ongoing set of tasks, as does the animal feeding with the home-grown fodder. Bee keeping is seasonal and the honey kept for home consumption. The land user continues to plant orchard trees every year and currently has more than 100. He gained a "certificate of ownership" in 2008.
Before the family occupied this land, the land user stated that it was "totally ruined and abandoned". That is why it was unoccupied. The family were prepared to work extremely hard to convert this ruined land to the green and productive "island" that it now is. The people in the area are dependent upon the produce of the land, however suitable land is in short supply and subject to population pressures.



Location: Varzob
Region: Central District of Tajikistan
Technology area: < 0.1 km^2 (10 ha)
Conservation measure: agronomic, vegetative, structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Land user - 10-50 years ago
Land use: Grazing land: Extensive grazing land (before), Mixed: Agroforestry (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ370e
Related approach: Enhancement of existing self innovated SLM technologies into demonstration sites (TAJ037)
Compiled by: Habib Kamolidinov, ADB Tajikistan
Date: 03rd May 2011 updated 11th Jul 2011

Classification

Land use problems: Massive water erosion causing gullies, sheet washing and landslides. This leads to land denudation of the soil and vegetation and in turn, enhanced erosion. Almost total lack of soil organic matter and above/below ground biodiversity. No water holding capacity of the land – combination of steep slopes and no vegetation causes all rainwater to immediately runoff.

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Mixed: Agro forestry (after) Mixed rainfed - Irrigated	semi-arid, temperate	Biological degradation: loss of soil life, Biological degradation: reduction of vegetation cover, Soil erosion by water: mass movements / landslides, Soil erosion by water: gully erosion / gulling, Soil erosion by water: loss of topsoil / surface erosion	Vegetation/soil cover, Tree and shrub cover, Walls / barriers / palisades

Stage of intervention

□ Prevention
□ Mitigation / Reduction
■ Rehabilitation

Origin

■ Land user's initiative: 10-50 years ago
□ Experiments / Research
□ Externally introduced

Level of technical knowledge

Land user: medium

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use, overgrazing
Direct causes - Natural: other natural causes, Loess landscape – highly susceptible to water erosion – massively exacerbated by vegetation clearing (tree chopping and animal grazing)

Main technical functions:
- control of raindrop splash
- control of dispersed runoff: impede / retard
- improvement of ground cover
- improvement of topsoil structure (compaction)
- increase in nutrient availability (supply, recycling)
- increase / maintain water stored in soil
- increase of biomass (quantity)
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:
- improvement of surface structure (crusting, sealing)
- increase in organic matter
- increase of infiltration
- improvement of water quality, buffering/filtering water

Environment

Natural Environment

Average annual rainfall (mm)

□ > 4000 mm
□ 3000-4000 mm
□ 2000-3000 mm
□ 1500-2000 mm
□ 1000-1500 mm
□ 750-1000 mm
■ 500-750 mm
□ 250-500 mm
□ < 250 mm

Altitude (m a.s.l.)

□ > 4000
□ 3000-4000
□ 2500-3000
□ 2000-2500
□ 1500-2000
■ 1000-1500
□ 500-1000
□ 100-500
□ <100

Landform

□ plateau / plains
□ ridges
□ mountain slopes
■ hill slopes
□ footslopes
□ valley floors

Slope (%)

□ flat
□ gentle
□ moderate
□ rolling
■ hilly
□ steep
□ very steep

Soil depth (cm)

□ 0-20
■ 20-50
□ 50-80
□ 80-120

Growing season(s): 180 days (April to September)
Soil texture: medium (loam)
Soil fertility: high
Topsoil organic matter: high (>3%)
Soil drainage/infiltration:

Soil water storage capacity: medium
Ground water table: 5 - 50 m
Availability of surface water: good, medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: No
If sensitive, what modifications were made / are possible: The technology is itself much more tolerant and adaptive to climate change than what was there previously.

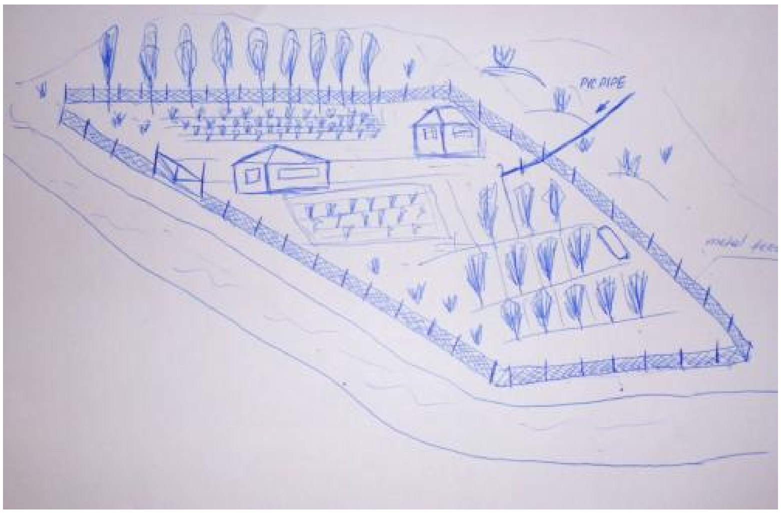
Human Environment

Grazing land per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50

Land user: Individual / household
Population density: < 10 persons/km^2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: individual (He gained a “certificate of ownership” in 2008)
Water use rights: (Not yet an issue – as he is the only one with access to the spring water.)
Relative level of wealth:

Importance of off-farm income: 10-50% of all income: The issue is that it tends to be the older and very young family members who stay on the farm (Mr Enomali and his wife are in their late 50s, and their pre-school age grandchildren stay with them). The others (18 to 50 yrs old) have paid employment in Dushanbe and Russia – and only visit the farm occasionally. However, it is believed they part-finance (contribute) to the upkeep of the family farm.
Access to service and infrastructure: low: health, technical assistance, energy, drinking water and sanitation, financial services; moderate: education, employment, market, roads & transport
Market orientation: subsistence (self-supply)
Livestock density: < 1 LU/km^2



Technical drawing

The drawing shows an enclosed area, a fence line consisting of wire fencing, brush and scrap metal materials. At the top of the slope a row of fast growing poplars was planted to protect the enclosure and the adjacent vegetable plot from the wind and rain. Perennials (Lucerne for fodder) are intercropped with fruit trees downslope of the dwelling and the area is gravity fed by an irrigation pipe originating from a local spring. (Habib Kamolidinov)

Implementation activities, inputs and costs

Establishment activities

- Fence
- Irrigation pipe
- plants
- Trees
- Cover cropping (lucerne replanting)
- Tree planting
- Vegetable garden
- Fence building
- Small vegetable beds

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	759.00	100%
Construction material		
- fence	100.00	100%
- pipe	500.00	100%
Agricultural		
- seeds	200.00	100%
- seedlings	120.00	100%
TOTAL	**1679.00**	**100.00%**

Maintenance/recurrent activities

- Animal husbandry (and bee keeping)
- Better crop cover and cover cropping
- Fertilising (garden vegetables)
- Stone clearing
- Vegetable garden
- Lucerne reseeding
- Tree planting
- Vegetable planting
- Small vegetable beds

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	330.00	100%
Equipment		
Agricultural		
TOTAL	**330.00**	**100.00%**

Remarks:
The human labour costs are somewhat misleading. The farmer and his family happily and willingly committed their time and effort over a period of 27 years to improving this piece of land – as they knew that their family lifestyle would vastly improve and be greatly assured through their efforts. As the farmer said during the interview: “What else would I be doing?” Meaning – this is his life and he thoroughly enjoyed the inputs, realising the richness of the outputs. Fence costs were minimal (a few hundred dollars) as on departure of the Russians after the Soviet period, all types of scrap metal and wire were sourced from the abandoned factories. Obviously not a

sustainable practice, but at thiat time gave locals access to free materials to use. In this case for fencing. Trees – there was an initial set up cost and the farmer said he tries to plant at least 20 new trees each year to maintain and enhance productivity. Lucerne – there was a set up cost (farmer forgets how much – but approx. $50) for seed. But now the lucerne is almost self-regenerating (from its own seeds) as the last cut each year is for seed production that the farmer spreads in the lucerne field. The total area is approximately one hectare in total, however the costs are spread over a period of almost 30 years upto 2010 and will continue.. The farmer proposes to purchase extra fencing materials to expand the enclosure area, and will partially irrigate the land by purchasing   of new polyethylene pipes to source a distant spring.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased crop yield	
+++ increased fodder production	
+++ increased fodder quality	
+++ increased wood production	
+++ reduced risk of production failure	
+++ increased drinking	
+++ increased water availability quality	
+++ increased irrigation water availability quality	
+++ reduced expenses on agricultural inputs	
+++ increased farm income	
+++ diversification of income sources	
+++ increased production area	
+++ increased product diversification	
++ increased animal production	

Socio-cultural benefits	Socio-cultural disadvantages
+++ knowledge conflict mitigation	
+++ improved food security self sufficiency	
+++ improved health	

Ecological benefits	Ecological disadvantages
+++ increased water quantity	
+++ increased water quality	
+++ improved harvesting collection of water	
+++ increased soil moisture	
+++ reduced evaporation	
+++ reduced surface runoff	
+++ improved excess water drainage	
+++ reduced hazard towards adverse events	
+++ improved soil cover	
+++ increased biomass above ground C	
+++ increased nutrient cycling recharge	
+++ reduced soil loss	
+++ reduced soil crusting sealing	
+++ reduced soil compaction	
+++ increased plant diversity	

Off-site benefits	Off-site disadvantages
+++ increased water availability	
+++ capacity (by soil, vegetation, wetlands)	

Contribution to human well-being/livelihoods

+++ The primary aim of the farmer in introducing the Technology was to improve the family's lifestyle and well being. He has easily achieved this and it seems to be getting better, year on year. The family have improved their food security and quality.

Benefits/costs according to land user

The establishment and ongoing costs are very small in comparison to the long and short term benefits. If natural materials cannot be used for fencing materials, then the initial establishment costs will be higher.

Benefits compared with costs	short-term:	long-term:
Establishment	negative	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption:

100% of land user's family has implemented the technology voluntarily. There seems a small trend towards (growing) spontaneous adoption of the technology. There are (seemingly) quite a few enclosures already in this area – but these have not been reviewed.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) The fence building started and underpins the whole SLM initiative. That it was achieved by only 2-3 people, in a one year period and at low cost (using mainly scrap materials) adds to the strengths. →The farmer wishes to expand his fenced area so the enclosure is 1 ha in size
2) Bringing water to the site (at his own cost) by poly pipe was a critical part to the technology. The land in the enclosure would probably have improved anyway, due to animal exclusion, but this was greatly improved by the provision of irrigation water. This is a relatively small volume of water, but it is available all year round which is key to the plants being able to survive through the hot summer months. →The farmer wishes to purchase more poly pipe to source a 2nd spring to water the extended (1 ha) site
3) The rich mix of vegetation on the site (trees, perennial fodder legume and vegetable production) not only ensures the intervention remains viable but also ensures a continuous, rich, healthy food supply to the family all year round →The farmer has already started to plant new fruit trees outside the fence area, in readiness for moving the fence to encompass a 1 ha site
4) Clearing stones was an important technological input, to greatly increase the available "growth area" for the introduced plants and trees as well as increase soil depth. Linked to the irrigation system, the increased soil depth has greatly aided the vitality of this SLM approach – especially in the hot summer months. →Stone clearing will be a critical phase of the expansion of the enclosure to 1 ha.

Land users' opinion:

1) The land provided food security and a small income for my family. →To replicate it, maybe small grants and loans could be awarded.

Weaknesses and →how to overcome

Specialists' opinion:

1) Enclosing the land is important, however the cost of the wire fence becomes an issue. →There may be access to finance through the bank or from relatives.
2) The success of the project is dependent upon the supply of irrigated water to supplement the rained supply. →Areas for replication need to be assessed for water supply. There is also potential that drip irrigation schemes could help support the implementation of the technology by using the water more efficiently. But cost of trickle pipe may preclude this.

Land users' opinion:

1) It is a lengthy process to secure land certificates.

Contact person: Des McGarry.GITEC/ADB/DMC Rural Development Project, Land Management Institute, Giprozem 15, Dushanbe, Tajikistan, desmcgarry@optusnet.com.au

Tree nurseries to test tree species adapted to local climate

Tajikistan - Mountain Societies Development Support Programme (MSDSP)

Tree nurseries are established to test and identify varieties of tree species that are tolerant to climate change in the region.

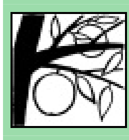
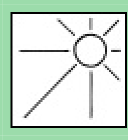
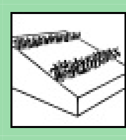
In 1995-96 the first tree nursery was established in the Vanj valley with support from the Mountain Societies Development Support Programme (MSDSP) of the Aga Khan Foundation. During Soviet times there were no tree nurseries in this region and seedlings had to be brought in from outside. Only the Pamir Biological Institute (PBI) was able to obtain seedlings for research purposes. A nursery of about 0.1 ha was established by one farmer on his own land. Tree species grown in the nursery include apple, peach, apricot, walnut, cherry and pear.
The main goal of the project was to make varieties of tree species adapted to different climatic conditions in GBAO locally available. The seedlings are used for other MSDSP projects, such as orchards for soil stabilisation, and are also purchased by private land users for their own land. In addition, the land user was taught how to establish a business by selling seedlings to other land users. There is a strong need for quality tree seedlings in the whole region and even people from as far away as Ishkhashim (7 hour journey by car) travel to Vanj valley to purchase seedlings from this nursery. The economic benefit for the land user is very high as during one year he can make more than 18,000 TJS (4000 USD) of profit from selling seedlings while the investments in fertilisers are comparably small.
The steps necessary for the establishment of a tree nursery are the following: (1) a suitable plot of flat land is chosen by the farmer, (2) the plot is fenced with dead branches to protect it from roaming animals, (3) in March, the farmer prepares several wooden boxes filled with humid soil in which he distributes 10 kg of seeds of different tree species and varieties. Those boxes have to be irrigated for a month while the seeds are germinating, (4) in April, the nursery plot is ploughed along the contour using animal traction and 1 ton of organic manure, 20 kg of phosphor and 2.5 kg of nitrogen is mixed with the soil, (5) seedlings are planted linearly along the contour with small irrigation ditches running parallel to the planting lines. These ditches were automatically established through the ploughing process, (6) two more times during the first season another 3 kg of nitrogen are applied. In the second year the grafting process is started and in the third year the farmer starts selling the seedlings. The farmer therefore splits up the nursery plot in three parts so that he can always have newly planted seedlings at the same time with second-year seedlings for grafting and third-year seedlings for selling
The technology was adopted by two other farmers from the village who had successfully applied to MSDSP for financial support for seeds and fertilisers. Many other farmers from neighbouring villages are interested. The bridge that is currently being built to allow for more trade between Afghanistan and Tajikistan might open further market opportunities for the land user. Furthermore this type of experience is being widely replicated in other districts and supported by MSDSP.

left: Overview of the tree nursery with dead fence in the background (Photo: MSDSP Khorog)
right: Tree planting lines with parallel irrigation ditches (Photo: MSDPS Khorog)

Location: Vanj
Region: GBAO
Technology area: < 0.1 km2 (10 ha)
Conservation measure: vegetative
Stage of intervention: prevention of land degradation
Origin: Externally - 10-50 years ago
Land use: Cropland: Annual cropping (before), Cropland: Tree and shrub cropping (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ390e
Related approach: Village development plan (not documented)
Compiled by: Mizrob Amirbekov, MSDSP, AKDN
Date: 12th May 2011 updated 11th Jul 2011

Classification

Land use problems: reduction of vegetation cover, erosion of slope areas, decline of soil fertility,

Land use	Climate	Degradation	Conservation measure
			
Cropland: Annual cropping (before) Cropland: Tree and shrub cropping (after) Full irrigation	semi-arid, temperate	Soil erosion by water: gully erosion, Biological degradation: reduction of vegetation cover, Biological degradation: loss of habitats	Tree and shrub cover

Stage of intervention	Origin	Level of technical knowledge
■ Prevention □ Mitigation / Reduction □ Rehabilitation	□ Land user's initiative □ Experiments / Research ■ Externally introduced: 10-50 years ago	Agricultural advisor: medium Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management, deforestation / removal of natural vegetation (incl. forest fires), overgrazing

Main technical functions:
- stabilisation of soil (eg by tree roots against land slides)
- increase of biomass (quantity)
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:
- increase of infiltration

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	■ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	□ rolling
□ 1000-1500 mm	■ 1500-2000	■ footslopes	□ hilly
□ 750-1000 mm	□ 1000-1500	□ valley floors	□ steep
■ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)		
□ 0-20 ■ 20-50 □ 50-80 □ 80-120 □ >120	**Growing season(s):** 90 days (March-May) **Soil texture:** medium (loam) **Soil fertility:** medium **Topsoil organic matter:** medium (1-3%) **Soil drainage/infiltration:** medium	**Soil water storage capacity:** medium **Ground water table:** 5 - 50 m **Availability of surface water:** medium **Water quality:** good drinking water **Biodiversity:** medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease
Sensitive to climatic extremes: heavy rainfall events (intensities and amount), wind storms / dust storms, floods, droughts / dry spells

Human Environment

Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, medium scale land users, common / average land users, mixed
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: individual (The land belongs to the state but the land user has a certificate.)
Water use rights: communal (organised) (The land belongs to the state but the land user has a certificate.)
Relative level of wealth: average - % of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income: teacher
Access to service and infrastructure: low: employment, financial services; moderate: health, education, technical assistance, market, energy, roads & transport; high: drinking water and sanitation
Market orientation: mixed (subsistence and commercial)
Mechanization: animal traction

Implementation activities, inputs and costs

Establishment activities

- After one month transfer seedlings to planting lines
- Fencing with dead branches
- Plant seeds in box with humid soil and irrigate
- Ploughing and distribution of fertilisers
- Select a place with enough water and good soil fertility on flat land for establishment of nursery

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	495.00	100%
Equipment		
Construction material		
Agricultural		
- seeds	11.00	0%
- fertilizer	20.50	0%
TOTAL	**526.50**	**94.00%**

Maintenance/recurrent activities

- Apply nitrogen fertiliser twice more during the growing season
- Grafting
- Weeding

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US)	% met by land user
Labour	252.50	100%
Equipment		
Construction material		
Agricultural		
- fertilizer	4.00	0%
TOTAL	**256.50**	**98.00%**

Remarks:
The most determinate factors affecting the costs are for labour, although in the documented example, labour was provided voluntarily by the family of the land user. Costs for labour are estimates for a situation in which labour had to be paid in Tajikistan. The costs were calculated for a nursery of 0.1 ha.

Assessment

Impacts of the Technology

Production and socio-economic benefits

++ increased farm income
++ diversification of income sources

Production and socio-economic disadvantages

+ reduced crop production

Socio-cultural benefits

++ knowledge conflict mitigation
++ improved food security self sufficiency
++ improved health
+ increased recreational opportunities

Socio-cultural disadvantages

Ecological benefits

+++ increased plant diversity
+++ increased maintained habitat diversity
+++ reduced hazard towards adverse events
++ increased water quality
++ increased soil moisture
++ reduced evaporation
++ increased biomass above ground C
++ reduced emission of carbon and greenhouse gases

Ecological disadvantages

Off-site benefits

+++ availability of tree seedlings in region

Off-site disadvantages

Contribution to human well-being/livelihoods

+++ Higher income from selling the tree seedlings, about 3,000 USD per year, allowing people to provide better education for their children and better access to healthcare

Benefits/costs according to land user

Increased income and benefit start after three years when seedlings can be sold.

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	very positive
Maintenance/recurrent	slightly negative	very positive

Acceptance/adoption: 100% of land user families (3 families; 100% of area) have implemented the technology with external material support.
There is moderate trend towards (growing) spontaneous adoption of the technology. People from other villages in the valley contacted MSDSP because they would like to adopt the technology (however, they would need financial or material support).

Concluding statements

Strengths and → how to sustain/improve

Specialists' opinion:

1) The technology is very important to the whole of the GBAO region as nurseries were not available during Soviet times and all tree seedlings were brought from outside →Improved access for farmers of interesting tree varieties that they can reproduce in their nurseries
2) Creation of business opportunities. →Experience sharing between farmers from outside GBAO
3) Through the spreading of this technology there will be more seedlings available to all interested households →Establishment of farmer field schools to disseminate the positive experiences of this technology and to increase the number of nurseries
4) Varieties of trees that are adapted to local climate can be more easily obtained →Access to other new varieties should be improved

Weaknesses and → how to overcome

Specialists' opinion:

1) It is quite a complicated process that requires some expertise; the farmer needs to know about planting technologies, grafting and market opportunities etc. → Farmer to farmer dissemination of knowledge could be facilitated through the establishment of farmer field schools.

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www.akdn.org

WOCAT

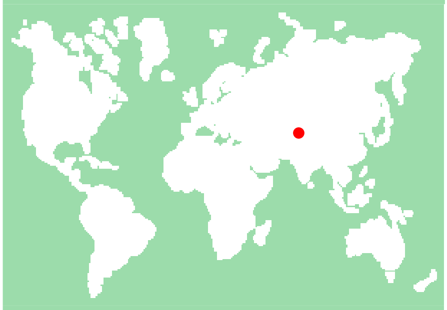
Pest management with pheromone insect traps

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Coloured pheromone traps are set up in agricultural fields to attract and eradicate flying insect pests.

Within the UNDP Farmer Field Schools, farmers were taught about how to use pheromone insect traps to combat insect pests in crop fields. In the past, people used to irrigate their fields in winter with ice-cooled water, or to apply deep ploughing in order to kill pests. According to local people, the winters in the Shaartuz area are getting shorter so it is difficult to apply these practices any more, and they cannot afford to pay for the ploughing devices they need, and therefore pests are spreading.
The purpose of these traps are to attract flying insects which might constitute crop pests by sending out pheromones and to kill them once in the trap. The main insect pests against which the traps are used include caradrina and other moths from the Noctuidae family, thrips, aphids, whiteflies and mole crickets.
The trap consists of a wooden body, covered with plastic sheets to protect it from the rain. The exterior is painted in yellow to make it more attractive the insects. Inside the plate, a small tube is fitted which sends out pheromones to attract insects and the floor is covered with a plate covered with a mix of glue and Vaseline to trap the insects. As an alternative to Vaseline, motor oil can also be used. The trap is set up in early May and the sticky plate has to be changed once every two months.
This technology is used in fields of tomatoes, watermelon, onion, pumpkin, beans, corn, wheat and sweet pepper. As it is very cheap and simple to establish, there is a strong adoption trend seen among farmers. The pheromone insect traps provide an effective replacement for expensive chemical insecticides. However, the trap is only works for flying insects and methods to combat other arthropod pests still need more testing.

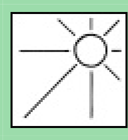
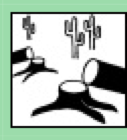
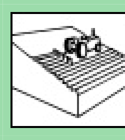
left: Setup of trap within crop field (Photo: UNDP Shaartuz)
right: Pheromone trap for integrated pest management (Photo: UNDP Shaartuz)



Location: Kabodion
Region: Khatlon
Technology area: 60 km^2
Conservation measure: agronomic
Stage of intervention: prevention of land degradation
Origin: Experiments - 10-50 years ago
Climate: arid, temperate
WOCAT database reference: TAJ109e
Related approach: Farmer Field Schools (TAJ018)
Compiled by: Firdavs Faizulloev, UNDP Tajikistan
Date: 14th Apr 2011 updated 08th Jul 2011

Classification

Land use problems: wind erosion, aridity, low soil fertility, increasing impacts of climate change, pests

Land use	Climate	Degradation	Conservation measure
			
Annual cropping	arid, temperate	Biological degradation: increase of pests / diseases, loss of predators	Others

Stage of intervention	Origin	Level of technical knowledge
■ Prevention □ Mitigation / Reduction □ Rehabilitation	□ Land user's initiative ■ Experiments / Research: 10-50 years ago □ Externally introduced	Agricultural advisor: low Land user: low

Main causes of land degradation:
Direct causes - Human induced: soil management
Direct causes - Natural: change in temperature

Main technical functions:
- control of pests

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	■ plateau / plains	■ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	□ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	□ hilly
□ 750-1000 mm	□ 1000-1500	□ valley floors	□ steep
□ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	■ 100-500		
■ < 250 mm	□ <100		

Soil depth (cm)

□ 0-20
■ 20-50
□ 50-80
□ 80-120
□ >120

Growing season(s): 240 days (March-October)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Soil water storage capacity: very low
Availability of surface water: poor / none
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), floods, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: wind storms / dust storms, hail
If sensitive, what modifications were made / are possible: a cover could be applied to the trap to protect it from hail

WOCAT

Human Environment

Cropland per household (ha)

<0.5
0.5-1
1-2
2-5
5-15
15-50
50-100
100-500
500-1,000
1,000-10,000
>10,000

Land user: Individual / household, medium scale land users, common / average land users, mixed
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: leased

Importance of off-farm income: less than 10% of all income
Access to service and infrastructure: low: employment, energy, drinking water and sanitation; moderate: health, education, roads & transport, financial services; high: technical assistance, market
Market orientation: mixed (subsistence and commercial)
Mechanization: mechanised
Livestock grazing on cropland:

Implementation activities, inputs and costs

Establishment activities

1) Set up pheromone trap

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
- pheromone traps	16	100 %
Agricultural		
TOTAL	**16.00**	**100.00%**

Maintenance/recurrent activities

1) Exchange glue inside the trap

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
TOTAL	**0.00**	**0.00%**

Remarks:
The costs mentioned apply to the set-up of 4 traps per hectare and include all materials used.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ reduced risk of production failure ++ reduced expenses on agricultural inputs	

Socio-cultural benefits	Socio-cultural disadvantages
+ improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
+++ increased biological pest disease control	

Off-site benefits	Off-site disadvantages

Contribution to human well-being/livelihoods

+

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption:

100% of land user families (160 families; 100% of area) have implemented the technology voluntary. The technology was shown to the farmers in the Farmer Field Schools, and as a result many adopted the techniques and built traps for themselves.
There is strong trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Biological pest control → Arrange for farmer to farmer visits to disseminate information

Land users' opinion:

1) Effective pest control
2) Very cheap and simple to apply technology

Weaknesses and →how to overcome

Specialists' opinion:

1) The trap only attracts flying insects, but does not help to kill other types of pests →Develop technologies to control caterpillars etc.
2) The trap does not differentiate between flying insects, so it is possible that it will also catch beneficial insects as well as pests.

Land users' opinion:

1) The small pheromone tube that is used in the setup of the trap is more and more difficult to find in the local chemist shops

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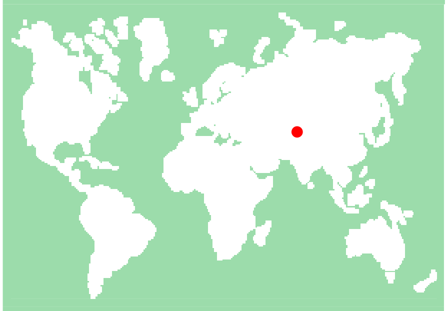
Solar greenhouses

Tajikistan – Youth Ecological Center

left: Showing a completed solar greenhouse. (Photo: Kalandarov R.)
right: Inside the solar greenhouse. Vegetables can be grown even during winter period. (Photo: Kalandarov R.)

Growing crops in solar greenhouses to support a year round crop yield.

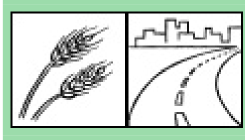
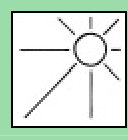
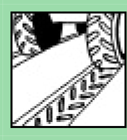
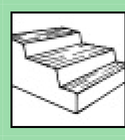
Solar greenhouses can be used all year round irrespective of weather conditions, especially in the winter period, when farmers are able to grow vegetables by using natural heat energy. The greenhouses provide a good growing environment as they are insulated and make use of passive solar energy. This solar greenhouse has three walls which reflect the sun's rays and accumulate heat. The front wall is heat-insulated. Two walls are black and one is white.
Protect plants from spring and autumn cold spells, including frosts. Extending the natural growing season.
Establishment activities: selection of the structure of greenhouse, selection of crops, effective ventilation and watering, use of agrotechnology, pest and disease control. Soil control: regeneration, disinfection, mulching, biohumus and drip irrigation in greenhouses.
This type of greenhouse can be used for many years in extreme climate conditions, saline soils, unpredictable weather (frosts) and with lack of water resources.



Location: Nosiri Husrav
Region: Khatlon District
Technology area: < 0.1 km2 (10 ha)
Conservation measure: structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Land user - recent (<10 years ago), Externally - recent (<10 years ago)
Land use: Cropland: Annual cropping (before), Cropland: Annual cropping (after)
Climate: arid, subtropics
WOCAT database reference: TAJ350e
Related approach: Training trips to (technology) demonstration plot (TAJ034)
Compiled by: Rustam Kalandarov, Youth Ecological Centre Tajikistan
Date: 25th May 2011 updated 11th Jul 2011

Classification

Land use problems: Intensive land use and getting early yield soil salinity, lack of water, climate change

Land use	Climate	Degradation	Conservation measure
			
Cropland: Annual cropping (before) Cropland: Annual cropping (after) Full irrigation	arid, subtropics	Physical soil deterioration: loss of bio-productive function due to other activities	Walls / barriers / palisades

Stage of intervention	Origin	Level of technical knowledge
Prevention Mitigation / Reduction Rehabilitation	Land user's initiative: recent (<10 years ago) Experiments / Research: recent (<10 years ago) Externally introduced: recent (<10 years ago)	Agricultural advisor: medium Land user: medium

Main causes of land degradation:
Direct causes - Natural: change in temperature, droughts
Indirect causes: poverty / wealth, labour availability

Main technical functions:
- Artificial soil conservation

Secondary technical functions:
- control of raindrop splash
- improvement of ground cover
- increase in organic matter
- increase in nutrient availability (supply, recycling)
- water harvesting / increase water supply
- increase of biomass (quantity)

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)

0-20
20-50
50-80
80-120
>120

Growing season(s): 150 days (December - April)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Soil water storage capacity: low
Ground water table: 5 - 50 m
Availability of surface water: medium
Water quality: poor drinking water
Biodiversity: medium

Tolerant of climatic extremes: seasonal rainfall increase, decreasing length of growing period, Temperature decrease
Sensitive to climatic extremes: temperature increase

Human Environment

Mixed land per household (ha)

- <0.5 (marked)
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50

Land user: Individual / household, Small scale land users, common / average land users, Mainly women
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: communal / village
Land use rights: leased ()
Water use rights: ()
Relative level of wealth: average - % of land users; owns % of the total land area, poor - % of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: low: health, education, technical assistance, market, energy, drinking water and sanitation; moderate: employment, roads & transport, financial services
Market orientation: mixed (subsistence and commercial)

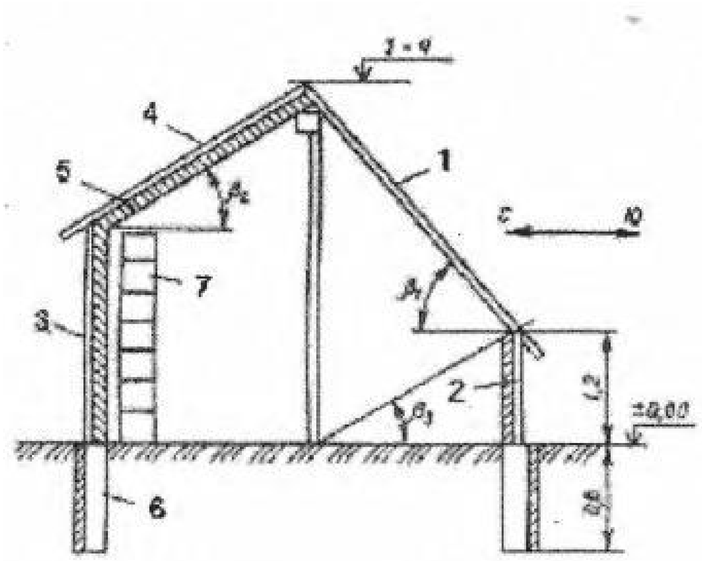


Рис. 2. Отдельно стоящая солнечная теплица:
1 - светопрозрачная изоляция;
2 - теплоизолированная передняя стенка;
3 - теплоизолированная северная стенка;
4 - крыша;
5 - теплоизоляция;
6 - теплоизолированный фундамент;
7 - аккумулятор теплоты.
8 - теплоизолированный фундамент.

Technical drawing

The drawing shows the scheme of the greenhouse. This greenhouse differs from other greenhouses as it has three specific walls. Each wall is directed towards the sun. The major heat-saving wall is black. Other walls are of white to reflect rays. The roof is covered with polyethylene film. (Kalandarov R.)

Implementation activities, inputs and costs

Establishment activities

- materials, labour
- disease control
- growing seedlings in flowerpots
- planting seedlings
- vertical tying
- watering, agro-maintenance
- training for farmers

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	2000.00	50%
Equipment		
- Materials	1000.00	50%
Agricultural		
- seeds	500.00	50%
- compost/manure	200.00	%
- pesticides	200.00	%
TOTAL	**3900.00**	**50.00%**

Maintenance/recurrent activities

- change of soil, improvement of soil fertility
- disease control
- ventilation, watering, temperature regime

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	2000.00	50%
Equipment		
Construction material		
Agricultural		
TOTAL	**2000.00**	**50.00%**

Remarks:
Labour - voluntary contribution

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased crop yield +++ reduced risk of production failure +++ diversification of income sources +++ increased product diversification ++ increased farm income	

Socio-cultural benefits	Socio-cultural disadvantages
++ improved situation of disadvantaged groups ++ improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
++ improved harvesting collection of water ++ reduced evaporation ++ improved soil cover ++ increased nutrient cycling recharge ++ increased soil organic matter below ground C	

Off-site benefits	Off-site disadvantages

Contribution to human well-being/livelihoods

++

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	very positive
Maintenance/recurrent	slightly positive	positive

Acceptance/adoption:

100% of land user families have implemented the technology voluntary.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Short-term positive effect, able to grow vegetables in winter in harsh weather conditions →Have a life span of for 5-10 years
2) Protection from climate change
3) Long-term technology for adaptation to climate change → Can be used for production of vegetables despite lack of water resources, and changes in outside temperature

Weaknesses and →how to overcome

Specialists' opinion:

1) Cost intensive construction and materials →Compromise between cost and effectiveness
2) Greenhouses are used for growing vegetables →Another technology is being developed

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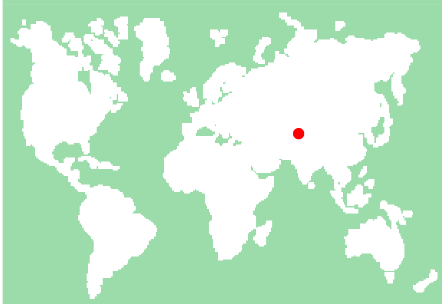
Vertical growing of potatoes in pits, by the gradual addition of further layers of soil

Tajikistan – Youth Ecological Center

Vertical growing of potatoes in pits, by the gradual addition of further layers of soil.

The technology is used in areas that have extreme climatic conditions and a high water deficit. The technology is quite simple; compost or enriched soil is placed into the bottom of a 50x50x50cm pit. Then, one or two potatoes are planted into the base of the pit, and covered with soil. As the potato grows, the pit is gradually filled up with soil to keep it covered. It is also watered regularly.
The purpose of this technology is to improve the potato yield, and therefore to increase farm income under these climatic conditions. The technology is well adapted to this arid area with only a little irrigation water available, because the method improves access to water.
The technology is quite simple and not cost intensive. Costs are mainly connected to the purchase of high-quality seeds and compost production. Labour is needed to dig the pits, and fill and maintain them.
The technology can be used under any agricultural conditions, such as on Dehkan farms as well as in kitchen gardens

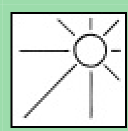
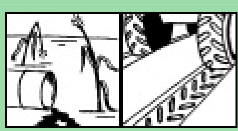
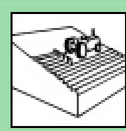
The photograph is showing the pits where the potatoes are planted. (Photo: Kalandarov R.)



Location: Nosiri Husrav
Region: Khatlon
Technology area: 1ha km^2
Conservation measure: agronomic
Stage of intervention: prevention of land degradation, mitigation / reduction of land degradation
Climate: arid, subtropics
WOCAT database reference: TAJ375e
Related approach: Training trips to (technology) demonstration plot (TAJ034)
Compiled by: Rustam Kalandarov, Youth Ecological Centre Tajikistan
Date: 25th May 2011 updated 11th Jul 2011

Classification

Land use problems: The main problem is connected with optimum use of land

Land use	Climate	Degradation	Conservation measure
			
Annual cropping full irrigation	arid, subtropics	Chemical soil deterioration: fertility decline and reduced organic matter content, Physical soil deterioration: sealing and crusting	Organic matter / soil fertility

Stage of intervention

- ■ Prevention
- ■ Mitigation / Reduction
- □ Rehabilitation

Origin

- ■ Land user's initiative: recent (<10 years ago)
- ▒ Experiments / Research: recent (<10 years ago)
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: low
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: crop management (annual, perennial, tree/shrub)
Indirect causes: land tenure

Main technical functions:
- improvement of surface structure (crusting, sealing)

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- □ 1000-1500 mm
- □ 750-1000 mm
- □ 500-750 mm
- ■ 250-500 mm
- □ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- □ 1500-2000
- □ 1000-1500
- □ 500-1000
- ■ 100-500
- □ <100

Landform

- □ plateau / plains
- □ ridges
- □ mountain slopes
- □ hill slopes
- □ footslopes
- ■ valley floors

Slope (%)

- □ flat
- □ gentle
- □ moderate
- □ rolling
- □ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 0 days (January - May)
Soil texture: medium (loam)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity: very low
Ground water table:
Availability of surface water: medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, droughts / dry spells
Sensitive to climatic extremes: seasonal rainfall decrease

Human Environment

Land user: Individual / household, medium scale land users, common / average land users, mixed
Population density: 10-50 persons/km2
Annual population growth: 0.5% - 1%
Land ownership: state

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: moderate: employment
Market orientation: subsistence (self-supply)
Mechanization: manual labour, animal traction

Technical drawing

Side view showing potatoes growing in pits. (Kalandarov R.)

Implementation activities, inputs and costs

Establishment activities

- Purchase of seeds

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	100.00	100%
Equipment (tools)	5.00	
Construction material		
Agricultural		
TOTAL	**105.00**	**100.00%**

Maintenance/recurrent activities

- Digging pits
- Filling pits with soil

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	100.00	100%
Equipment		
Construction material		
Agricultural		
TOTAL	**100.00**	**100.00%**

Remarks:
Digging the pits is the most determinate factor as it requires a lot of labour.

Assessment

Impacts of the Technology	
Production and socio-economic benefits	**Production and socio-economic disadvantages**
+++ reduced demand for irrigation water ++ increased crop yield	
Socio-cultural benefits	**Socio-cultural disadvantages**
++ improved food security self sufficiency	
Ecological benefits	**Ecological disadvantages**
++ reduced hazard towards adverse events + reduced surface runoff	
Off-site benefits	**Off-site disadvantages**
Contribution to human well-being/livelihoods	

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	not specified
Maintenance/recurrent	very positive	not specified

Acceptance/adoption:

There is little trend towards (growing) spontaneous adoption of the technology. There has been some gradual adoption.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) New agricultural technology
2) Growing in pits promotes an increase in crop yield → Good yields are possible with the use of required agrotechnology
3) Water saving technology → Individual irrigation
4) The technology can be used on small land plots and is therefore well adapted for the use in kitchen gardens → The technology is able to provide one family with enough food for their use.

Weaknesses and →how to overcome

Specialists' opinion:

1) Problems during harvesting period → Not taken into account due to specific characteristics of the technology

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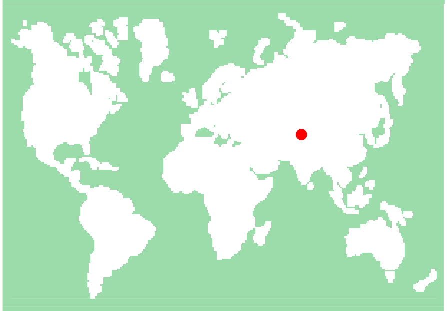
Phytopesticides

Tajikistan – Youth Ecological Center

Using environmentally friendly phytopesticides, made from natural plant extracts to help combat pests and diseases.

Phytopesticides are made mainly from plants, including; potatoes, onions or tomato stalks as well as from garlic, pepper, dandelion, common wormwood and thorn apple extracts. Other biological pesticides can be produced from ash or soap. Phytopesticides can be stored for up to a year.
The overall goal of phytopesticides is to combat pests and diseases, using an environmentally friendly, natural method without the need for chemical pesticides. They do not affect the surrounding flora and fauna and preserve biological organisms in the soil.
This is an easy-to-use and low-cost technology, which mainly requires the collection and drying of plant parts to make the pesticides.
The technology can be used in any environment during the growing period. The technology is currently used in arid zones in the South of Tajikistan, in Dehkan farms as well as on other farmlands.

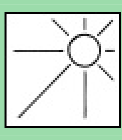
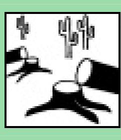
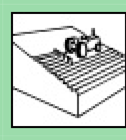
left: These are several types of phytopesticides produced by Dehkan farms made from ashes, pepper and garlic extracts. (Photo: Kalandarov R.)



Location: Nosiri Husrav
Region: Khatlon District
Technology area: < 0.1 km2 (10 ha)
Conservation measure: agronomic
Stage of intervention: mitigation / reduction of land degradation, rehabilitation / reclamation of denuded land
Origin: Land user
Climate: arid, temperate
WOCAT database reference: TAJ380e
Related approach: Training trips to (technology) demonstration plot (TAJ034)
Compiled by: Rustam Kalandarov, Youth Ecological Centre Tajikistan
Date: 25th May 2011 updated 13th Jul 2011

Classification

Land use problems: As above This technology allows avoidance of the use of chemical pesticides. Phyto pesticides do not destroy the organic matter in the soil, in fact they enrich the soil and are evironmentally friendly.

Land use	Climate	Degradation	Conservation measure
			
Annual cropping Full irrigation	arid, temperate	Biological degradation: increase of pests / diseases, loss of predators	Vegetation/soil cover

Stage of intervention

- □ Prevention
- ■ Mitigation / Reduction
- ■ Rehabilitation

Origin

- ■ Land user's initiative
- □ Experiments / Research
- □ Externally introduced

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: crop management (annual, perennial, tree/shrub)
Indirect causes: population pressure

Main technical functions:
- Preservation of biohumus in soil
- Enrichment of bioorganisms in soil
- Decrease of pests

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)		Altitude (m a.s.l.)		Landform		Slope (%)	
□	> 4000 mm	□	> 4000	□	plateau / plains	■	flat
□	3000-4000 mm	□	3000-4000	□	ridges	□	gentle
□	2000-3000 mm	□	2500-3000	□	mountain slopes	□	moderate
□	1500-2000 mm	□	2000-2500	□	hill slopes	□	rolling
□	1000-1500 mm	□	1500-2000	□	footslopes	□	hilly
□	750-1000 mm	□	1000-1500	■	valley floors	□	steep
□	500-750 mm	□	500-1000			□	very steep
□	250-500 mm	■	100-500				
■	< 250 mm	□	<100				

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): days (In the course of the growing period)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity: very low
Ground water table: <5 m
Availability of surface water: good, medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, droughts / dry spells
Sensitive to climatic extremes: not known

Human Environment

Land user: Individual / household, medium scale land users, common / average land users, mixed
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: group, individual, titled
Mechanization: manual labour, mechanised

Implementation activities, inputs and costs

Establishment activities

- Production of pesticides

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
TOTAL	**No documented costs**	**100.00 %**

Maintenance/recurrent activities

- Preparation of materials
- Purchase of sprayer
- Spraying

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	20.00	100.00 %
Equipment		
Construction material		
Agricultural		
TOTAL	**20.00**	**100.00%**

Assessment

Impacts of the Technology

Production and socio-economic benefits

++ increased crop yield
++ increased product diversification

Production and socio-economic disadvantages

Socio-cultural benefits

++ improved food security self sufficiency

Socio-cultural disadvantages

+ increased health problems

Ecological benefits

++ increased biological pest disease control
++ increased maintained habitat diversity

Ecological disadvantages

Off-site benefits

Off-site disadvantages

Contribution to human well-being/livelihoods

+++ The technology has not impacted on livelihoods

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	not specified
Maintenance/recurrent	very positive	not specified

Acceptance/adoption: 60 % of land users (40 households) that have applied the technology have done so without any external support. There is a moderate trend of spontaneous adoption.

Concluding statements

Strengths and → how to sustain/improve

Specialists' opinion:

1) The technology is acceptable
2) The technology is environmentally friendly → The technology replaces chemical pesticides with environmentally friendly ones.
3) Low cost → Phytopesticides can be produced at any time

Weaknesses and → how to overcome

Specialists' opinion:

1) Phytopesticides are effective for only two weeks → Pesticides can be prepared and used at any time

Contact person: Kalandarov, Rustam, Youth Ecological Center, Dushanbe, 3 Herzen street, tel:+992-227-81-18, kalandarov.r@gmail.com

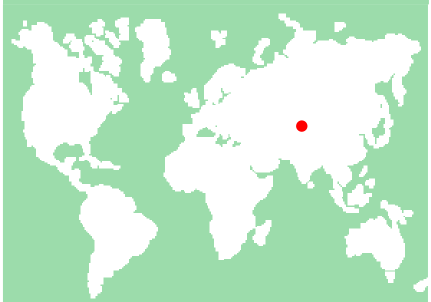
Passive solar greenhouses for winter commercial vegetable production

Tajikistan - Mountain Societies Development Support Programme (MSDSP)

Passive solar greenhouses heated entirely by sunlight were established with the aim to produce vegetables for commercial use during the harsh winter conditions.

A passive solar greenhouse is a greenhouse heated entirely by sunlight, with no additional fuel-based heating. In the Pamirs, the temperature inside these greenhouses can be kept high enough to grow vegetables throughout the year, even in winter if the greenhouse is built efficiently. Thus greenhouses can be of great use, particularly in those areas where there are continuing concerns about food security and economic development. These greenhouses were developed by GERES (Renewable Energy and Environment Group) and ICIMOD (International Centre for Integrated Mountain Development) and first tested with farmers in Ladakh, India. MSDSP adopted the idea and introduced it to the GBAO region in Tajikistan establishing 3 demonstration greenhouses in collaboration with farmers in the Shugnan district in 2010.
A solar greenhouse aims to trap and intensify the heating effect of solar radiation and thus enables plants to be grown that cannot be grown under the normal (outside) ambient conditions. Solar greenhouses are particularly useful in areas where there is a lot of sunshine in winter, but where the air is too cold for growing crops. The main benefits of solar greenhouses are that vegetables can be grown during the winter, helping to fulfil basic subsistence needs of people in remote areas and income generation through selling the produce.
A greenhouse is only efficient if it is constructed in the right place, in the right way, and is used properly. An efficient solar greenhouse should be designed along an east-west axis, with the length of the south face increased and angled to present the largest possible surface area to the sun, the size of the east and west facing walls reduced to minimise heat loss and provide shade inside the greenhouse, and the north wall should be heavily insulated. The following steps are required in constructing an efficient greenhouse: (1) selecting an appropriate place: there needs to be a source of running water close to the greenhouse, solar radiation needs to be sufficient (sunrise should be before 9.30 and sunset after 3.00 pm even on the shortest days of the year), the land has to be flat and dry; (2) selecting the most appropriate design: (see manual); (3) constructing the foundation: digging a trench and filling the foundation with mud mortar; (4) preparing the floor; (5) building the double walls separated by one insulation layer; (6) making and installing an access door; (7) making and installing the wall ventilator; (8) constructing the roof; (9) making and installing the roof ventilator (shutter); (10) installing the polyethylene shutter; (11) installing night insulation.
The greenhouses were established in three villages of Shugnan district: Buni, Sokhcharv and Darmoracht. Two of these villages are located at about 2,500 metres a.s.l. and receive less than 300 mm of annual precipitation. The farmers who constructed these greenhouses are small-scale farmers with less than 0.5 ha of land available.

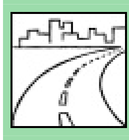
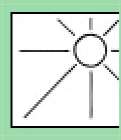
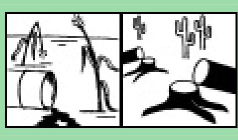
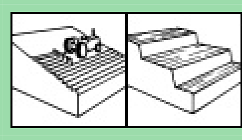
Left: Exemplary solar greenhouse in Khorog (Photo: Julie Zähringer)
Right: South-facing side of a solar greenhouse during construction process before the cellophane layer was put in place (Photo: MSDSP Khorog)



Location: Shugnan
Region: GBAO
Conservation measure: agronomic, structural
Stage of intervention: prevention of land degradation
Origin: Externally - recent (<10 years ago)
Land use: Other: Settlements, infrastructure networks (before), Cropland: Annual cropping (after)
Climate: arid, temperate
WOCAT database reference: TAJ393e
Related approach: not documented
Compiled by: Mizrob Amirbekov, Aga Khan Foundation
Date: 13th May 2011 updated 08th Jul 2011

Classification

Land use problems: A lack of precipitation and therefore irrigation water, soil erosion, low soil fertility (no fertilisers used or rotations), harsh climatic conditions (high altitude).

Land use	Climate	Degradation	Conservation measure
			
Other: Settlements, infrastructure networks (before) Cropland: Annual cropping (after) Full irrigation	arid, temperate	Biological degradation: quantity / biomass decline, Chemical soil deterioration: fertility decline and reduced organic matter content, Biological degradation: quality and species composition /diversity decline	Organic matter / soil fertility, Others

Stage of intervention

- ■ Prevention
- □ Mitigation / Reduction
- □ Rehabilitation

Origin

- □ Land user's initiative
- □ Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management, deforestation / removal of natural vegetation (incl. forest fires), overgrazing
Direct causes - Natural: change of seasonal rainfall, droughts

Main technical functions:
- increase in organic matter
- reduction in wind speed
- increase of biomass (quantity)
- spatial arrangement and diversification of land use
- production of microclimate suitable for crop growth in winter

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)		Altitude (m a.s.l.)		Landform		Slope (%)	
□	> 4000 mm	□	> 4000	■	plateau / plains	□	flat
□	3000-4000 mm	□	3000-4000	□	ridges	□	gentle
□	2000-3000 mm	□	2500-3000	□	mountain slopes	□	moderate
□	1500-2000 mm	■	2000-2500	■	hill slopes	□	rolling
□	1000-1500 mm	□	1500-2000	■	footslopes	■	hilly
□	750-1000 mm	□	1000-1500	■	valley floors	□	steep
□	500-750 mm	▒	500-1000			□	very steep
■	250-500 mm	□	100-500				
□	< 250 mm	□	<100				

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 170 days (late April-early October)
Soil texture: coarse / light (sandy)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

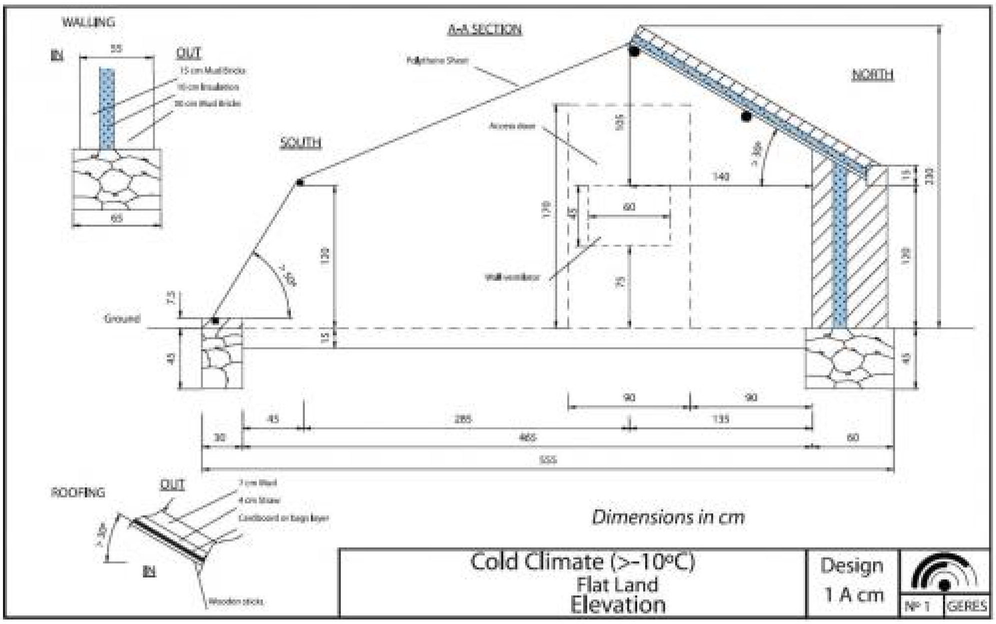
Soil water storage capacity: medium
Ground water table: <5 m
Availability of surface water: good
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, decreasing length of growing period
Sensitive to climatic extremes: wind storms / dust storms, droughts / dry spells

Human Environment

Land user: Individual / household, small scale land users, common / average land users
Land ownership: state, individual, titled
Land use rights: individual
Relative level of wealth: average - % of land users; owns % of the total land area

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: employment, energy, roads & transport, financial services; moderate: health, education, market; high: technical assistance, drinking water and sanitation



Technical drawing

The diagram shows a greenhouse adapted to a cold climate, for greenhouses adapted to different climates please see the manual (annex 1) (GERES / ICIMOD)

Implementation activities, inputs and costs

Establishment activities

- Build doors
- Build roof: southfacing side put 2 layers of each 40m2 cellophane, northfacing side put woodlogs
- Build roof ventilators
- Build walls: outer layer stones (40 cm width), then insulation layer with straw or wool (10 cm), inner layer out of mudbricks (15-20 cm). Total height of wall is 1.20 m.
- Build wall ventilators
- Digging trench for fundament, 60 cm deep
- Install night insulation
- Put fundament using stones mixed with mud

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	584.00	100%
Equipment		
- tools	9.00	100%
- nails	7.00	0%
Construction material		
- cellophane	71.00	0%
Agricultural		
TOTAL	**671.00**	**50.00%**

Maintenance/recurrent activities

- Replace cellophane

Maintenance/recurrent inputs and costs

Inputs	Costs (US)	% met by land user
Labour	18.00	100%
Equipment		
Construction material		
- cellophane	71.00	0%
Agricultural		
TOTAL	**89.00**	**100.00%**

Remarks:
Apart from the cellophane cover, mainly local materials were used which did not require investments. If labour has to be paid, this is the most determinate factor, also wooden poles if they have to be bought.
The costs were calculated for the establishment of one 5x10m greenhouse.

Assessment

Impacts of the Technology

Production and socio-economic benefits		Production and socio-economic disadvantages	
+++	increased crop yield	+++	high investment
+++	reduced risk of production failure	++	increased labour constraints
+++	increased farm income		
+++	diversification of income sources		
+++	increased production area		

Socio-cultural benefits		Socio-cultural disadvantages
+++	improved food security self sufficiency	
++	improved health	

Ecological benefits		Ecological disadvantages
+++	creation of microclimate for growing vegetables during wintertime	

Off-site benefits		Off-site disadvantages
++	availability of vegetables on the market during wintertime	

Contribution to human well-being/livelihoods

+++ higher income and better health through availability of vegetables in the winter

Benefits/costs according to land user

Income revenues from vegetables are high, during one winter season two yields of vegetables can be planted.

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	very positive
Maintenance/recurrent	slightly positive	very positive

Acceptance/adoption:

100% of land user families (3 families; 100% of area) have implemented the technology with external material support.
There is strong trend towards (growing) spontaneous adoption of the technology. many land users who have seen the demonstration greenhouses want to start constructing their own.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Vegetable production during wintertime and diversified food production all year round →Farmers should have access to microloan organisations in order to be able to invest in building greenhouses (initial investments are relatively high)
2) Availability of vegetables during wintertime, otherwise they have to be brought in from the capital (600 km by road) which makes them very expensive →Greenhouses should be distributed over the whole of GBAO in order to ensure local availability of crops, because during wintertime transport might be a big problem
3) Income opportunity →Better access to markets would improve profitability
4) Minimal heat loss, heat is stored during the day time and released at night →The greenhouse and should be constructed in a very careful and exact manner in order to make sure that the inside temperature can be well regulated
5) Adequate air circulation and prevention of crop damage by overheating, through installation of manually operated ventilators in walls and roof → Farmers need access to specialists who will help them in designing greenhouses appropriate to the prevailing ecological conditions

Land users' opinion:

1) The materials are locally available (mud, wood, straw, stone), except for the transparent cover sheet →Some traders should start providing transparent foil
2) Using the available construction manual it can be constructed by local builders →The local builders still need to be advised by specialists

Weaknesses and →how to overcome

Specialists' opinion:

1) Comparatively expensive, about 400 USD have to be invested for the construction of one greenhouse →The increased revenues from selling the produced vegetables can help cover the initial investment
2) Comparatively time consuming to build compared to conventional greenhouses in the area, one greenhouse needs about 6 weeks to be constructed →Plastic poles could be used instead of wooden ones
3) No good quality cellophane foil is available in this area, therefore it has to be replaced every 1-2 years →Instead of cellophane plexiglas could be used which is stronger.

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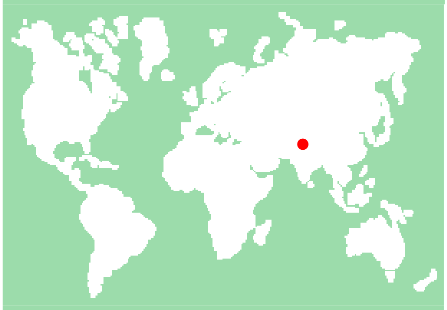
Terrace with Tree Barrier

Tajikistan – NCCR North-South

left: Forward sloping terrace stabilised with aligned poplar trees and adjacent grass strips (Photo: Erik Bühlmann)



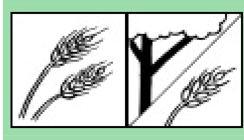
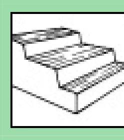
Forward sloping terraces stabilised with aligned poplar trees and adjacent grass strips

On steep and severely eroded cropland a forward sloping terrace (15% gradient) was established by moving available earth with a bulldozer. Below the terraced field, a cut-off drain diverts excessive rain and irrigation water to an existing gully. The terrace and the cut off drain are stabilised by an aligned tree barrier (poplar trees planted in 0.5 metre intervals), and by two parallel grass strips of 1-2 metres in width. The terrace was built using a bulldozer. Digging the cut-off drain and planting the poplar cuttings was done by hand. For the initial establishment of the grass strip clods were transferred from a neighbouring pasture. The poplar trees are pruned in early spring; the cut off-drain needs to be cleared of washed in soil after heavy storm events. The described terrace is established on steep cropland prone to soil erosion. The technology is relatively simple to implement.
The terrace was established to reduce soil erosion and subsequent fertility decline through the reduction of the slope angle. The tree barrier is planted because of the usefulness of poplar trees for construction purposes and to mark field boundaries; its capability of acting as a stabilising terrace is a very useful extra side effect.
Establishment costs and the rather low maintenance costs are offset by the benefits of the harvested wood produced. Poplar trees can be gradually felled and used for construction purposes 15 years after they are initially planted. Through reduction of the slope angle, the risk of soil erosion is lowered significantly. However, poplar trees can only be planted on land where sufficient water for irrigation is available, since they need to be watered on a weekly basis during the summer. Furthermore, the technology covers land which then cannot be used for cultivation of food crops.

Location: RRS
Region: Faizabad Rayon
Technology area: 0.5 km^2
Conservation measure: structural
Stage of intervention: prevention of land degradation
Origin: Experiments -
Climate: subhumid
WOCAT database reference: TAJ005e
Related approach: Voluntary Labour Assistance (TAJ05)
Compiled by: Erik Bühlmann, CDE Centre for Development and Environment
Date: 03rd Mar 2011 updated 12th Jul 2011

Classification

Land use problems: soil erosion and fertility decline severe water erosion (rills and gullies) and subsequent fertility decline on cropland and overgrazed pastures

Land use	Climate	Degradation	Conservation measure
			
Annual cropping Agroforestry	subhumid	Soil erosion by water: gully erosion, Soil erosion by water: loss of topsoil / surface erosion	Structural

Stage of intervention		Origin		Level of technical knowledge
■	Prevention	□	Land user's initiative	Agricultural advisor: medium
□	Mitigation / Reduction	■	Experiments / Research	Land user: medium
□	Rehabilitation	□	Externally introduced	

Main technical functions:
- reduction of slope angle
- reduction of slope length

Secondary technical functions:
- control of dispersed runoff: impede / retard
- control of concentrated runoff: impede / retard

Environment

Natural Environment

	Average annual rainfall (mm)		Altitude (m a.s.l.)		Landform		Slope (%)
□	> 4000 mm	□	> 4000	□	plateau / plains	□	flat
□	3000-4000 mm	□	3000-4000	□	ridges	□	gentle
□	2000-3000 mm	□	2500-3000	▒	mountain slopes	□	moderate
□	1500-2000 mm	□	2000-2500	■	hill slopes	□	rolling
□	1000-1500 mm	▒	1500-2000	□	footslopes	■	hilly
■	750-1000 mm	■	1000-1500	□	valley floors	▒	steep
□	500-750 mm	□	500-1000			□	very steep
□	250-500 mm	□	100-500				
□	< 250 mm	□	<100				

	Soil depth (cm)
□	0-20
□	20-50
□	50-80
□	80-120
■	>120

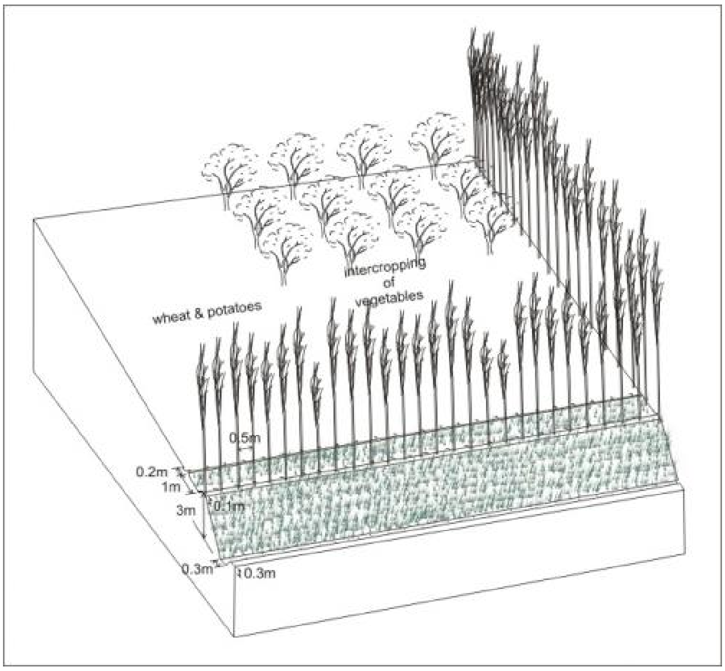
Growing season(s): 210 days (March to August)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Human Environment

	Cropland per household (ha)
□	<0.5
□	0.5-1
■	1-2
▒	2-5
□	5-15

Land ownership: state
Land use rights: leased
Relative level of wealth: average - 75% of land users; owns 70% of the total land area

Importance of off-farm income: > 50% of all income: In general, all farmers (including those applying SWC technologies) are highly dependent on off-farm income which in most cases is earned in Russia either by themselves or by their relatives.
Market orientation: subsistence (self-supply)
Mechanization: manual labour



Technical drawing

Forward sloping terrace stabilised with aligned trees and adjacent grass strips, a cut-off drain diverts irrigation water at the downslope field boundary (Erik Bühlmann)

Implementation activities, inputs and costs

Establishment activities

- digging of pits for tree planting
- planting of poplar cuttings
- transplanting of grass clods
- construction of terrace
- digging of cut-off drain

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Equipment		
- tools	10.00	100%
Agricultural		
- poplar cuttings (neighbours)	0.00	100%
Other		
- labour (terrace)	80.00	100%
- abour (terrace & tree planting	75.00	100%
TOTAL	**165.00**	**100.00%**

Maintenance/recurrent activities

- cutting of grass (grass strips)
- irrigation/watering of trees
- pruning of trees
- clearing cut-off drain from washed in soil

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour		
- labour (pruning)	12.00	100%
- labour(cutting of grass strip)	3.00	100%
TOTAL	**15.00**	**100.00%**

Remarks: Costs were calculated per ha, costs increase if longer field boundary is on contour

WOCAT

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased wood production ++ increased farm income + increased crop yield	++ hindered farm operations + loss of land

Ecological benefits	Ecological disadvantages
+++ reduced soil loss ++ improved excess water drainage + reduced wind velocity	

Off-site benefits	Off-site disadvantages
++ reduced downstream flooding	

Benefits/costs according to land user

The terraces were established with the help of bulldozers which is costly, therefore short-term benefits are slightly negative.

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	very positive
Maintenance/recurrent	neutral / balanced	very positive

Acceptance/adoption:

100% of land user families have implemented the technology voluntary.

Concluding statements

Strengths and → how to sustain/improve

Specialists' opinion:

1) meets household needs for wood for construction → trees should be gradually harvested and replaced with new cuttings
2) reduces slope angle and, hence, decreases risk of soil erosion
3) relatively simple to implement
4) moderate establishment costs, low maintenance costs

Land users' opinion:

1) reduces soil erosion
2) slows fertility decline
3) 15 years after establishment poplar trees can be harvested, their wood is essential for

Weaknesses and → how to overcome

Specialists' opinion:

1) the poplar trees used to stabilise the structure require irrigation during summer
2) farm operations hindered

Land users' opinion:

1) loss of cropland due to structure, grass strips and trees
2) cultivation using a tractor is impossible due to the type of terrain impeding access
3) poplar trees require irrigation

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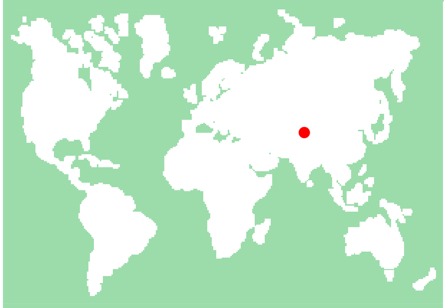
left: Overview of SWC field: wheat field above grass strip, chickpeas and flax cultivated on field below technology (Photo: Erik Bühlmann)
right: Grass strip in the middle of steep sloping cropland (Photo: Erik Bühlmann)

Buffer Strip on Steep Sloping Cropland

Tajikistan – NCCR North-South

A buffer strip of grass is left uncultivated in the middle of an area of steep sloping cropland to help reduce soil erosion.

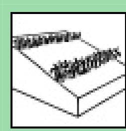
An grass strip, approximately 10m wide is left uncultivated across the upper part of the slope. This buffer strip is followed by an adjacent drainage ditch to enhance the technology's capability of reducing run-on onto the field further down the slope. Neighbouring land users decided to implement the technology in order to reduce soil erosion on their cropland (wheat, chickpeas and flax), and to prevent disputes about land management practices. Upslope and downslope land users reported a significant reduction of observed rill development and fertility decline, emphasising that the benefits of the grass strip offset the area of crop land lost to it. The farmers paid equally for the lost cropland area.
Apart from the annual digging of the drainage ditch no establishment activities are required, since the grass strip was simply left uncultivated when the former pasture was turned into cropland. The drainage ditch needs to be cleared out of soil on a regular basis; the grass strip is cut for haymaking once during each growing season. The technology is cost and labour intensive and is easy to implement. Farmers state the area lost to the grass growing, as only disadvantage. However, the grass strip alone does only reduce, not fully prevent soil erosion and should therefore be combined with other SWC technologies such as drainage ditches, terraces and/or agroforestry.



Location: RRS
Region: Faizabad
Technology area: < 0.1 km2 (10 ha)
Conservation measure: vegetative
Stage of intervention: mitigation / reduction of land degradation
Origin: Experiments -
Climate: subhumid
WOCAT database reference: TAJ006e
Related approach: Joint Land User Initiative (TAJ06)
Compiled by: Erik Bühlmann, CDE Centre for Development and Environment
Date: 26th Jan 2011 updated 12th Jul 2011

Classification

Land use problems: fertility decline, soil erosion and washing downslope of seeds before they can sprout. severe water erosion (rills and gullies) and subsequent fertility decline

Land use	Climate	Degradation	Conservation measure
			
Annual cropping	subhumid	Soil erosion by water: loss of topsoil / surface erosion	Grasses and perennial herbaceous plants

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land user's initiative
- Experiments / Research
- Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: low

Main causes of land degradation:

Main technical functions:
- control of dispersed runoff: impede / retard
- control of concentrated runoff: impede / retard
- reduction of slope length

Secondary technical functions:
- control of concentrated runoff: drain / divert

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): 210 days (Mar - Aug)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Human Environment

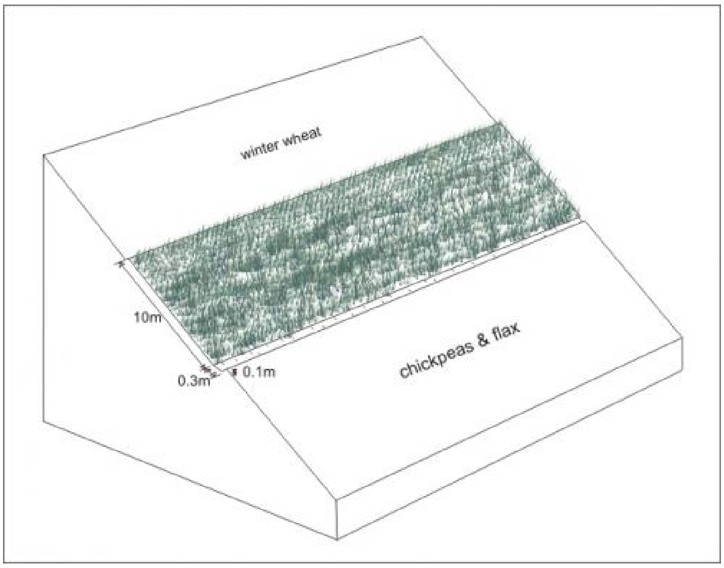
Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5

Land ownership: state
Land use rights: leased
Relative level of wealth: average - 75% of land users; owns 70% of the total land area
Importance of off-farm income: > 50% of all income: In general, all farmers (including those applying SWC technologies) are highly dependent on off-farm income, which in most cases is earned in Russia either by themselves or

Market orientation: subsistence (self-supply)
Mechanization: manual labour

	5-15	by their relatives.



Technical drawing

Grass strip with adjacent drainage ditch on an area of steep sloping cropland (Erik Bühlmann)

Implementation activities, inputs and costs

Establishment activities

- no establishment activities needed as grass strip is left uncultivated

Establishment inputs and costs per ha

Inputs	Costs (US$ / local currency)	% met by land user
Labour		%
Equipment		
- tools	10.00	100%
Construction material		
Agricultural		
Other		
TOTAL	**10.00**	**100.00%**

Maintenance/recurrent activities

- clearing of drainage ditch from washed in soil
- digging of drainage ditch
- cutting of grass (haymaking)

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$ / local currency)	% met by land user
Labour		
- labour (digging of drainage ditch)	1.00	100%
- labour (maintainance of drainage ditch)	3.00	100%
TOTAL	**4.00**	**100.00%**

Remarks: If the technology is not established at the point of the initial cultivation of the cropland, grass clods will need to be transplanted which considerably increases the establishment costs. Costs were calculated per hectare (including adjacent land upslope and downslope).

Assessment

Impacts of the Technology	
Production and socio-economic benefits	**Production and socio-economic disadvantages**
+ increased crop yield	++ loss of land for crop production
Socio-cultural benefits	**Socio-cultural disadvantages**
+ community institution strengthening	
Ecological benefits	**Ecological disadvantages**
++ reduced soil loss	
Off-site benefits	**Off-site disadvantages**
+++ reduced downstream flooding	
Contribution to human well-being/livelihoods	

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	positive
Maintenance/recurrent	positive	positive

Acceptance/adoption:

100% of land user families (1 families; 100% of area) have implemented the technology voluntary. estimates
There is no trend towards (growing) spontaneous adoption of the technology. no other land users have adopted the technology so far

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) effectively reduces formation of large rills on steep sloping cropland →substitution of drainage ditch with a permanent cut-off drain (graded) would enhance the technologies capability of reducing soil erosion
2) very little costs for establishment and maintenance
3) easy to implement, easy to maintain
4) helps to prevent disputes between neighbouring land users about land management practices

Land users' opinion:

1) protects his land from water erosion
2) prevents downslope washing of seeds before germination
3) no conflicts about land management with neighbours upslope
4) defines field boundaries

Weaknesses and →how to overcome

Specialists' opinion:

1) does only reduce, not fully prevent soil erosion → combination with other SWC technologies, such as graded drainage ditches (TAJ10)
2) occupies a relatively large amount of space

Land users' opinion:

1) loss of cropland area only disadvantage

Contact person: Wolfgramm, Bettina, NCCR North-South, CDE University of Bern, Hallerstrasse 10, CH-3012, Bern, Switzerland, e-mail: bettina.wolfgramm@cde.unibe.ch. www.north-south.unibe.ch.

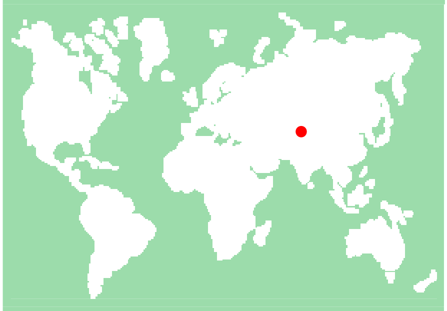
left: Overview of SWC field: graded drainage ditches and cut-off drain at top of field (Photo: Erik Bühlmann)
right: Drainage ditch in steep wheat field (Photo: Erik Bühlmann)

Drainage Ditches in Steep Sloping Cropland

Tajikistan – NCCR North-South

Drainage ditches are dug in steep cropland areas to reduce soil erosion by diverting excess rain water away.

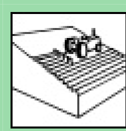
In steep wheat fields drainage ditches are dug at 5-10m intervals to help reduce soil erosion. The ditches are on average 15cm deep and 30cm wide, and are dug with a gradient of 10-20%, to facilitate the draining of excessive rain water. At the top of the field a 50x50cm cut-off drain prevents run-on onto the field. The small drainage ditches in the field are dug each year after tillage and sowing activities. The earth removed from the ditches is piled up below the ditch to decrease the risk them breaching. The cut-off drain at the top was established 5 years ago and is cleared regularly from washed in soil. Most farmers in Faizabad Rayon dig 1-3 drainage ditches in their sloping cropland. Drainage ditches and cut-off drains are often not constructed deep enough and are not well maintained. Construction of the technology is not time consuming or costly, however, drainage ditches and cut-off drains are completely ineffective if not maintained on a regular basis.
Labour input for this work does not exceed three person days per hectare.



Location: RRS
Region: Faizabad Rayon
Technology area: 10 - 100 km2
Conservation measure: agronomic
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user -
Climate: subhumid
WOCAT database reference: TAJ010e
Related approach: not documented
Compiled by: Erik Bühlmann, CDE Centre for Development and Environment
Date: 08th Mar 2011 updated 12th Jul 2011

Classification

Land use problems: fertility decline, soil erosion and downslope washing of seeds before sprouting severe water erosion (gullies and rills) and subsequent fertility decline on cropland and overgrazed pastures

Land use	Climate	Degradation	Conservation measure
			
Annual cropping	subhumid	Soil erosion by water: loss of topsoil / surface erosion	

Stage of intervention	Origin	Level of technical knowledge
□ Prevention ■ Mitigation / Reduction □ Rehabilitation	■ Land user's initiative □ Experiments / Research □ Externally introduced	Agricultural advisor: low Land user: low

Main causes of land degradation:

Main technical functions:
- control of concentrated runoff: drain / divert
- reduction of slope length

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	▨ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	■ hill slopes	□ rolling
□ 1000-1500 mm	▨ 1500-2000	□ footslopes	■ hilly
■ 750-1000 mm	■ 1000-1500	□ valley floors	▨ steep
□ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)

- □ 0-20
- □ 20-50
- □ 50-80
- □ 80-120
- ■ >120

Growing season(s): 210 days (March - August)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Human Environment

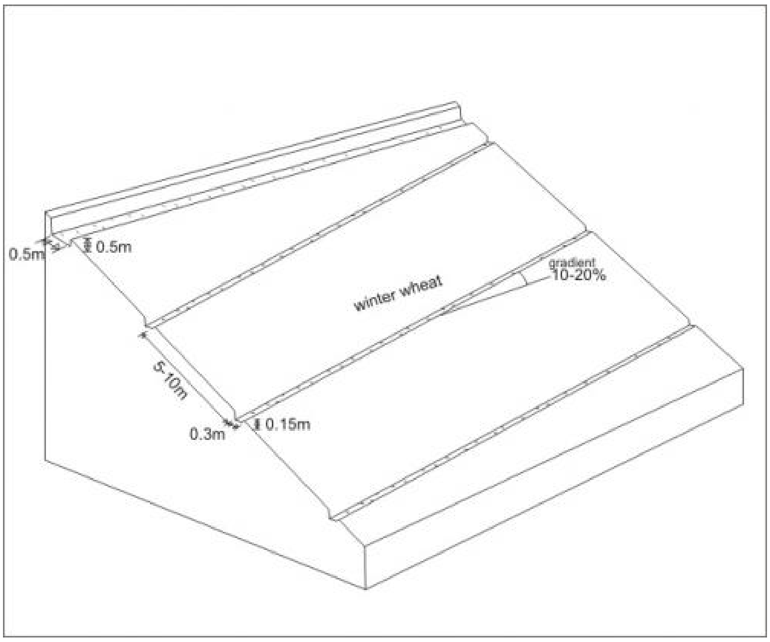
Cropland per household (ha)

- □ <0.5
- □ 0.5-1
- ■ 1-2
- ▨ 2-5
- □ 5-15

Land ownership: state
Land use rights: leased
Relative level of wealth: average - 75% of land users; owns 70% of the total land area

Importance of off-farm income: > 50% of all income: In general, all farmers (including those applying SWC technologies) are highly dependent on off-farm income which in most cases is earned in Russia either by themselves or by their relatives.
Market orientation: subsistence (self-supply)
Mechanization: manual labour

![WOCAT]



Technical drawing

Graded drainage ditches in steep sloping cropland, cut-off drain at top of field to prevent runon (Erik Bühlmann)

Implementation activities, inputs and costs

Establishment activities

- digging of cut-off drainage ditch

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Equipment		
- tools	5.00	100%
Construction material		
Agricultural		
Labour		
- labour (digging of drainage ditch)	3.00	100%
TOTAL	**8.00**	**100.00%**

Maintenance/recurrent activities

- deepening and clearing
- digging of drainage ditches
- clearing of cut-off drain from washed in soil

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour		
- labour (digging of drainage ditch)	9.00	100%
- labour (deepening and clearing)	12.00	100%
TOTAL	**21.00**	**100.00%**

Remarks: Per hectare of cropland; maintenance activities for drainage ditches and cut-off drain after every heavy rainfall (twice a week over 3 months, based on an average of one hour of work per time)

WOCAT

Assessment

Impacts of the Technology	
Production and socio-economic benefits	**Production and socio-economic disadvantages**
+ increased crop yield	
Socio-cultural benefits	**Socio-cultural disadvantages**
+ knowledge conflict mitigation	
Ecological benefits	**Ecological disadvantages**
+++ improved excess water drainage ++ reduced soil loss + increase in soil fertility	
Off-site benefits	**Off-site disadvantages**
++ reduced downstream flooding	

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	positive
Maintenance/recurrent	positive	positive

Acceptance/adoption:

100% of land user families have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology. Increasingly, farmers have to cope with fertility decline of their cropland; one of the first measures they take is the establishment of drainage ditches. However, most farmers implement only a few drainage ditches without maintaining them in an appropriate way.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Require only a small cost for establishment and maintenance.
2) Effectively prevents development of large rills and therefore reduces soil erosion
3) Has the potential to reduce the decline in fertility of the soil

Land users' opinion:

1) Reduces soil erosion
2) Reduces fertility decline
3) Low cost

Weaknesses and →how to overcome

Specialists' opinion:

1) Technology ineffective if not maintained on a regular basis →deepening and clearing after every rainfall event
2) Does not prevent development of small rills and hence does not stop all erosion →small intervals between drainage ditches reduce soil erosion more effectively. Combining this technology with other measures (grass strips, agroforestry etc.) is advisable
3) If the drainage ditches collapse, they cause a lot of damage to the cropland →appropriate management reduces the risk of braking

Land users' opinion:

1) Requires regular checking
2) Cause a lot of damage, if they collapse

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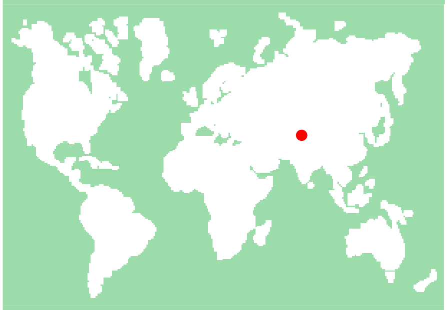
Gradual development of bench terraces from contour ditches

Tajikistan - Welthungerhilfe

Use of the SLM technology facilitates the development of bench terraces from contour channels by gradually removing soil material up the slope for an estimated 5 years until the terraces on the slope reach a desired width of 1.2 m.

The SLM technology is thought to stop water run-off resulting in the prevention of damage to the top soil on steep slopes. This enables better distribution and infiltration of water into the soil. A complementing live fence, along with a metal net along the perimeter aim to stop livestock grazing. Contour ditches are planted in intervals with fruit trees, and the live fence is made of a combination of fire wood, trees and bushes. This combination makes possible the establishment of an agro forestry system on a slope in an area with limited irrigation using making use of the natural rainfall. Details: 1. Ditches are dug out along the contour lines drawn by an "A" frame on the slope. 2. Seedlings are planted in 5 metre intervals, positioned right in the middle of the ditch. 3. The back wall behind each tree (upslope) has a half moon cutting to enable an even water/moisture supply. 4. The ditches are barriered with "septas" between two trees to trap water in the individual sections. 5. Horizontally across the ditches, the tree species vary, but vertically are homogeneous. 6. The strips between ditches are left free to enable natural grass to grow. 7. The residual soil material is mounted in front of the ditches in piles the width of a shovel. 8. The complementing perimeter live fence and metal net (1.5m height) is supported by wooden poles made of Acacia trees. (Assumed life span of poles is 25 years). 9. Improvised drip irrigation with 5 litre plastic bottles is used together with mulch coverage beneath the trees. 10. Species composition: apple, cherry, apricot, grape, walnut, pomegranate. In the garden; species of Acacia, Ailantus, dogroses and willow act as a live fence.
The aim of this system is to significantly reduce the water run-off that removes the top soil, and to subsequently prevent water erosion, and the formation/development of gullies. This can be achieved through the following methods; conserving the available resources and using them more efficiently, prevention overgrazing and improving the natural soil cover, as well as changing the type of land management towards a more sustainable and profitable one.
The plot was established on one side of a micro watershed. In mid February the contour lines were identified using an “A” frame. Digging of contour ditches then took until late February. The material was accumulated down the slope in deposits the width of a shovel to build a riser. At the beginning of March all the fruit tree seedlings were planted in the middle of the ditches. Perimeter fencing was constructed and live fence plants were planted up until late March. In May, the grass around the trees was cut and used for mulching beneath the trees. During June and July in the first year the plants needed watering 3 times a week which was done using a drip irrigation system with 5 litre plastic bottles. To help prevent the water heating and evaporating, the bottles were left under the mulch cover. Mulching and irrigation are repeated every dry and hot season. Every spring, the soil material is removed alongside the inner wall of the ditch just taking an amount that equals the width of a shovel, and accumulated down the slope to extend the riser.
Materials required include: (1) Ditches: hand tools, stakes, rope, “A” frame, (2) Live fence: seedlings of Acacia, Ailantus, willow and dog rose, (3) Fencing: metal net, wooden poles, metal wire, (4) Cow dung, lime suspension, straw, mulch, plastic bottles.
The micro watershed was first inhabited in early 2000. Five households were established with a total of around 40 inhabitants. Of these 5 households, only 4 households have adopted the SLM technology. The fifth household only decided to join the project after witnessing their neighbour’s positive experiences. Both men and women took part in the training sessions and orientation meeting. However, it is likely that most decisions were made by the men, after the women had shared their ideas. Work load: providing the external inputs, construction and the heavy manual labour were done by the men. Maintenance work: watering, mulching and grass cutting was shared between men and women. Digging and fencing were performed in "hashars" - community labour groups.

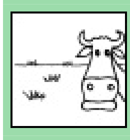
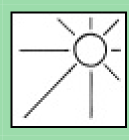
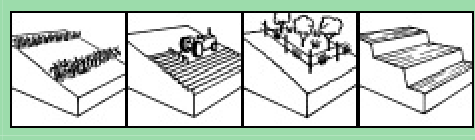
left: (left) contour ditches with half moon structure planted with apple trees; (right) early stage live fencing with a combination of fuelwood trees and dog rose (Photo: Manuchehr Rakhmatdzhonov)
right: Technology plot in Khirob microwatershed (Photo: Manuchehr Rakhmatdzhonov)



Location: Baljuvon, Khirob
Region: Khatlon
Technology area: 0.112 km^2
Conservation measure: agronomic, vegetative, structural, management
Stage of intervention: prevention of land degradation
Origin: Externally - recent (<10 years ago)
Land use: Grazing land: Extensive grazing land (before), Mixed: Agroforestry (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ362e
Related approach: Project facilitation of farmer action for micro watershed management (TAJ029)
Compiled by: Manuchehr Rakhmatdzhonov, Deutsche Welthungerhilfe, Tajikistan
Date: 02nd May 2011 updated 11th Jul 2011

Classification

Land use problems: There is a soil and water conservation project in place to manage water runoff, soil erosion and gully formation. Low land productivity only allows for wheat production with long fallow periods. Improper pasture management has led to overall overgrazing. Implementation of land tenure rights at a local level was also a major barrier.

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Mixed: Agroforestry (after) Rainfed	semi-arid, temperate	Soil erosion by water: loss of topsoil / surface erosion	Vegetation/soil cover, Tree and shrub cover, Bench terraces (slope of terrace bed <6%), Change of land use type

Stage of intervention

Prevention
Mitigation / Reduction
Rehabilitation

Origin

Land user's initiative
Experiments / Research
Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management, deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use, overgrazing, disturbance of water cycle (infiltration / runoff)
Indirect causes: land tenure, inputs and infrastructure

Main technical functions:
- control of dispersed runoff: retain / trap
- reduction of slope angle
- increase of infiltration
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:
- control of dispersed runoff: impede / retard
- improvement of ground cover
- increase / maintain water stored in soil
- water harvesting / increase water supply
- water spreading
- increase of biomass (quantity)
- spatial arrangement and diversification of land use

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)

0-20
20-50
50-80
80-120
>120

Growing season(s): 180 days (March - August)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity:
Ground water table: 5 - 50 m
Availability of surface water:
Water quality: for agricultural use only

Tolerant of climatic extremes: seasonal rainfall increase, wind storms / dust storms, floods, decreasing length of growing period
Sensitive to climatic extremes: temperature increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), droughts / dry spells

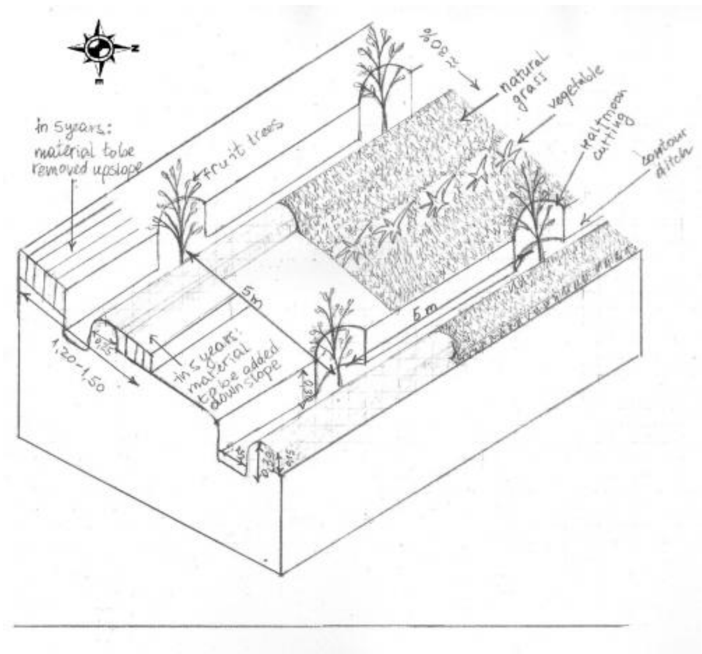
Human Environment

Grazing land per household (ha)

<0.5
0.5-1
1-2
2-5
5-15
15-50

Land user: Individual / household, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: ()
Water use rights: communal (organised)
Relative level of wealth: poor - 60% of land users; owns 20% of the total land area, very poor - 22% of land users; owns 10% of the total land area

Importance of off-farm income: 10-50% of all income: Complemented by salary from state job, NGO activity, transport service and construction work in capital town and other regions, labour migration to Russia.
Access to service and infrastructure: low: health, education, technical assistance, employment, roads & transport, drinking water and sanitation, financial services; moderate: market, energy
Market orientation: subsistence (self-supply)
Livestock density: 50-100 LU /km2



Technical drawing

The drawing shows the contour ditches on a slope with a 25 - 30 % steepness. The gradient is 3-5%. Vertically, the contour ditches are spaced at 5 m intervals. The upper left part of the drawing shows how the material on the slope will be removed in portions during the five years to create a leveled terrace. The ditches are planted with fruit trees, and strips of natural grass cover the space between the ditches. In the middle line of the strips in the bottom part of the plot the farmer has grown vegetables. (Manuchehr Rakhmatdzhonov)

Implementation activities, inputs and costs

Establishment activities

- A wood frame, m
- Labour
- Mulching
- Set of shovels, hoes, picks
- Cost of seedlings: fruit and firewood trees
- Planting seedlings and bushes along the perimeter
- Planting seedlings in contour ditches
- Gradual terracing by broadening the ditch on-slope and extending the raiser down-slope
- Attending the training
- Management of staff
- Membership fees
- Taxes

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	589.00	100%
Equipment		
- tools	69.00	50%
Agricultural		
- seedlings	333.00	50%
- mulch	4.50	100%
TOTAL	**995.50**	**79.81%**

Maintenance/recurrent activities

- Drip irrigation with plastic bottles
- Mulching
- Grafting
- Manuring
- Shaping the trees, cutting branches

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	123.60	100%
Agricultural		
- mulch	22.00	100%
TOTAL	**145.60**	**100.00%**

Remarks: The most affecting factors were the high cost inputs for construction material which usually has to be imported into the area: Fuel, metal nets for fencing, cement, etc. Labour costs apply to the cultivation of the whole 7 ha plot.

Assessment

Impacts of the Technology

Production and socio-economic benefits

- ++ increased crop yield
- ++ increased fodder production
- ++ reduced demand for irrigation water
- ++ reduced expenses on agricultural inputs
- ++ increased farm income
- ++ increased production area
- ++ simplified farm operations
- ++ increased product diversification
- \+ increased wood production
- \+ reduced risk of production failure
- \+ increased irrigation water availability quality
- \+ diversification of income sources

Production and socio-economic disadvantages

- ++ reduced crop production
- ++ increased demand for irrigation water
- ++ increased expenses on agricultural inputs
- ++ increased labour constraints
- \+ reduced animal production

Socio-cultural benefits

- ++ community institution strengthening
- ++ knowledge conflict mitigation

Socio-cultural disadvantages

- \+ socio cultural conflicts
- \+ worsen situation of disadvantaged groups

Ecological benefits

- +++ reduced soil loss
- ++ increased soil moisture
- ++ reduced surface runoff
- ++ improved soil cover
- ++ increased biomass above ground C
- ++ reduced soil compaction
- \+ increased plant diversity
- \+ reduced evaporation
- \+ reduced hazard towards adverse events
- \+ reduced emission of carbon and greenhouse gases

Ecological disadvantages

- \+ increased fire risk
- \+ increased niches for pests

Off-site benefits

- ++ reduced downstream flooding
- ++ improved buffering filtering capacity
- ++ reduced damage on neighbours fields

Off-site disadvantages

- \+ reduced sediment yields

Contribution to human well-being/livelihoods

++ Work is provided to HH adults, better food provision will improve state of nutrition and health, more income could be generated, will allow more time for education and cultural engagement, and reduce need for labour migration

Benefits/costs according to land user

Use of locally available materials - low establishment costs cheap labour, no machinery needed well managed pest and climate extremes: benefits increased good processing, marketing: -benefits increased

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	positive
Maintenance/recurrent	slightly negative	positive

Acceptance/adoption:

100% of land user families (4 families; 75% of area) have implemented the technology with external material support. Project subsidised only 50% of material inputs. 0% of land user families (0 families; 0% of area) have implemented the technology voluntary. Metal for the net was costly- farmers had to convince the project to subsidise prior to adoption, otherwise would reject adopting (area has high risk of crop damage- high livestock density, grazing not controlled). Year following implementation: 3 farmers in neighbourhood have adopted on own funds; much more are willing to adopt, but need external support.

Concluding statements

Strengths and → how to sustain/improve

Specialists' opinion:

1) It made possible the change to more sustainable land management techniques.
2) The technology is well suited to the sloping landscape and is easy to adopt.
3) The technology allows the use of locally available materials, and has low maintenance costs.
4) It fits well to the local needs for land reclamation and conservation, and sits within the legislative frameworks. →There has been a recent state decree to encourage promotion of orchard development.
5) It has a positive effect on the areas downstream. → Prior to implementation of the technology, areas downstream were often were damaged by floods.

Land users' opinion:

1) It has good potential for replication in other areas. →It would be better if the more expensive parts of the input were subsidised.
2) Good long term perspectives for improvement of livelihoods.
3) Land users feel they have an increased status in local society.
4) It helped to acquire more land user rights.
5) It allows a positive long term change in household provision regarding food, employment and energy sources, allowing more spare time for cultural events and education.

Weaknesses and → how to overcome

Specialists' opinion:

1) Needs more until the final structure is finished
2) It is a new technology in this area so will need some time to be proven effective.
3) External knowledge is needed for the establishment and maintenance of the technology.
4) Extra workers are needed for the complementary drip irrigation - child labour is often used for this. →This depends on the length and intensity of any precipitation/drought/dry spells etc.

Land users' opinion:

1) It needed some immediate on-site adjustments when structuring the half moon cuttings in the contour ditches. → The farmer's opinion should be considered during the adoption of the technology, and to assist with any changes made.
2) It caused some disagreements between the farmers and the consultant over what part of the material input should be subsidised. →The consultant should try to ensure they understand the social and economic factors affecting the locals.

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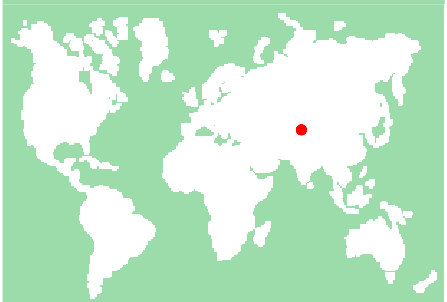
Left: The ditches run towards the river bed at the base of the valley. (Photo: Foteh Rahmatilloev)
Right: The photo shows the ditches running towards the main trench at the foot of the slope. (Photo: Bonati Giuseppe)

Landslide prevention using drainage trenches lined with fast growing trees

Tajikistan - CESVI

The construction of linear gravel bed ditches lined with local tree species, at angles across a hill slope to channel the surface water.

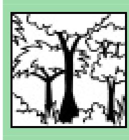
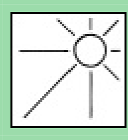
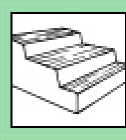
A series of 80m long ditches are constructed at angles of approximately 30 degrees, across a hill slope at the base of the watershed. This land is prone to waterlogging, therefore several ditches approximately 0.5m deep, with a gravel bed to prevent erosion, drain the excess surface water away to the main tributary of the watershed. The edge of the ditches are further lined with fast growing tree species such as willow and poplar for stabilisation and afforestation purposes.
The purpose of the ditches is two fold, firstly to channel the surface water to prevent waterlogging that had previously led to landslides and small mud flows. Secondly, to enable cultivation on land that was previously unusable.
The technology is very simple and cost effective. Initially there needs to be an assessment of the amount of surface water that runs over the slope, this will determine the number of ditches required. The ditches are marked out, running at approximately 30 degrees perpendicular to the slope. The ditches are dug to a depth of 0.5m (or deeper) and filled with a base layer of stone to prevent the bed of the ditch from being eroded. Once the ditch is established, preferably in the spring time, fast growing and naturally available cuttings from trees such as poplars and willows are planted alongside the edge of the ditch at 0.2m intervals. These will stabilise the ditch bank and as the trees become established some thinning out will be required due to their close proximity to each other.
The area used is a hillside slope, subject to substantial amounts of surface water run off due to its location at the base of the watershed. The region suffers from a lack of accessible irrigation water, especially during the hot summer months. This technology allows land to be brought into cultivation that has natural access to water and is able to sustain vegetation during the dry months.



Location: Khovaling
Region: Khatlon
Technology area: 0,1 km^2
Conservation measure: structural
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user - recent (<10 years ago)
Land use: Forests / woodlands: Natural (before), Cropland: Tree and shrub cropping (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ353e
Related approach: not documented
Compiled by: Giuseppe Bonati, CESVI
Date: 30th Apr 2011 updated 11th Jul 2011

Classification

Land use problems: In Soviet times the land was not used due to waterlogging, but the land had good potential to plant trees and produce an income. Due to a lack of drainage in the existing soil, surface flow collects and becomes concentrated leading to top soil washing and gulleying. Animal paths across the slope exacerbate the erosion process.

Land use	Climate	Degradation	Conservation measure
			
Natural Forests / woodlands: Natural (before) Cropland: Tree and shrub cropping (after)	semi-arid, temperate	Soil erosion by water: mass movements / landslides, Soil erosion by water: loss of topsoil / surface erosion	Graded ditches / waterways (to drain and convey water)

Stage of intervention	Origin	Level of technical knowledge
☐ Prevention ■ Mitigation / Reduction ☐ Rehabilitation	■ Land user's initiative: recent (<10 years ago) ☐ Experiments / Research ☐ Externally introduced	Agricultural advisor: low Land user: low

Main causes of land degradation:
Direct causes - Human induced: overgrazing
Direct causes - Natural: Heavy / extreme rainfall , other natural causes, Topological situation at the base of the watershed means it is susceptible to mud flows and other natural disasters

Main technical functions:
- control of concentrated runoff: drain / divert
- stabilisation of soil (eg by tree roots against land slides)

Secondary technical functions:
- control of dispersed runoff: impede / retard
- control of concentrated runoff: impede / retard

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
☐ > 4000 mm	☐ > 4000	☐ plateau / plains	☐ flat
☐ 3000-4000 mm	☐ 3000-4000	☐ ridges	☐ gentle
☐ 2000-3000 mm	☐ 2500-3000	☐ mountain slopes	■ moderate
☐ 1500-2000 mm	☐ 2000-2500	■ hill slopes	☐ rolling
■ 1000-1500 mm	■ 1500-2000	☐ footslopes	☐ hilly
☐ 750-1000 mm	☐ 1000-1500	☐ valley floors	☐ steep
☐ 500-750 mm	☐ 500-1000		☐ very steep
☐ 250-500 mm	☐ 100-500		
☐ < 250 mm	☐ <100		

Soil depth (cm)
- ☐ 0-20
- ■ 20-50
- ☐ 50-80
- ☐ 80-120
- ☐ >120

Growing season(s): 180 days (April - October)
Soil texture: medium (loam)
Soil fertility: high
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: poor (eg sealing /crusting)

Soil water storage capacity: low
Ground water table: <5 m
Availability of surface water: good, medium
Water quality: poor drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease
Sensitive to climatic extremes: heavy rainfall events (intensities and amount), floods, droughts / dry spells

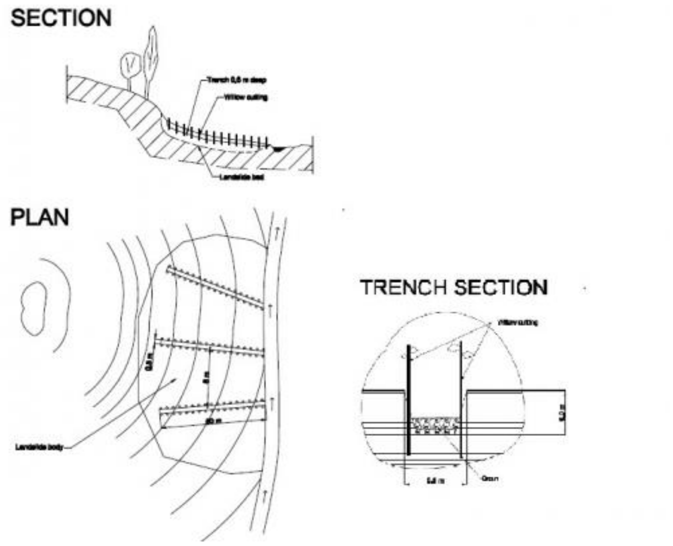
Human Environment

Forest / woodland area per household (ha)

- <0.5 (selected)
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: groups / community, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: communal (organised) (Water user right refer to the water running over the land)
Water use rights: open access (unorganised) (Water user right refer to the water running over the land)

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: health, technical assistance, employment, market, energy, drinking water and sanitation, financial services; moderate: education, roads & transport
Market orientation: subsistence (self-supply)
Purpose of forest / woodland use: fruits and nuts



Technical drawing

The drawing shows the layout of the trench and the lining with fast growing native trees. (BONATI GIUSEPPE)

Implementation activities, inputs and costs

Establishment activities

- Tree planting
- Construction of the drainage ditches

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	33.00	100%
Equipment		
- tools	4.00	100%
Construction material		
- stone	66.00	100%
Agricultural		
- seeds	177.00	100%
TOTAL	**280.00**	**100.00%**

Maintenance/recurrent activities

- Tree maintenance
- Clearance of ditches

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	16.50	100%
TOTAL	**16.50**	**100.00%**

Remarks: The cost of an 80m ditch is mainly determined by labour and seedlings. Labour can be provided by the land owner and seedlings for willows and poplars can be found locally and therefore are of no cost. The stone may occur naturally but there may be transport costs. The costs are calculated for an 80m trench based on 2010 prices in rural Tajikistan.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ increased wood production	
++ increased irrigation water availability quality	
++ increased production area	
++ reduced risk of natural disasters	
+ increased crop yield	
+ increased farm income	
+ diversification of income sources	

Socio-cultural benefits	Socio-cultural disadvantages
+++ knowledge conflict mitigation	

Ecological benefits	Ecological disadvantages
++ reduced hazard towards adverse events	
++ reduced soil loss	
++ improved excess water drainage	
+ improved harvesting collection of water	
+ reduced surface runoff	
+ recharge of groundwater table aquifer	
+ improved soil cover	

Off-site benefits	Off-site disadvantages
++ improved buffering filtering capacity	
++ reduced damage on neighbours fields	
+ movement of debris to adjacent land	

Contribution to human well-being/livelihoods

+ Has limited the potential for landslides that would disrupt day to day living patterns and provided a little more livelihood security. There will be better access to fruits, fire wood, and the opportunity to sell wood for construction.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	very positive
Maintenance/recurrent	positive	very positive

Acceptance/adoption:

100% of land user families (1 families; 100% of area) have implemented the technology voluntary.
There is no trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) It is a basic and easy technology that could be easily replicated, over larger areas. →Further training on the correct angles to build channels and dimensions
2) The technology is low cost and potentially quick to build. →It can be built on many different slopes types, angles and heights.
3) It allows the land to be used for growing fruit trees and timber. There is the opportunity to sell the products. →Training could be provided on tree cultivation.

Land users' opinion:

1) It is easy to build and cheap.

Weaknesses and →how to overcome

Specialists' opinion:

1) The trench may be ineffective if there is a heavy deluge of surface water, and may in fact concentrate the surface water run off. →The trenches could be filled with gravel and rocks, and intertwined in a grid network, this is a common practice for railway embankments in Europe. The slope has to be shallow enough to prevent the gravel material being washed away.

Contact person: Bonati, Giuseppe, CESVI, 84, Hakimzoda street, Dushanbe, Tajikistan; dushanbe@cesvioverseas.org

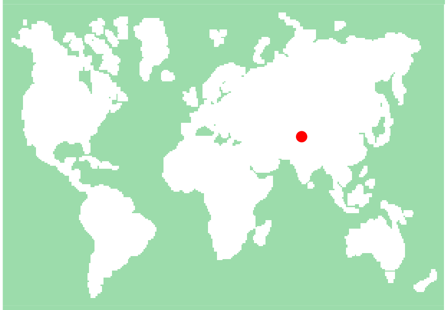
Left: Growing of one year old barriers in the autumn (Photo: Daler Domullojonov)
Right: Sediment deposition after first rainy season (Photo: Daler Domullojonov)

Infilling of gullies with vegetative structures

Tajikistan - Welthungerhilfe

Reclamation and infilling of eroded gullies using barriers of willow branches and live mulberry cuttings to trap loess soil from surface water runoff.

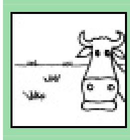
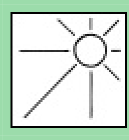
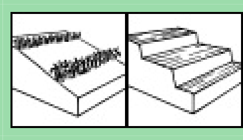
Due to many different factors and mechanisms, soil erosion is at an advanced stage in many of the hilly and mountainous parts of Tajikistan. After disrupting the soil cover in steep areas, starting the process of soil detachment and transportation water runoff gets concentrated into specific areas. As a result, rills develop on the steep areas, and eventually enlarge into gullies.
To address this problem, low cost barriers are constructed from flexible living branches of a sprouting variety of tree, such as willow. These branches are placed along the gulley at intervals of 3-10 metres, so that they slow down the flow of surface water and trap the sediment, thus eventually filling in the gulley over a period of several months or sometimes years.
The barriers are designed to slowly help infill eroded gullies by trapping the sediment from muddy surface water runoff. This helps prevent further erosion, increases the amount of land available for pasture, and reduces the risk of mud flows or floods further down the slope. In gullies no wider than 1-2 m, live cuttings from local tree varieties with a diameter of 3-5 cm and 1 metre in length can be used to establish horizontal woven barriers across the gulley. Based on gulley bed slope, the barriers are placed at 3-10 m intervals along the gulley, starting at the base. These barriers are constructed from cuttings that are woven in narrow sections with 5-6 cm intervals between them. Enforcement and strengthening of these plugs can be achieved through the use of long branches of locally available mulberry. The height of the plug should not exceed 0.5 m. The construction activities start in the spring and within several weeks some of the cuttings begin to sprout and grow. To avoid erosion at the sides of the structure, the cut offs are embedded into the sides of the gulley.
Gulley plugging is used in pasture land that suffers from overgrazing, deforestation and trampling, which has resulted in the degradation of the soil. Subsequently, the soil has become more vulnerable to the impact of heavy rain in the spring and autumn months, and is prone to erosion from surface water runoff.



Location: Khovaling / Dorobi
Region: Khatlon
Technology area: 0.017 km^2
Conservation measure: vegetative, structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Externally - recent (<10 years ago)
Land use: Grazing land: Extensive grazing land (before), Mixed: Agroforestry (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ356e
Related approach: Implementation of soil and water conservation measures through village school involvement (TAJ022)
Compiled by: Daler Domullojonov, Not a member of an institution
Date: 01st May 2011 updated 11th Jul 2011

Classification

Land use problems: Gullies are formed after intensive rainfall events. There is nothing in place to stop this erosion. Overgrazing on pasture lands that leads to reduced vegetation cover and deforestation, contributes greatly to the causes of top soil erosion and gulley formation.

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Mixed: Agroforestry (after) extensive grazing land Rainfed	semi-arid, temperate	Soil erosion by water: gully erosion / gullying	Tree and shrub cover, Walls / barriers / palisades

Stage of intervention

- Prevention
- Mitigation / Reduction
- ■ Rehabilitation

Origin

- Land user's initiative
- Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires), overgrazing

Main technical functions:
- control of concentrated runoff: impede / retard
- stabilisation of soil (eg by tree roots against land slides)

Secondary technical functions:
- improvement of ground cover
- increase of surface roughness
- sediment retention / trapping, sediment harvesting

Environment

Natural Environment

Average annual rainfall (mm)

- > 4000 mm
- 3000-4000 mm
- 2000-3000 mm
- 1500-2000 mm
- ■ 1000-1500 mm
- 750-1000 mm
- 500-750 mm
- 250-500 mm
- < 250 mm

Altitude (m a.s.l.)

- > 4000
- 3000-4000
- 2500-3000
- 2000-2500
- 1500-2000
- ■ 1000-1500
- 500-1000
- 100-500
- <100

Landform

- plateau / plains
- ridges
- mountain slopes
- ■ hill slopes
- footslopes
- valley floors

Slope (%)

- flat
- gentle
- moderate
- ■ rolling
- hilly
- steep
- very steep

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- ■ >120

Growing season(s): 160 days (March - June)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: poor (eg sealing /crusting)

Soil water storage capacity: low
Ground water table: %gt;50 m
Availability of surface water: poor / none
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: seasonal rainfall increase, heavy rainfall events (intensities and amount)
Sensitive to climatic extremes: floods, droughts / dry spells
If sensitive, what modifications were made / are possible: As a living barrier it needs to grow, and therefore it is sensitive to drought conditions.

Human Environment

Grazing land per household (ha)

■	<0.5
□	0.5-1
□	1-2
□	2-5
□	5-15
□	15-50

Land user: groups / community, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: leased
Relative level of wealth: average - 20% of land users; owns % of the total land area, poor - 80% of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: low: health, technical assistance, employment, energy, financial services; moderate: education, market, roads & transport, drinking water and sanitation
Market orientation: subsistence (self-supply)
Livestock density: 1-10 LU /km2

Technical drawing
For the plugging of the gully, a low cost and simple barrier was made from locally available fast sprouting species of trees; in this case live willow cuttings were used. In the gully a narrow section was selected, and cuttings (3-5 cm diameter, 1 m length) were placed in a line with 10 cm intervals in between. One third of the cuttings were planted in the gulley, and the rest were used to create a 'wave' wall of flexible branches, which was planted with local mulberry trees (1-1.5 cm diameter). The weaved branches have to be pushed down from the top to make the barrier suitably dense. The ends of the mulberry branches have to be stuck securely to the soil inside the gulley. (Daler Domullojonov)

Implementation activities, inputs and costs

Establishment activities

- Planting mulberry in willow wave structure
- Establishment of barriers in gully bed

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	11.00	100%
Equipment		
Construction material		
- Mulberry branches	4.50	100%
- Willow branches	4.50	%
Agricultural		
- willow cuttings		100%
TOTAL	**20.50**	**100.00%**

Maintenance/recurrent activities

- Reinforce structure with additional seedlings when needed
- Establishment of additional barriers after filling existing barriers with sediments

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	5.50	100%
Construction material		
- Mulberry branches	4.50	100%
- Willow branches	4.00	100%
Agricultural		
TOTAL	**15.00**	**100.00%**

Remarks: The materials used to construct the gulley plug are locally available, and are therefore free of charge to the land user. The labour (or time in labour) is the most substantial cost, and this is directly proportional to the number of gulley plugs required to infill the entire eroded gulley. If there is a big sediment load in the surface water runoff it will back fill behind the gulley plugs rapidly and additional barriers will need to be established. The unit cost is for a gulley plug, 1.5 metre wide and around 1m in height.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+ increased wood production + increased production area	

Socio-cultural benefits	Socio-cultural disadvantages
+ knowledge conflict mitigation	

Ecological benefits	Ecological disadvantages
++ improved soil cover ++ reduced soil loss + reduced hazard towards adverse events	

Off-site benefits	Off-site disadvantages
++ reduced damage on neighbours fields ++ reduced damage on public private infrastructure + reduced downstream flooding + improved buffering filtering capacity	

Contribution to human well-being/livelihoods

+ It will help increase the amount of land available for pasture, and furthermore help reduce the risk of mud flows directed from the gulley.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption:

100% of land user families (10 families; 100% of area) have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Gulley plugs are relatively easy to construct and have a low initial outlay. →It could be further supported by the strong involvement of local authorities, through the organisation of cross visits, and disseminating ideas between farmers.
2) It is flexible as various varieties of local sprouting trees can be used to build the gulley plug.
3) It can prevent further erosion and expansion of the gulley. It can also increase the amount of land available for pasture activities.
4) Environmentally friendly

Land users' opinion:

1) No training and additional skills are required. →Broad promotion to other communities with similar climatic conditions and similar issues.
2) It is low cost option.
3) Easy to establish, with a low workload.

Weaknesses and →how to overcome

Specialists' opinion:

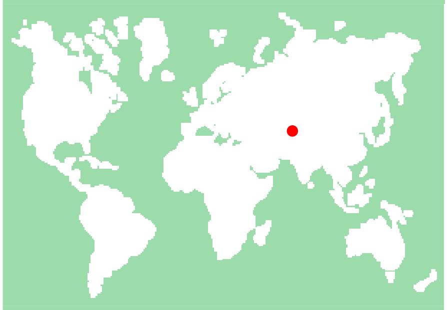
1) The gulley plug is weak in the beginning as the mulberry trees become more established. It is more susceptible to the impact of heavy rainfall events and concentrated run off down the gulley. →High levels of maintenance in the first initial few seasons.
2) The gulley plug has to be protected from livestock who will eat the vegetation. →Fencing around the gulley.
3) The gulley plug becomes less effective as the gullies become wider and deeper.

Contact person: Domullojonov, Daler, Welthungerhilfe, Temurmalik office, 77, H. Zarif street, Soviet settlement, Temurmalik district, Khatlon province, Tajikistan, +992 918 248084, daler.domullojonov@welthungerhilfe.de; dalerd@list.ru; www.welhungerhilfe.de

Strengthening of river banks with stones and gabions

Tajikistan - Community Agriculture & Watershed Management Project (CAWMP)

left: Strengthening of river banks with gabions (Photo: CAWMP Project's archive)
right: Laying stones to protect river banks (Photo: CAWMP Project's archive)



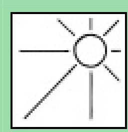
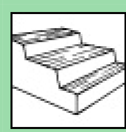
Strengthening of river banks and counter landslide operations with the use of stones and gabions

The technology includes collection of stones of average size (with the diameter of 20-40cm) and laying them in a specific way in places that are most affected by the water flow and which are prone to washout. Stones will protect arable and inhabited areas from washouts. There are two traditional ways for laying stones: (1) in the form of gabions or, in other words, stones are laid in the form of vertical walls bounded with wire, (2) in the form of masonry when stones are laid on branches of trees and shrubs.
Preventing river banks from being washed out by water flow and mudslides.
Collection of stones and tree branches, laying them down in a specific way, tying stones with tree branches or wire
The technology is applicable to any river banks in rural settlements.

Location: Tajikistan
Region: Tajikobod region, Jamoats of Shirinchashma and Shagodaev
Technology area: 1 - 10 km2
Conservation measure: structural
Stage of intervention: prevention of land degradation
Origin: Land user - traditional (>50 years ago)
Land use: Other: Settlements, infrastructure networks (before), Other: Settlements, infrastructure networks (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ403e
Related approach:
Compiled by: German Kust
Date: 08th Jun 2011 updated 11th Jul 2011

Classification

Land use problems: Washout of river banks by water and mudslides, reduction of arable land Washout of river banks by water and mudslides, reduction of arable land

Land use	Climate	Degradation	Conservation measure
Other: Settlements, infrastructure networks (before) Other: Settlements, infrastructure networks (after) Mixed rainfed - irrigated	 semi-arid, temperate	 Soil erosion by water: riverbank erosion	 Walls / barriers / palisades

Stage of intervention	Origin	Level of technical knowledge
Prevention Mitigation / Reduction Rehabilitation	Land user's initiative: traditional (>50 years ago) Experiments / Research Externally introduced: recent (<10 years ago)	Agricultural advisor: medium Land user: medium

Main causes of land degradation:
Direct causes - Natural: Heavy / extreme rainfall , floods

Main technical functions:
Stabilisation of soil (eg by tree roots against landslides)

Secondary technical functions:
Control of concentrated runoff: impede / retard
Control of concentrated runoff: drain / divert

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)

0-20
20-50
50-80
80-120
>120

Growing season(s):
Soil texture:
Soil fertility:
Topsoil organic matter:
Soil drainage/infiltration:

Soil water storage capacity:
Ground water table:
Availability of surface water: excess (eg flood)
Water quality:
Biodiversity:

Tolerant of climatic extremes: temperature increase, seasonal rainfall decrease, wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: seasonal rainfall increase, heavy rainfall events (intensities and amount), floods

Human Environment

Mixed land per household (ha)

■	<0.5
	0.5-1
	1-2
	2-5
	5-15
	15-50
	50-100
	100-500
	500-1,000
	1,000-10,000
	>10,000

Land user: groups / community, Small scale land users, common / average land users, mixed
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: communal / village, individual, titled
Land use rights: communal (organised)
Relative level of wealth: poor - % of land users; owns % of the total land area

Importance of off-farm income: > 50% of all income:
Access to service and infrastructure: low: health, technical assistance, energy, financial services; moderate: education, employment, market, roads & transport, drinking water and sanitation

Implementation activities, inputs and costs

Establishment activities

- Collection of cuttings
- Cuttings of poplar and willow trees or sea-buckthorn
- Planting the cuttings
- Collection and transportation of branches of trees
- Collection and transportation of stones
- Fixing stones in gabions
- Layout of mats or stones
- Design of structures
- Organization of works

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
Other		
- Minimum costs	200	%
- Maximum costs	800	%
TOTAL	**200-800**	**0.00%**

Maintenance/recurrent activities

- Planting the cuttings
- Replacement of destroyed sections of stones
- Maintenance of structures
- Repair works

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$))	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
Other		
TOTAL	**0.00**	**0.00%**

Remarks:
Season, distance of transportation of stones, height of the structure, width and thickness of the structure, opportunity to mechanise works determine the costs.
$200-$800 USD costs are calculated for 1 running meter of the average structure with the use of manual labor

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ disaster risk reduction ++ decreased labour constraints ++ increased production area	+++ No disadvantages

Socio-cultural benefits	Socio-cultural disadvantages
+++ community institution strengthening ++ improved food security self sufficiency + improved conservation erosion	+++ No disadvantages

Ecological benefits	Ecological disadvantages
+++ reduced hazard towards adverse events +++ reduced soil loss	

Off-site benefits	Off-site disadvantages
++ reduced damage on neighbours fields	+++ No disadvantages

Contribution to human well-being/livelihoods

++ New land areas could be taken under production. These areas can be used without any risks

Benefits/costs according to land user

It is difficult to assess economic benefits since prevented risks can be very expensive in terms of rehabilitation works in critical situations

Benefits compared with costs	short-term:	long-term:
Establishment	not specified	positive
Maintenance/recurrent	not specified	positive

Acceptance/adoption:

100% of land user families (76 families; 100% of area) have implemented the technology with external material support. This is the number of families who have applied this technology in the frameworks of the CAWMP Project.
There is moderate trend towards (growing) spontaneous adoption of the technology. These technologies are traditional for Tajikistan, but they are quite expensive and need supporting funds

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:
1) Cheapness of local materials (since only transportation of materials is paid)
2) Engineering simplicity of the structures
3) Opportunity to reduce land use risks in critical areas

Land users' opinion:
1) Less critical situations

Weaknesses and →how to overcome

Specialists' opinion:
1) Structures can be destroyed by floods or mudslides → Make structures more stable, use modern technologies

Contact person: German Kust, gkust@yandex.ru. Tajikistan World Bank Country Office, Ayni street 48, Business Center "Sozidanie", 3rd floor. Tel. (48) 701 58 08, 93 588 99 76.

Reduced pressure on forest resources by improved thermal insulation in private houses

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Thermal insulation of private houses with energy efficient products to reduce the fuel-wood demand and pressures on the natural environment.

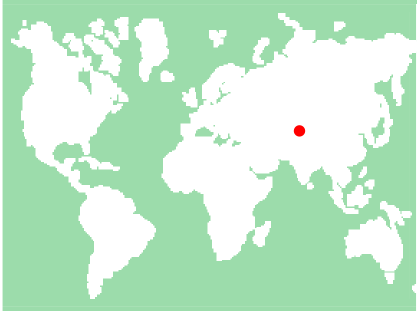
Well insulated doors and windows are installed together with thermal insulation of the ceilings and floors in houses in the remote villages of the Gorno-Badakhshan Autonomous Region. Improved quality windows and doors, as well as improved thermal insulation of the houses contribute to retain the heat inside, which is one of the main problems in many of these traditionally built houses. The quality of the materials used to produce the products as well as the quality of the product itself and its installation process are ensured through using locally trained craftsmen. Local available organic materials such as sawdust, straw, water plants, leaves and others can be used as thermal insulation material for walls, floors and ceilings. The materials should be dry and free of insects. The local labour market plays a crucial role in the technical accurate performance of the thermal insulation measures. Therefore the local labour market has to be analysed and training needs for the craftsmen have to be defined, e.g. for producing double-glazed windows and improved doors, as well as insulating walls, ceilings or floors, and the installation of windows and doors in accordance to the defined and standardised thermal insulation measures.

Thermal insulation contributes to the reduction of heat exchange between indoors and outdoors and therefore may have two main effects: Less fuel may be needed to heat the houses, or using the same quantities of fuel the temperature indoors can be significantly increased. A reduction in fuel consumption means a reduction either of financial expenses or of labour, so the saved money or time can be used for other purposes - ideally for making investments and creating additional income sources. Higher and more constant indoor temperatures can contribute to a reduction in health risks and to increased quality of life during the winter period. Going beyond the level of the individual household, a reduction in fuel consumption means less pressure on natural resources: The less firewood that is used for heating, the less trees will be cut down and the less the forests will degrade. Also the less manure that is burnt in the stoves means more of it can be used as fertilizer on the arable land. In this framework many of the economical, social and environmental problems could be mitigated if houses were properly insulated.

A technical assessment of the identified house for thermal insulation is carried out to investigate which materials are used for the construction of the house, and to identify measures and materials that could be used for thermal insulation purposes, in order to be able to offer the most technically appropriate solution, which is adapted to the local cultural and climatic conditions. The organic thermal insulation material should be prepared in advance to make sure it is dry and clean. The designated area whether it is the floor, ceiling or walls should be cleared of furniture and other things items. Electric wires should be safely removed, or covered adequately for safety reasons to prevent fire. In the case of the roof, the insulation material is laid out evenly on the surface to a thickness of 15-20 cm depending on the type of organic material which is used. The lime is then spread out over the organic insulation material. For 1 m2 about 1-1.5kg of lime is required. The material is thoroughly tamped down to reduce subsidence of the protective cover, which will be put over the insulation material. A mixture of clay, straw and water is prepared to form a substance with a solid consistency to prevent the surface from cracking when it dries. This clay and straw mixture is then spread evenly on the surface about 4-6 cm thick, ensuring that the whole insulation material is covered. The surface should dry in 24 hours after which some cracks might appear and if this happens then a liquid mixture of clay and sand is used to flatten the area left to dry again. The same process is applied to the floors, and the more complex roof thermal insulation materials where roof felt is used as a basis for the organic insulation material as it is moisture proof. The windows and doors as well as these insulated areas in the house should be properly maintained. It should be ensures that there are no leaks in the roof so that the ceiling insulation is kept dry.

The thermal insulation technology should contribute to ease the pressure on the natural resources in the GBAO area and allow natural regeneration of forests and Teresken shrubs.

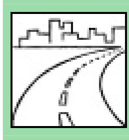
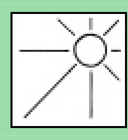
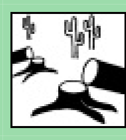
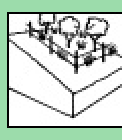
Left: Shows how craftsmen are insulating the roof of the house. In the photo you also see the willow trees of which the branches will be cut for firewood.
Right: Trained craftsmen are installing double-glazed windows at clients house (Photo: Heike Volkmer)



Location: Roshtkala, Shugnan, Murgab and Ishkashim
Region: Gorno Badakhshan Autonomous Oblast (GBAO)
Technology area: 100 km2 - 1,000 km2
Conservation measure: management
Stage of intervention: prevention of land degradation
Origin: Externally - recent (<10 years ago)
Land use: Other: Settlements, infrastructure networks (before), Other: Settlements, infrastructure networks (after)
Climate: arid, boreal
WOCAT database reference: TAJ102e
Related approach: Access to thermal insulation through micro loans (TAJ031)
Compiled by: Roziya Kirgizbekova, GIZ Tajikistan
Date: 02nd Feb 2011 updated 12th Jul 2011

Classification

Land use problems: Unable to heat their houses properly during cold winters; shortage of fuel for cooking and heating; during cold winters, fire wood becomes so scarce that even fruit trees are cut down. Due to a shortage of energy sources, wood, teresken and manure are extensively used for heating private houses; natural resources are therefore severely overused, which has resulted in degraded land, destroyed forests and lack of natural fertilizer for agriculture; poor thermal insulation of houses also leads to increased demand for fuel.

Land use	Climate	Degradation	Conservation measure
			
Other: Settlements, infrastructure networks (before) Other: Settlements, infrastructure networks (after) Selective felling of (semi-) natural forests	arid, boreal	Biological degradation: quantity / biomass decline	Change of management / intensity level

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land user's initiative
- Experiments / Research
- Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high
Land user: low
craftsmen: high
construction workers: high

Main causes of land degradation:
Direct causes - Human induced: over-exploitation of vegetation for domestic use
Indirect causes: poverty / wealth, Lack of finances

Main technical functions:
- increase of biomass (quantity)
- Reduced heat loss from houses
- Reduced fuel consumption

Secondary technical functions:
- improvement of topsoil structure (compaction)
- stabilisation of soil (eg by tree roots against land slides)
- increase in organic matter
- increase in nutrient availability (supply, recycling)
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Environment

Natural Environment

Average annual rainfall (mm)

- > 4000 mm
- 3000-4000 mm
- 2000-3000 mm
- 1500-2000 mm
- 1000-1500 mm
- 750-1000 mm
- 500-750 mm
- 250-500 mm
- < 250 mm

Altitude (m a.s.l.)

- > 4000
- 3000-4000
- 2500-3000
- 2000-2500
- 1500-2000
- 1000-1500
- 500-1000
- 100-500
- <100

Landform

- plateau / plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Slope (%)

- flat
- gentle
- moderate
- rolling
- hilly
- steep
- very steep

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): 120 days (May-July)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

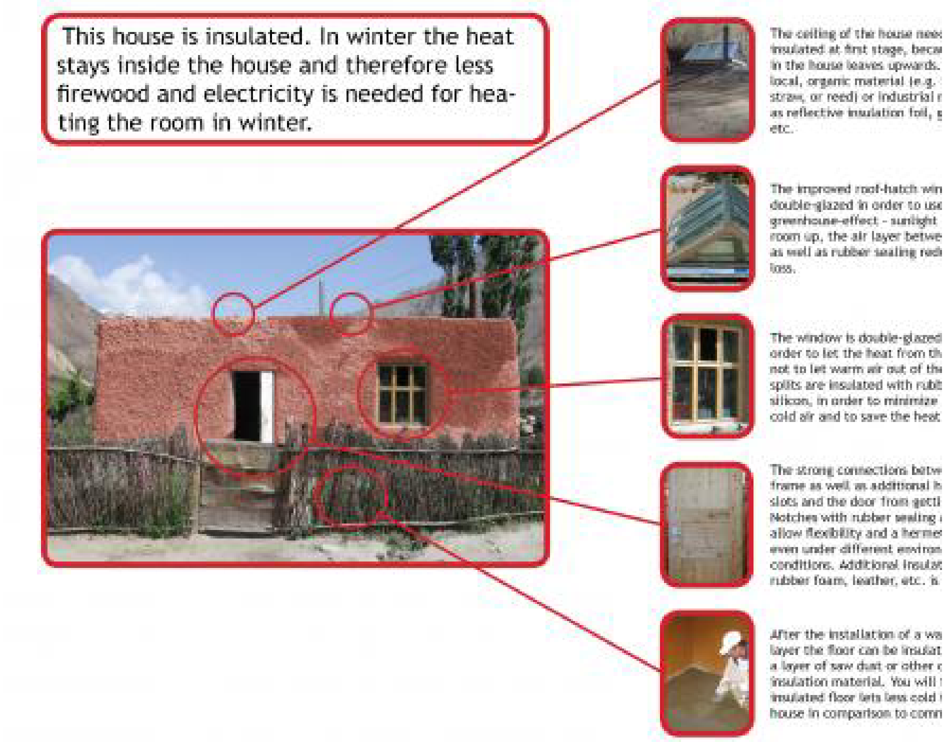
Soil water storage capacity: low
Ground water table: 5 - 50 m
Availability of surface water: good
Water quality: good drinking water
Biodiversity: high

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), droughts / dry spells, decreasing length of growing period, Extreme cold temperatures
Sensitive to climatic extremes: No

Human Environment

Land user: Individual / household, Small scale land users, Leaders / privileged, mixed
Population density: 10-50 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Relative level of wealth: average - % of land users; owns % of the total land area

Importance of off-farm income: > 50% of all income: The majority of households rely heavily on remittances from Russia.
Access to service and infrastructure: low: health, technical assistance, employment, market, energy, roads & transport, financial services; moderate: education; high: drinking water and sanitation



Technical drawing

This diagram with photos shows the different thermal insulation measures.

Implementation activities, inputs and costs

Establishment activities

- Installation of door 2.00x0.90
- Installation of window 1.40x1.30
- Thermal insulation

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	17.00	100%
Equipment		
Construction material		
- Door	133.00	100%
- Window	126.00	100%
- Insulation material	126.00	100%
TOTAL	**402.00**	**100.00%**

Maintenance/recurrent activities

- No maintenance activities reported

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	0.00	%
Equipment		
Construction material		
TOTAL	**0.00**	**%**

Remarks: The costs for the installation of windows and doors depend on their size and also whether additional work has to be done to fit the door or window hatch to the required size. With regards to the thermal insulation the costs are estimated based of the size of the area in square metres, whether it is the floor, ceiling or wall. The labour costs are indicated for installation of one window/door. With regards to the thermal insulation the labour costs are higher, so they are calculated per square metre of the area where thermal insulation will be applied.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ decreased workload ++ reduced demand for fuel-wood + increased fodder production + increased fodder quality + increased animal production + increased farm income + diversification of income sources	+ inaccessibility of natural insulation material: straw, saw dust, etc.
Socio-cultural benefits	**Socio-cultural disadvantages**
+ knowledge conflict mitigation + improved situation of disadvantaged groups + improved health	
Ecological benefits	**Ecological disadvantages**
++ increased biomass above ground C ++ increased maintained habitat diversity + increased soil moisture + improved soil cover + increased plant diversity	
Off-site benefits	**Off-site disadvantages**
+ reduced wind transported sediments	

Contribution to human well-being/livelihoods

++ In general, people save money on energy sources and spend less time collecting wood and animal dung from the field. Houses are warmer, which can be beneficial for the family's health.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption: There is moderate trend towards (growing) spontaneous adoption of the technology. When one household installs quality windows or doors or has its house insulated, the effects are visible not only to that given household but also to neighbours and other visitors. As a result the number of people interested in installing such technology to their homes is increasing.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:
1) If implemented on a larger scale can prevent overuse of natural resources for fuel. → When applied together with Joint Forestry Management (see QA TAJ015) forests can be conserved more efficiently.
2) Incentives in form of micro loans to make the technology more accessible to local people. →More incentives could be provided by government subsidies for private households when implementing this energy saving technology, especially in the rural areas
3) Imported timber used to produce doors and windows. →Local timber is not harvested in order to allow the forests to recover.
4) More fertilizer available. →Continue to raise awareness about the environmental importance of manure to prevent its use as fuel
5) Reduced workload and costs spent on buying fuel.

Land users' opinion:
1) Warm and comfortable houses →Appropriate ventilation of the insulated house, proper maintenance of windows and doors.
2) Costs of firewood reduced
3) Reduced workload

Weaknesses and →how to overcome

Specialists' opinion:
1) Lack of skilled craftsmen → Improved professional craftsmen education through training courses.
2) Lack of modern equipment to produce wooden products → Financial support to supply the local craftsmen with modern equipment to further improve the quality of the products and increase the rate the production process.

Contact person: Kirgizbekova, Roziya. GIZ. Forestry Sector Reform in Tajikistan. Regional Program on Sustainable Use of Natural Resources in Central Asia; roziya.kirgizbekova@giz.de /Zevarshoev, Rustam; Retail Cooperative "Zindagi"; phone: +992 935922699 4A, Ainy Ave., Dushanbe, Tajikistan 734024

left: Heat exchanger installed on chimney to retain heat and for cooking. (Photo: Firuza Hafizova)
right: Modified cooking stoves and pressure cookers (Photo: Tahmina Hafizova)

Energy efficiency measures to increase the application of organic fertilizers

Tajikistan - Welthungerhilfe

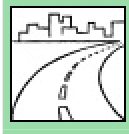
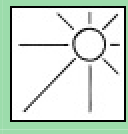
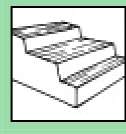
The implementation of several low cost energy efficiency measures to reduce the amount of organic material used as fuel within rural households.

In many cases local inhabitants of rural areas depend heavily on locally available natural resources, contributing to, and accelerating deforestation. As a low cost fuel source, local households often use cow-dung and wood. Taking these from the local area contributes to decreased soil fertility and erosion processes. Most of the dung collected from livestock is burnt in a very inefficient manner for cooking, boiling, baking and heating purposes. Based upon assessments by Welthungerhilfe in 600 households (HH) who were using cow dung as the only fuel material, on average one HH uses 4.6 tons of cow dung annually when using traditional cooking stoves, 6 tons for heating and 4.5 tons for bread baking. This means almost 15.1 tons of cow dung is burnt annually per HH. Using a simple modification of the traditional cooking stove, approximately 50 - 60% or 2.3 tons of fuel material can be saved. This saving can be further increased by the utilisation of a pressure cooker that decreases the cooking time by 50%. Not all local hot meals can be cooked with a pressure cooker but it can contribute to an additional saving of 0.7 ton of organic matter. The introduction of a metal heat exchanger on the exhaust pipe of a cast iron stove can help save a household 3 tons of fuel material per year, the effectiveness can be further increased by the incorporation of bread baking compartment. Further savings can be made by using straw, mud and wood to improve the thermal insulation of the exterior walls, ceiling and floor in the house. Through the integration of all above measures approx 60% of the current usage rates of organic material used for fuel can be saved. In addition it will keep the house warmer for longer, reduce the smoke in the air, and help retain organic material in the soil.
The main objective of the energy efficiency technology is to address one of the root causes of the deforestation process and to improve soil fertility i.e. to decrease the demand from the local population for organic fuel. This project used a range of technologies to address this issue which in combination provided substantial savings in organic fuel.
Cooking stoves: For centuries local populations have been using traditional cooking stoves for cooking, especially during the warm seasons of the year. These were made from a mixture of mud and straw. The modification of these involves improving the aeration process during the burning of the fuel. This is achieved by putting a metallic cover with one inflow cutting and six small smoke outflow holes surrounding the cooking pot. The only input needed which is not locally available is the metallic cover.
Pressure cookers: As maintenance is required 1-2 times per season to keep the cooking stove functioning efficiently, the utilization of pressure cookers can be easily integrated with the modified cooking stoves.
Heat exchangers: The heat exchangers installed on top of the iron ovens, can be produced by local tradesmen and need to be cleaned every 1-2 months. They have to be installed before the start of the winter season when the heating is needed.
House installation: The house insulation, using locally available materials does not need maintenance once it is installed. However, the storage of dry fruits or bread in the attic should be avoided as it could attract mice which can destroy the insulation. Welthungerhilfe provided subsidies for all the above work, except for the heat exchangers.
The geographical area served by the project is mainly hill slopes, covered in low grade pasture fodder with wheat crops planted in loess soil. Although the soils have the potential to be very fertile, they are overused and not well managed and thus have become degraded and denuded. One of the main contributing factors to this is the removal of organic material from the biomass cycle. Trees, bushes and organic material is cut and collected to be used as fuel. The main source of income in the area is from semi-subsistence farming, and the removal of organic material has a significant impact on their crops and livestock.

Location: Temurmalik. Davad
Region: Khatlon
Technology area: > 10,000 km2
Conservation measure: structural
Stage of intervention: prevention of land degradation
Origin: Externally - recent (<10 years ago)
Climate: semi-arid, temperate
WOCAT database reference: TAJ354e
Related approach: not documented
Compiled by: Daler Domullojonov
Date: 30th Apr 2011 updated 11th Jul 2011

Classification

Land use problems: Crop yields decrease. The land in rural Tajikistan is becoming denuded due to the pressure for organic fertilisers used as a source of fuel for heating and cooking. This impacts on soil quality, yields and soil stability. This issue is compounded by the relatively high price of mineral fertilisers.

Land use	Climate	Degradation	Conservation measure
			
Settlements, infrastructure networks	semi-arid, temperate	Chemical soil deterioration: fertility decline and reduced organic matter content	Structural

Stage of intervention

- ■ Prevention
- ▒ Mitigation / Reduction
- □ Rehabilitation

Origin

- □ Land user's initiative
- □ Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high
Land user: medium
Local masters: high

Main causes of land degradation:
Direct causes - Human induced: soil management, deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use, overgrazing, disturbance of water cycle (infiltration / runoff)
Indirect causes: poverty / wealth

Main technical functions:
- increase in organic matter

Secondary technical functions:
- increase of infiltration / soil humidity

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	▒ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	■ hill slopes	■ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	□ hilly
■ 750-1000 mm	■ 1000-1500	□ valley floors	□ steep
□ 500-750 mm	■ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 220 days (March - October)
Soil texture: medium (loam)
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: poor (eg sealing /crusting)

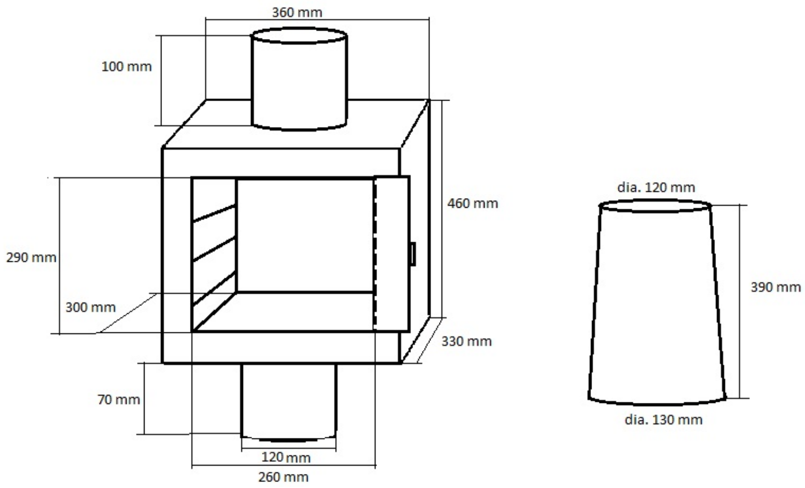
Soil water storage capacity: medium
Ground water table: 50 m
Availability of surface water: medium
Water quality: unusable
Biodiversity: medium, low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: no
If sensitive, what modifications were made / are possible: The pressure cooker could be modified to increase its thermal properties.

Human Environment

Land user: Individual / household, Small scale land users, common / average land users, mixed
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: individual (There are a variety of land user and water rights within the three districts, but they do not directly affect the implementation of the technologies.)
Relative level of wealth: poor - 90% of land users; owns % of the total land area, very poor - 10% of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income: local inhabitants are in many cases dependent on remittances from Russia and other income generating activities.
Access to service and infrastructure: low: health, technical assistance, employment, energy, drinking water and sanitation, financial services; moderate: education, market, roads & transport



Technical drawing

Heat exchanger adopted by Welthungerhilfe, promoted in communities of the Khatlon region of Tajikistan. (Daler Domullojonov)

Implementation activities, inputs and costs

Establishment activities

- Cook stove modification
- Heat exchanger
- House insulation
- Pressure cooker

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	43.30	100%
Equipment		
- Transportation cost	44.00	100%
Construction material		
- earth	0.50	100%
- wheat straw	53.80	100%
- metallic cover	5.10	34%
- lath	72.00	15%
- nail, lime, brush, enamel	72.00	100%
Other		
- pressure cooker	22.20	80%
- heat exchanger	30.00	100%
- veneer, hermetic	43.80	0%
TOTAL	**386.70**	**70.83%**

Maintenance/recurrent activities

- Adjustment of modified cook stove
- Cleaning of heat exchanger

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	3.30	100%
Equipment		
TOTAL	**3.30**	**100.00%**

Remarks: The price of the construction materials is dependent on many different external factors, and prices are generally increasing seasonally and annually. The costs are based upon 2010 prices.

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ Decreased fuel material demand
++ increased crop yield
++ increased farm income
++ Less work load to collect fuel
++ Initial financial cost

Production and socio-economic disadvantages

Socio-cultural benefits

+ knowledge conflict mitigation
+ improved food security self sufficiency
+ improved health

Socio-cultural disadvantages

Ecological benefits

+ increased biomass above ground C
And decreasing air pollution

Ecological disadvantages

Contribution to human well-being/livelihoods

+++ There are savings in cost and time by reducing the amount of fuel required. There are also health improvements with warmer rooms and less smoke inside the rooms.

Benefits/costs according to land user

As it uses mainly locally available materials, it is a low cost approach which increases energy efficiency and improves resource use.

Benefits compared with costs	short-term:	long-term:
Establishment	positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption:

70% of land user families have implemented the technology with external material support. The amount of the local's contribution to the project themselves was between 53% to 100%. 30% of land user families have implemented the technology voluntary. Fitting heat exchangers, adapting cooking stoves, and improving house thermal insulation are the main forms of technology that have been replicated in the above households.
There is little trend towards (growing) spontaneous adoption of the technology. This is restricted due to limited access to funds.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) It is a low cost measure using locally available materials. The heat exchanger can improve the heating capacity of the room threefold, for example. → Replication rates could be increased through promotion to larger audiences with support of local authorities or by law.
2) It saves time for collecting fire material wood and cow dung.
3) It presents an opportunity to increase land productivity through application of organic fertilizers
4) It is environmental friendly and increases the amount of organic material that stays within the soil. →There could be further awareness raising of the benefits of keeping organic materials in the soil.
5) The technologies do not have a large initial financial cost and can be implemented progressively as funds become available. →Training of more local teachers to provide demonstrations to the community.

Land users' opinion:

1) It is very affordable →By involving local relevant authorities and departments
2) It saves and minimizes expenditures for electricity, gas, and firewood procurement
3) The rooms are warmer and I can cook bread inside and save more fuel.

Weaknesses and →how to overcome

Specialists' opinion:

1) Not all meals can be cooked in a pressure cooker
2) Heat exchangers can get very hot for cooking purposes

Land users' opinion:

1) More labor needed to cut fuel into smaller pieces →Behavioral change

Contact person: Domullojonov, Daler, Welthungerhilfe, Temurmalik office, 77, H. Zarif street, Soviet settlement, Temurmalik district, Khatlon province, Tajikistan, +992 918 248084, daler.domullojonov@welthungerhilfe.de: dalerd@list.ru; www.welthungerhilfe.de

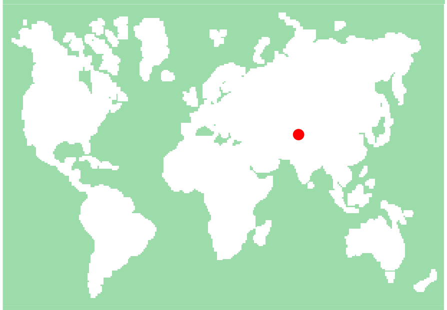
left: Melliferous plants increasing vegetation cover on hillsides (Photo: CAWMP archive data)
right: Beehives (Photo: CAWMP archive data)

Bee-keeping in uplands

Tajikistan – Community Agriculture & Watershed Management Project (CAWMP)

Contributing to biodiversity conservation and land rehabilitation in uplands through beekeeping.

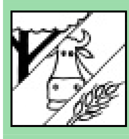
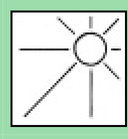
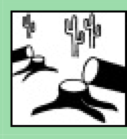
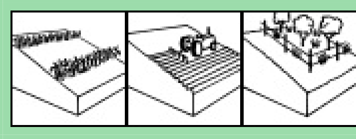
In general the technological goals are achieved indirectly in two main ways: (1) bees carry pollen over long distances as hives are carried from one place to another and help to spread melliferous (honey producing) plants to uplands; (2) planting melliferous herbs (mainly esparcet and lucerne) on degraded pastures and arable lands as well as intercropping melliferous herbs in orchards. Melliferous herbs improve soil structure, accumulate organic carbon and increase crop capacity of high-energy fodder crops. These types of herbs also help to reduce pressure on nearby (winter) pastures.
Bee-keeping contributes to a diversified use of natural resources. Indirectly the project activities help the preservation of biodiversity and rehabilitation of degraded lands. Through the combination of these impacts rural livelihoods can be improved.
Purchase of hives, bee-families and specific equipment (frames, separators, etc).
Any regions of Tajikistan are suitable for the implementation of the technology. The technology requires specific knowledge, which can be obtained from local associations of bee-farmers which have been set up in all regions of the country. Through the CAWMP project local associations of bee-farmers have increased their knowledge and skills and strengthened their potential. Therefore the population got access to products of traditional medicine – honey and other useful products.



Location: Tajikistan
Region: Zarafshan, Surkhob, Vanj and Toirsu watersheds
Technology area: > 10,000 km2
Conservation measure: agronomic, vegetative, management
Stage of intervention: prevention of land degradation
Origin: Land user - traditional (>50 years ago)
Climate: semi-arid, subtropics
WOCAT database reference: TAJ402e
Related approach:
Compiled by: German Kust
Date: 08th Jun 2011 updated 08th Jul 2011

Classification

Land use problems: soil erosion, poor vegetation cover, lack of irrigation water, poor vegetation cover, lack of access to water resources in some regions

Land use	Climate	Degradation	Conservation measure
			
Agro-silvopastoralism	semi-arid,	Biological degradation:	Vegetation/soil cover, Grasses and perennial

Before: extensive grazing land After: agro-silvo-pastoralism Rainfed	subtropics	reduction of vegetation cover, Biological degradation: quality and species composition /diversity decline, Biological degradation: loss of habitats	herbaceous plants, Control / change of species composition

Stage of intervention

- Prevention (selected)
- Mitigation / Reduction
- Rehabilitation

Origin

- Land user's initiative: traditional (>50 years ago) (selected)
- Experiments / Research
- Externally introduced: recent (<10 years ago) (secondary)

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: overgrazing

Main technical functions:
Promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes (selected)	moderate
1500-2000 mm	2000-2500	hill slopes (secondary)	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500 (selected)	valley floors	steep
500-750 mm (selected)	500-1000 (selected)		very steep
250-500 mm (secondary)	100-500		
< 250 mm	<100		

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): days ()
Soil texture:
Soil fertility:
Topsoil organic matter:
Soil drainage/infiltration:

Soil water storage capacity:
Ground water table:
Availability of surface water:
Water quality:
Biodiversity:

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease
Sensitive to climatic extremes: heavy rainfall events (intensities and amount), wind storms / dust storms, floods, droughts / dry spells, decreasing length of growing period

Human Environment

Mixed land per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user:
Population density:
Annual population growth:
Land ownership:
Land use rights: ()
Water use rights: ()
Relative level of wealth:

Importance of off-farm income: :
Access to service and infrastructure:
Market orientation:

Implementation activities, inputs and costs

Establishment activities

- Planting legumes in some cases
- Preparing apiaries and hives
- Purchase of bee-hives and bee-families
- Purchase of specific beekeeping equipment
- Replacement of apiaries
- Honey harvesting
- Organization of purchases of materials, equipment and instruments
- Organization of seasonal transportation of apiaries
- Sale of products and distribution of income
- Trainings on beekeeping

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	5.00	100%
Equipment		
- tools	10.00	100%
- bee-families, hives	50.00	0%
Construction material		
Agricultural		
TOTAL	**65.00**	**67.00%**

Maintenance/recurrent activities

- Keeping bees
- Repair of hives
- Seasonal transportation of apiaries

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
TOTAL		**%**

Remarks:
Length of vegetative season, harsh cold spells (dying of bees), pests and diseases, ways of transportation of apiary, number of places for localization of apiaries in vegetative period, distance and conditions of transportation, availability of markets and etc.

Assessment

Impacts of the Technology

Production and socio-economic benefits

- ++ increased production area
- ++ increased product diversification
- + increased fodder quality

Production and socio-economic disadvantages

- +++ no disadvantages

Socio-cultural benefits

- ++ community institution strengthening
- ++ knowledge conflict mitigation
- + improved situation of disadvantaged groups
- + improved food security self sufficiency
- + improved health

Socio-cultural disadvantages

- +++ no disadvantages

Ecological benefits	**Ecological disadvantages**
+++ increased plant diversity +++ increased beneficial species +++ increased maintained habitat diversity + increased soil moisture + improved soil cover + increased biomass above ground C + increased nutrient cycling recharge + reduced soil loss	
Off-site benefits	**Off-site disadvantages**
	+++ no disadvantages

Contribution to human well-being/livelihoods

++ Local associations of bee-farmers have increased their knowledge and skills, associations of bee-farmers have strengthened their potential, population got access to products of traditional medicine – honey and other useful products.

Benefits/costs according to land user

With high market prices for this products it is a very beneficial investment

Benefits compared with costs	short-term:	long-term:
Establishment	positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption:

100% of land user families have implemented the technology with external material support. Data are taken from the results of CAWMP project, even though it is known that this technology is more widely used. According to experts, 20-25 times more across Tajikistan.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Preservation and expansion of biodiversity in uplands → regular monitoring
2) Additional fodder crops →expand lucerne and esparcet plantations
3) Improving health of rural population
4) Improving rural livelihoods

Land users' opinion:

1) Improving public health
2) More money available

Weaknesses and →how to overcome

Specialists' opinion

1) Poor organizational structure used for transportation of beehives →develop associations of bee-farmers
2) Lack of inventory of melliferous areas at national / regional level →governmental support to associations of bee-farmers in terms of inventory of melliferous areas

Land users' opinion:

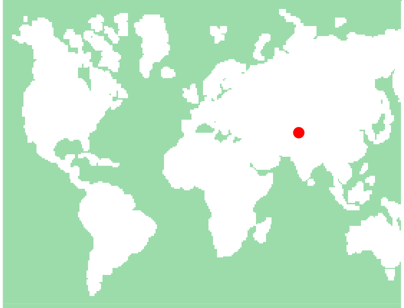
3) High prices for specific equipment required for bee-farming →expand market of materials for bee-farming, stimulate domestic and small production of materials and tools
4) Remoteness of melliferous areas

Contact person: German Kust, gkust@yandex.ru. Tajikistan World Bank Country Office, Ayni street 48, Business Center "Sozidanie", 3rd floor. Tel. (48) 701 58 08, 93 588 99 76.

left: The back of the two room stove will heat a second room. (Photo: S. Stevenson)
right: The front of a two room stove that has been used for two years. There are two cooking rings. (Photo: S. Stevenson)

Two Room Stove

Tajikistan – CAMP Kuhiston



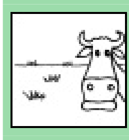
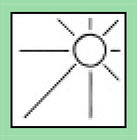
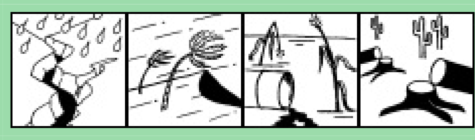
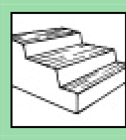
Location: Hakimi Jamoat, Nurobod
Region: Regional Subordination of Tajikistan
Technology area: 0.1 - 1 km2
Conservation measure: structural
Stage of intervention: mitigation / reduction of land degradation
Origin: Externally - recent (<10 years ago)
Climate: semi-arid, temperate
WOCAT database reference: TAJ551
Related approach: Participatory cost benefit analysis for energy efficiency measures (TAJ26)
Compiled by: Shane Stevenson
Date: 11th Jul 2011 updated 13th Jul 2011

A brick stove that is built into the existing internal wall, that will heat the two rooms and can be used for cooking.

The 2-room stove is a brick based structure that filters hot air into a second room, hence maximising the heating potential of the fuel. The basic stove is built of fire bricks, house bricks, cement and coated with a natural mix of straw and mud. It is a traditional concept based upon former soviet stoves, that was modernised and adapted to improve the energy efficiency, and make use of the materials that are available to the people. It is able to burn coal, wood, and tapac, and is designed to reduce the amount of natural resources used to meet the household energy needs.
The purpose of the 2-room stove is to replace the traditional cast iron pig style of stove, with a more modern and energy efficient stove that can be used effectively for cooking and the heating of two rooms. The 2-room stove is designed to filter the hot air between the rooms and the use the bricks as a thermal sink for heat retention. As most of the houses are made of mud bricks, the heat from the stove will conduct through the walls, which will act as radiators to emit warmth into the room. The 2-room stove also means that cooking activities can be conducted inside the house in a smoke free environment.
The stove requires basic training in construction by a skilled technician, however after a three day training course the local trades people are able to build their own stoves with limited supervision. The stove is constructed from 45 fire bricks and 400 household bricks, the hot plate and stove doors are bought second hand from the markets, and metal bars are used to reinforce the structure. There are two smoke vents in the wall between the two rooms to allow the smoke to filter its way along the snake like chimney until it vents through the roof. The final structure is coated in straw and mud which acts as an insulation layer.
There is a high reliance on natural resources in Shahtuti Bolo. The average family burns several tons of tapac (straw dung mix) and wood each year. The surrounding mountain area is sparsely vegetated and does not even provide enough fuel for the village during the harsh winter months. This is supplemented by buying wood from the neighbouring villages. One tapac weighs one kilo, this is organic matter that can no longer be used for soil enhancement, but for fuel purposes. It is estimated that the 2-room stove will reduce the amount of fuel burnt by 20-40% depending upon the household.

Classification

Land use problems: The land has become increasingly unproductive over the last few decades. There is not enough pasture to feed our animals. The over exploitation of natural resources that have lead to soil erosion and degradation of the soil structure.

Land use	Climate	Degradation	Conservation measure
			
Extensive grazing land	semi-arid, temperate	Chemical soil deterioration: fertility decline and reduced organic matter content, Biological degradation: loss of habitats, Biological degradation: reduction of vegetation cover, Soil erosion by wind: loss of topsoil, Soil erosion by water: mass movements / landslides, Soil erosion by water: gully erosion, Soil erosion by water: loss of topsoil / surface erosion	Structural

Stage of intervention	Origin	Level of technical knowledge
▒ Prevention ■ Mitigation / Reduction □ Rehabilitation	□ Land user's initiative □ Experiments / Research ■ Externally introduced: recent (<10 years ago)	Agricultural advisor: high Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management, deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use, overgrazing, disturbance of water cycle (infiltration / runoff)
Indirect causes: poverty / wealth, labour availability, war and conflicts

Main technical functions:
- reduces the amount of dung and wood used as fuel.

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	■ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	□ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	□ hilly
■ 750-1000 mm	■ 1000-1500	□ valley floors	■ steep
□ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)
- ■ 0-20
- □ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 180 days (April - October)
Soil texture: coarse / light (sandy)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: poor (eg sealing /crusting)

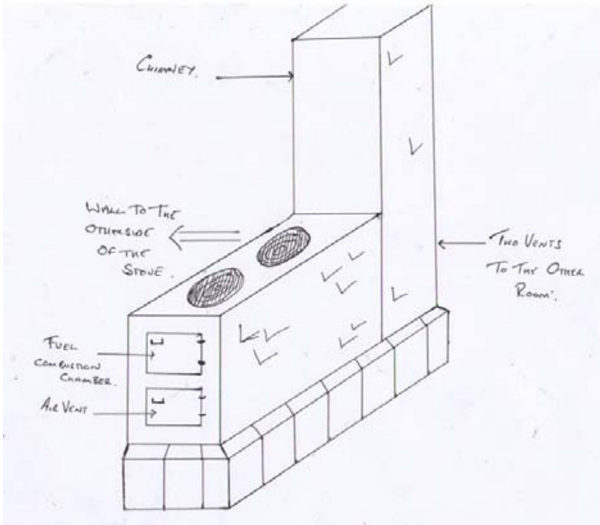
Soil water storage capacity: low
Ground water table: <5 m
Availability of surface water: poor / none
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, floods, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes:
If sensitive, what modifications were made / are possible: The stove is able to take other fuel sources in the event that natural resources are not available.

Human Environment

Land user: Individual / household, Small scale land users, disadvantaged land users, mixed
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: communal (organised) (Four people have the majority of the land user rights in a village of 58.)
Relative level of wealth: poor - 80% of land users; owns 95% of the total land area

Importance of off-farm income: 10-50% of all income: 44 out of the 58 households are reliant on remittances from Russia, however all the families have livestock which they buy and sell in the local markets and a small household plot for vegetables.
Access to service and infrastructure: low: health, education, technical assistance, employment, market, energy, roads & transport, drinking water and sanitation, financial services



Technical drawing

A simple view of the main part of the stove used for cooking. There are two cast iron doors, the lower is for air circulation and the upper is the combustion chamber for the fuel. There are two hot plates for cooking. The smoke travels from the fire vent towards the chimney and then through a 10cm sq hole to the brick structure on the other side. The smoke snakes it way around the second structure which acts as a radiator as the bricks warm up. The smoke then returns into the chimney in the main room, heating the chimney as it vents. (S. Stevenson)

Implementation activities, inputs and costs

Establishment activities

- Construction of stove
- Construction of stove cont.

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	32.00	100%
Equipment		
- tools	20.00	0%
Construction material		
- bricks	152.00	0%
- metal bars	17.00	0%
- stove doors	45.00	0%
- cast iron hot plate	63.00	0%
Agricultural		
Other		
- fire cement	25.00	0%
- ceramic tiles	24.00	0%
- transport	50.00	%
TOTAL	**428.00**	**7.48%**

Maintenance/recurrent activities

- Cleaning the stove

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	4.00	100%
TOTAL	**4.00**	**100.00%**

Remarks: The main cost is the fire bricks. These have to be transported from the capital. However, in some regions of Tajikistan, materials are available from stoves that were constructed several decades ago which could be reused. The costs are based upon 2011 prices and are based on constructing only one stove.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ reduced demand on natural resources ++ decreased labour constraints ++ decreased workload	

Socio-cultural benefits	Socio-cultural disadvantages
+ community institution strengthening + improved situation of disadvantaged groups + improved health	

Ecological benefits	Ecological disadvantages
+ improved soil cover + increased biomass above ground C + Retention of the remaining habitats	

Contribution to human well-being/livelihoods

++ It has reduced the time, effort and money spent on fuel which can be up to 50% of the household's budget in extreme cases. It has improved the heating in the household and created a smoke free environment for cooking.

Benefits/costs according to land user

There is a high initial outlay in the building materials and labour costs, but once the two room stove is constructed it only requires annual cleaning which can be done via hatches already included in the design.

Benefits compared with costs	short-term:	long-term:
Establishment	negative	very positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption: 100% of land user families (10 families; 100% of area) have implemented the technology with external material support. All land users given support have constructed a stove. The project will build a further 11 stoves in the local district for the most vulnerable families.
There is no trend towards (growing) spontaneous adoption of the technology. Too early in the project to say, but several members of the community are trained to build the stove.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) It improved the household heating system dramatically, as the previous cast iron stove does not retain the heat after the fire dies. →The room could be insulated using traditional techniques or modern materials that are starting to appear on the market.
2) The brick design will retain the heat for several hours and will heat two rooms. →Doors and windows in the rooms could be sealed to prevent drafts.
3) The stove will last for 25yrs with minimal maintenance. →If the stove became popular a small brick making factory could be established.

Land users' opinion:

1) It keep the house warm and for longer. →Thermal insulation techniques and energy efficiency training may support reduced fuel use.
2) I do not have to cook outside in the winter months.
3) It is easy to clean.

Weaknesses and →how to overcome

Specialists' opinion:

1) There is a high initial investment that has required project funding. →Collective building of the stoves will reduce the cost. Micro-finance loans could be made available to help cover the initial costs.
2) The stove requires technical training in its construction. →A booklet could be produced to support self building of the stoves.

Land users' opinion:

1) It is expensive, and I need an expert to help me. →Remittances could be used to fund the initial set up costs.

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Roof top rainwater harvesting stored in polythene lined earth retention tank

Tajikistan – Welthungerhilfe

Left: Low cost rain water harvesting pond connected to the gutter with a pipe (Photo: Daler Domullojonov)
Right: Low cost rain water harvesting pound (Photo: Daler Domullojonov)

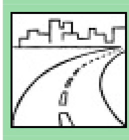
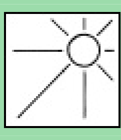
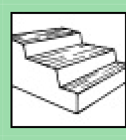
The use of an earth tank lined with a polyethylene sheet to retain rainwater collected from the roof of the house.

An earth retention tank is a simple low cost structure that can be used to retain rain water from the rooftop. A hole is prepared and lined with a polyethylene sheet to prevent leakage. The top of the hole is covered with a metal lid for access. The roof of the house is fitted with a plastic/ metallic guttering that captures the rainwater and funnels the water via a plastic pipe into the earth tank. The water in the earth tank then can be utilised for the irrigation of crops (especially during the hot dry summer months), sanitation, and potentially drinking water.
The population in Southern Tajikistan consists largely of subsistence farmers and are thus highly reliant upon their kitchen garden plots. As the population in the area continues to expand, the pressure on the land increases. The latter is already in a poor state, because it is becoming degraded through deforestation, overgrazing and general over exploitation. There is much precipitation during the rainy season from autumn until spring in Southern Tajikistan, but the scarcity of water from late spring to the end of autumn poses a problem with water shortages. During the rainy season, a lot of water is lost as surface runoff, this water can be saved in a retention tank to be utilised during the dry season. It can be used to water crops to help increase yields as well as crop diversity and quality. The additional water can also be used for sanitation, drinking water and watering of livestock.
For the establishment of such a retention tank several steps are needed. In preparation, a rough estimation of the potential volume of harvested rainwater needs to be calculated. Thereafter, a location for the tank needs to be selected so that expenses are minimised and it is easy to access. The establishment of ponds near big trees is not recommended, because the polyethylene layer might be punctured by the roots.
The actual steps of constructing the tank involve: (1) digging the pond, (2) plastering the inside walls with a fine soil and water mixture to smooth them, (3) lining the pond's walls with double polyethylene layer, (4) connecting the inside polyethylene sheets with the pond coverage through a piece of cord, so that it can be taken out of the pond any time to be cleaned of sediments, (5) covering the pond with any available material such as a soil, water and straw mixture, reinforced by several poles, leaving an opening of 0.25 x 0.25m to extract water, (6) finally connecting the roof to the pond with a plastic pipe. To avoid dirty water flowing from the roof into the pond, the pipe should only be connected to the pond some time after the rainfall has started.

Location: Temurmalik, Baljuvon
Region: Khatlon province
Technology area: 10 - 100 km2
Conservation measure: structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Externally - recent (<10 years ago)
Climate: semi-arid, temperate
WOCAT database reference: TAJ104e
Related approach: not documented
Compiled by: Daler Domullojonov
Date: 06th Apr 2011 updated 08th Jul 2011

Classification

Land use problems: lack of water Inefficient natural resource management, which is mainly visual because people throw potential organic fertilisers away instead of spreading them on the fields. Incorrect ploughing techniques which leads to the acceleration of erosion, deforestation and waste of fuel materials in inefficient stoves and ovens. Overgrazing leading to pasture degradation.

Land use	Climate	Degradation	Conservation measure
			
Settlements, infrastructure networks	semi-arid, temperate	Water degradation: change in quantity of surface water, Water degradation: decline of surface water quality, Water degradation: acidification	Dams / pans: store excessive water

Stage of intervention	Origin	Level of technical knowledge
□ Prevention □ Mitigation / Reduction ■ Rehabilitation	□ Land user's initiative □ Experiments / Research ■ Externally introduced: recent (<10 years ago)	Agricultural advisor: low Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management, deforestation / removal of natural vegetation (incl. forest fires), overgrazing
Indirect causes: inputs and infrastructure

Main technical functions:
- control of concentrated runoff: retain / trap
- control of concentrated runoff: drain / divert
- water harvesting / increase water supply

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	■ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	■ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	▒ rolling
□ 1000-1500 mm	□ 1500-2000	■ foot slopes	□ hilly
□ 750-1000 mm	□ 1000-1500	□ valley floors	□ steep
■ 500-750 mm	■ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

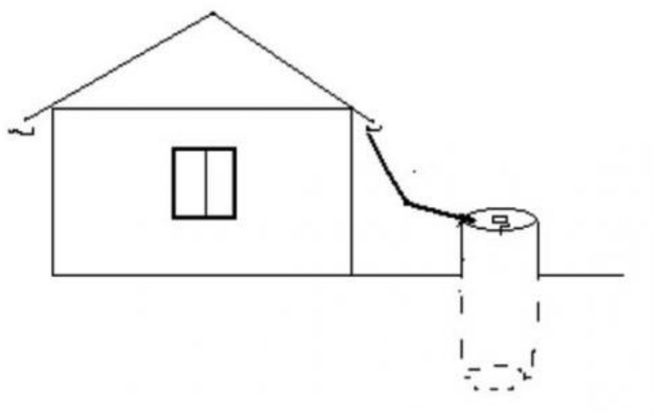
Soil depth (cm)		
□ 0-20 □ 20-50 □ 50-80 □ 80-120 ■ >120	**Growing season(s):** 180 days (March - November) **Soil texture:** fine / heavy (clay) **Soil fertility:** medium **Topsoil organic matter:** low (<1%) **Soil drainage/infiltration:** medium	**Soil water storage capacity:** medium **Ground water table:** 5 - 50 m **Availability of surface water:** poor / none **Water quality:** poor drinking water **Biodiversity:** low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, heavy rainfall events (intensities and amount), wind storms / dust storms, decreasing length of growing period
Sensitive to climatic extremes: seasonal rainfall decrease, floods, droughts / dry spells
If sensitive, what modifications were made / are possible: To minimise the damage to the polyethylene waterproofing layers and, reduce evaporation rates, pond is covered. As the pond is dug into earth the temperature remains fairly stable. If precipitation decreases less water can be harvested.

Human Environment

Land user: Individual / household, Small scale land users, common / average land users, mixed
Population density: < 10 persons/km2
Annual population growth: 1% - 2%
Land ownership: state, individual, titled
Land use rights: individual
Water use rights: individual
Relative level of wealth: poor - 100% of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income: In this example the farmer's son has migrated to Russia.
Access to service and infrastructure: low: health, technical assistance, employment, market, energy, roads & transport, drinking water and sanitation, financial services; moderate: education
Types of other land: settlement / urban



Technical drawing

Harvesting water from the household roof to an earth built retention pond with plastic sheet lining. The retention pond is covered with a removable metal plate for access. (Daler Domullojonov)

Implementation activities, inputs and costs

Establishment activities

- Manual digging of pond; smoothing and plastering; covering pond
- polyethylene sheet and pipe procurement, preparation and placement;

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	13.83	100%
Equipment		
- bucket	1.00	100%
Construction material		
- wood	4.40	100%
- earth	1.00	100%
- polyethylene sheet	5.10	50%
- Plastic pipe	2.20	100%
- Cord	0.11	50%
Agricultural		
TOTAL	**27.64**	**86.00%**

Maintenance/recurrent activities

- Changing polyethylene sheet; covering
- Cleaning of pond (washing out sediments)
- Changing polyethylene sheet; covering

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US)	% met by land user
Labour	1.00	100%
Equipment		
- bucket		%
Construction material		
- earth	0.55	100%
- polyethylene sheet	5.10	100%
- Plastic pipe		%
- Cord	2.20	100%
TOTAL	**8.85**	**100.00%**

Remarks: The type of earth in Tajikistan is very good for making the retention ponds, the labour is provided by the land user, and the funnel can be manufactured out of empty plastic bottles. The polythene sheet, pipes and cord have to be purchased from the shop. The above costs were calculated for the building of one retention tank. One household could have several ponds in one kitchen garden.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased water availability quality ++ increased irrigation water availability quality ++ increased farm income ++ decreased workload + increased crop yield + increased fodder production + increased animal production	

Socio-cultural benefits	Socio-cultural disadvantages
++ improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
+++ increased water quantity +++ improved harvesting collection of water + reduced surface runoff	

Contribution to human well-being/livelihoods

++ Much more water is readily available for use by the household. Less time and effort is spent carrying water.

Benefits/costs according to land user

Before the implementation of this technology, one family would spend an average of $44.5 on one truck of water per month. A pond costs around $25 to build, and should provide families with around 4 months worth of water after the rainy season.

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	not specified
Maintenance/recurrent	very positive	not specified

Acceptance/adoption:

58% of land user families have implemented the technology with external material support. In the initial stages of the project, they were provided with 50% of the costs of the polyethylene sheets and cord only.
42% of land user families have implemented the technology voluntary. After observing the benefits of the technology and the high cost benefit ratio, many people in the community and surrounding villages have replicated this technology themselves.
There is strong trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) It is a low cost technology and can be made from many locally available materials. →To disseminate these ideas in areas with water scarcity through local Extension Service providers / NGOs or local inhabitants.
2) It reduces the time and effort to collect water and also the cost to buy water. →Promotion of different water saving methods and technologies by interested and line departments.
3) Increases access to water for drinking and sanitation purposes. →Construction of larger and/or more tanks.
4) Provides water for irrigation during the hot dry months, therefore improving crop diversity and yields. →Training and education on kitchen garden farming techniques to optimise the use of the extra water supply.
5) More water available for gardening and household purposes

Land users' opinion:

1. Easy and quick to establish, and maintain.

Weaknesses and →how to overcome

Specialists' opinion:

1) The plastic layers have a limited lifespan. →To find thicker more hardy materials, or apply multiple layers.
2) The polyethylene only lasts for 2-4 years. →To increase the number of layers or use a thicker polyethylene sheet.
3) The waterproof layer easily can be degraded by mice and large insects.

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Left: The plastic pipe running from the roof to the concrete tank. (Photo: S. Stevenson)
Right: The plastic pipe running from the roof to the concrete tank. (Photo: S. Stevenson)

Roof Top Rain Water Harvesting - Concrete Tank
Tajikistan - CARITAS

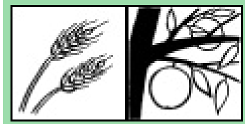
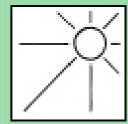
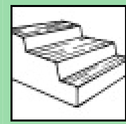
The roof top rain water harvesting system using a concrete tank was designed to improve household access to water for irrigation of kitchen garden plots during the hot and dry summer months.

A 16 cubic metre concrete tank situated in the shadow of the house constructed to retain rainwater that collects in the roof guttering.
The purpose of the tank is to retain water to be used for drinking, sanitation and irrigation during the hot and dry summer months. The retained water allows for the irrigation of kitchen garden plots and more diverse crops, and hence should improve the livelihoods of households involved.
There are three main elements to the construction of the rainwater harvesting system. The first is the construction of a metal gutter on wooden supports around the perimeter of the roof; second, the construction of a concrete pool in the shadow of the house; and finally the provision of a connection pipe between the gutter and the pool. The pool needs to be cleaned periodically to prevent contamination and build up of algae around the edge the pool.
During the Soviet period the water supply for the village was supplied through a concrete storage tank located at the foot of the hills above the village. After the collapse of the Soviet Union the concrete tank and its associated infrastructure fell into disrepair. As a result the inhabitants were faced with water shortages, especially during the hot dry summers. In response to this issue the residents invested time, finance and resources into constructing rainwater collection systems.

Location: Boshkengash
Region: Rudaki
Technology area: < 0.1 km2 (10 ha)
Conservation measure: structural
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user - 10-50 years ago
Land use: Forests / woodlands: Other (before), Cropland: Tree and shrub cropping (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ348e
Related approach: not documented
Compiled by: Sa'dy Odinashoev
Date: 27th Apr 2011 updated 08th Jul 2011

Classification

Land use problems: Lack of water at critical times of the year. The village has 600 mm/yr of precipitation, but it only falls during two months of the year. The land within the village is becoming increasingly dry and thus more denuded and unsuitable for cultivation.

Land use	Climate	Degradation	Conservation measure
			
Tree and shrub cropping Forests / woodlands: Other (before) Cropland: Tree and shrub cropping (after) Rainfed	semi-arid, temperate	Soil erosion by water: loss of topsoil / surface erosion	Dams / pans: store excessive water

Stage of intervention

- □ Prevention
- ■ Mitigation / Reduction
- □ Rehabilitation

Origin

- ■ Land user's initiative: 10-50 years ago
- □ Experiments / Research
- □ Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: over-exploitation of vegetation for domestic use

Main technical functions:
- water harvesting / increase water supply

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- □ 1000-1500 mm
- □ 750-1000 mm
- ■ 500-750 mm
- □ 250-500 mm
- □ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- □ 1500-2000
- □ 1000-1500
- ■ 500-1000
- □ 100-500
- □ <100

Landform

- □ plateau / plains
- □ ridges
- □ mountain slopes
- □ hill slopes
- ■ footslopes
- □ valley floors

Slope (%)

- ■ flat
- ▒ gentle
- □ moderate
- □ rolling
- □ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 220 days (March - November)
Soil texture: medium (loam)
Soil fertility: high
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: medium

Soil water storage capacity: low
Ground water table: 5 - 50 m
Availability of surface water: good, medium, poor / none
Water quality: good drinking water, poor drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), decreasing length of growing period
Sensitive to climatic extremes: droughts / dry spells
If sensitive, what modifications were made / are possible: In times of heavy rainfall and prolonged summer drought the size of the tank could be increased.

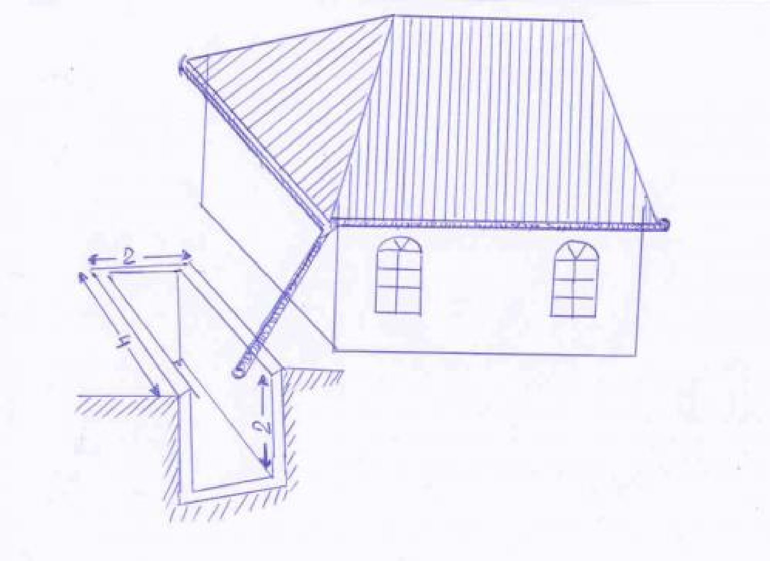
Human Environment

Mixed land per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, Small scale land users, common / average land users, mixed
Population density: 100-200 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: individual (In regards to the water in the tank, household plots are allocated by the local government. All land is owned by the state.)
Water use rights: individual (In regards to the water in the tank, household plots are allocated by the local government. All land is owned by the state.)
Relative level of wealth: average - 70% of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income: The residents do not have a significant income from their garden plots.
Access to service and infrastructure: low: health, education, technical assistance, drinking water and sanitation, financial services; moderate: employment, market, energy, roads & transport
Market orientation: subsistence (self-supply)



Technical drawing

The drawing shows the metal guttering (0.15m) wide around the perimeter of the roof top. The guttering collects the rainwater run off from the roof, and through a plastic pipe made of old plastic bottles stitched together by thin wire it drains into a concrete tank. In this example the tank is 4m long, 2 wide and 2 metres deep and is located within the shadow of the house to reduce evaporation rates. In this example the tank is located on a slope and is partially buried on the upslope. The tank is covered for safety reasons and to prevent external contamination. (Soisin Peter)

Implementation activities, inputs and costs

Establishment activities

- construction of concrete tank and guttering
- construction of concrete tank and guttering (cont)

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	100.00	100%
Equipment		
- tools	15.00	100%
Construction material		
- wood	30.00	100%
- Cement, stone, sand	150.00	100%
- Metal sheet for roof gutter	100.00	100%
- plastic pipe	2.00	100%
TOTAL	**397.00**	**100.00%**

Maintenance/recurrent activities

- Cleaning

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	5.00	100%
TOTAL	**5.00**	**100.00%**

Remarks: Labour, tools and piping can be provided by the land user and stone for the foundation is locally available, however, there is an initial outlay of $300 for the cement, wood and metal guttering. The costs were calculated based on 2010 prices per tank.

Assessment

Impacts of the Technology

Production and socio-economic benefits	**Production and socio-economic disadvantages**
+++ increased drinking +++ increased water availability quality +++ increased irrigation water availability quality ++ reduced expenses on agricultural inputs ++ increased crop yield + decreased workload + increased wood production	+ potential debt issues if finance is borrowed for the initial outlay
Socio-cultural benefits	**Socio-cultural disadvantages**
++ improved conservation erosion ++ improved food security self sufficiency	
Ecological benefits	**Ecological disadvantages**
+++ increased water quantity +++ increased water quality +++ improved harvesting collection of water ++ increased soil moisture ++ reduced evaporation ++ increased plant diversity	
Off-site benefits	**Off-site disadvantages**
++ increased water availability	

Contribution to human well-being/livelihoods

+++ Permanent access to water has dramatically improved the sanitation and hygiene levels, and increased crop quality and diversification. It has also improved the quality of and access to drinking water, and therefore has significant health benefits.

Benefits/costs according to land user

If it is constructed to a reasonable standard then it will not need any significant maintenance.

Benefits compared with costs	**short-term:**	**long-term:**
Establishment	very positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption:

70% of land user families have implemented the technology voluntary. The urban roof top rainwater harvesting has been replicated by many members of the community without external support.
There is moderate trend towards (growing) spontaneous adoption of the technology. People observed, and experienced the benefits, and decided that it was worth the initial investment.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Improves the provision of irrigated water for the hot dry summer periods. →Further dissemination to other households.
2) Allowed for the improvement and expansion of kitchen gardens. →Training on keeping a kitchen garden.
3) Improved the access of water for sanitation and drinking water purposes →Education on sanitation methods.

Land users' opinion:

1) Improved the standard of living, and the increased access to water allowed the households to have more autonomy over what that grow and eat.

Weaknesses and →how to overcome

Specialists' opinion:

1) The perception was that the water was not clean in the concrete pool. →However, it was tested and proved to be safe to use. This provided reassurance to the household members. It would be a major benefit if the water tank remains covered and is cleaned periodically.
2) The initial outlay may be considered expensive for some families. →Many families have adopted this, possibly if many were built at once the material costs would be reduced. The technology could be tied in with micro finance activities.

Contact person: Sa'dy Odinashoev, CARITAS, 20 Pavlova street, Dushanbe, Tajikistan. Mob: 985-170-125, E mail: sady.dc@mail.ru, www.caritas.ch

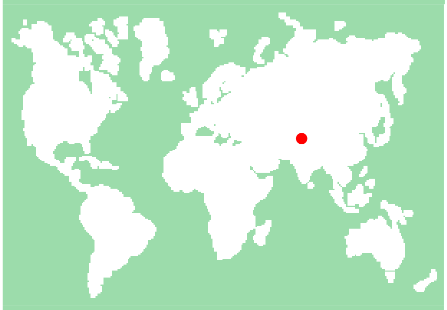
left: Positioning gravel on top of the perforated pipes. (Photo: Giuseppe Bonati)
right: Perforated pipes placed upon a gravel bed to stop them from becoming clogged. (Photo: Giuseppe Bonati)

Natural spring catchment protection

Tajikistan - CESVI

The construction of a natural spring catchment pit for the collection and distribution of uncontaminated ground water.

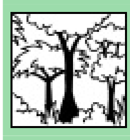
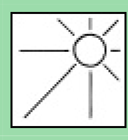
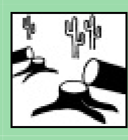
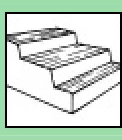
The technology consists of digging of a pit around the spring outlet and placing a 15cm perforated plastic pipe on a bed of gravel. The gravel acts as a natural sediment filter and protects the pipe from clogging. The pipe is buried in more gravel and covered with a plastic sheet to prevent animals contaminating the spring source. The plastic pipe can be extended and attached to a flexible pipe to deliver clean ground water to the final destination.
There are two main aims of the technology, the first is to prevent contamination of the spring source from livestock who use the spring head as a watering hole. The second aim is to optimise the springs capacity for irrigation, and human consumption by capturing the water in the perforated pipe and channeling to the usage point.
The construction of the spring catchment is relatively straight forward. A 1m deep pit is dug around the spring head approximately 2m wide. A bed of washed gravel is placed in the foot of the pit, and a 15cm perforated plastic pipe is embedded into the gravel, this is attached to a flexible tube to transport the clean water away. The perforated pipe is covered in more clean gravel and covered with a heavy polythene sheet and covered in earth. The construction process can be completed in one day if the materials are available. The only substantial maintenance required would be the cleaning of the pipe and gravel if it has become clogged with earth.
In many parts of Tajikistan water for human use and irrigation is scarce and plays a critical role in securing the livelihoods of the local population. The construction of the spring catchment increases the not only the volume of water but also improves the quality of water available. This can and does have a dramatic effect on the productivity of the land and the health of the land users.



Location: Khovaling
Region: Khatlon region
Technology area: < 0.1 km2 (10 ha)
Conservation measure: structural
Stage of intervention: mitigation / reduction of land degradation
Origin: Externally - recent (<10 years ago)
Land use: Forests / woodlands: Natural (before), Forests / woodlands: Natural (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ399
Related approach: not documented
Compiled by: Giuseppe Bonati, CESVI
Date: 19th May 2011 updated 12th Jul 2011

Classification

Land use problems: Provides a better cleaner source of water for the land and the people. Lack of access to water. Contamination of the water due to animals using the spring.

Land use	Climate	Degradation	Conservation measure
			
Forests / woodlands: Natural (before) Forests / woodlands: Natural (after) plantation forestry	semi-arid, temperate	Biological degradation: reduction of vegetation cover	Graded ditches / waterways (to drain and convey water)

Stage of intervention

- ▒ Prevention
- ■ Mitigation / Reduction
- □ Rehabilitation

Origin

- □ Land user's initiative
- □ Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high

Land user: high

Main causes of land degradation:
Direct causes - Natural: other natural causes, The land degradation was caused by uncontrolled natural spring runoff.

Main technical functions:

- control of concentrated runoff: drain / divert
- water harvesting / increase water supply

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	□ rolling
□ 1000-1500 mm	□ 1500-2000	■ footslopes	■ hilly
■ 750-1000 mm	■ 1000-1500	□ valley floors	□ steep
□ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)

- □ 0-20
- □ 20-50
- □ 50-80
- ■ 80-120
- □ >120

Growing season(s): 180 days (April - October)
Soil texture: fine / heavy (clay)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: medium

Soil water storage capacity: medium
Ground water table: <5 m
Availability of surface water: good, medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: no

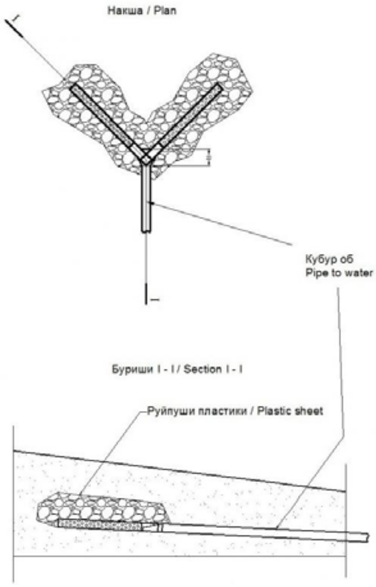
Human Environment

Forest / woodland area per household (ha)

■	<0.5
	0.5-1
	1-2
	2-5
	5-15

Land user: groups / community, large scale land users, Leaders / privileged, mixed
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: communal (organised)
Water use rights: communal (organised)
Relative level of wealth: poor - 80% of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: low: technical assistance, employment, energy, financial services; moderate: health, education, market, roads & transport, drinking water and sanitation
Purpose of forest / woodland use: fruits and nuts



Technical drawing

Basic sketch of perforated drainage collecting the spring water and flowing into a pipe. To take an increased quantity of water you can install more pipes (See section 2.1.3). (Foteh)

Implementation activities, inputs and costs

Establishment activities

- Digging of the spring head
- Fill back the drainage
- Gravel positioning and covering with plastic sheet
- Pipe positioning

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	44.44	100%
Equipment		
- tools	8.00	0%
- Drill	5.60	0%
Construction material		
- stone	15.10	0%
- Drainage screen	33.33	0%
- Plastic sheet	2.00	0%
Agricultural		
TOTAL	**108.47**	**40.97%**

Maintenance/recurrent activities

- Cleaning the water channel after drainage

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	11.50	100%
Equipment		
- tools	8.00	100%
Construction material		
TOTAL	**19.50**	**100.00%**

Remarks: The cost is determined by the depth of the spring head. If it needs to be deeper it requires additional labour and material costs.Costs are based upon one spring at a depth of 1m at 2010 prices.

Assessment

Impacts of the Technology

Production and socio-economic benefits	**Production and socio-economic disadvantages**
+++ increased drinking ++ increased irrigation water availability quality	
Socio-cultural benefits	**Socio-cultural disadvantages**
+ knowledge conflict mitigation	
Ecological benefits	**Ecological disadvantages**
++ increased water quality ++ improved harvesting collection of water ++ reduced surface runoff ++ improved excess water drainage + reduced hazard towards adverse events + increased water quantity	
Off-site benefits	**Off-site disadvantages**
++ increased water availability ++ increased stream flow in dry season	

Contribution to human well-being/livelihoods

+ It has improved access to running water for sanitation, hygiene, irrigation and animal husbandry purposes.

Benefits/costs according to land user

Benefits compared with costs	**short-term:**	**long-term:**
Establishment	slightly positive	positive
Maintenance/recurrent	positive	positive

Acceptance/adoption:

100% of land user families (1 families; 100% of area) have implemented the technology voluntary. In the course of the project 24 springs will be refurbished (2011-2013).
There is no trend towards (growing) spontaneous adoption of the technology. The technology is new and in its infancy.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Increased access to water through controlled piping.
→ Provision of guidance of which pipes to use.
2) Reduced the contamination at the spring head by animals.
3) It is quick and cheap to install.
→ Provide further training and support on maintenance.
4) It is easy to teach people how to install it.

Land users' opinion:

1) Pleased at the increase in water and ability to improve the yield of his crops.

Weaknesses and →how to overcome

Specialists' opinion:

1) It incurs an initial financial outlay, which may be considerable if the spring is located far from

Land users' opinion:

1) Difficult at times to find good cheap plastic pipe.

Contact person: Bonati, Giuseppe, CESVI; 84, Hakimzoda street, Dushanbe, Tajikistan. dushanbe@cesvioverseas.org. Tel : (+992 37) 224 67 28, 221 37 23.

Irrigation of orchards by using low cost drip irrigation technique

Tajikistan – Pamir Biological Institute

Irrigation of a young orchard using locally available and low-cost materials for a drip irrigation system in the Pamir's arid zone

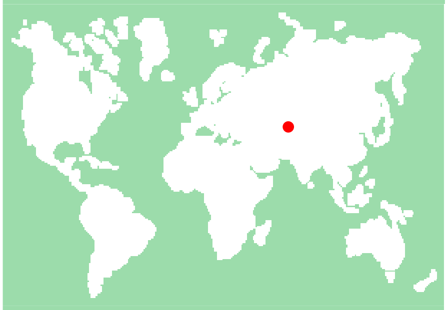
The system consists of a reservoir and polyethylene irrigation tubes and emitters installed along the rows of trees. Water accumulates in the reservoir during spring and early summer when there is no deficit in irrigation water. During the dry summer months water is then used for drip irrigation. Located in the upper part of the system, the reservoir ensures water pressure in the system. Due to the complex local topography, this irrigation method can be used without water pumps since natural water pressure ensures normal functioning of the system. Even though this water saving technology is quite effective, drip irrigation is rarely used since both the construction and maintenance of the system are quite expensive. With the introduction of this technology into the poor mountain communities of GBAO, the overall objective was to make drip irrigation technology cheaper and more easily available to farmers. The objective was achieved by the use of simple polyethylene irrigation tubes, simple screws instead of expensive emitters, and natural water pressure excluding the construction of a water pump station. Water is dripped directly to the roots of the trees, thus excluding loss of water and soil erosion. Fertilisers can be added directly to the water reservoir. This technology allows increased water savings of 50%, and 90% of fertilisers. During the growing period trees are watered once every 6 days.

The purpose of this technology is to improve the water supply for fruit orchards during the growing period in the arid conditions of the Pamirs where available water is very limited.

Steps to implement the technology include the following: dig holes for trees, plant trees, establish water reservoir, lay polyethylene tubes, install emitters and regularly clean irrigation system.

The plot is located in an arid zone at the height of 2000m above sea level. It is a high mountain area with typical brown soils and slopes up to 60 degrees steepness. Annual precipitation is quite low and mainly occurs in the autumn and winter period. Summers are extremely dry. The main occupations of the local population include agriculture and cattle breeding.

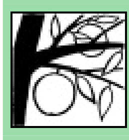
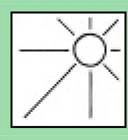
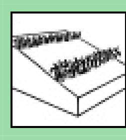
left: Apple tree with irrigation tube (Photo: Alab Abdulqodirov)
right: Drip irrigation polyethylene tube with screw (Photo: Alab Abdulqodirov)



Location: Shugnan
Region: GBAO
Technology area: < 0.1 km2 (10 ha)
Conservation measure: vegetative
Stage of intervention: prevention of land degradation
Origin: Externally - recent (<10 years ago)
Land use: Cropland: Tree and shrub cropping (before), Cropland: Tree and shrub cropping (after)
Climate: arid, temperate
WOCAT database reference: TAJ107e
Related approach: not documented
Compiled by: Aslam Qadamov, Pamir Biological Institute
Date: 11th Apr 2011 updated 11th Jul 2011

Classification

Land use problems: lack of irrigation water, reduction of yield lack of water, soil erosion, reduction of yield, reduction of soil fertility

Land use	Climate	Degradation	Conservation measure
			
Tree and shrub cropping Cropland: Tree and shrub cropping (before) Cropland: Tree and shrub cropping (after) full irrigation	arid, temperate	Water degradation: aridification, Biological degradation: reduction of vegetation cover	Tree and shrub cover

Stage of intervention	Origin	Level of technical knowledge
■ Prevention □ Mitigation / Reduction □ Rehabilitation	□ Land user's initiative □ Experiments / Research ■ Externally introduced: recent (<10 years ago)	Agricultural advisor: medium Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management, crop management (annual, perennial, tree/shrub)
Direct causes - Natural: change in temperature, change of seasonal rainfall

Main technical functions:
- stabilisation of soil (eg by tree roots against land slides)
- increase / maintain water stored in soil
- water harvesting / increase water supply

Secondary technical functions:
- improvement of ground cover
- increase in organic matter
- increase in nutrient availability (supply, recycling)
- water spreading
- increase of biomass (quantity)
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	■ mountain slopes	□ moderate
□ 1500-2000 mm	■ 2000-2500	▒ hill slopes	▒ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	■ hilly
□ 750-1000 mm	□ 1000-1500	□ valley floors	□ steep
□ 500-750 mm	□ 500-1000		□ very steep
■ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)

□ 0-20
■ 20-50
□ 50-80
□ 80-120
□ >120

Growing season(s): 190 days (from April to October)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

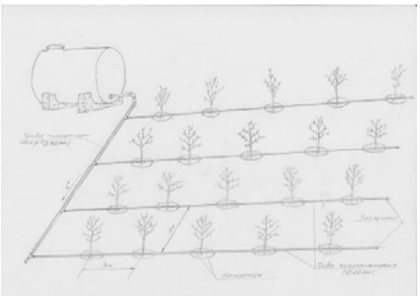
Soil water storage capacity: medium
Ground water table: <5 m
Availability of surface water: medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, heavy rainfall events (intensities and amount), wind storms / dust storms, decreasing length of growing period
Sensitive to climatic extremes: seasonal rainfall decrease, floods, droughts / dry spells

Human Environment

Land user: Individual / household, Small scale land users, common / average land users, mixed
Population density: 10-50 persons/km2
Annual population growth: 2-3%
Land ownership: communal / village
Land use rights: individual
Water use rights: communal (organised)
Relative level of wealth: poor - 60% of land users; owns 70% of the total land area

Importance of off-farm income: 10-50% of all income: In dry season the harvest is about 20 - 30% higher as compared with the farmers which did not use the technology
Access to service and infrastructure: low: employment; moderate: health, technical assistance, market, roads & transport, drinking water and sanitation, financial services; high: education, energy
Market orientation: subsistence (self-supply)
Mechanization: manual labour
Livestock grazing on cropland: yes little



Technical drawing

The system consists of a reservoir and polyethylene irrigation tubes and emitters installed along the rows of trees.

Implementation activities, inputs and costs

Establishment activities

- mounting of drip irrigation system
- tree planting

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	148.00	30%
Equipment		
- tools	17.00	20%
Construction material		
- polyethylene tube	380.00	0%
- screw	10.00	0%
- Water tank	600.00	0%
Agricultural		
- seedlings	243.00	100%
- fertilizer	17.00	100%
TOTAL	**1415.00**	**36.00%**

Maintenance/recurrent activities

- hay harvest
- sanitary cutting of trees
- unclogging the irrigation tubes

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	30.00	100%
Equipment		
- tools	7.00	100%
Construction material		
- polyethylene tube	25.00	100%
- screw	5.00	100%
- Water tank	10.00	100%
Agricultural		
- seedlings	10.00	100%
- fertilizer	17.00	100%
TOTAL	**104.00**	**100.00%**

Remarks: For creation of drip irrigation system on a plot of 1 ha (May 2011)

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased fodder quality	
+++ reduced risk of production failure	
+++ increased farm income	
+++ increased production area	
++ increased wood production	
++ increased crop yield	

Socio-cultural benefits	Socio-cultural disadvantages
++ improved conservation erosion	
++ improved situation of disadvantaged groups	

Ecological benefits	Ecological disadvantages
+++ increased water quantity	
+++ improved harvesting collection of water	
+++ increased soil moisture	
+++ reduced surface runoff	
+++ reduced hazard towards adverse events	
+++ reduced soil loss	
++ reduced soil compaction	
++ increased maintained habitat diversity	
++ increased biomass above ground C	

Contribution to human well-being/livelihoods

+++ After the implementation of the technology the households were protected from negative influence of dry season.

Benefits/costs according to land user

Increase of irrigation water availability will improve agricultural production and cover all the expenses that were needed for the establishment of the irrigation system

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption:

80% of land user families (15 families; 90% of area) have implemented the technology with external material support.
20% of land user families (3 families; 10% of area) have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology. some land users have already adopted the system

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Increases water saving up to 50%
2) Opportunity to irrigate orchards during droughts and dry spells (when there is no irrigation water available)
3) Opportunity to apply this technology on steep slopes
4) Reservoir can be filled with rainwater →through installation of rainwater harvesting system

Land users' opinion:

1) Increase water resources for irrigation of orchards

Weaknesses and →how to overcome

Specialists' opinion:

1) The system has to be regularly cleaned from sediments → use filters to clean water from sediments

Contact person: Aslam Quadamov, Pamir Biological Institute, Khorog; Kholdorov St. 2, Khorog, Tajikistan, 736000, mobile: (+992) 93 538 02 23, asbest111@mail.ru

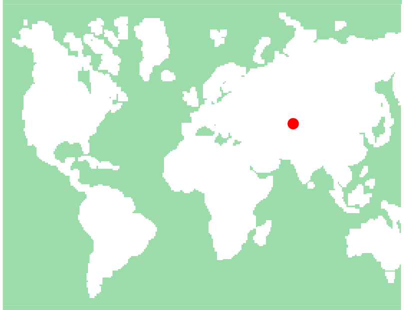
left: Sticking bottle in soil next to tree seedling. (Photo: Mirzokurbon Pochoev)
right: Tree seedling watered through bottle irrigation (Photo: Mirzokurbon Pochoev)

Bottle irrigation of a newly planted orchard

Tajikistan - Tajik Soil Institute

A water-saving irrigation technique is used to ensure the establishment of young seedlings in arid conditions which have a water deficit.

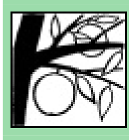
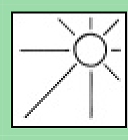
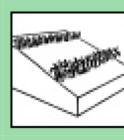
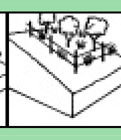
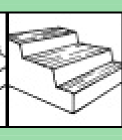
Plastic bottles, 1.5-2 liters in size, are used for this technology. The bottom of the plastic bottle is removed and retained to be used as a cover. The bottle is then turned upside down and filled with water like a funnel. In this position, the lid of the bottle is twisted open very slowly until a drip rate of 5 drops per second is achieved. As soon as the desired water drip rate is reached, the lid is stuck to the bottle with some tape. At this drip rate 1.5 liters of water will drip out of the bottle every 90-100 minutes. The bottle is then buried in the soil next to the seedling with the wide part of the funnel sticking 10cm up out of the ground. The bottle's lid must be buried at the same level as the root collar. After this, grass, straw or black film is used to mulch the soil around the newly planted seedlings. Water drips slowly out and can go straight to the roots. Thus, no watering of the upper layer is needed. This technique also helps exclude evaporation of water from the upper layer of the soil. During the growth period bottles are filled with water once every 5 days. Bottles should be filled with clean water to avoid clogging of the lids.
The purpose of the technology is to improve the acclimation of seedlings with minimal use of water, as well as to help reduce erosion and risk of mudslides on these steep loess slopes which can occur as a result of other irrigation techniques.
Selection of a plot, digging holes, purchase of seedlings, fencing nets, plastic bottles, preparation of bottles, planting seedlings, mulching, post-planting care for seedlings, irrigation
Middle mountain area, typical mountain brown soil, 30° slopes, rainless dry summer period. Vegetation cover is mainly large-sized cereal semi-savanna. Local population is involved in cattle-breeding and gardening.



Location: Nurabad District
Region: RRP
Technology area: 0.05 km^2
Conservation measure: vegetative, structural, management
Stage of intervention: prevention of land degradation
Origin: Experiments - recent (<10 years ago)
Land use: Grazing land: Extensive grazing land (before), Cropland: Tree and shrub cropping (after)
Climate: semi-arid, subtropics
WOCAT database reference: TAJ108e
Related approach: not documented
Compiled by: Pjotr M Sosin, Tajik Academy of Agricultural Sciences
Date: 12th May 2011 updated 11th Jul 2011

Classification

Land use problems: Farming can lead to erosion. Steep slopes are prone to mudslides. There is lack of irrigation water. Vegetation cover is severely damaged by extensive grazing.

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Cropland: Tree and shrub cropping (after) Rainfed	semi-arid, subtropics	Soil erosion by water: gully erosion	Tree and shrub cover, Others, Change of land use type

Stage of intervention

- ■ Prevention
- □ Mitigation / Reduction
- □ Rehabilitation

Origin

- □ Land user's initiative
- ■ Experiments / Research: recent (<10 years ago)
- ▒ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: overgrazing
Direct causes - Natural: Heavy / extreme rainfall
Indirect causes: land tenure

Main technical functions:
- increase / maintain water stored in soil

Secondary technical functions:
- stabilisation of soil (eg by tree roots against land slides)

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- ■ 1000-1500 mm
- □ 750-1000 mm
- □ 500-750 mm
- □ 250-500 mm
- □ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- ■ 1500-2000
- □ 1000-1500
- □ 500-1000
- □ 100-500
- □ <100

Landform

- □ plateau / plains
- □ ridges
- ■ mountain slopes
- □ hill slopes
- □ footslopes
- □ valley floors

Slope (%)

- □ flat
- □ gentle
- □ moderate
- □ rolling
- ■ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- □ 20-50
- ■ 50-80
- □ 80-120
- □ >120

Growing season(s): days ()
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: medium

Soil water storage capacity: medium
Ground water table: %gt;50 m
Availability of surface water: medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: heavy rainfall events (intensities and amount)

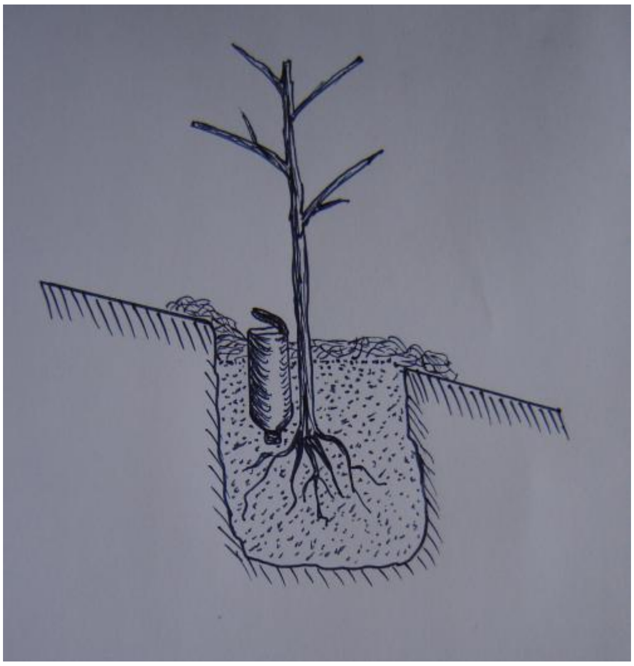
Human Environment

Cropland per household (ha)

☐	<0.5
☐	0.5-1
■	1-2
☐	2-5
☐	5-15
☐	15-50

Land user: Individual / household, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: > 4%
Land ownership: communal / village
Land use rights: leased
Water use rights: leased
Relative level of wealth: average - % of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: low: health, technical assistance, market, energy, roads & transport, financial services; moderate: education, drinking water and sanitation
Market orientation: subsistence (self-supply)
Mechanization: animal traction
Livestock grazing on cropland: yes



Technical drawing

Installation of bottle when planting a seedling (Sosin Pjotr)

Implementation activities, inputs and costs

Establishment activities

- Fencing the plot
- Planting of seedlings
- Purchase of fencing net to fence the plot
- Purchase of seedlings

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	209.00	100%
Equipment		
- animal traction	55.00	100%
Construction material		
Agricultural		
- seedlings	755.00	0%
- Fencing net	564.00	0%
- Plastic bottles	9.00	100%
TOTAL	**1592.00**	**15.00%**

Maintenance/recurrent activities

- Mulching
- Plastic bottles
- Watering

No costs related to maintenance

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ reduced demand for irrigation water ++ increased farm income + diversification of income sources + increased product diversification	

Socio-cultural benefits	Socio-cultural disadvantages
++ improved conservation erosion ++ knowledge conflict mitigation ++ improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
+++ increased biomass above ground C +++ reduced hazard towards adverse events ++ reduced evaporation ++ reduced surface runoff ++ improved soil cover ++ reduced soil loss + increased plant diversity + increased biological pest disease control + increased maintained habitat diversity + increased soil moisture	+ increased niches for pests

Off-site benefits	Off-site disadvantages
	+++ Soil degradation caused by water erosion + Land slides

Contribution to human well-being/livelihoods

++ No improvement in livelihood is observed within the first three years after planting a new orchard. Livelihoods should improve with the first fruit bearing season.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption: 2% of land user families (360 families; 2% of area) have implemented the technology with external material support.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Prevents water erosion on steep slopes →The demand for this technology among farmers will grow together with the development of gardening and reduction of risk of natural disasters which cause landslides, mudslides and erosion.
2) Prevents landslides →For the period of existence of the orchard
3) Increases the percentage of fruit trees that acclimatise and survive. → Used for a period of two to three years until the root system is two-metres deep
4) Bottle irrigation saves water resources →For a period of two to three years
5) Furrow irrigation is inappropriate for steep slopes since a surplus of water saturates loess soils causing landslides →Not recommended

Weaknesses and →how to overcome

Specialists' opinion:

1) Bottle irrigation requires frequent re-filling and is labour intensive →Introduce drip irrigation

Contact person: Sosin, Pjotr, Tajik Soil Institute, 21A, Rudaki ave., Dushanbe, 734025, psosin46@mail.ru

Rehabilitation of iron water gates to improve distribution of irrigation water

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

left: View of the main irrigation channel. (Photo: Julie Zähringer)
right: A member of the local Water User Association demonstrates the handling of a water gate. (Photo: Julie Zähringer)

The recycling of broken iron water gates which can be used to regulate the water flow into smaller side canals were reconstructed along the main irrigation canal.

This technology is based on the rehabilitation of iron water gates which regulate the water flow into smaller side canals along the main irrigation canal.
After the collapse of the Soviet Union irrigation facilities in the Shaartuz area were neglected and consequently broke down. In this arid environment, (only about 100 mm annual precipitation) many fields were subsequently abandoned due to a lack of irrigation water. Conflicts arose between people living upstream and downstream along the main irrigation canals as water flow could not be regulated anymore. During the wet spring period the side canals connecting the main canal with the fields had to be monitored day and night, and could only be plugged with vegetative material to protect the fields from flooding. Upstream users received all the water available, and at the same time suffered from waterlogging and water erosion. Downstream users however suffered from a lack of irrigation water, which led to severe conflicts between the different land users.
In order to help solve these problems, during 2010 UNDP replaced the 32 damaged irrigation gates along the irrigation canal. 12 big and 20 small iron gates were set up to regulate the water flow. Water distribution was regulated according to norms defining water need per ha of irrigated field and taking into account crop and soil types. Farmers then paid for the irrigation water according to those norms. The financial contributions go the Water Agency and are used for canal maintenance. Ideally the channels require cleaning every year as they get filled up with sand and other dirt washed in by the water. Irrigation gates if used appropriately should not need repair for at least the first five years after installation. After that some minor repairs are required which can take up to 4-5 days for the concrete works to be finished and to dry.
As a result of the replacement of these water distribution facilities, the irrigation and ameliorative condition of 3,570 ha of land were improved, including around 400 ha of kitchen gardens. Around 32,000 people are now benefiting from this intervention. Livelihoods have greatly improved as farmers now feel encouraged to invest in agricultural activities. According to local farmers, now only 1 out of 4 people have to migrate to Russia whereas before the implementation of this sub-project most of them would have been forced to leave the country. As the neglect of irrigation systems from the Soviet times is a problem all over the irrigated lowlands of Tajikistan, this technology could prove highly useful for a more widespread application.

Location: Kabodion / Khudoikulov
Region: Khatlon
Technology area: 10 - 100 km2
Conservation measure: structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: externally - recent (<10 years ago)
Climate: arid, temperate
WOCAT database reference: TAJ112e
Related approach: not documented
Compiled by: Firdavs Faizulloev, UNDP Tajikistan
Date: 26th Apr 2011 updated 12th Jul 2011

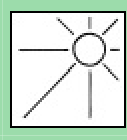
Classification

Land use problems: waterlogging, reduced rational use of water and land resources, flooding, water use conflicts, lack of irrigation water, water erosion degradation of vegetation cover, loss of topsoil through wind erosion, access to water is restricted.

Land use

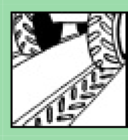
Annual cropping
full irrigation

Climate



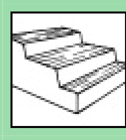
arid,
temperate

Degradation




Physical soil deterioration: waterlogging, Water degradation: change in quantity of surface water

Conservation measure



Graded ditches / waterways (to drain and convey water)

Stage of intervention

□ Prevention
▒ Mitigation / Reduction
■ Rehabilitation

Origin

□ Land user's initiative
□ Experiments / Research
■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: high
Land user: low

Main causes of land degradation:
Direct causes - Human induced: over abstraction / excessive withdrawal of water (for irrigation, industry, etc.)
Indirect causes: inputs and infrastructure, governance / institutional

Main technical functions:
- control of concentrated runoff: drain / divert
- water harvesting / increase water supply
- water spreading

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)

□ > 4000 mm
□ 3000-4000 mm
□ 2000-3000 mm
□ 1500-2000 mm
□ 1000-1500 mm
□ 750-1000 mm
□ 500-750 mm
□ 250-500 mm
■ < 250 mm

Altitude (m a.s.l.)

□ > 4000
□ 3000-4000
□ 2500-3000
□ 2000-2500
□ 1500-2000
□ 1000-1500
□ 500-1000
■ 100-500
□ <100

Landform

■ plateau / plains
□ ridges
□ mountain slopes
□ hill slopes
□ footslopes
□ valley floors

Slope (%)

■ flat
□ gentle
□ moderate
□ rolling
□ hilly
□ steep
□ very steep

Soil depth (cm)

□ 0-20
■ 20-50
□ 50-80
□ 80-120
□ >120

Growing season(s): 240 days (March-October)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: poor (eg sealing /crusting)

Soil water storage capacity: low
Availability of surface water: excess (eg flood), poor / none
Water quality: for agricultural use only
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: heavy rainfall events (intensities and amount), floods
If sensitive, what modifications were made / are possible: Flood diversion channels were built and so in case of floods there is an emergency system in place.

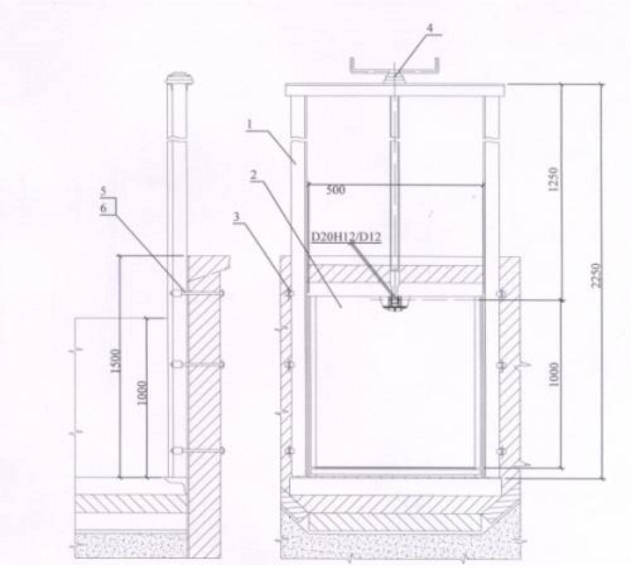
Human Environment

Cropland per household (ha)

<0.5
0.5-1
1-2
2-5
5-15
15-50
50-100
100-500
500-1,000
1,000-10,000
>10,000

Land user: groups / community, medium scale land users, common / average land users
Population density: 50-100 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: communal (organised)
Water use rights: communal (organised), water is paid
Relative level of wealth:

Access to service and infrastructure: low: employment, energy, drinking water and sanitation, financial services; moderate: health, education, market, roads & transport; high: technical assistance
Market orientation: mixed (subsistence and commercial)
Mechanization: mechanised



Technical drawing

Specifications: 1. Hoist-Head Frame PS-50-100 01.000 – 1 unit 1. Embedded Frame PS-50-100 03.000 – 1 unit 2. Gate PS 50-100 02.000 – 1 unit 3. Backing block PS 50-100 00.001 4. Screw hoist 1 EV TP №820-165 Model B-73 – 1 unit 5. Screw M20x300.4.6.02 State Standard 7798-70 – 6 units 6. Screw nut M20.8.02 State Standard 5915-70 – 6 units Technical characteristics: 1. Total mass - 90kg 2. Pressure – 1.25m 3. Full hydrostatic pressure – 0.8 ton 4. Rated force – 0.6 ton (UNDP Shaartuz)

Implementation activities, inputs and costs

Establishment activities

- Installation of irrigation gates along main irrigation channel

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	111.00	0%
Equipment		
- irrigation gate	300.00	0%
TOTAL	**411.00**	**0.00%**

Maintenance/recurrent activities

- Cleaning of irrigation channels
- Irrigation gates might need some minor repair after 5 years

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	22.00	0%
TOTAL	**22.00**	**0.00%**

Remarks: The most determinate costs are those for the purchase of water gates. Cleaning of channels was not part of this project, and therefore only installation of water distribution facilities have been completed. Channels are usually cleaned by local users who are in many cases supported by international donors. The costs are indicated for the installation of one big water gate.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased water availability quality +++ increased irrigation water availability quality +++ increased production area ++ decreased workload ++ increased crop yield	

Socio-cultural benefits	Socio-cultural disadvantages
+++ improved conservation erosion ++ improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
+++ increased water quantity +++ improved harvesting collection of water +++ improved excess water drainage ++ reduced hazard towards adverse events ++ reduced surface runoff	

Off-site benefits	Off-site disadvantages
+++ increased water availability	

Contribution to human well-being/livelihoods

+++ Farmers feel more confident about investing in other agricultural activities as they can rely on having access to irrigation water which prevents them from needing to migrate for work.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	very positive
Maintenance/recurrent	positive	positive

Acceptance/adoption:

100% of land user families have implemented the technology with external material support.
There is moderate trend towards (growing) spontaneous adoption of the technology. However, the only issue with installation of water gates is that they require a sufficient amount of funding (mostly external).

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:
1) Improved regulation of water flow as previously some areas suffered from flooding and waterlogging whereas others did not receive enough water →Ensure proper maintenance of the facilities

Land users' opinion:
1) Reduced conflicts about water distribution as previously upstream users received all the available water and downstream users received nothing
2) Reduced workload as previously gates had to be constantly monitored
3) Improved livelihoods due to regular water access
4) Increased confidence of farmers to invest in other agricultural activities due to more guaranteed water availability
5) Less migration to Russia as income opportunities through agriculture have improved

Weaknesses and →how to overcome

Specialists' opinion:
1) High costs involved with the installation of such an irrigation system along a whole canal →If every collective farm along the river pays for the gates within their territory, the costs could be divided between them

Contact person: Faizulloev, Firdavs. UNDP, Area Manager, Shaartuz Area Office, 2 Ziyodaliev Street, Shaartuz, Tajikistan, e-mail: firdavs.faizulloev@undp.org, phone: (992-918) 79 52 78

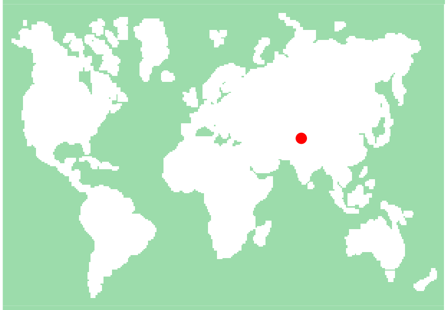
left: Cascading rock channel lined with poplar trees on the mountain slopes of Ayni. (Photo: S. Stevenson)
right: Rock irrigation channel outlet. Rock is used to slow the speed of the water to prevent scouring. (Photo: Davlatov Davlatbek)

Cascading Rock Irrigation Channel

Tajikistan – CAMP Kuhiston

A cascading rock irrigation channel lined with fast growing poplar trees, constructed on rocky slopes to channel water runoff from the high mountains for human use at the valley floor.

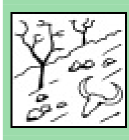
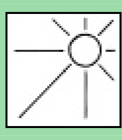
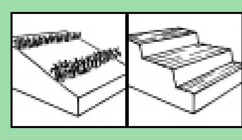
A one metre wide, 300m long, irrigation channel constructed of stones, that is built into the steep slope of a mountain gorge. The channel is 0.5m deep and is lined with poplar trees that help stabilise the structure. The water runs down the channel from the top mountains, with water splashing onto the poplar trees. At the foot of the channel the water is used to irrigate cultivated land and also provide drinking water.
The main purpose of the cascading rock irrigation structure is to capture surface water run-off from the top of the mountain and channel it to where it can be utilised for human use such as drinking water, sanitation, and irrigation. The uneven surface of the rock channel slows the pace of the water thus preventing scouring at the foot of the channel. The channel also provides a suitable environment for the cultivation of poplar trees which in turn can help reduce water and wind erosion on the slopes, thus preventing rock and debris movement down onto the cultivated lands on the valley floor.
The channel is dug perpendicular to the steep slope and lined with stones gathered from the mountainous slopes. This activity is labour intensive, but can be more efficient with the use of donkeys. The stones are placed upon/on top of each other in the base of the channel, and used to line the sides of the channel to retain the water. The soil along the edge of the channel is cleared of debris and stone until it is suitable for the planting of poplar cuttings. The cuttings are supplemented with organic fertiliser. The channel is financed by the land owner, with voluntary support from the community.
The cascading rock irrigation channel is located in a remote steep mountainous gorge where there is a shortage of land for cultivation. Water is in short supply, especially during the hot summer months. Subsequently the inhabitants have a high dependency on irrigated water from the top of the mountain range. The majority of the residents have a semi-subsistence living and are highly reliant upon the cultivated land where they grow a range of crops (e.g. wheat, potatoes. etc), fruits (e.g. apricots) and poplar trees for selling and construction purposes.



Location: Veshab, Ayni
Region: Sogd region
Technology area: < 0.1 km2 (10 ha)
Conservation measure: vegetative, structural
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user - 10-50 years ago
Land use: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before), Forests / woodlands / woodlands: Plantations, afforestations (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ371e
Related approach: not documented
Compiled by: Davlatbek Davlatov
Date: 03rd May 2011 updated 08th Jul 2011

Classification

Land use problems: Debris movement due to excessive rains damaging crops and infrastructure. Water and wind erosion, rockfalls and debris movement.

Land use	Climate	Degradation	Conservation measure
			
Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before) Forests / woodlands: Plantations, afforestations (after) Selective felling of (semi-) natural forests	semi-arid, temperate	Soil erosion by water: mass movements / landslides	Tree and shrub cover, Graded ditches / waterways (to drain and convey water)

Stage of intervention	Origin	Level of technical knowledge
□ Prevention ■ Mitigation / Reduction □ Rehabilitation	■ Land user's initiative: 10-50 years ago □ Experiments / Research □ Externally introduced	Agricultural advisor: low Land user: medium

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires)
Direct causes - Natural: Heavy / extreme rainfall

Main technical functions:
- control of concentrated runoff: drain / divert
- water harvesting / increase water supply
- Prevent off site damage to cultivated land at the foot of the slope.

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	■ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	□ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	□ hilly
□ 750-1000 mm	■ 1000-1500	□ valley floors	■ steep
■ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)		
■ 0-20 □ 20-50 □ 50-80 □ 80-120 □ >120	**Growing season(s):** 180 days (March-October) **Soil texture:** coarse / light (sandy) **Soil fertility:** very low **Topsoil organic matter:** low (<1%) **Soil drainage/infiltration:** poor (eg sealing /crusting)	**Soil water storage capacity:** very low **Ground water table:** %gt;50 m **Availability of surface water:** poor / none **Water quality:** good drinking water, for agricultural use only **Biodiversity:** low

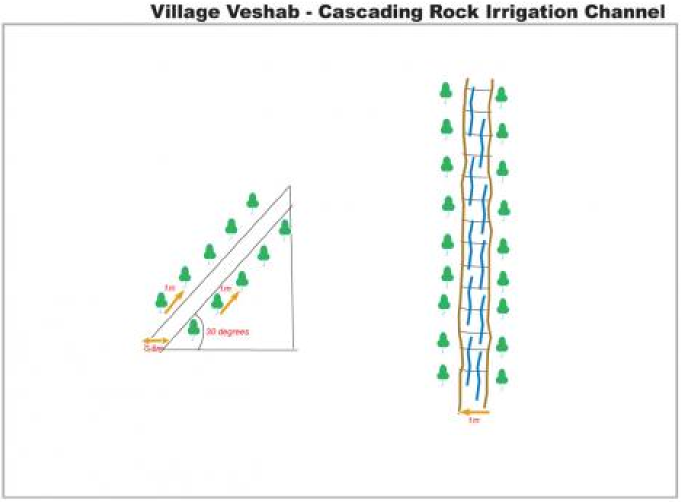
Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms
Sensitive to climatic extremes: floods, droughts / dry spells, mass soil movement

Human Environment

Land user: groups / community, Small scale land users, common / average land users, mixed
Population density: < 10 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: communal (organised)
Water use rights: communal (organised)
Relative level of wealth: average - 100% of land users; owns 100% of the total land area

Importance of off-farm income: > 50% of all income: Some of the incomes come from driving, teaching etc
Access to service and infrastructure: low: health, technical assistance, market, roads & transport, drinking water and sanitation, financial services; moderate: education, employment, energy
Types of other land: wastelands / deserts / glaciers / swamps

Village Veshab - Cascading Rock Irrigation Channel



Technical drawing

The drawing shows in plan and profile the cascading rock channel. The slope of the mountain is 30 degrees, a one metre wide channel, 0.5 m deep, is dug into the slope. The channel is lined with stones. The soil either side of the channel is cleared of rocks, and poplar branches are planted at 1m intervals lining the channel. (Davlatov Davlatbek)

Implementation activities, inputs and costs

Establishment activities

- Composting
- Planting Poplars
- Construction of rock irrigation channel

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	1164.00	100%
Equipment		
- animal traction	300.00	100%
- tools	39.00	100%
Construction material		
- stone	666.00	100%
Agricultural		
- seedlings	798.00	100%
- compost/manure	399.00	100%
TOTAL	**3366.00**	**100.00%**

Maintenance/recurrent activities

- Tree tending
- Maintenance of channel

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	285.00	100%
Equipment		
Construction material		
Agricultural		
TOTAL	**285.00**	**100.00%**

Remarks:
There was no real cost in construction of the rock irrigation channel. All labour, animal traction and materials were sourced locally for no cost, poplar seedlings are cuttings from local poplars, and organic compost for the trees was collected from local livestock. The indicative cost of the technology was calculated based on 2010 prices.

Assessment

Impacts of the Technology	
Production and socio-economic benefits	**Production and socio-economic disadvantages**
+++ increased wood production ++ increased drinking ++ increased water availability quality ++ increased farm income + increased production area	
Socio-cultural benefits	**Socio-cultural disadvantages**
+ knowledge conflict mitigation + improved food security self sufficiency	
Ecological benefits	**Ecological disadvantages**
+++ improved harvesting collection of water ++ increased water quantity ++ increased water quality ++ reduced hazard towards adverse events + reduced wind velocity + reduced soil loss + reduced surface runoff	
Off-site benefits	**Off-site disadvantages**
+++ increased water availability +++ Increased yields +++ Sanitation +++ Drinking water ++ reduced damage on neighbours fields	

Contribution to human well-being/livelihoods

++ This includes wood for construction, improved water supply for irrigation and improved water quality for drinking and sanitation.

Benefits/costs according to land user

Low initial expense due to inputs easily available.

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption: 5% of land user families have implemented the technology voluntary. Minimal replication in small areas of land, but no replication in recent years. (It appears in this area the implementation of the technology may have been optimised). There is no trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve	Weaknesses and →how to overcome
Specialists' opinion: 1) It reduces soil and wind erosion from the mountain slopes. → Further planting of trees. 2) It reduces rockfalls and debris movement, thus protecting the land down slope that is used for cultivation. 3) It provides water for irrigation and hence leads to an increase in crops yields and crop diversification down slope of the channel. These crops include wheat, potatoes, onions and some fruit trees mainly apricot. →Pipes form the channel to other areas. 4) Increased access to clean running water has improved sanitation and hygiene conditions for the inhabitants. →Further training on hygiene and sanitation. 5) The use of uneven rocks slows down the speed of the water in the channel and prevents water erosion at the base of the slope. **Land users' opinion:** 1) Improved livelihoods and the variety and yield of crops. →If the water was not available through the channel then the land would have to be abandoned. 2) The poplar trees provide a good source of secondary income.	**Specialists' opinion:** 1) The technology is a major construction activity that needs to be strategically positioned. → The location should be carefully considered with help of specialists. **Land users' opinion:** 1) The channel can become severely damaged after a harsh winter. →The rock lining could be cemented in but that would increase the cost, and the trees would not be able to use the water that soaks through the channel.

Contact person: Davlatbek, Davlatov, CAMP Kuhiston, Dushanbe Rudaki ave. h.131, apt.19; davlatbek_davlatov@camp.tojikiston.com, www.camp.tj.

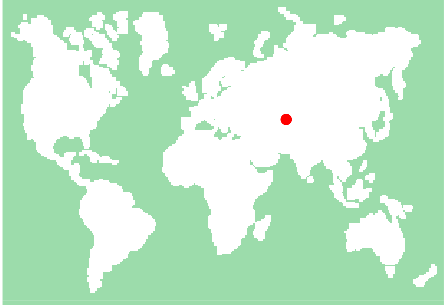
left: The polyethylene film covers vegetable patches and is filled with water. Every plant is watered with the use of rag strings. (Photo: Kalandarov R.)
right: Rag strings are used for drip irrigation (Photo: Kalandarov R.)

Drip irrigation using polyethylene sheeting and intermittent cloth strips

Tajikistan – Youth Ecological Center

Drip irrigation using polyethylene sheeting and intermittent cloth strips.

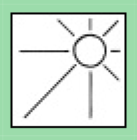
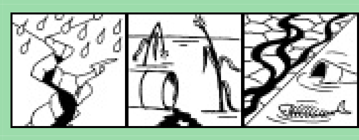
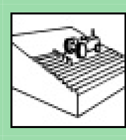
Drip irrigation with polyethylene film was used in areas with extreme conditions who have poor irrigation water available for the cultivation of vegetables. The polyethylene film covers vegetable patches and is filled with water. Every plant is watered with the use of cloth strips which soak up the water. Roots of the plants are watered on a regular basis.
The overall goal of the technology is to save water and prevent soil erosion, conserve nutrient medium, and reduce weeds.
This technology requires polyethylene sheeting, and cloth strips for drip irrigation.
Annual plants are grown under extreme climatic and unpredictable weather conditions, in saline soils and with poor irrigation water available



Location: Nosiri Husrav
Region: Khatlon
Technology area: < 0.1 km2 (10 ha)
Conservation measure: agronomic
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Land user - , Experiments -
Climate: arid, subtropics
WOCAT database reference: TAJ372e
Related approach: Training trips to (technology) demonstration plot
Compiled by: Rustam Kalandarov, Youth Ecological Centre Tajikistan
Date: 25th May 2011 updated 11th Jul 2011

Classification

Land use problems: lack of irrigation water, high soil salinity, unpredictable weather conditions lack of irrigation water, high soil salinity, unpredictable weather conditions

Land use	Climate	Degradation	Conservation measure
			
Annual cropping Full irrigation	arid, subtropics	Chemical soil deterioration: salinisation / alkalinisation, Soil erosion by water: loss of topsoil / surface erosion, Water degradation: aridification	Others

Stage of intervention	Origin	Level of technical knowledge
Prevention Mitigation / Reduction Rehabilitation	Land user's initiative Experiments / Research Externally introduced	Agricultural advisor: high Land user: low

Main causes of land degradation:
Direct causes - Human induced: soil management, crop management (annual, perennial, tree/shrub)

Main technical functions:
- increase / maintain water stored in soil
- water harvesting / increase water supply

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)
0-20
20-50
50-80
80-120
>120

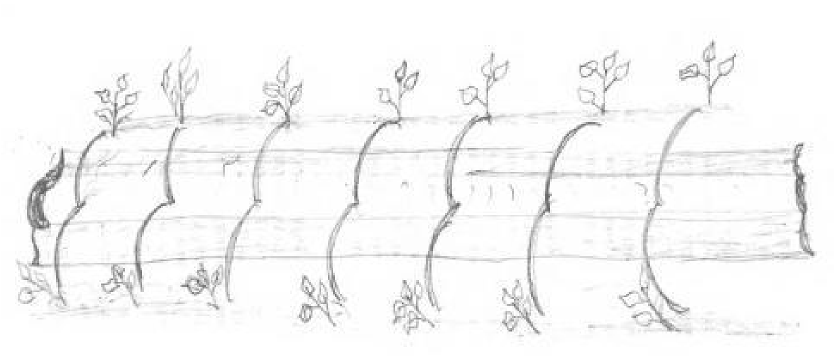
Growing season(s): 4 days (February - May)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity: medium
Ground water table: <5 m
Availability of surface water: medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: heavy rainfall events (intensities and amount), wind storms / dust storms, floods

Human Environment

Cropland per household (ha)		
<0.5 0.5-1 1-2 2-5 5-15 15-50 50-100 100-500 500-1,000 1,000-10,000 >10,000	**Land user:** Individual / household, medium scale land users, common / average land users, mixed **Population density:** < 10 persons/km2 **Annual population growth:** < 0.5% **Land ownership:** communal / village **Land use rights:** individual () **Water use rights:** individual () **Relative level of wealth:** average - % of land users; owns % of the total land area	**Importance of off-farm income:** 10-50% of all income: **Access to service and infrastructure:** low: energy, roads & transport; moderate: health, education, market, drinking water and sanitation, financial services; high: employment **Market orientation:** **Mechanization:** manual labour **Livestock grazing on cropland:**



Technical drawing

Basic diagram showing drip irrigation. (Kalandarov R.)

Implementation activities, inputs and costs

Establishment activities

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour		100%
Equipment		
- tools	400.00	100%
Construction material		
Agricultural		
- seeds	25.00	100%
TOTAL	**425.00**	**100.00%**

Maintenance/recurrent activities

- Planting seedlings or seeds (tomatoes, cucumbers, pepper)
- Preparation of soil

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	2000.00	100%
Equipment		
TOTAL	**2000.00**	**100.00%**

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ increased crop yield ++ reduced risk of production failure	

Socio-cultural benefits	Socio-cultural disadvantages
++ improved conservation erosion + improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
+++ improved excess water drainage +++ reduced hazard towards adverse events +++ increased nutrient cycling recharge ++ improved harvesting collection of water ++ reduced evaporation ++ reduced soil crusting sealing + reduced salinity	

Off-site benefits	Off-site disadvantages

Contribution to human well-being/livelihoods

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	not specified
Maintenance/recurrent	not specified	not specified

Acceptance/adoption:

Is being developed further

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) This variant of drip irrigation is a low cost technology
2) Can be used in greenhouses and under extreme climatic conditions →Can be developed in changing climate conditions
3) By reducing the amount of water used for irrigation the technology helps to save water →Water is available during the growing period
4) As the technology is not labour intensive it can be readily used →The technology is not labour intensive
5) The technology is beneficial for the environment as it prevents soil degradation

Land users' opinion:

1) This variant of drip irrigation is a low cost technology
2) Higher crop yields are achieved →This technology helps preserve soil fertility and reduces the washout of nutrients

Weaknesses and →how to overcome

Specialists' opinion:

1) Not appropriate for use in open spaces with high temperatures →Only apply in suitable area
2) The technology can be used for Solanaceae only → Being developed for other crops

Land users' opinion:

1) Useless in open space with high temperatures →Only apply in suitable area

Contact person: Kalandarov, Rustam, Youth Ecological Center, Dushanbe, 3 Herzen street, tel:+992-227-81-18, kalandarov.r@gmail.com

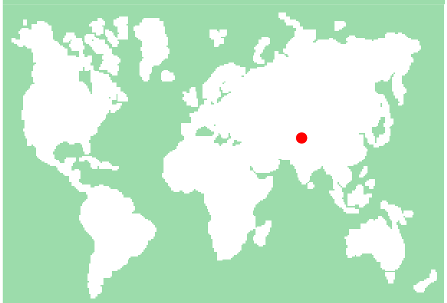
Spiral water pumps

Tajikistan - Mountain Societies Development Support Programme (MSDSP)

Spiral water pumps can carry water from the river to fields that are up to 30 metres higher than the river without the input of electricity or fuel.

A Spiral tube water pump is a method of pumping water by using an undershot water wheel which has a scoop connected to a spiral tube. As the wheel turns, the scoop will alternatively introduce either water or air into the spiral tube. The pressure from the hydrostatic head generated from the column of water introduced by the scoop, is added to the pressure from previous scoops, and so as the wheel turns it will increase the water pressure with every turn of the spiral.
The main characteristic of the spiral water pump is that it can pump water without the input of electricity or fuel. It works with the power of the water flow. Once built, the spiral water pump is able to push water up to 30 metres high (horizontal push) and up to 70 metres away (vertical push). The water push (how far water will be pushed horizontally and vertically) depends on how big the wheel of the Spiral Water Pump is built, and how much tube is put around the wheel.
The spiral tube water pumps were installed with the aim to provide irrigation water from rivers to higher level crop fields. Land users in GBAO are dependent on irrigation water to grow their crops and without the use of water pumps they can not access the water from rivers that are at a lower level than the fields.
The type, size and thus material costs of a spiral water pump will depend on 2 parameters: first, the irrigation needs (how far the water needs to go and how much is used per day) and second, the available water flow (the velocity and depth of the water source). There is only an initial investment in material for the water wheel, after that the pump should work without any further costs incurred.
The spiral water pumps were installed in 4 different districts of the semi-arid to arid GBAO region where the availability of irrigation water is crucial to crop production. So far, 4 spiral water pumps have been installed for test runs but it is very likely that they will be adopted by other farmers as they observe the benefits created by the ones that are already in place.

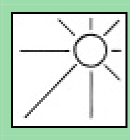
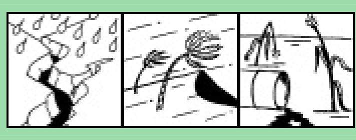
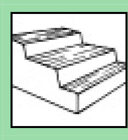
left: Spiral water wheel being transported to the site (Photo: MSDSP Khorog)
right: Spiral water wheel on a river in GBAO providing water to fields further uphill (Photo: MSDSP Khorog)



Location: Roshtkalah, Ishkashim, Vanj, Rushnan
Region: GBAO
Technology area: 100 km2 - 1,000 km2
Conservation measure: structural
Stage of intervention: prevention of land degradation
Origin: Externally - recent (<10 years ago)
Climate: arid, temperate
WOCAT database reference: TAJ394e
Related approach: not documented
Compiled by: Mizrob Amirbekov, Aga Khan Foundation
Date: 13th May 2011 updated 13th Jul 2011

Classification

Land use problems: There has been less snow cover during winter time, and less precipitation in the spring, resulting in a lack of irrigation water, and a decline of soil fertility.

Land use	Climate	Degradation	Conservation measure
			
Annual cropping Full irrigation	arid, temperate	Soil erosion by water: loss of topsoil / surface erosion, Chemical soil deterioration: fertility decline and reduced organic matter content, Soil erosion by wind: loss of topsoil	Structural

Stage of intervention	Origin	Level of technical knowledge
■ Prevention □ Mitigation / Reduction □ Rehabilitation	□ Land user's initiative □ Experiments / Research ■ Externally introduced: recent (<10 years ago)	Agricultural advisor: high Land user: high

Main causes of land degradation:
Direct causes - Natural: change of seasonal rainfall, droughts

Main technical functions:
- water harvesting / increase water supply
- water spreading

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	■ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	■ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	■ 2000-2500	□ hill slopes	□ rolling
□ 1000-1500 mm	▒ 1500-2000	□ footslopes	□ hilly
□ 750-1000 mm	□ 1000-1500	□ valley floors	□ steep
▒ 500-750 mm	□ 500-1000		□ very steep
■ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)

□ 0-20
■ 20-50
□ 50-80
□ 80-120
□ >120

Growing season(s): 170 days ()
Soil texture: coarse / light (sandy)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

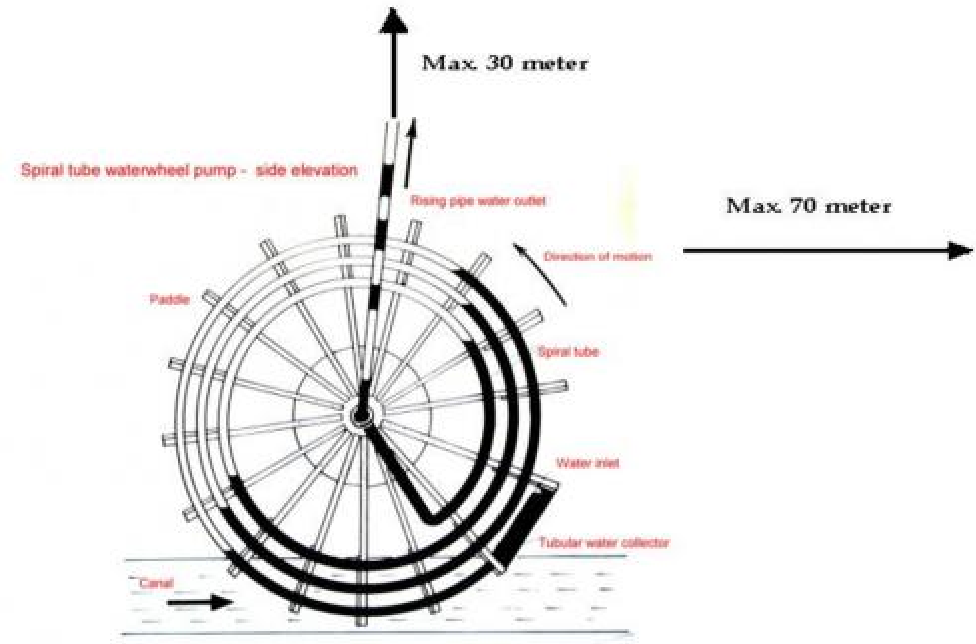
Soil water storage capacity: medium
Ground water table: <5 m
Availability of surface water: poor / none
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: seasonal rainfall decrease, floods
If sensitive, what modifications were made / are possible: Of course the technology only works if there is a water flow available, therefore a decrease in seasonal rainfall could negatively impact the performance of the spiral water pumps.

Human Environment

Land user: groups / community, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state, individual, titled
Land use rights: communal (organised)

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: employment, roads & transport, financial services; moderate: health, education, market, energy, drinking water and sanitation; high: technical assistance
Market orientation: mixed (subsistence and commercial)
Mechanization: animal traction



Technical drawing

Spiral water pump: When the wheel rotates with the power of the water, a “gulp” will add water and air into the tube at every rotation. The combination of water and air in the tube will create an increasing pressure at every rotation of the wheel. This build-up of pressure will allow the water to be pushed to a definite height. (MSDSP Khorog)

Implementation activities, inputs and costs

Establishment activities

- Building a steel frame to fix two empty water tanks that keep the water pump floating (if the water source is a river, not a canal)
- Painting wheels white
- Putting in polyethylene tube
- Setting up the outer steel frame connected with axel, outriggers, pedals

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	45.00	100%
Equipment		
Construction material		
- all materials together	651.00	100%
Agricultural		
TOTAL	**696.00**	**100.00%**

Maintenance/recurrent activities

- Maintenance of pump

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	10.00	100%
Equipment		
Construction material		
Agricultural		
TOTAL	**10.00**	**100.00 %**

Remarks: The material needed to build such a spiral waterpump is the most important factor determining the costs. The costs apply to the construction of 1 spiral pump.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased water availability quality +++ increased irrigation water availability quality	

Socio-cultural benefits	Socio-cultural disadvantages

Ecological benefits	Ecological disadvantages
+++ improved harvesting collection of water	

Off-site benefits	Off-site disadvantages

Contribution to human well-being/livelihoods

\+ This has improved the amount of area that can be utilised for cultivation of several varieties of crops.

Benefits/costs according to land user

The spiral pumps were only installed in 2011, therefore long-term returns can not be assessed yet

Benefits compared with costs	short-term:	long-term:
Establishment	positive	not specified
Maintenance/recurrent	positive	not specified

Acceptance/adoption:

100% of land user families (4 families; 100% of area) have implemented the technology with external material support. It was the Social Unit Development Village Organisations (SUDVO) who received the spiral water pumps from MSDSP
The trend towards spontaneous adoption has not yet been determined, as the technology has been installed only recently

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Spiral water pumps can provide water up to 30 m higher than the river due to the system of compressed air in the spiral tubes
2) Increase of irrigation water quantity
3) The impact on crop production and thus increased farm income can not yet be assessed as the pumps were only been installed in 2011
4) The pumps provide water without the need for fuel or electricity which is very useful for poor rural communities →Spreading this technology among rural areas in GBAO
5) Once established the pumps do not require any further investments

Land users' opinion:

1) The water pumps are easy to build using the manual provided →Provide an user friendly manual, listing the detailed steps of construction including materials and prices
2) The land was not productive and now I have a good yield of fruit →Training on fruit tree cultivation.

Weaknesses and →how to overcome

Specialists' opinion:

1) Relatively high initial investment →A micro-loan might help to cover the initial investment

Land users' opinion:

1) It may be expensive to replace some of the parts if they wear out in a few years time. →Buy replacement parts in advance.

Contact person: Khudonazarov, Artur, Manager of the "Centre for Sustainable and Innovative Technology", a project of MSDSP, e-mail: artur.khudonazarov@yahoo.com, mobile: +992 93 582 72 27 / Shariff, Jamil, Rural Economic Development Unit Advisor, Mountain Societies Development Support Programme (MSDSP), A project of the Aga Khan Foundation, e-mail: jamil.shariff@akdn.org
137, Rudaki, ave., Dushanbe, Tajikistan. Tel: (992 372) 24 76 50. www.akdn.org.

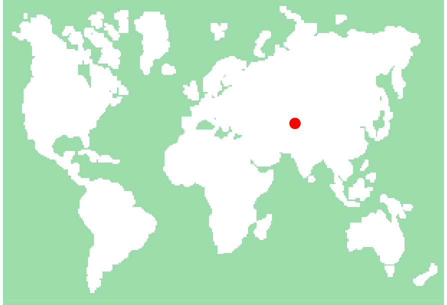
Left: The photo shows the water retention tank for the pumped water. The water is used to irrigate the trees. (Photo: Sa'dy Odinashoev)
Right: Photo shows the water wheel generating energy to power the water pump. The pump can operate to vertical height of 200m. (Photo: Sa'dy Odinashoev)

Water wheel pump system

Tajikistan - CARITAS

A water wheel that powers a pump that provides water to an orchard further upslope.

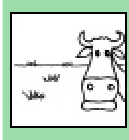
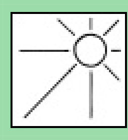
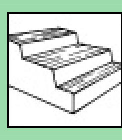
After the end of the Soviet era the mass irrigation system fell into disrepair, and many of the orchard areas subsequently suffered from dehydration and production levels declined. The case study plot is situated on a steep slope of 50° with stone/sand soils with high filtration rates. As the irrigation systems no longer worked, the orchard in the Penjikent area lost much productivity and became very dry. As the quality of the soil is very poor the trees need much irrigation. The farmer often resorted to using a bucket to irrigate the orchards. The land user developed a water powered pump using the flow from the existing river to pump water along a plastic pipe to the orchards. The pump can irrigate the orchard 200m above the river level. To help improve the process and regulate irrigation amount a large tank was installed in the orchard.
The purpose of the pump is to provide water 220m upslope to irrigate the orchards at minimal running costs, and not to be reliant on the often intermittent electricity supply.
The setting up the water wheel, pump, gear system, valves and piping system requires a certain level of technical knowledge. However, it is apparent that if you have a fast flowing river, water can be diverted to power a water wheel and a pump. Technical knowledge of the gearing will be required set up the ratios depending on the speed required for the water wheel.
In this area the very sandy soil, suffers from high infiltration rates and low water retention capacity. It is, therefore, unfavourable for growing any sort of water dependent crops. The water pump, albeit expensive in its initial financial expenditure does allow for irrigation of land that would otherwise become increasingly denuded and degraded. The demise of the Soviet irrigation system means that the land users have had to invent and discover new innovative ways to irrigate the land.



Location: Sughd
Region: Penjakent, Toshminor
Technology area: < 0.1 km2 (10 ha)
Conservation measure: structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Land user - 10-50 years ago
Land use: Grazing land: Extensive grazing land (before), Cropland: Tree and shrub cropping (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ397e
Related approach: not documented
Compiled by: Sa'dy Odinashoev,
Date: 17th May 2011 updated 08th Jul 2011

Classification

Land use problems: The land was very highly degraded and the soil condition was very poor. The land is very highly degraded, there is also limited vegetation due to the poor water supply

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Cropland: Tree and shrub cropping (after) Full irrigation	semi-arid, temperate	Soil erosion by water: loss of topsoil / surface erosion, Biological degradation: reduction of vegetation cover	Reshaping surface (reducing slope)

Stage of intervention	Origin	Level of technical knowledge
□ Prevention □ Mitigation / Reduction ■ Rehabilitation	■ Land user's initiative: 10-50 years ago □ Experiments / Research □ Externally introduced	Agricultural advisor: low Land user: high

Main causes of land degradation:
Indirect causes: Irrigation system

Main technical functions:
- water harvesting / increase water supply
- water spreading

Secondary technical functions:
- improvement of surface structure (crusting, sealing)
- increase of infiltration

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	■ hill slopes	□ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	□ hilly
□ 750-1000 mm	□ 1000-1500	▒ valley floors	■ steep
■ 500-750 mm	■ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)
- ■ 0-20
- □ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 220 days (March - October)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Soil water storage capacity: very low
Ground water table: %gt;50 m
Availability of surface water: poor / none
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, floods, droughts / dry spells
Sensitive to climatic extremes:
If sensitive, what modifications were made / are possible: In the winter months, the pipe may become frozen and split. The pipe could be insulated to help prevent this happening.

Human Environment

Grazing land per household (ha)

■	<0.5
	0.5-1
	1-2
	2-5
	5-15
	15-50
	50-100
	100-500
	500-1,000
	1,000-10,000
	>10,000

Land user: Individual / household, medium scale land users, Leaders / privileged, mainly men
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: leased ()
Water use rights: open access (unorganised) ()
Relative level of wealth: average - 40% of land users; owns % of the total land area

Importance of off-farm income: less than 10% of all income: Many people are interested in adopting of the technology.
Access to service and infrastructure: low: technical assistance, employment, market, energy, roads & transport, drinking water and sanitation; moderate: health, education, financial services
Market orientation:
Livestock density: 50-100 LU /km2

Implementation activities, inputs and costs

Establishment activities

Construction of water pump

Establishment inputs and costs per ha

Inputs	Costs (US$ / local currency)	% met by land user
Labour		%
Equipment		
- machine use	50.00	100%
- welding rod	5.00	100%
- drilling pump	1200.00	100%
- gear system	200.00	100%
- valve gate	25.00	100%
Construction material		
- stone	220.00	100%
- pipe 15, 1800m	800.00	100%
Agricultural		
Other		
- pipe dimetr 200	45.00	100%
- tank 5 ton	500.00	100%
- pipe 32, 200	180.00	100%
- pipe 50, 100m	55.00	100%
TOTAL	**3280.00**	**100.00%**

Maintenance/recurrent activities

none

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$ / local currency)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
Other		
TOTAL		**0.00%**

Remarks:
The initial set up costs are quite high, but the actual operating costs are minimal.
Costs are based upon 2010 prices.

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
+++ increased water availability quality +++ increased irrigation water availability quality ++ increased crop yield ++ increased wood production ++ reduced expenses on agricultural inputs ++ increased production area ++ decreased labour constraints ++ decreased workload ++ simplified farm operations + reduced risk of production failure	
Socio-cultural benefits	**Socio-cultural disadvantages**
++ knowledge conflict mitigation	
Ecological benefits	**Ecological disadvantages**
+++ improved harvesting collection of water ++ increased soil moisture ++ increased water quantity + improved soil cover + reduced soil crusting sealing + increased water quality	
Off-site benefits	**Off-site disadvantages**
+ increased water availability	

Contribution to human well-being/livelihoods

++ Timber and fruit production has increased on the irrigated land.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	very positive
Maintenance/recurrent	slightly positive	very positive

Acceptance/adoption:

100% of land user families (1 families; 100% of area) have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology. Many farmers and projects are interested in implementing the technology in the future.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Specialists' opinion: 1) An increase in the production of wood, fruit and timber → More training on tree cultivation techniques 2) The quality of the soil has increased with a reduction in crusting of the surface due to drying out **Land users' opinion:** 1) Decrease in the workload, previously the trees were irrigated using a bucket 2) Has improved their livelihood considerably, feel more secure 3) Took some time to pay for all materials	**Land users' opinion:** 1) High initial cost → Loans could be made available 2) High level of technical knowledge required to construct and maintain → Training could be provided to interested personnel

Contact person: Odinashoev, Sa'dy, CARITAS, 20, Pavlova street, Dushanbe, Tajikistan, mob: 985-170-125,
e mail: sady.dc@mail.ru


Left: **The photo shows the irrigation pipe feed to the wool bed. (Photo: Sa'dy Odinashoev)**
Right: Photo shows the orchard which is planted the same way. (Photo: Sa'dy Odinashoev)

A woollen water retention bed installed under the roots of a tree irrigated by a pipe feed.

Tajikistan - CARITAS

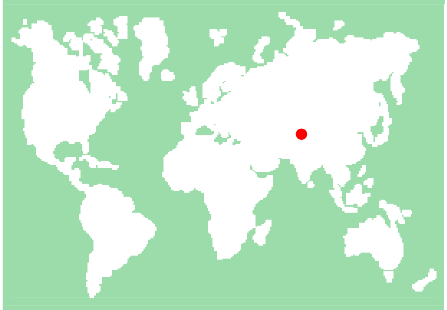
The use of sheep's wool placed below the roots of fruit trees, to retain the water fed from a surface pipe.

A bed of wool is placed within the hole before a fruit sapling is planted. The wool is fed water via a plastic pipe, which is used to saturate the wool with irrigated water. This provides a prolonged source of moisture for the trees which subsequently helps the tree survive intense dry periods and improves fruit yields. This technology could also be applied using hay or pressed sawdust as an alternative to the wool to store the water.

The purpose was to implement a sustainable cost effective and easy irrigation process that will help increase fruit production in the Penjakant region of Tajikistan during the long hot dry summer periods. The process utilises readily locally available natural materials that are environmentally friendly.

A 1m deep hole is prepared to plant the tree inside. Placed at the foot of the hole is layer of natural wool, approximately 10kg, and a plastic pipe is installed running from the wool layer to the above the surface. On top of the wool a bed of organic compost and/or high quality soil is placed to assist the growth and the sapling is planted in this. The sapling is then watered through the pipe. It is estimated that 10kg of wool will retain around 8 litres of water.

This region has low levels of annual precipitation and poor soil quality. Therefore, the land users are reliant on devising ways to improve the soil quality and irrigation practices to increase the amount of land that can be cultivated. With an increasing population and a heavy reliance on the land to support the people, there is a strong desire to bring into production land that in it's current state is unproductive.

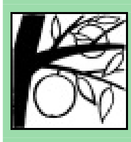


Location: Penjakent, Toshmunor
Region: Tajikistan, Sughd
Technology area: < 0.1 km2 (10 ha)
Conservation measure: structural
Origin: Land user - recent (<10 years ago)
Climate: semi-arid, temperate
WOCAT database reference: TAJ398e
Related approach: not documented
Compiled by: Sa'dy Odinashoev
Date: 18th May 2011 updated 07th Jul 2011

Classification

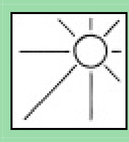
Land use problems: There is a lack of irrigation water for the vegetation. The soil structure is very poor, with low density vegetation cover.

Land use



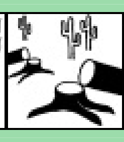
Tree and shrub cropping, Plantation forestry

Climate



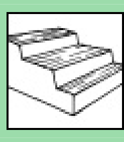
semi-arid, temperate

Degradation

Soil erosion by water: loss of topsoil / surface erosion, Biological degradation: reduction of vegetation cover

Conservation measure



Stage of intervention

Prevention
Mitigation / Reduction
Rehabilitation

Origin

Land user's initiative: recent (<10 years ago)
Experiments / Research
Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: low

Main causes of land degradation:
Direct causes - Human induced: overgrazing, other human induced causes, Disintegration of the irrigation system
Direct causes - Natural: change in temperature
Indirect causes: war and conflicts

Main technical functions:
- increase of infiltration
- water harvesting / increase water supply

Secondary technical functions:
- improvement of ground cover
- improvement of subsoil structure (hardpan)

Environment

Natural Environment

Average annual rainfall (mm)

> 4000 mm
3000-4000 mm
2000-3000 mm
1500-2000 mm
1000-1500 mm
750-1000 mm
500-750 mm
250-500 mm
< 250 mm

Altitude (m a.s.l.)

> 4000
3000-4000
2500-3000
2000-2500
1500-2000
1000-1500
500-1000
100-500
<100

Landform

plateau / plains
ridges
mountain slopes
hill slopes
footslopes
valley floors

Slope (%)

flat
gentle
moderate
rolling
hilly
steep
very steep

Soil depth (cm)

0-20
20-50
50-80
80-120
>120

Growing season(s): 270 days (October-June)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

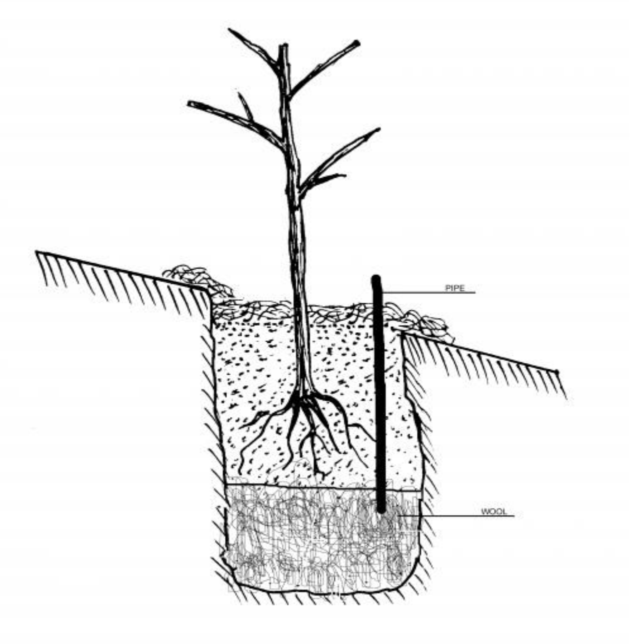
Soil water storage capacity: low
Ground water table: %gt;50 m
Availability of surface water: poor / none
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells
Sensitive to climatic extremes:

Human Environment

Land user: Individual / household, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: leased
Water use rights: leased
Relative level of wealth: poor - 100% of land users; owns % of the total land area

Importance of off-farm income: > 50% of all income:
Access to service and infrastructure: low: employment, roads & transport; moderate: health, education, technical assistance, market, energy, drinking water and sanitation, financial services



Technical drawing

The photo shows how the tree will be planted; 1) digging of hole, 2) inlaying the wool, 3) installing the pipe, 4) planting the sapling. (Sa'dy Odinashoev)

Implementation activities, inputs and costs

Establishment activities

- A 1m deep hole is prepared to plant the tree inside
- Installing of plastic pipe from the wool layer to the above surface
- On top of the wool a bed of organic compost and/or high quality soil is placed to assist the growth
- Placing approximately 10kg of wool at the foot of the hole

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
- Pipe	0.3	100%
Agricultural		
TOTAL	**0.3**	**100 %**

Maintenance/recurrent activities

No maintenance activities recorded

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		%
TOTAL		

Remarks:
In this situation, the wool is free to the farmers as they obtain it from their own sheep. The labour is provided free of charge by the farmers themselves.
The costs previously are based on the cost for providing enough pipe for one tree.

Assessment

Impacts of the Technology

Production and socio-economic benefits

- ++ increased crop yield
- ++ increased wood production
- ++ reduced risk of production failure
- ++ increased irrigation water availability quality
- ++ increased production area

Production and socio-economic disadvantages

- ++ increased labour constraints

Socio-cultural benefits

- ++ knowledge conflict mitigation
- ++ improved food security self sufficiency

Socio-cultural disadvantages

Ecological benefits

- ++ improved harvesting collection of water
- ++ increased soil moisture
- ++ reduced evaporation
- ++ reduced surface runoff
- ++ improved soil cover

Ecological disadvantages

Off-site benefits

Off-site disadvantages

Contribution to human well-being/livelihoods

\+ It has helped improve the fruit harvests on land that was becoming increasingly degraded and would in the future be unsuitable for farming practices.

Benefits/costs according to land user

The impacts can be seen within the first growing season.

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	positive
Maintenance/recurrent	neutral / balanced	very positive

Acceptance/adoption:

There is no trend towards (growing) spontaneous adoption of the technology. Some other people and projects expressed an interest.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) It reduces the number of times the trees need to be irrigated. →The technology is so easy to implement, the information should be dispersed to other farmers.
2) The technology could be applied in very dry, desert conditions →It could be used in the more dry arid areas of the country.
3) It increases the length of the planting season, as it holds the water in the ground for longer. →To implement the technology across a wider area.
4) It can be applied to older, established trees, not just seedlings. →Educate the farmers about these methods.

Land users' opinion:

1) It is easy to buy the wool. →Wool could be made available to other orchards.

Weaknesses and →how to overcome

Specialists' opinion:

1) It still reliant on some water being available at crucial times of the year. →Piped irrigation to the land plot.

Contact person: Odinashoev, Sa'dy, CARITAS, 20 Pavlova street, Dushanbe, Tajikistan. mob: 985-170-125,
e-mail: sady.dc@mail.ru. www.caritas.ch

left: Cultivation of esparcet entails an intact canopy cover (>85%) and high yields for fodder production (plant high of esparcet before first harvest 80-100cm) (Photo: Erik Bühlmann)
right: Cultivation of alfalfa (left), and esparcet (right) on a steep slope to be used for fodder production (Photo: Erik Bühlmann)

Perennial Herbaceous Fodder Plants for Intact Canopy Cover

Tajikistan – NCCR North-South

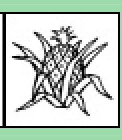
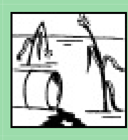
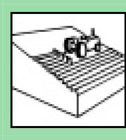
The cultivation of perennial herbaceous fodder plants to be used to fertilise unproductive cropland, and as permanent crops to be used to increase farm fodder production.

Perennial herbaceous fodder plants such as alfalfa and esparcet are cultivated for fodder production and to fertilise unproductive cropland. Esparcet and alfalfa are often grown on steep slopes not suitable for annual cropping and on unproductive cropland as green manure. Alfalfa and esparcet can be harvested for 6-10 years without tillage.
These crops fix nitrogen, so they help fertilise the soil so that farmers can plough or harrow the land after 5-10 years to grow annual crops again.
Alfalfa and esparcet can be harvested for 6-10 years without tillage (depending on the soil characteristics and inclination). As yield from perennial herbaceous fodder plant fields starts declining around 4-6 years after the initial cultivation, farmers make up for declining yields by applying additional seeds. Alfalfa and esparcet can be harvested twice a year (3-4 harvests a year if irrigated), which results in a significantly higher annual farm fodder production in comparison to ordinary haymaking fields.
Some farmers reported problems in growing esparcet or alfalfa on slopes with an inclination of more than 30%. However, various examples have shown that these perennial herbaceous fodder plants can be cultivated on steep slopes of up to 60%. On steep slopes an extra amount of seeds must be applied to offset those lost downslope by washing before germinating. Alfalfa and esparcet are effective in reducing soil erosion since their cultivation leads to a more intact ground cover throughout the year. Furthermore, not needing to tillage for up to ten years helps conserve the soil resources.

Location: RRS
Region: Faizabad Rayon
Technology area: 1 - 10 km2
Conservation measure: agronomic
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Experiments -
Climate: subhumid
WOCAT database reference: TAJ009e
Related approach: not documented
Compiled by: Erik Bühlmann, CDE Centre for Development and Environment
Date: 08th Mar 2011 updated 12th Jul 2011

Classification

Land use problems: fertility decline, soil erosion and washing downslope of seeds before they can sprout. severe soil erosion (gullies and rills) and subsequent fertility decline on the cropland and overgrazed pastures

Land use	Climate	Degradation	Conservation measure
 			
Annual cropping Perennial (non-woody) cropping Rainfed	subhumid	Chemical soil deterioration: fertility decline and reduced organic matter content	Agronomic

Stage of intervention	Origin	Level of technical knowledge
Prevention Mitigation / Reduction Rehabilitation	Land user's initiative Experiments / Research Externally introduced	Agricultural advisor: low Land user: low

Main technical functions:
- improvement of ground cover
- increase in soil fertility

Secondary technical functions:
- increase in organic matter

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): 210 days (Mar - Aug)
Soil texture: medium (loam)
Soil fertility: very high
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: floods

Human Environment

Mixed land per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land ownership: state
Land use rights: leased
Relative level of wealth: average - 75% of land users; owns 70% of the total land area

Importance of off-farm income: > 50% of all income: In general, all farmers (including those applying SWC technologies) are highly dependent on off-farm income which in most cases is earned in Russia either by themselves or by their relatives.
Market orientation: subsistence (self-supply)

Implementation activities, inputs and costs

Establishment activities

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
- tools	10.00	100%
Construction material		
Agricultural		
- seeds	30.00	100%
Other		
- labour (harrowing)	18.00	100%
- labour (haymaking twice)		%
TOTAL	**58.00**	**100.00%**

Maintenance/recurrent activities

- applying of additional seeds
- harrowing of land
- harvesting (haymaking)
- sowing

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour		%
Equipment		
Construction material		
Agricultural		
Other		
- labour (haymaking twice)	12.00	100%
TOTAL	**12.00**	**100.00%**

Remarks:
Costs per hectare under following assumptions: esparcet: 50kg/ha (price per kg: 0.65 USD) or alfalfa: 15kg/ha (price per kg: 2 USD)

Assessment

Impacts of the Technology

Production and socio-economic benefits	Pro duction and socio-economic disadvantages
+++ fodder production/quality increase + increased farm income	++ loss of land for annual crop production

Socio-cultural benefits	Socio-cultural disadvantages
+ knowledge conflict mitigation	

Ecological benefits	Ecological disadvantages
+++ improved soil cover +++ increase in soil fertility ++ biodiversity enhancement ++ reduced soil loss	

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	positive
Maintenance/recurrent	positive	positive

Acceptance/adoption:

100% of land user families have implemented the technology voluntary.
There is little trend towards (growing) spontaneous adoption of the technology. Instead of leaving unproductive cropland uncultivated, some farmers have recently started cultivating alfalfa or esparcet. Often esparcet is preferred by farmers to alfalfa, since esparcet-hay is easier to feed to animals because of its hollow stem.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) increase farm production of good quality fodder →If land is irrigated three, (instead of two) harvests are possible each year
2) reduces soil erosion through an intact ground cover being present throughout the year
3) involves only little costs for establishment, almost no inputs for maintenance
4) can be used to improve canopy cover on uncultivated (abandoned) cropland
5) no tillage necessary for 6-10 years →additional application of seeds when yields start declining

Land users' opinion:

1) increase of fodder production
2) fertilises unproductive cropland
3) easy to feed to cows in winter
4) in comparison to ordinary hayfields, two to three harvests are possible
5) only a few inputs required

Weaknesses and →how to overcome

Specialists' opinion:

1) loss of land which could have been used for production of food crops →cultivate perennial herbaceous fodder plants especially on land which is unsuitable for production of annual crops
2) increase of farm fodder production allows farmers to have more animals which ultimately will lead to further overgrazing of pastures →keep animals in stables - cut and carry system
3) loss of possible cropland →higher return from fodder production than for limited crop production on degraded land

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Right: Herd during the hot summer days after drinking water having rest under the tree shade. (Photo: Viviane Bigler).
Left: Herd during the hot summer days coming from the pasture to drink water from the water points. (Photo: Sady Odinashoev).

Rotational grazing supported by additional water points

Tajikistan - CARITAS

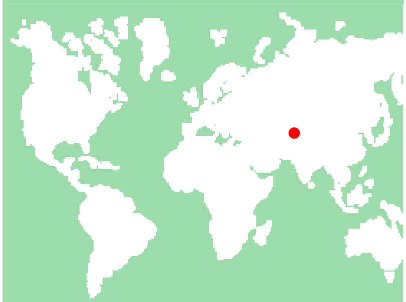
After the end of the Soviet era, an increased number of livestock on fewer grazing lands has led to the deterioration of pastures, including overgrazing, a reduction in plant diversity, poor livestock health and soil erosion. To tackle the problem, Caritas Switzerland together with livestock committees at the village level introduced rotational grazing supported by water points and rest places.

When in 2009 the project started in the two watersheds of Fayzabad and Gesh in Muminabad district, the communities had identified insufficient livestock water points in the pastures, and poor pasture management, as top priorities concerning natural resource management in the watersheds. At that time, one of the biggest problems for livestock and herders was the difficult access to water when grazing the daily pastures above the villages. At lunch time, herds had to walk long distances (4-5 kilometres), and actually had to come back to the villages for access drinking water. Climbing twice a day to the pasture costs the cattle a lot of energy leading to an average yearly weight loss of 40 to 50 kg per cow, according to a Caritas Switzerland study. One initial measure to improve the condition of the livestock, was therefore to establish water points in the actual pastures. Initially, water sources that supply water throughout the year were identified.

The water is now collected in a cement catchment device, from where it is channelled through pipes to the drinking water points for animals. In some cases water tanks are placed above water points, to collect water and to distribute it to the water points. Additionally, rest places were found for the livestock, where they can have a rest in the shade after drinking water on hot summer days. In conjunction to the establishment of water points, a rotational grazing scheme was introduced. The pasture land in the watershed was divided in ten parts, and in each plot the animals were allowed to graze for five to eight days, assuring longer growing times for grass on specific pastures and thus increasing the quantity of grass and the quality of pastures.

Livestock committees, consisting of five people, were organised. They took the lead in developing appropriate grazing schemes, and discussed the location of the water points with the villagers. They are in charge of the further maintenance of the water points, and the daily organisation of the rotational grazing. One of the five committee members is the shepherd. Every morning they should accompany the herd and check the water points and the resting places. Once a month he collects one Somoni from each family to cover the costs arising from pasture management in the watershed.

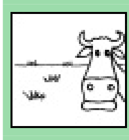
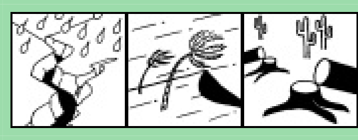
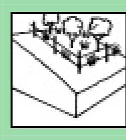
The technology is implemented on pasture land where animal drinking water is readily available only in spring, and where during the rest of the year the distances to water sources are long. Daily pastures in stony terrain with steep slopes, and especially higher up situated pastures are difficult to reach. The livestock grazing on common grazing land is controlled by the head shepherd, who has the task of coordinating the different helpers, and has the overall responsibility for herding the livestock.



Location: Tajikistan, Khatlon
Region: Muminabad
Technology area: 10000
Conservation measure: management
Stage of intervention: prevention of land degradation
Origin: LandUser - recent (<10 years)
Climate: subhumid, temperate
WOCAT database reference: TAJ100e
Related approach: Livestock Committee at Village Level (QATAJ013)
Compiled by: Sa'dy Odinashoev
Date: 27th Dec 2010 updated 14th Jun 2011

Classification

Land use problems: Degraded pastures, bad access to water points. Animal trampling and little vegetation cover, wind erosion, water erosion.

Land use	Climate	Degradation	Conservation measure
			
Extensive grazing land extensive grazing land rainfed	subhumid, temperate	Biological degradation: reduction of vegetation cover, Soil erosion by wind: loss of topsoil, Soil erosion by water: loss of topsoil / surface erosion	Change of management / intensity level

Stage of intervention

- [x] Prevention
- [ ] Mitigation / Reduction
- [ ] Rehabilitation

Origin

- [x] Land user's initiative: recent (<10 years)
- [ ] Experiments / Research
- [ ] Externally introduced

Level of technical knowledge

- [x] Agricultural advisor
- [ ] Land user

Main causes of land degradation:
Direct causes - Human induced: overgrazing
Indirect causes: population pressure, scarce pasture land resources and large number of cattle

Main technical functions:
- increase in organic matter
- increase of infiltration

Secondary technical functions:
- improvement of ground cover

Environment

Natural Environment

Average annual rainfall (mm)

- [ ] > 4000 mm
- [ ] 3000-4000 mm
- [ ] 2000-3000 mm
- [ ] 1500-2000 mm
- [x] 1000-1500 mm
- [ ] 750-1000 mm
- [ ] 500-750 mm
- [ ] 250-500 mm
- [ ] < 250 mm

Altitude (m a.s.l.)

- [ ] > 4000
- [ ] 3000-4000
- [ ] 2500-3000
- [ ] 2000-2500
- [x] 1500-2000
- [ ] 1000-1500
- [ ] 500-1000
- [ ] 100-500
- [ ] <100

Landform

- [ ] plateau / plains
- [ ] ridges
- [x] mountain slope
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Slope (%)

- [ ] flat
- [ ] gentle
- [ ] moderate
- [ ] rolling
- [ ] hilly
- [x] steep
- [ ] very steep

Soil depth (cm)

- [ ] 0-20
- [x] 20-50
- [ ] 50-80
- [ ] 80-120
- [ ] >120

Growing season(s): 145 days (March-September)
Soil texture: medium (loam)
Soil fertility: high
Topsoil organic matter: high (>3%)
Soil drainage/infiltration: good

Soil water storage capacity: high
Ground water table: 5 - 50 m
Availability of surface water: medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, floods, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: none
If sensitive, what modifications were made / are possible: temperature increase --> install more water points, rainfall decrease and heavy rainfall --> adapt the rotational grazing

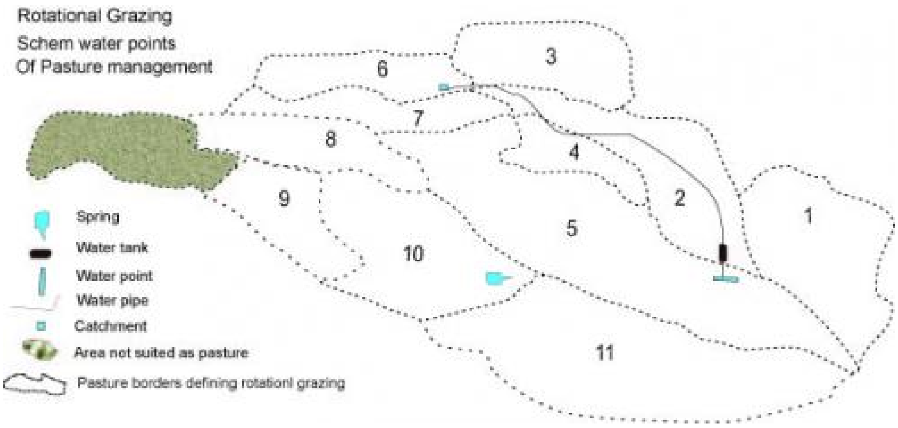
Human Environment

Grazing land per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15

Land user: groups / community, large scale land users, common / average land users, mixed
Population density: < 10 persons/km2
Annual population growth: 1% - 2%
Land ownership: communal / village
Land use rights: ()
Water use rights: ()
Relative level of wealth: average - % of land users; owns % of the total land area

Importance of off-farm income: > 50% of all income: most families have remittances from Russia
Access to service and infrastructure: low: employment, energy, financial services; moderate: health, education, technical assistance, market, roads & transport, drinking water and sanitation
Market orientation: subsistence (self-supply)
Livestock density: > 100 LU /km^2



Technical drawing

Rotational Grazing map for Pasture Management. (Sa'dy Odinashoev)

Implementation activities, inputs and costs

Establishment activities

Planting trees to create rest places for livestock.
Calculating carrying capacity and number of days of grazing period on each plot.
Catchment on the spring.
Construction of the pipeline from the spring to the water points.
Water points.

Establishment inputs and costs per ha

Inputs	Costs (US$ / local currency)	% met by land user
Labour		20%
Equipment		
- tank		%
- concrete channel		%
Construction material		
- cement (kg)		%
- pipe (m)		%
- sand (kg)		%
- concrete water channels		%
Agricultural		
TOTAL	**7881.00**	**20%**

Maintenance/recurrent activities

Protecting young trees with dead branches from thorny bushes
Watering of trees (done by shepherd)
Rotational grazing and checking the water catchment and distribution system

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$ / currency)	% met by land
Labour		100%
Equipment		
- concrete channel		%
Construction material		
- cement (kg)		%
- pipe (m)		%
- sand (kg)		%
- concrete water channels		%
Agricultural		
TOTAL	**450.00**	**100%**

Remarks: Distance to the water source and availability of high resolution maps from the satellite. For Ghesh it is 1500m --> very steep slope and for Faizabad it is 4800m.

Assessment

Impacts of the Technology

Production and socio-economic benefits	**Production and socio-economic disadvantages**
++ increased fodder production	
++ increased fodder quality	
++ increased animal production	
+++ increased water availability quality	
++ increased irrigation water availability quality	
+ reduced expenses on agricultural inputs	
++ increased farm income	
++ decreased workload	
++ increased pasture area	

Socio-cultural benefits	**Socio-cultural disadvantages**
++ improved cultural opportunities	
++ community institution strengthening	
++ knowledge conflict mitigation	
++ increased collaboration between different stakeholders	
+++ conflict mitigation	
++ empowerment of women and marginalized groups	

Ecological benefits	**Ecological disadvantages**
++ increased water quantity	
++ increased water quality	
++ increased soil moisture	
++ reduced evaporation	
+ reduced surface runoff	
+ improved soil cover	
++ increased soil organic matter below ground C	
+ reduced emission of carbon and greenhouse gases	
++ reduced soil loss	
+ increased plant diversity	

Off-site benefits	**Off-site disadvantages**
+++ drinking water for seven + seventeen households livestock have improved	
++ reduced conflicts	
+++ six additional herds from outside are using the newly constructed water point	

Contribution to human well-being/livelihoods

++ More families are depending on the livestock because by fatting them they can make money.

Benefits/costs according to land user

Benefits compared with costs	**short-term:**	**long-term:**
Establishment	positive	positive
Maintenance/recurrent	positive	positive

Acceptance/adoption: 80% of land user families have implemented the technology with external material support. Nine villages would like to adopt this technology.

Concluding statements

Strengths and →how to sustain/improve	Weaknesses and →how to overcome
Rotational grazing →to improve grass cover	One year for such a project it is too short →project of two to three years --> within three years the trees in the rest places will be well established
Better income for the farmer and at the same time pasture resources are better managed →more meetings and workshops	Only one water point it is not enough to improve soil and water conservation →rotational grazing and rest places have to be implemented together with water points
Water points →Less dangerous for animals	Young trees have to be protected →PET bottles or thorny bushes
	Difficult to work with maps →one day workshop
	One private person had to share the water of the area of the village → organise meetings --> good communication, show the advantages to everybody

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e mail: sady.dc@mail.ru, www.caritas.ch.

Growing of fodder crops on steep slopes in arid highlands

Парвариши алафхои бисьерсола (юнучка) дар нишебихои ростфуромадагии минтакахои баландкухои хушк

Tajikistan – Tajik Soil Institut / Sustainable Land Management in the High Pamir and Pamir-Alai Mountains (PALM)

Cultivation of fodder crops (alfalfa) on irrigated slopes of 60% steepness in the arid mountainous area of the Western Pamirs (Vanj valley).

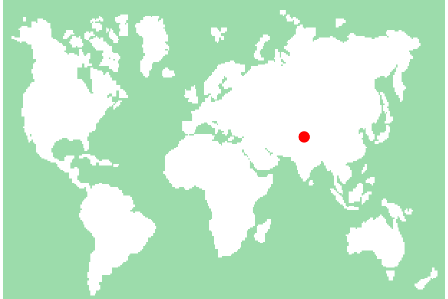
In 1993, in the Vanj district all land suitable for tilling was already occupied, only steep slopes were uncultivated. However, one innovative land user began to set up on a slope with 60% steepness, a 3 ha plot for intensive grass / fodder production through his own initiative. By the application of irrigation, within 3-5 years the very low productive grazing land was converted into a highly productive and sustainable cut-and-carry system. The technology is very effective in these ecological conditions for rapid rehabilitation of degraded lands. Over the 18 years of on-going fodder production on the plot, the pure alfalfa culture transformed into a grass-bean mixture, which provides even better soil cover and soil conservation.

The main purpose is secured fodder production for keeping livestock in the winter time. Despite the steep slope of 60%, and low-productive soils, by applying irrigation, the farmer gets three harvests of hay per season, amounting to about 8-12 ton of high quality fodder. Thus, over all these years, the farmer has had no problems producing sufficient fodder for his livestock.

The establishment of such a plot is very labour-intensive. However, within 3-4 years the productivity of the land improves several times over. High yields of high quality hay can be obtained within the short term, and the labour intensive activities are mostly needed just within the first year of establishment. Thus, many farmers have been attracted to apply this technology.

The plot described is situated in the village of Ravgada, Jamoat Teharv in Vanj district. Vanj is one of the two districts of GBAO with favourable agro-climatic conditions. But even here the natural fertility of the stony soils is low, especially on pasture lands with sparse vegetation. Due to the high aridity, farming is not possible without irrigation. The main income of the population is from livestock and the sale of nuts and fruits. All families that have recently become independent farmers, had mostly lands on steep slopes allocated to them. These families have therefore been applying the described technology with minor variations depending on the topography of their land.

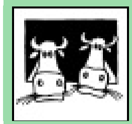
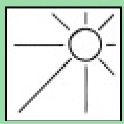
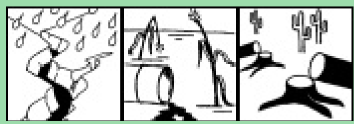
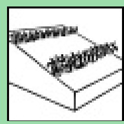
left: Intensive fodder production on irrigated land in a cut-and-carry system on a slope with 60% steepness (Photo: Gulniso Nekushoeva)
right: The high production fodder plot yielding about 8-10 t/ha of high quality hay (Photo: Gulniso Nekushoeva)



Location: Shugnan / Vankala
Region: GBAO
Technology area: 0.3 km^2
Conservation measure: vegetative
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user - 10-50 years ago
Land use: Grazing land: Extensive grazing land (before), Grazing land: Intensive grazing/ fodder production (after)
Climate: arid, subtropics
WOCAT database reference: TAJ103e
Related approach: not documented
Compiled by: Gulniso Nekushoeva, Tajik Academy of Agricultural Sciences
Date: 31st Mar 2011 updated 11th Jul 2011

Classification

Land use problems: Lack of water. A lot of money and work is required to supply water to areas on steep slopes. Low natural fertility of soils, very stony land, farming is not possible without irrigation.

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Grazing land: Intensive grazing/ fodder production (after) Full irrigation	arid, subtropics	Biological degradation: reduction of vegetation cover, Chemical soil deterioration: fertility decline and reduced organic matter content, Soil erosion by water: loss of topsoil / surface erosion	Grasses and perennial herbaceous plants

Stage of intervention

- [ ] Prevention
- [x] Mitigation / Reduction
- [ ] Rehabilitation

Origin

- [x] Land user's initiative: 10-50 years ago
- [ ] Experiments / Research
- [ ] Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: medium

Main causes of land degradation: Direct causes - Human induced: overgrazing; Direct causes - Natural: droughts, other natural causes, very steep slopes (all other land was already occupied); Indirect causes: population pressure, poverty / wealth.

Main technical functions:
- reduction of slope length
- improvement of ground cover
- increase in organic matter
- increase in nutrient availability (supply, recycling)
- increase of biomass (quantity)

Secondary technical functions:
- control of dispersed runoff: retain / trap
- control of dispersed runoff: impede / retard
- control of concentrated runoff: retain / trap
- improvement of surface structure (crusting, sealing)
- stabilisation of soil (eg by tree roots against land slides)
- increase / maintain water stored in soil
- water harvesting / increase water supply
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
[ ] > 4000 mm	[ ] > 4000	[ ] plateau / plains	[ ] flat
[ ] 3000-4000 mm	[ ] 3000-4000	[ ] ridges	[ ] gentle
[ ] 2000-3000 mm	[ ] 2500-3000	[x] mountain slopes	[ ] moderate
[ ] 1500-2000 mm	[x] 2000-2500	[ ] hill slopes	[ ] rolling
[ ] 1000-1500 mm	[ ] 1500-2000	[ ] footslopes	[ ] hilly
[ ] 750-1000 mm	[ ] 1000-1500	[ ] valley floors	[x] steep
[ ] 500-750 mm	[ ] 500-1000		[ ] very steep
[ ] 250-500 mm	[ ] 100-500		
[x] < 250 mm	[ ] <100		

Soil depth (cm)

- [ ] 0-20
- [x] 20-50
- [ ] 50-80
- [ ] 80-120

Growing season(s): 180 days (April-September)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: good

Soil water storage capacity: medium
Ground water table: %gt;50 m
Availability of surface water:
Water quality: good drinking water
Biodiversity: high

Tolerant of climatic extremes: seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, floods, decreasing length of growing period
Sensitive to climatic extremes: temperature increase, droughts / dry spells
If sensitive, what modifications were made / are possible: The use of irrigation has made the technology sustainable and more tolerant to temperature increases and drought. However, if climate change leads to decreasing snow fall, this may effect the quantity and the duration of irrigation water available. Reduced irrigation water may lead to a reduced number of yields.

Human Environment

Grazing land per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, medium scale land users, common / average land users, mixed
Population density: 50-100 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: leased ()
Water use rights: open access (unorganised) ()
Relative level of wealth: rich - 20% of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income: In addition to to the fodder plot, he also has a big forest plot rented from the Forest committee, a big apple and nut orchard, and he also keeps chickens and turkeys.
Access to service and infrastructure: low: technical assistance, employment, market, roads & transport, financial services; moderate: health, education; high: energy, drinking water and sanitation
Market orientation:
Livestock density:

Implementation activities, inputs and costs

Establishment activities

- Alfalfa seeds
- Applying fertilisers
- Clearing the site of stones
- Planting (sowing) alfalfa
- Plowing the land using ox
- Purchasing fertilisers (50 kg=150s)
- Watering the field
- Construction of irrigation network on site
- Construction of main irrigation canal (pipes water from a spring)
- Installation of pipes over a length of 120m
- Purchasing of pipes 20 Ø= 50cm x 6m 1=100$
- Stabilisation of irrigation canals with stones collected from the fields

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	1715.30	100%
Equipment		
- animal traction	119.20	100%
Construction material		
- plastic pipes	2000.00	100%
Agricultural		
- seeds	70.60	100%
- fertilizer	110.40	100%
TOTAL	**4015.50**	**100.00%**

Maintenance/recurrent activities

- Cutting of alfalfa and natural grass
- Watering the field 10 times per vegetation period (5 month). Once, every 9 days for 3 ha.
- Repairing and cleaning of the irrigation network from sediment and branches on an overall area of 3 ha
- Repairing and cleaning of the main irrigation canal from sediments and debris

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	324.50	100%
Equipment		
Construction material		
Agricultural		
TOTAL	**324.50**	**100.00%**

Remarks:
The steepness of the slope.
The slope of the plot described is 55-60%.

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased fodder production
+++ increased fodder quality
++ increased animal production
++ increased farm income
+ diversification of income sources

Production and socio-economic disadvantages

Socio-cultural benefits

+++ improved food security self sufficiency
++ knowledge conflict mitigation

Socio-cultural disadvantages

Ecological benefits

+++ increased soil moisture
+++ increased beneficial species
+++ improved soil cover
+++ increased biomass above ground C
+++ increased nutrient cycling recharge
+++ increased soil organic matter below ground C
+++ reduced emission of carbon and greenhouse gases
+++ reduced soil loss
++ increased animal diversity
++ increased plant diversity
++ increased maintained habitat diversity

Ecological disadvantages

Off-site benefits

+++ reduced downstream flooding
+++ reduced damage on neighbours fields

Off-site disadvantages

Benefits/costs according to land user

The largest amount of money was spent on the purchase of water pipes to bring irrigation water to the site. But the farmer says that over the long-term (18 years), he has already covered this cost.

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	very positive
Maintenance/recurrent	slightly negative	positive

Acceptance/adoption: 30% of land user families have implemented the technology voluntary. All families that have recently come to live as individual farmers and had lands allocated to them, have mostly obtained land on steep slopes. There is moderate trend towards (growing) spontaneous adoption of the technology. The rapidly seen benefits of the technology have attracted many farmers to apply this technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) This technology is very effective in these ecological conditions for the rapid rehabilitation of, and reduction of land degradation in these low-productivity soils.
2) Alfalfa has been grown for the last 18 years, giving a stable hay yield.
3) Over many years, the pure alfalfa fields became mixed with grass-bean herbs, which provide much better soil cover than alfalfa alone.
4) Despite the 60% steep slope and low-productive soils, thanks to irrigation, the farmer can harvest three yields of hay per season, which is about 12 ton of high quality fodder.

Land users' opinion:

1) For many years the farmer had no problems with fodder for his 10 cows.

Weaknesses and →how to overcome

Specialists' opinion:

1) The farmer did not engage in beekeeping. Possibly because he does not have enough knowledge. →The farmer should start beekeeping which can have several benefits, including ecologically clean honey and good pollination of alfalfa, which will lead to greater seed yields and greater income.

Land users' opinion:

1) Next year the farmer wants to plow the field and re-plant the alfalfa. He is already an old man and on such a steep slope it will be difficult

Contact person: Nekushoeva, Gulniso, Tajik Academy of Agricultural Sciences, 21A, Rudaki ave., Dushanbe, 734025, gulniso@mail.ru

Rehabilitation of grazing areas through planting of Izen perennial shrubs

left: Izen in autumn (Photo: Safarov)

Tajikistan – Community Agriculture & Watershed Management Project (CAWMP)

Development of grazing areas through plantation of Izen

Improvement of grazing areas through plantation of Izen in non-used areas for improvement of condition of grazing areas and to increase fodder basis. In general, grazing territories located in Tohirsu watershed are severely degraded due to overgrazing and digression. Pastures that are located on mountain slopes have turned into paths, bare ground and tussocks. Soil is often washed out, it is quite stony; Pastures are located on steep slopes, pastures that located close to settlements are severely degraded and covered by noxious plants and burrs. Grazing areas suffer from non-regulated daily and annual grazing during spring-summer-autumn period or even all-year-round. Vegetation cover was severely damaged by overgrazing, couch grass can be seen in some places, soil suffer from water erosion, multiple gullies have formed and etc. Non-regulated grazing causes damage to grass cover and changes ecological situation in the area. Continuous grazing compacts or destroys soil cover and causes specific forms of the so-called “grazing microtopography”. As a result, soil permeability is reduced, runoff level increases, pit-run fines, humus and mineral nutrients are washed out. This severely affects soil fertility. As a result, grass cover is reduced as well as the total number of animals that can be grazed there. Thus, additional measures for ecological optimization of grazing areas are needed. With support of the project and local initiative group 5ha of non-used areas were selected in Lokhur Jamoat of Dangara region for plantation of Izen (Kochia). The overall idea was to improve the condition of grazing areas, prevent wind and water erosion through plantation of Izen. With 100% germination capacity 6-8kg of seeds are needed per one hectare. Seeds are selected with the use of laboratory analysis. Simultaneous tillage and harrowing at depth of 25-30cm allowed to save fuel and funds. Seeds of Izen of “Kuikanak” sort were planted at the depth of 0,5-1,0cm. The area sown with Izen was fenced. “Kuikanak” is tolerant to +40C temperature and is really good for climatic conditions of Dangara region. Its root system reaches 80-150cm per year.

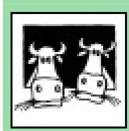
The overall goal of the idea was to improve the condition of grazing areas, prevent wind and water erosion, rehabilitate saline soils, preserve moisture in soils, increase fodder basis, enrich soil organic matter with nitrates, harvest and sale seeds and improve rural livelihoods. Improve agricultural conditions, increase and create soils that can resist degradation. Create favorable socio-economic and ecologic conditions for rural population. First of all, a group of common interest has been set up. Group members took part in a workshop on application of this technology. During the workshop it was suggested to improve productive capacity of grazing areas. Members of the group have selected a 5ha grazing area in Lokhur Jamoat. According to the project, the group has provided 20% of funding. At the initial stage land was prepared for tillage. Izen seeds were planted following the laboratory analysis. Average lifetime of Izen is 25-30 years.

Izen is mainly used to enrich arid grazing areas. Biological value of Izen is that it is tolerant to hot summer periods that are typical for south Tajikistan. At the same time, Izen also grows in the eastern Pamir where winter temperatures vary from -40 down to -45C. The selected land is the property of the group of common interest which has official land use certificate. The group consists of representatives of 10 households. They have equal access to fodder crops, seeds and have equal grazing opportunities.

Location: Tajikistan
Region: Dangara, Lokhur
Technology area: 0.05 km^2
Stage of intervention: prevention of land degradation
Origin: Experiments - 10-50 years ago
Land use: Grazing land: Intensive grazing/ fodder production (before), Cropland: Perennial (non-woody) cropping (after)
WOCAT database reference: TAJ368e
Related approach: not documented
Compiled by: Tuychiboy Safarov, Worldbank Tajikistan
Date: 15th Jun 2011 updated 12th Jul 2011

Classification

Land use problems: A Group of Common Interest has been set up Prevention from wind and water erosion, improvement of fodder basis

Land use	Climate	Degradation	Conservation measure
 Intensive grazing/ fodder production Grazing land: Intensive grazing/ fodder production (before) Cropland: Perennial (non-woody) cropping (after) Rainfed			

Stage of intervention

Prevention
Mitigation / Reduction
Rehabilitation

Origin

Land user's initiative
Experiments / Research: 10-50 years ago
Externally introduced: 10-50 years ago

Level of technical knowledge

Agricultural advisor: medium
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: soil management
Indirect causes: population pressure

Main technical functions:
- control of dispersed runoff: retain / trap

Secondary technical functions:
- improvement of ground cover

Environment

Natural Environment

Average annual rainfall (mm)

> 4000 mm
3000-4000 mm
2000-3000 mm
1500-2000 mm
1000-1500 mm
750-1000 mm
500-750 mm
250-500 mm
< 250 mm

Altitude (m a.s.l.)

> 4000
3000-4000
2500-3000
2000-2500
1500-2000
1000-1500
500-1000
100-500
<100

Landform

plateau / plains
ridges
mountain slopes
hill slopes
footslopes
valley floors

Slope (%)

flat
gentle
moderate
rolling
hilly
steep
very steep

Soil depth (cm)

0-20
20-50
50-80
80-120
>120

Growing season(s): 6 days (8)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: poor (eg sealing /crusting)

Soil water storage capacity: very low
Ground water table: %gt;50 m
Availability of surface water:
Water quality:
Biodiversity:

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), droughts / dry spells
Sensitive to climatic extremes:

Human Environment

Grazing land per household (ha)

	<0.5
	0.5-1
	1-2
	2-5
	5-15
	15-50

Land user: groups / community, Small scale land users, disadvantaged land users, mixed
Population density: 10-50 persons/km2
Annual population growth:
Land ownership: communal / village
Land use rights: ()
Water use rights: ()
Relative level of wealth: poor - % of land users; owns % of the total land area

Importance of off-farm income: 10-50% of all income: Firs yield is used for internal purposes, then seeds are produced and animals are grazed
Access to service and infrastructure: low: health, education, technical assistance, employment, market, energy, drinking water and sanitation, financial services; moderate: roads & transport
Market orientation:
Livestock density:

Technical drawing

This saline soil was sown with Izen in February. This is Izen 10 months after initial planting during vegetative period. (Safarov T.S.)

Implementation activities, inputs and costs

Establishment activities

- Fencing
- Leveling
- Planting
- Tillage

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	69.00	100%
Equipment		
- machine use	45.00	20%
- tools	20.00	20%
Construction material		
- wire fencing	285.60	20%
Agricultural		
- seeds	80.00	20%
TOTAL	**499.60**	**31.05%**

Maintenance/recurrent activities

- Harvesting
- Hay production

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	50.40	100%
TOTAL	**50.40**	**100.00%**

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ increased crop yield ++ increased fodder production + increased farm income	

Socio-cultural benefits	Socio-cultural disadvantages
++ community institution strengthening ++ improved conservation erosion + improved situation of disadvantaged groups + improved food security self sufficiency	

Ecological benefits	Ecological disadvantages
++ improved soil cover + increased soil moisture + reduced surface runoff + reduced wind velocity + reduced soil loss + reduced soil compaction	

Off-site benefits	Off-site disadvantages
++ reduced damage on neighbours fields + Wind transported seeds to neighboring fields + reduced wind transported sediments	

Contribution to human well-being/livelihoods

++ Land degradation processes have been stopped. Grazing areas have been improved, members of the group get income from Izen seeds and hay production. They also graze their animals.

Benefits/costs according to land user

Single tillage and Izen seeds are planted after fencing of the area. One year after initial planting fence will be removed. The technology can be used for a period of 25 years.

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	positive
Maintenance/recurrent	slightly positive	very positive

Acceptance/adoption:

100% of land user families (10 families; 100% of area) have implemented the technology with external material support. The technology was implemented with support from the World Bank and the group of common interest. After the project people got interested in growing Izen.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) The technology can be used in areas that are not used for cultivation of other crops →Effective for a period of 25 years
2) Can be applied in saline soils in different climatic conditions. Tolerant to droughts →One year after initial planting fence can be removed
3) Increases fodder basis. Reduces load on grazing areas. → Transportation of seeds to other areas by wind
4) Income from sale of seeds. Demand for seeds.
5) Prevents soil from wind and water erosion

Land users' opinion:

1) Can be applied in saline soils
2) Can be used as additional source of income for farmers and rural population, fodder production and sale of seeds
3) Expansion of grazing areas
4) Prevents soil from erosion

Weaknesses and →how to overcome

Specialists' opinion:

1) During the first year should be protected from animals →Area should be fenced
2) Fencing requires funds →Can be done through support of donors and projects
3) Limited during the first year

Contact person: Safarov Tuychiboy, CAWMP, tuichiboi-79@mail.ru

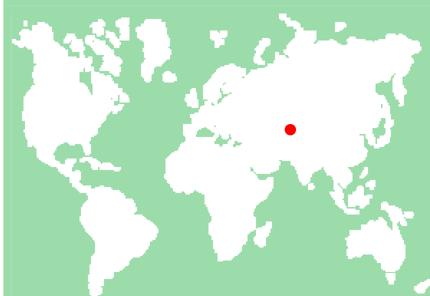
Saxaul plantation for stabilisation of sandy soils

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

left: Arid environment around Shaartuz with interspersed Saxaul bushes (Photo: Julie Zähringer)
right: Saxaul bush (Photo: Julie Zähringer)

Saxaul (*Haloxylon ammodendron*) bushes are planted on denuded sandy soils with the aim to reduce the rate of desertification.

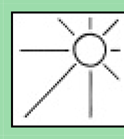
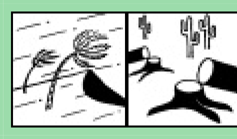
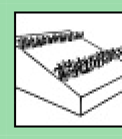
On 15 ha of denuded land, prone to wind erosion the Saxaul bush which is native to Central Asia was planted in order to stabilise the soils and halt desertification. Over two years 25 ha of Saxaul plantation was established through planting. The idea came from UNDP who also funded the purchase of seeds and fuel. UNDP further conducted an awareness raising campaign among local land users and members of dekhkan farms about the role of Saxaul bushes in combating land degradation and techniques of planting Saxaul plantations.
The Shaartuz area has repeatedly suffered from droughts, and the natural vegetation cover is highly degraded due to overexploitation for firewood. This renders the sandy soils very susceptible to wind erosion. Saxaul plantations have been widely applied in other arid areas of Central Asia to combat desertification, and were selected as an appropriate method for soil fixation around Shaartuz. Saxaul seeds have to be collected in November, and need to be planted immediately, as otherwise they lose their viability. A tractor was used to plough the land, and the seeds were planted manually. 15 ha of plantation were planted in one single day. As they are not irrigated in this area, the Saxaul bushes are entirely dependent on winter rain and dew for their water supply. The trees grow slowly and need protection from roaming cattle. As the forestry department (Leskhoz) responsible for the protection of the plantation has limited number of guards, the project employed a local forester from the Jamoat to protect the area. Meetings were held with surrounding villages to discuss the risk of wind erosion, and the need for the plantations. Also a mobile theatre was involved in order to raise the public awareness with regards to deforestation and desertification issues. An agreement was achieved with the local residents to help protect the newly planted trees from cattle.
Saxaul plantations improve vegetation cover, and therefore also increase water infiltration into the soil and improve soil structure. Once the soil has stabilised with the help of the Saxaul bushes, other herbs and bushes will regenerate in the area, and reinforce the vegetation cover. Moreover, different wild animals and birds are already nesting in the area as the vegetation increases.



Location: Jura Nazarov Jamoat
Region: Shaartuz, Khatlon
Technology area: 0.15 km^2
Conservation measure: vegetative
Stage of intervention: mitigation / reduction of land degradation, rehabilitation / reclamation of denuded land
Origin: Externally - recent (<10 years ago)
Land use: Grazing land: Extensive grazing land (before), Forests / woodlandsrests / woodlands: Plantations, afforestations (after)
Climate: arid, temperate
WOCAT database reference: TAJ114e
Related approach: not documented
Compiled by: Firdavs Faizulloev, UNDP Tajikistan
Date: 27th Apr 2011 updated 12th Jul 2011

Classification

Land use problems: wind erosion, droughts, removal of natural vegetation cover, loss of topsoil through wind erosion

Land use	Climate	Degradation	Conservation measure
			
Grazing land: Extensive grazing land (before) Forests / woodlands: Plantations, afforestations (after) Plantation forestry	arid, temperate	Biological degradation: reduction of vegetation cover, Soil erosion by wind: deflation and deposition, Soil erosion by wind: loss of topsoil	Tree and shrub cover

Stage of intervention

- □ Prevention
- ■ Mitigation / Reduction
- ■ Rehabilitation

Origin

- □ Land user's initiative
- □ Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: low
Land user: low

Main causes of land degradation:
Direct causes - Human induced: over-exploitation of vegetation for domestic use, overgrazing

Main technical functions:
- improvement of ground cover
- stabilisation of soil (eg by tree roots against land slides)

Secondary technical functions:
- increase of infiltration
- reduction in wind speed
- increase of biomass (quantity)

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- □ 1000-1500 mm
- □ 750-1000 mm
- □ 500-750 mm
- □ 250-500 mm
- ■ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- □ 1500-2000
- □ 1000-1500
- □ 500-1000
- ■ 100-500
- □ <100

Landform

- ■ plateau / plains
- □ ridges
- □ mountain slopes
- □ hill slopes
- □ footslopes
- □ valley floors

Slope (%)

- ■ flat
- □ gentle
- □ moderate
- □ rolling
- □ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 240 days (March-October)
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

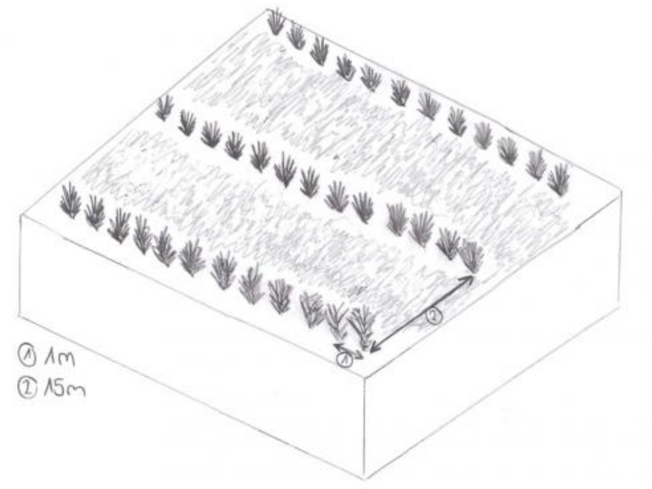
Soil water storage capacity: very low
Ground water table: %gt;50 m
Availability of surface water: poor / none
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: floods

Human Environment

Land user: employee (company, government)
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: communal (organised)

Importance of off-farm income: It is not the land users who apply the technology, but forestry agency employees
Access to service and infrastructure: low: employment, energy, drinking water and sanitation, financial services; moderate: health, education, market, roads & transport; high: technical assistance
Market orientation: only protection function
Purpose of forest / woodland use: nature conservation / protection



Technical drawing

Saxaul seeds are planted in parallel rows, with 15 m spacing between each row. The interval between seeds within each row is 1m. (Julie Zaehringer)

Implementation activities, inputs and costs

Establishment activities

- Collect Saxaul seeds
- Plough the land using tractor and seed plants manually

Establishment inputs and costs per ha

Inputs	Costs (US)	% met by land user
Labour	93.00	100%
Equipment		
- fuel	22.00	0%
Agricultural		
- seeds	43.00	0%
- fertilizer	1.80	0%
TOTAL	**159.80**	**58.00%**

Maintenance/recurrent activities

- Protection of plantation from roaming cattle by local forestry employee
- Awareness raising meetings amongst local population on importance of saxaul

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US)	% met by land user
Labour	672.00	0%
Equipment		
TOTAL	**672.00**	**0.00%**

Remarks:
For this technology, costs are related to the use of a tractor for planting of seeds and for the purchase of seeds. As the plantation was implemented by the forestry agency, labour used was provided by current employees of the agency.
Costs for the purchase of seeds and fertilisers were calculated for one ha of plantation. However, the costs indicated for machinery and labour regarding the seed collection and planting process are with respect to the whole plantation of 15 ha. The costs for labour during maintenance are for the monthly salary of an employee who is needed to protect the plantation from outsiders.

Assessment

Impacts of the Technology

Production and socio-economic benefits

Production and socio-economic disadvantages

++ increased labour constraints
+ loss of land
+ increased expenses on agricultural inputs

Socio-cultural benefits

Socio-cultural disadvantages

Ecological benefits

++ reduced evaporation
++ reduced wind velocity
++ improved soil cover
++ increased biomass above ground C
++ reduced soil loss
++ increased maintained habitat diversity

Ecological disadvantages

Off-site benefits

+++ reduced wind transported sediments

Off-site disadvantages

Contribution to human well-being/livelihoods

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	neutral / balanced	positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption:

There is little trend towards (growing) spontaneous adoption of the technology. Farmers have understood the importance of Saxaul plantations, and the role Saxaul bushes can play in combating sand drifts. There has been a trend towards growing spontaneous adoption of the technology by others.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Effective fixation of sandy soils, protecting them from wind storms and preventing erosion →Increase plantation areas in the region
2) Use of native tree species which are very well adapted to arid ecosystems
3) Through the plantation of Saxaul, the establishment of other plant species follows on naturally

Weaknesses and →how to overcome

Specialists' opinion:

1) The plantation only has protective function, but there is no aim to introduce a sustainable management scheme which would allow for the extraction of firewood →Develop a management plan
2) The area covered by the plantation is very small so the impacts might be minimal →Increase the plantation area

Land users' opinion:

1) Decline of areas suitable for cattle grazing →Developing a management plan which could include restricted user rights for cattle grazing

Contact person: Faizulloev, Firdavs. UNDP, Area Manager, Shaartuz Area Office, 2 Ziyodaliev Street, Shaartuz, Tajikistan, e-mail: firdavs.faizulloev@undp.org, phone: (992-918) 79 52 78

The pictures are showing the floodplain ecosystem with poplar forest (Photo: Gulniso Nekushoeva)

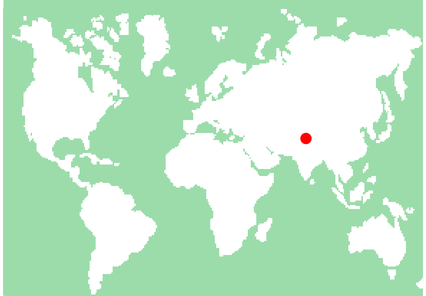
Planting poplar trees in the flood plains of high mountain river areas

Буньедкардани чакалакзор дар сохили даръехои баландкух (Tajik)

Tajikistan – Tajik Soil Institute / Sustainable Land Management in the High Pamir and Pamir-Alai Mountains (PALM)

The afforestation of the low productivity sandy lands in the river valley areas of arid highlands with fast growing poplar trees provides the population with firewood as well as timber and also provides conservation benefits.

In the Jamoat Vankala area of the Shugnan district in GBAO, low temperatures make it very difficult to grow fruit or trees other than poplar (*Populus pamirico*) or willow (*Salix schugnanica Coerz*). The natural forest consists mainly of the latter and this grows very slowly. It is very cold for 6-7 months of the year in this region, so the demand for cheap firewood to heat homes is extremely high. In the 1980s, the Sovhoz decided to transform 10ha of a low productivity pasture land into more productive irrigated forest land. After the collapse of the Soviet system, the Jamoat rented this forest land to a farmer, who still remains in charge of this piece of land. The creation of a poplar forest on the river shore in this treeless desert alpine zone can go some way towards meeting the local's demand for firewood. It can provide cheap timber and environmental benefits as well as a pleasant environment.
The process of establishing this poplar forest began with the creation of irrigation canals and the planting of seedlings. In the first few years, the seedlings had to be watered frequently due to the thirsty sandy soils. Other factors that needed to be considered were protecting the area from grazing cattle, watering areas around the forest away from the river bank, the selective felling of some poplars, the additional planting of trees on barren soil, as well as the protection of the forest from predatory deforestation by the locals (which has increased during the economic crisis). Thanks to natural regeneration processes, farmers can now prepare firewood for the winter and do not have to bring the timber from far away.
88% of the Pamir region is covered by glaciers, snow, and rocks, and is thus completely devoid of soil. Consequently, the area of arable and orchard lands in the GBAO region is only about 2%, with a forest area of 0.4%. Two-thirds of all the Pamir natural forests are located along the river banks of the Vanch, Gunt, Tokuzbulak, and others, at an altitude of 3200m. In the narrow V-shaped valleys of the Western Pamirs, the lowest points are at an altitude of 1,200m, extending up to the highest points at 7,400m. This explains the climatic differences within the region, because the lower parts in the valleys enjoy a warmer climate than the higher parts. Overall, the annual average air temperature in the region is 9°C, and most rainfall occurs between the winter and spring periods with an average precipitation of 191-227mm.



Location: Tajikistan / GBAO
Region: Shugnan / Vankala
Technology area: 1 km^2
Conservation measure: vegetative, management
Stage of intervention: mitigation / reduction of land degradation
Origin: Land user - 10-50 years ago
Land use: Grazing land: Extensive grazing land (before), Forests / woodlands: Plantations, afforestations (after)
Climate: arid, boreal
WOCAT database reference: TAJ342e
Related approach: not documented
Compiled by: Gulniso Nekushoeva, Tajik Academy of Agricultural Sciences
Date: 24th Apr 2011 updated 08th Jul 2011

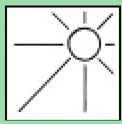
Classification

Land use problems: water shortages, low soil fertility, low yields The main problems include; Low soil productivity, a short growing season, desertification, low temperatures and a sharp drop in average daily temperatures and an early night frost. Very sparse vegetation of drought-tolerant grass and little shrubs

Land use

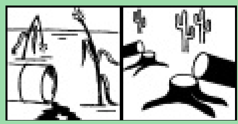
Grazing land: Extensive grazing land (before)
Forests / woodlands: Plantations, afforestations (after)
Full irrigation
Selective felling of (semi-) natural forests, plantation forestry

Climate



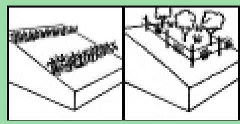
arid, boreal

Degradation



Chemical soil deterioration: fertility decline and reduced organic matter content, Biological degradation: reduction of vegetation cover, Biological degradation: quantity / biomass decline

Conservation measure



Tree and shrub cover, Change of land use type

Stage of intervention

- ▒ Prevention
- ■ Mitigation / Reduction
- □ Rehabilitation

Origin

- ■ Land user's initiative: 10-50 years ago
- □ Experiments / Research
- □ Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use, overgrazing
Direct causes - Natural: change in temperature
Indirect causes: poverty / wealth

Main technical functions:
- improvement of ground cover
- increase in organic matter
- increase of biomass (quantity)
- spatial arrangement and diversification of land use

Secondary technical functions:
- improvement of topsoil structure (compaction)
- improvement of subsoil structure (hardpan)
- stabilisation of soil (eg by tree roots against landslides)
- increase in nutrient availability (supply, recycling)
- increase / maintain water stored in soil
- reduction in wind speed
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- □ 1000-1500 mm
- □ 750-1000 mm
- □ 500-750 mm
- □ 250-500 mm
- ■ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- ■ 3000-4000
- □ 2500-3000
- □ 2000-2500
- □ 1500-2000
- □ 1000-1500
- □ 500-1000
- □ 100-500
- □ <100

Landform

- □ plateau / plains
- □ ridges
- □ mountain slopes
- □ hill slopes
- □ footslopes
- ■ valley floors

Slope (%)

- □ flat
- ■ gentle
- □ moderate
- □ rolling
- □ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): 120 days (May- September)
Soil texture: coarse / light (sandy)
Soil fertility: low
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: good

Soil water storage capacity: low
Ground water table: <5 m
Availability of surface water: good
Water quality: good drinking water
Biodiversity: high

Tolerant of climatic extremes: seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), floods, decreasing length of growing period
Sensitive to climatic extremes: temperature increase, wind storms / dust storms, droughts / dry spells
If sensitive, what modifications were made / are possible: The use of irrigation has made the technology more sustainable and more tolerant to temperature changes and to droughts.

Human Environment

Forest / woodland area per household (ha)

<0.5
0.5-1
1-2
2-5
5-15
15-50
50-100
100-500

Land user: Individual / household, medium scale land users, Leaders / privileged, mixed
Population density: < 10 persons/km2
Annual population growth: 2% - 3%
Land ownership: state
Land use rights: leased (before 1992-93 it was the Sovhoz forest land, after 1993 the forest was in the Vankala Jamoat. The farmer rents this land.)
Water use rights: open access (unorganised) (before 1992-93 it was the Sovhoz forest land, after 1993 the forest was in the Vankala Jamoat. The farmer rents this land.)
Relative level of wealth: rich - 10% of land users; owns % of the total land area

Importance of off-farm income: > 50% of all income: The farmer owns a car, sometimes he works as a tour gide, he sells the timber and firewood, and in autumn he buys meat in Murgab to resell in Khatlon.
Access to service and infrastructure: low: health, technical assistance, employment, market, financial services; moderate: education; high: energy, roads & transport, drinking water and sanitation
Market orientation: mixed (subsistence and commercial)
Purpose of forest / woodland use: timber, fuelwood

Implementation activities, inputs and costs

Establishment activities

- Delivering of manure to plot by tractor and truck
- Digging holes 50x60cm on 1 ha - 400 on 10 hectares - 4000 holes
- Growing seedlings in a nursery
- Manure (dung)
- Planting poplar seedlings and watering them
- Prepare a mixture of soil and dung for filling planting holes on 10 ha
- Establishment of irrigation networks from the canal in the garden (7x 1000м per day)
- Planting trees along the irrigation canal along the road to Jelondi and the upper boundaries of the site (10m on 1day)
- Collection of sea buck thorn stems and branches
- Delivering stems and branches using a car
- Fencing the area
- Load sea buck thorn stems and branches into the car and unload them

Establishment inputs and costs

Inputs	Costs (US$)	% met by land user
Labour	3742.00	100%
Equipment		
- machine use	574.00	100%
Construction material		
Agricultural		
- compost/manure	441.50	100%
TOTAL	**4757.50**	**100.00%**

Maintenance/recurrent activities

- Annual harvest of firewood
- Annual haymaking of natural grass
- Protection, avoidance of grazing (5 hour per day)
- Selective felling of trees (Ø=40-50cм)
- Watering seedlings 2 times per week first year (40 pers days on 1 month - 10 ha)
- Watering seedlings once per week per year (20 pers days -1 month- 10 ha)
- Repairs and cleaning of the irrigation network to clear sediment and branches on 10 ha
- Repairs and cleaning of the main irrigation canal to clear sediment and debris
- Repairing fences

Maintenance/recurrent inputs and costs per year

Inputs	Costs (US$)	% met by land user
Labour	3092.40	100%
Equipment		
Construction material		
Agricultural		
TOTAL	**3092.40**	**100.00%**

Remarks:
Labour is the most determinate factor affecting the costs, however, in this situation, most of it was provided by the land users themselves. Costs reported are those for additional labour that would need to be paid for.
The costs were calculated for the whole plantation area of 10 ha

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased fodder production
+++ increased wood production
+++ diversification of income sources
++ increased fodder quality
++ increased farm income
++ increased animal production

Production and socio-economic disadvantages

Socio-cultural benefits

+++ increased recreational opportunities
+++ improved food security self sufficiency

Socio-cultural disadvantages

++ socio cultural conflicts

Ecological benefits

+++ increased soil moisture
+++ reduced wind velocity
+++ improved soil cover
+++ increased biomass above ground C
+++ increased soil organic matter below ground C
+++ reduced emission of carbon and greenhouse gases
+++ reduced soil loss
+++ increased plant diversity
+++ increased beneficial species
+++ increased maintained habitat diversity
++ increased nutrient cycling recharge
++ increased animal diversity

Ecological disadvantages

Off-site benefits

+++ reduced downstream flooding
+++ reduced damage on neighbours fields

Off-site disadvantages

Contribution to human well-being/livelihoods:

++ The extra money earned from the sale of timber, firewood and livestock can be spent on health and education for the family.

Benefits/costs according to land user

In the short term the farmer doesn't have a lot of available firewood, timber or grass.

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	very positive
Maintenance/recurrent	negative	very positive

Acceptance/adoption: 100% of land user families have implemented the technology voluntary. There is moderate trend towards (growing) spontaneous adoption of the technology. Many other farmers planted trees on plots surrounding their own homes, these included poplar and willow trees.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) The micro climate created by the forest increased plant and animal biodiversity.
2) This technology also provides increased economic benefits, such as firewood, timber, fodder grass, medicinal herbs etc. →It will be good to plant some perennial fodder grasses
3) Poplar and willows do need a good water supply which can be provided by the rivers or by irrigation systems when planted next to houses.
4) The soil became more productive. Carbon sequestration is much higher when compared to the surrounding arid desert landscape.

Land users' opinion:

1) It gives the land user wood, grass, money, and a beautiful place for rest
2) The land user can graze his cows by rotation in this forest and has dairy production all year.

Weaknesses and →how to overcome

Specialists' opinion:

1) No fencing in situ, maybe the farmer is not sure of the length of the land rental period. →If the forest is protected by fencing this will mean less work for the farmers in protecting the area of land from grazing and tree cutting.

Land users' opinion:

2) No money available for fencing → The farmer could use stones to construct a fence which are plentiful in this area.

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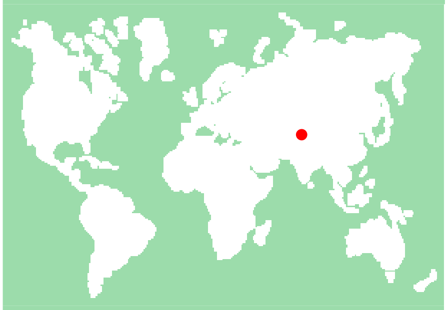
Establishment of living sea buckthorn fences for the protection of reforestation sites

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Left: Construction of seabuckthorn fence by forest tenants (Photo: Anke Gaude)
Right: Seabuckthorn fence protecting a nursery plot (Photo: Anke Gaude)

Protection of reforestation sites (willow, poplar and fruit trees) through living seabuckthorn perimeter fencing on Joint Forestry Management plots.

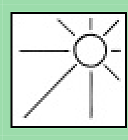
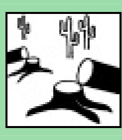
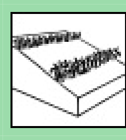
In the heavily degraded flood plain forests of the Pamirs in eastern Tajikistan, living fences made out of seabuckthorn are protecting reforestation and Joint Forestry Management (JFM) sites. A living seabuckthorn fence consists of two layers. The outer layer is an instant fence made of thorny seabuckthorn branches. The purpose of the outer layer is to immediately restrict animal and human access to the reforestation site. The outer layer also buffers the inner layer of seabuckthorn, which is planted from seabuckthorn seedlings. The inner layer will establish itself over a number of seasons, eventually growing to a height of 1.5-2m. Once established, the seabuckthorn bush provides a low cost sustainable perimeter fence to protect reforestation activities. The bush also produces fruits for processing.
The purpose of this technology is to improve heavily degraded forest areas and establish new areas by restricting open access to the human population and preventing uncontrolled livestock grazing. As part of the Joint Forestry Management approach, these reforested areas are leased to the land user providing long-term legal control, as well as income opportunities for the tenants and the State Forestry Agency.
As part of the Joint Forestry Management approach (TAJ015), land is allocated by the State Forestry Agency to a designated land user. Once the size of the plot is established, a solid fence constructed of off-cuts of seabuckthorn and supported by willow poles is established around the perimeter of the JFM reforestation area. The seabuckthorn branches are fixed together with willow twigs, willow branches or wire and are attached to wooden poles. Once completed, seabuckthorn seedlings are planted at 0.5m intervals along a small irrigation channel on the inner side of the perimeter fence. After a few seasons these seedlings will grow into a natural living fence, which will take over the protection role from the perimeter fence constructed from off-cuts. The reforestation area is planted with branches of willow and poplar and interspersed with fruit trees.
Reforestation planting materials are readily available in most parts of GBAO, and the Forestry Agency facilitates free access to seabuckthorn branches, willow branches and wooden poles. If required, wire and tools are provided by the JFM project.
The natural forest cover and biological diversity in many areas of GBAO has been significantly degraded. While population density in GBAO is low, natural resources are scarce due to the high altitude mountain environment and the pressure on these resources is great. In Soviet times, the Pamir region was highly dependent on subsidized coal from other parts of the Soviet Union. After independence, coal was no longer available and other fuel had to be sourced. Population pressure, poverty, and the lack of established local level institutions to manage forest lands have rendered forest areas an open access resource where the local population harvests forest products and grazes livestock without regulation. The local Forestry Agencies do not have the capacity to control overuse or to implement sustainable forestry management. As a part of the Joint Forestry Management approach (TAJ015) this SLM technology is a reintroduction of a traditional method for the protection of reforestation sites against livestock and, additionally, it clearly demarcates forest plot ownership and boundaries.



Location: Tajikistan, Gorno Badakhshan Autonomous Region (GBAO)
Region: Ishkashim, Roshtkala and Shugnan Districts
Technology area: 20 km^2
Conservation measure: vegetative
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Externally - recent (<10 years ago)
Land use: Mixed: Silvo-pastoralism (before), Forests / woodlands: Plantations, afforestations (after)
Climate: arid, temperate
WOCAT database reference: TAJ366e
Related approach: Joint Forest Management (TAJ015)
Compiled by: Roziya Kirgizbekova, GIZ Tajikistan
Date: 03rd May 2011 updated 28th Jun 2011

Classification

Land use problems: Shortage of fuel wood for cooking and heating; lack of pastures and fodder for maintaining or increasing livestock herds; land degradation and increasing vulnerability to natural hazard periods Open access to forests leads to illegal use and destruction of forests; grazing of livestock within forest areas hinder regeneration of forests.

Land use	Climate	Degradation	Conservation measure
			
Mixed: Silvo-pastoralism (before) Forests / woodlands: Plantations, afforestations (after) Selective felling of (semi-) natural forests	arid, temperate	Biological degradation: reduction of vegetation cover	Tree and shrub cover

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land user's initiative: traditional (>50 years ago)
- Experiments / Research
- Externally introduced: recent (<10 years ago)

Level of technical knowledge

Agricultural advisor: low
Land user: medium

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires), over-exploitation of vegetation for domestic use
Indirect causes: land tenure, governance / institutional

Main technical functions:
- improvement of ground cover
- stabilisation of soil (eg by tree roots against land slides)
- increase of biomass (quantity)

Secondary technical functions:
- reduction in wind speed
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
> 4000 mm	> 4000	plateau / plains	flat
3000-4000 mm	3000-4000	ridges	gentle
2000-3000 mm	2500-3000	mountain slopes	moderate
1500-2000 mm	2000-2500	hill slopes	rolling
1000-1500 mm	1500-2000	footslopes	hilly
750-1000 mm	1000-1500	valley floors	steep
500-750 mm	500-1000		very steep
250-500 mm	100-500		
< 250 mm	<100		

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): 100 days (May to July)
Soil texture: coarse / light (sandy)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Soil water storage capacity: low
Ground water table: <5 m
Availability of surface water: medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, wind storms / dust storms
Sensitive to climatic extremes: seasonal rainfall decrease, heavy rainfall events (intensities and amount), floods, droughts / dry spells, decreasing length of growing period

Human Environment

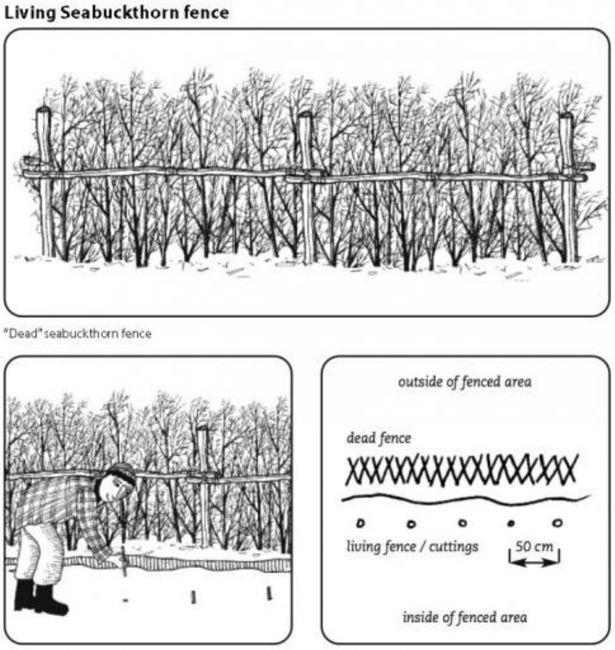
Forest / woodland area per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, Small scale land users, common / average land users, mainly men
Population density: < 10 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: leased (Forest plots of the State Forestry Agency are leased to local forest tenants according to the procedure described in the approach TAJ015 "Joint Forestry Management". Therefore the tenants hold 20-years management and user rights specified in the contract for the leased plots. The technology is applied on these forest plots leased by the State Forestry Agency. Water use rights are strictly regulated on a communal basis, whereas use rights for forest plots have to be negotiated on a communal basis as well.)
Water use rights: communal (organised) (Forest plots of the State Forestry Agency are leased to local forest tenants according to the procedure described in the approach TAJ015 "Joint Forestry Management". Therefore the tenants hold 20-years management and user rights specified in the contract for the leased plots. The technology is applied on these forest plots leased by the State Forestry Agency. Water use rights are strictly regulated on a communal basis, whereas use rights for forest plots have to be negotiated on a communal basis as well.)
Relative level of wealth: poor - 80% of land users; owns % of the total land area

Importance of off-farm income: > 50% of all income: Mostly subsistence farming. Income mainly from remittances and formal employment.
Access to service and infrastructure: low: health, employment, market, roads & transport; moderate: education, technical assistance, energy, drinking water and sanitation, financial services
Market orientation: mixed (subsistence and commercial)
Purpose of forest / woodland use: fuelwood

Living Seabuckthorn fence



"Dead" seabuckthorn fence
Planting seabuckthorn seedlings along the channel
Schematic view (as seen from above)

Technical drawing

Living seabuckthorn fence: The dead part of the fence prevents livestock from entering the forest plot, while in the long run the planted seedlings take over this role by forming a dense living seabuckthorn barrier.
(Hahnewald/Gaude/Rosset)

Implementation activities, inputs and costs

Establishment activities

- Establishment of living seabuckthorn fence
- Planting of fruit trees
- Planting of poplar and willows

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	1352.00	100%
Equipment		
- tools	22.00	0%
Construction material		
- wood	800.00	0%
- wire	111.00	0%
Agricultural		
- seedlings	767.00	8%
TOTAL	**3052.00**	**46.00%**

Maintenance/recurrent activities	Maintenance/recurrent inputs and costs per ha per year
- Fence repair - Plant tending	

Inputs	Costs (US$)	% met by land user
Labour	47.00	100%
Equipment		
- tools	11.00	0%
Construction material		
- wood	8.90	100%
- wire	1.00	0%
TOTAL	**67.90**	**82.00%**

Remarks:
The seabuckthorn seedlings are readily available in the area of implementation and incur no financial cost to the forest tenant. The labour is provided by the forest tenant. Labour is potentially a major expense if the land user must pay for it. Factors that contribute to the amount of labour required include the distance the seabuckthorn wood and seedlings have to be transported and the soil texture for the digging of a trench for the erection of the fence. So far, the material needed for fencing and tree planting has been provided free of charge by the Forestry Agency. The only financial cost to the land user is the cost of the fruit trees, approximately 5 Som per sapling. The land is provided by the Forestry Agency free of charge; however percentages of harvested forest products have to be paid to the Forestry Agency as the land owner's share.
The costs were calculated for 1000m of live seabuckthorn fence and approximately 1ha of tree planting, including 50 fruit trees and 1200 poplars and willows. Costs were calculated in April 2011. It is assumed that seabuckthorn and wood for poles are readily available on the forest plot or can be provided by the State Forestry Agency from nearby plots. Seedlings needed for the live part of the fence are very small parts of seabuckthorn plants, which are available as well wherever seabuckthorn grows. Tools are provided through the Joint Forestry Management project for the period they are needed for construction and maintenance. The mentioned enrichment plantings do not apply to every plot to the same extent. These also highly depend on the motivation and interest of the tenant.

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased wood production
++ increased irrigation water availability quality
++ increased product diversification
+ diversification of income sources

Production and socio-economic disadvantages

+++ Reduced open access to forest resources
+ reduced animal production
+ increased demand for irrigation water
+ Reduced grazing area

Socio-cultural benefits

+++ knowledge conflict mitigation
++ improved food security self sufficiency
+ improved health
+ improved conservation erosion
+ improved situation of disadvantaged groups

Socio-cultural disadvantages

+ socio cultural conflicts

Ecological benefits

+++ improved soil cover
++ reduced surface runoff
++ increased biomass above ground C
++ increased soil moisture
++ increased plant diversity
+ increased maintained habitat diversity
+ reduced hazard towards adverse events
+ reduced wind velocity
+ reduced soil loss

Ecological disadvantages

+ increased competition

Off-site benefits

++ reduced wind transported sediments

Off-site disadvantages

+ Reduced water availability for other land use types

Contribution to human well-being/livelihoods

++ The technology contributes to a better protection and increased growth of forest resources. Therefore the income and self-sufficiency of tenants increases through legally available forest products and fuel wood.

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption:

20% of land user families (83 families; 15% of area) have implemented the technology with external material support. Material support was only provided where necessary inputs were not available but fencing nonetheless was crucial for the rehabilitation of the site.
80% of land user families (333 families; 85% of area) have implemented the technology voluntary. For some forest areas a fence was established around the whole forest plot (not around each tenants individual plot), significantly reducing the workload as compared to the calculated costs.
There is moderate trend towards (growing) spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Use of locally available material and indigenous species, therefore low level of external input. →Support availability and spatial distribution of seabuckthorn for fencing, establish nurseries for seabuckthorn seedlings.
2) Implementation and promotion of traditionally used technology. →Training to show advantages and sustainability of the traditional fencing technique.
3) Effective protection of forest areas, protection of planted seedlings, support of natural regeneration. →Support the establishment of marketing opportunities for forest products and highlight the increased income and harvest opportunities if forests are protected and growing well.
4) Sustainability through the planting of seabuckthorn seedlings and the evolution towards a living seabuckthorn fence. → Highlight the lower maintenance costs once the fence is naturally growing and dense.
5) Potential for further processing of seabuckthorn. →Support the establishment of sustainable and market-oriented structures for seabuckthorn and other NTFP processing.

Land users' opinion:

1) Ownership for a demarcated forest plot. →Support trust in the ownership among tenants, effective collaboration with the Forestry Agency.
2) Increased income opportunities if regeneration of forests is improved and legal access to fuelwood for subsistence. → Support the establishment of marketing opportunities.
3) Technology is easy to implement and non-available materials are provided. →Encourage building of living seabuckthorn fences and provide access to places where building materials are available.

Weaknesses and →how to overcome

Specialists' opinion:

1) Conflicts might arise within the village between the interest of protecting and supporting regeneration of the forest and the interest of villagers to graze their livestock on the forest plots. →Facilitation of integrated land management including forestry, pasture management and irrigation; facilitation of civil society organization formation.

Land users' opinion:

1) Livestock cannot be grazed on forest areas. →Trainings and participatory discussions on opportunities to increase fodder and pasture availability, including "cut and carry" systems and increased production of perennial and other fodder crops within the forest plots.
2) High workload for fencing and planting. →Highlight the longterm income and subsistence opportunities when increased amounts of forest products can be harvested and support the creation of value chains and marketing options for forest products.

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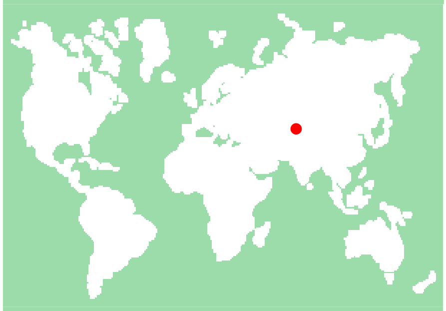
Wind forest strips for land protection against wind erosion on sandy soils

Tajikistan – Pamir Biological Institute

Establishment of an 8-row shelterbelt consisting of different varieties of willow, poplar and sea-buckthorn to protect irrigated cropland with poor quality soil in the high Pamir region from wind erosion.

The 24m wide shelterbelt consists of eight rows of trees. Three plots, 50m wide and 350m long were left in-between the trees to intercrop with lucerne and other perennial herbs. Thus, the total area which includes the shelterbelts, meadows and irrigation ditches makes up nearly 10 ha. The shelterbelt was established perpendicular to the direction of the strong winds. Past trials have shown that under the harsh climatic conditions of the Pamir region, shelterbelts in sandy and pebbly areas should include at least eight rows of trees and shrubs.
The purpose of this technology was to intercrop the shelterbelts with lucerne in order to help protect crops from wind erosion.
Shelterbelts were planted by hand, not using any machinery. Trees and shrubs were planted in accordance with their physiological characteristics and their tolerance to deflation. The eight rows were planted in the following order: 1st row: sea-buckthorn, 2nd: Shugnan willows, 3rd: Thuran willows, 4th: Pamir poplars, 5th: Bolle's poplars, 6th: Wilhelm's willows, 7th: Shugnan willows and 8th: Sea Buckthorn. The distance between trees in each row was 4m. Willows and poplars were planted as cuttings, around 1.5–3m in length cut off at the point at which the diameter of the base was around 6cm. Sea buckthorn was planted as seeds at a depth of 4-6cm. Horizontal planting, which increases the growth by 25%, was used instead of vertical planting. The trees were planted between late March and early April. Furrow irrigation ditches were dug before the actual planting of the trees. The irrigation ditches were 0.3m deep and 0.5m wide. The plot was then watered before the actual planting of the trees and the lucerne, to increase the soil moisture and improve the subsequent growth of the trees. Further watering of the area was carried out every 4-7 days depending on the weather conditions and levels of moisture in the soil. These willow and poplar trees can be pruned 5-6 years after the initial planting. At this stage the branches will be 1-3 m long and can be used by the local population.
The plot is located in an arid zone which has sandy and pebbly soil with low fertility. Initially this area was covered by Tugai forest and used as grazing land as well as for timber production. However, as a result of deforestation, the land in this area has become highly unstable and poses a threat to the irrigated lands upslope. 80% of the soil consists of stones and sand. Vegetation cover is mainly composed of sagebrush deserts. These shelterbelts were established during Soviet times and when the civil war broke out after independence, many of the poplar trees were cut down by the local population for construction- and firewood. Therefore only parts of the original shelterbelts are still in place today.

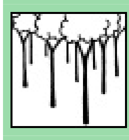
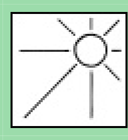
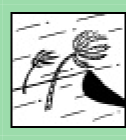
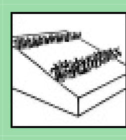
left: Created forest shelterbelts after implementation of the technology. (Photo: Kosumbekov A)
right: The sandy landscape before implementation of the technology (Photo: Kosumbekov Anoyatbek)



Location: Ishkashim
Region: GBAO
Technology area: 0.1 km^2
Conservation measure: vegetative
Stage of intervention: prevention of land degradation
Origin: Experiments - traditional (>50 years ago)
Land use: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before), Forests / woodlands: Plantations, afforestations (after)
Climate: arid, boreal
WOCAT database reference: TAJ106e
Related approach: not documented
Compiled by: Aslam Qadamov, Pamir Biological Institute
Date: 09th Apr 2011 updated 08th Jul 2011

Classification

Land use problems: land degradation, land fertility decrease, deforestation, poverty land loss, soil fertility decrease, desertification of the area

Land use	Climate	Degradation	Conservation measure
			
Plantations, afforestations Other: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before) Forests/ woodlands: Plantations, afforestations (after) Full irrigation Plantation forestry	arid, boreal	Soil erosion by wind: deflation and deposition	Tree and shrub cover

Stage of intervention	Origin	Level of technical knowledge
■ Prevention □ Mitigation / Reduction □ Rehabilitation	□ Land user's initiative ■ Experiments / Research: traditional (>50 years ago) □ Externally introduced	Agricultural advisor: medium Land user: medium

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires)
Direct causes - Natural: wind storms / dust storms
Indirect causes: land tenure, poverty / wealth

Main technical functions:
- improvement of ground cover
- improvement of surface structure (crusting, sealing)
- improvement of topsoil structure (compaction)
- stabilisation of soil (eg by tree roots against land slides)
- increase in nutrient availability (supply, recycling)
- reduction in wind speed
- increase of biomass (quantity)
- promotion of vegetation species and varieties (quality, eg palatable fodder)
- spatial arrangement and diversification of land use

Secondary technical functions:
- increase of surface roughness
- improvement of subsoil structure (hardpan)
- increase in organic matter
- increase of infiltration
- increase / maintain water stored in soil
- increase of groundwater level, recharge of groundwater

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	■ 2500-3000	□ mountain slopes	□ moderate
□ 1500-2000 mm	□ 2000-2500	□ hill slopes	■ rolling
□ 1000-1500 mm	□ 1500-2000	■ footslopes	□ hilly
□ 750-1000 mm	□ 1000-1500	■ valley floors	□ steep
□ 500-750 mm	□ 500-1000		□ very steep
□ 250-500 mm	□ 100-500		
■ < 250 mm	□ <100		

Soil depth (cm)

■ 0-20
□ 20-50
□ 50-80

Growing season(s): 150 days (from May to September)
Soil texture: medium (loam)
Soil fertility: low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity: low
Ground water table: <5 m
Availability of surface water: good, medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, decreasing length of growing period
Sensitive to climatic extremes: floods, droughts / dry spells
If sensitive, what modifications were made / are possible: No, drought is only a problem if it lasts for a year or more

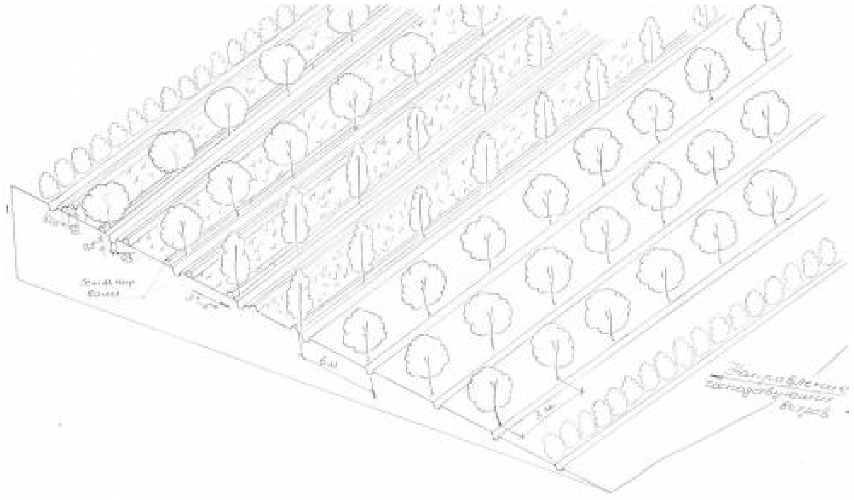
Human Environment

Forest / woodland area per household (ha)

■	<0.5
□	0.5-1
□	1-2
□	2-5
□	5-15

Land user: groups / community, small scale land users, common / average land users, mixed
Population density: < 10 persons/km2
Annual population growth: 0.5% - 1%
Land ownership: state
Land use rights: individual ()
Relative level of wealth: poor - 60% of land users; owns 70% of the total land area

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: health, technical assistance, employment, market, energy, financial services; moderate: education, roads & transport, drinking water and sanitation
Market orientation: mixed (subsistence and commercial)
Purpose of forest / woodland use: fuelwood, nature conservation / protection, protection against natural hazards



Technical drawing

Eight rows were planted in the following order: 1st row: sea-buckthorn, 2nd: Shugnan willows, 3rd: Thuran willows, 4th: Pamir poplars, 5th: Bolle's poplars, 6th: Wilhelm's willows, 7th: Shugnan willows and 8th: Sea Buckthorn. The rows were intercropped with Lucerne.

Implementation activities, inputs and costs

Establishment activities

- construction of irrigation canals
- digging of pits for tree planting
- planting of trees
- sowing of the alfalfa in drills

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	70.00	100%
Equipment		
- tools	10.00	%
Construction material		
Agricultural		
- seeds	10.00	%
- seedlings	5.00	100%
- fertilizer	6.00	%
TOTAL	**101.00**	**100.00%**

Maintenance/recurrent activities

- cutting of alfalfa
- maintenance of the irrigation system
- sanitary cutting and pruning

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	22.00	100%
Equipment		
- tools	5.00	%
Agricultural		
- seeds	3.00	%
- seedlings	2.00	100%
- fertilizer	6.00	%
TOTAL	**38.00**	**100.00%**

Assessment

Impacts of the Technology

Production and socio-economic benefits

- +++ increased crop yield
- +++ reduced risk of production failure
- +++ increased farm income
- +++ diversification of income sources
- +++ increased production area
- +++ increased product diversification
- ++ increased fodder production
- ++ increased wood production

Production and socio-economic disadvantages

Socio-cultural benefits

- +++ improved situation of disadvantaged groups
- +++ improved food security self sufficiency

Socio-cultural disadvantages

Ecological benefits

- +++ reduced hazard towards adverse events
- +++ reduced wind velocity
- +++ improved soil cover
- +++ increased biomass above ground C
- +++ increased nutrient cycling recharge
- +++ increased soil organic matter below ground C
- +++ reduced soil loss
- +++ reduced soil crusting sealing
- +++ reduced soil compaction
- +++ increased plant diversity
- +++ increased beneficial species

Ecological disadvantages

Off-site benefits

- ++ reduced damage on public private infrastructure
- \+ reduced wind transported sediments

Off-site disadvantages

Contribution to human well-being/livelihoods

- +++ increased knowledge of the local farmers about erosion, reduce wind storm related diseases

Benefits/costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	very positive
Maintenance/recurrent	slightly positive	very positive

Acceptance/adoption:

100% of land user families (81 families; 100% of area) have implemented the technology with external material support.
There is little trend towards (growing) spontaneous adoption of the technology. unfortunately, after the collapse of the Soviet Union and during the civil war people cut down all the shelterbelts for fuelwood. Some people have started to rehabilitate the shelterbelts as they understand their importance, but it is difficult because there is no material support

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) Low cost of the technology as compared to other technologies
2) The use of local sorts of trees and shrubs allows to apply this technology in any climatic zone of the Pamir
3) High tolerance of selected sorts of trees and shrubs to sand storms, which has been confirmed by multiple practical surveys

Weaknesses and →how to overcome

Land users' opinion:

1) Forest strips need irrigation →construction of irrigation system
2) Willows and poplar trees are prone to various diseases →use herbicides
3) Willows and poplar trees are prone to various diseases →use herbicides

Contact person: Aslam Quadamov, Pamir Biological Institute, Kholdorov St. 2, Khorog, Tajikistan, 736000, asbest111@mail.ru
mobile: (+992) 93 538 02 23

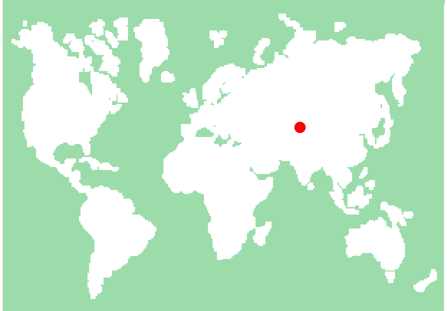
left: Shelterbelt with a variety of tree species planted in 1992/1993 (before implementation of the project) (Photo: Julie Zähringer)
right: Shelterbelts with *Elaeagnus angustifolia* planted through UNDP support in 2010 (Photo: Julie Zähringer)

Shelterbelts with Russian Olive for the protection of irrigated fields

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Shelterbelts are used to protect irrigated land from deposition of sand and to reduce wind speed

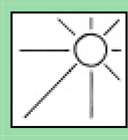
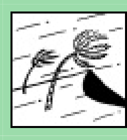
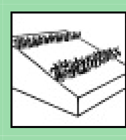
This technology consists of shelterbelts made of Russian Olive (*Elaeagnus angustifolia*) to protect irrigated fields from strong winds.
In the Shaartuz area wind erosion poses huge problems to crop cultivation as topsoil is being removed and deposited as sediments on neighbouring fields. Dusty storms not only damage the crops but they also cause damage to the fertile layer of soil. Sand also damages the irrigation canals, roads, gardens and streets in urban areas which forces people to leave such areas. Good yields cannot be achieved if fields are not properly protected. A solution to this problem is the planting of shelterbelts around fields to slow wind speed to prevent erosion of the arable soil layer and reduce evapotranspiration. During Soviet times shelterbelts were planted on collective farms by the state forestry committee under contracts. After the collapse of the USSR, and before the formation of Dekhkan farms, land users were not interested in investing in shelterbelts due to unprotected land use rights and unclear legal procedures. One farmer however tested the planting of a shelterbelt in 1992 when his son came back from his studies at the Agricultural University where he had learnt about the technology. They planted the first shelterbelt using a mixture of different tree species to protect newly irrigated fields. Due to financial constraints they could not invest in any other shelterbelts but in 2010 UNDP provided them with seedlings to increase the shelterbelt area. For this new shelterbelt the native Russian Olive was considered the most appropriate species as soils were highly saline and only this species proved tolerant.
Trees were planted in three rows, along field boundaries and also along irrigation channels. Within rows trees were spaced at a 1m interval with a 6 m distance between rows. The plantations were established through “haschar” (voluntary neighbourhood help) with 30 people planting about 10,000 trees within one month. During the first three years after planting the saplings need regular irrigation and sanitary care to help establish themselves. After 6-7 years the trees start drawing a lot of water from the soil which prevents the irrigated soils from damage through water logging. Russian olive can grow up to 12 m in 10-12 years.
Benefits of these shelterbelts are increased crop yields (wheat, cotton and rice, etc) due to the protection from strong winds and decreased evapotranspiration. Thanks to the species association with nitrogen fixing root bacteria soil fertility is improved. The trees further produce edible fruits and provide valuable firewood that is consumed by the households. Russian Olive is resistant to pests and diseases and drought-tolerant once established; however, it requires a lot of water during the first few years. One constraint to the establishment of the shelterbelt is local people who often cut down branches for firewood. The farmer therefore has to guard his field whenever possible with the help of his family and the staff he has employed to work on his field. Implementation of forestry Initiatives began in 2009 and a total of 11 ha land was covered between 2009-2010. 11 farmers were involved in the project and establishment of the shelterbelts was initiated stage by stage during these two years. The project initiatives have also continued into 2011 as well. As other farmers observe and understand the importance of shelterbelts, there has been a trend towards adoption of the technology by other farmers.



Location: Khatlon
Region: Shaartuz
Technology area: 0.09 km^2
Conservation measure: vegetative
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Experiments - 10-50 years ago
Land use: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before), Cropland: Annual cropping (after)
Climate: arid, temperate
WOCAT database reference: TAJ110e
Related approach: Not documented
Compiled by: Firdavs Faizulloev, UNDP Tajikistan
Date: 15th Apr 2011 updated 12th Jul 2011

Classification

Land use problems: Wind erosion leading to deflation of sandy soils, low soil fertility, reduction of vegetation cover, and increasing impacts of climate change. Dusty storms not only damage the crops but they also cause damage to the fertile layer of soil. Sand also damages the irrigation canals, roads, gardens, streets in urban areas which can force people to leave such areas.

Land use	Climate	Degradation	Conservation measure
			
Annual cropping Other: Other: wastelands, deserts, glaciers, swamps, recreation areas, etc (before) Cropland: Annual cropping (after) full irrigation	arid, temperate	Soil erosion by wind: loss of topsoil, Soil erosion by wind: deflation and deposition, Soil erosion by wind: offsite degradation effects	Tree and shrub cover

Stage of intervention

- □ Prevention
- ▒ Mitigation / Reduction
- ■ Rehabilitation

Origin

- □ Land user's initiative
- ■ Experiments / Research: 10-50 years ago
- □ Externally introduced

Level of technical knowledge

Agricultural advisor: low
Land user: low

Main causes of land degradation:
Direct causes - Human induced: over-exploitation of vegetation for domestic use
Direct causes - Natural: wind storms / dust storms
Indirect causes: inputs and infrastructure

Main technical functions:
Stabilisation of soil (eg by tree roots against land slides)

Secondary technical functions:

Environment

Natural Environment

Average annual rainfall (mm)

- □ > 4000 mm
- □ 3000-4000 mm
- □ 2000-3000 mm
- □ 1500-2000 mm
- □ 1000-1500 mm
- □ 750-1000 mm
- □ 500-750 mm
- □ 250-500 mm
- ■ < 250 mm

Altitude (m a.s.l.)

- □ > 4000
- □ 3000-4000
- □ 2500-3000
- □ 2000-2500
- □ 1500-2000
- □ 1000-1500
- □ 500-1000
- ■ 100-500
- □ <100

Landform

- ■ plateau / plains
- □ ridges
- □ mountain slopes
- □ hill slopes
- □ footslopes
- □ valley floors

Slope (%)

- ■ flat
- □ gentle
- □ moderate
- □ rolling
- □ hilly
- □ steep
- □ very steep

Soil depth (cm)

- □ 0-20
- ■ 20-50
- □ 50-80
- □ 80-120
- □ >120

Growing season(s): days ()
Soil texture: coarse / light (sandy)
Soil fertility: very low
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: good

Soil water storage capacity: very low
Ground water table: <5 m
Availability of surface water: poor / none
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells
Sensitive to climatic extremes: no

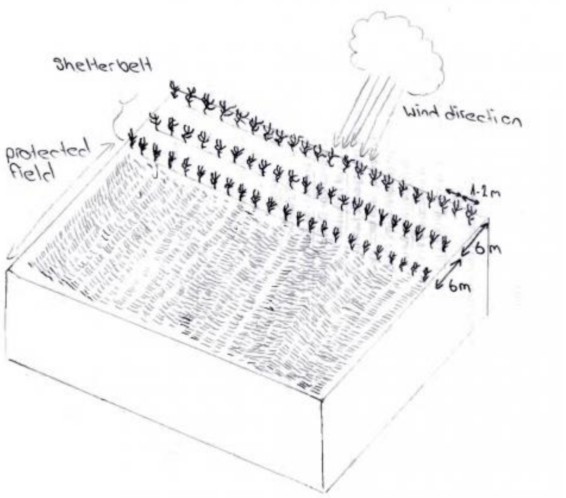
Human Environment

Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, medium scale land users, common / average land users
Annual population growth: 1% - 2%
Land ownership: individual, titled
Land use rights: individual ()

Importance of off-farm income: 10-50% of all income:
Access to service and infrastructure: low: employment, energy, drinking water and sanitation, financial services; moderate: health, education, technical assistance, market, roads & transport
Market orientation: mixed (subsistence and commercial)
Mechanization: manual labour, mechanised
Livestock grazing on cropland:



Technical drawing

Shelterbelts consist of three rows of trees (Russian Olive). The rows are spaced 6 meters apart from each other and the interval between trees within the rows is 1-2 m. (Julie Zaehringer)

Implementation activities, inputs and costs

Establishment activities

- Planting of grafting material or tree seedlings

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	720.00	100%
Equipment		
Construction material		
Agricultural		
- seedlings	1350.00	0%
TOTAL	**2070.00**	**100.00%**

Maintenance/recurrent activities

- Irrigation of seedlings
- Sanitary cleaning of trees

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	85.00	100%
TOTAL	**85.00**	**100.00%**

Remarks:
Labour was provided for free through the so-called "haschar" or neighborhood help. Labour costs mentioned here were calculated for a situation in which labour would have to be paid (using an estimate of a local salary).

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ increased crop yield ++ increased fodder production ++ reduced risk of production failure ++ increased production area	

Socio-cultural benefits	Socio-cultural disadvantages

Ecological benefits	Ecological disadvantages
+++ reduced evaporation +++ reduced wind velocity ++ reduced soil loss + increased maintained habitat diversity	

Off-site benefits	Off-site disadvantages
+++ reduced wind transported sediments ++ reduced damage on neighbours fields	

Contribution to human well-being/livelihoods

++ through increased crop yield

Benefits/costs according to land user

The trees take time to establish during which the benefits are not yet tangible

Benefits compared with costs	short-term:	long-term:
Establishment	slightly negative	positive
Maintenance/recurrent	neutral / balanced	positive

Acceptance/adoption:

100% of land user families (11 families; 100% of area) have implemented the technology with external material support.
There is strong trend towards (growing) spontaneous adoption of the technology. It is impossible to get good yield in these areas which are prone to strong winds without shelterbelts. Farmers do realise and understand the importance of shelterbelts and there is a trend towards spontaneous adoption of the technology.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:
1) Russian olive is a native tree species with high drought-tolerance and the ability to grow on nutrient-poor soils thanks to its root association with nitrogen fixing bacteria → Promote expansion of this species
2) Once established the shelterbelts do not need a lot of maintenance
3) Rehabilitation of unproductive, denuded land into productive cropland →Farmer to farmer spread of knowledge and grafting material to increase shelterbelt area

Land users' opinion:
1) Reduced deflation and deposition of sand on fields and therefore improved crop growth
2) Increased crop yield as before the establishment of shelterbelts no crops could grow on this land →Combine with other sustainable crop production measures such as integrated pest management, intercropping, crop rotations, no-tillage etc.
3) Reduced wind speed
4) Russian Olive produces edible fruits rich in vitamins
5) Increased production area

Weaknesses and →how to overcome

Land users' opinion:
1) The shelterbelts have to be protected from being damaged by local people who want to cut them for firewood → Awareness raising; increase of firewood supply through tree planting

Contact person: Faizulloev, Firdavs. UNDP, Area Manager, Shaartuz Area Office, 2 Ziyodaliev Street, Shaartuz, Tajikistan, e-mail: firdavs.faizulloev@undp.org, phone: (992-918) 79 52 78

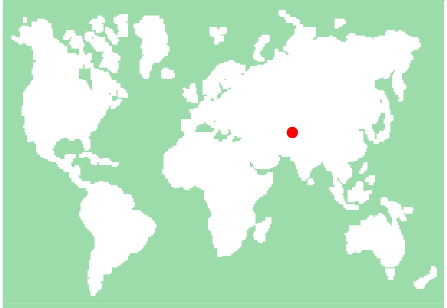
left: View from inside the enclosure, showing the rich natural pasture (centre), the planted poplar trees (left) on the inside of the perimeter wall and orchard trees and vegetable garden (in the far distance) (Photo: Des McGarry)
right: Shows the exterior of the walled agro-forestry enclosure. The stones were collected from within the enclosure, hence clearing the land and increasing soil depth, as well as providing materials to build the wall (Photo: Des McGarry)

Integrated stone wall and poplar tree perimeter fencing

Tajikistan – GITEC/ADB/GEF/DMC Rural Development Project

Stones cleared from land within a narrow valley floor where flat land is at a premium, were used to construct a perimeter stone wall which was subsequently supplemented with a row of poplar trees to protect an agro-forestry area with small scale supplementary irrigation.

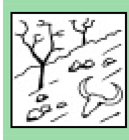
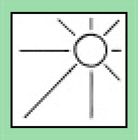
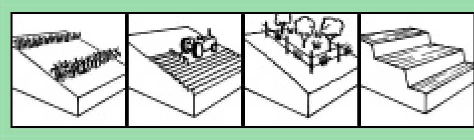
The area in question is a very narrow, flat valley floor, 95% of which was covered in stones and boulders, and devoid of vegetation, both grass and trees/shrubs. The stones in the area were cleared and used to build a protecting, perimeter wall (approx. 1.5 m high). This was then supplemented by an inner row of fast growing poplar trees. The stone clearing has resulted in deeper soil within the protected area that has led to far greater vegetation coverage, such as grass (that can be cut and used as fodder), forest and orchard trees and vegetable gardens. Irrigation was provided to the area by a small diameter poly pipe from a permanent spring. The area is now being extended to almost double the size of the initial walled agro-forest area.
The farmer's primary aim, in initiating and continuing this SLM approach, was to "leave a legacy of improved land" for future generations, recognising how little flat and potentially productive land there is in this high, narrow valley location. Clearing the land of stones and building a walled enclosure that was irrigated greatly assured the quantity and quality of fodder for his animals, as they remain fenced in beside his village home almost all year. Fruit and vegetable production was also greatly improved. Timber production, in time, will provide construction timber.
The family commenced stone clearing and wall construction in 2005. The next task was tree planting; poplar trees were planted around the wall's perimeter. The irrigation source was tapped into using a poly pipe and gravity feed. The vegetable gardens are seasonal and their plants change with the seasons and the family's needs. Stone removal continues even now, to improve the soil in the walled area. The farmer hopes to extend the walled area in the future.
Before the family began clearing stones and building the wall, this land had almost zero productivity. This area has a shortage of cultivated land and with increases in population and continued food insecurity; land is at a premium.



Location: Kushon village, Romit Jamoat, Vahdat
Region: Central District of Tajikistan
Technology area: < 0.1 km^2 (10 ha)
Conservation measure: agronomic, vegetative, structural, management
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Land user - recent (<10 years ago)
Land use: Other: wastelands, extremely rocky pasture, (before); intensive fodder, fruit trees, construction timbers and vegetablesproduction (after)
Climate: semi-arid, temperate
WOCAT database reference: TAJ376
Related approach: Enhancement of existing self SLM technologies into demonstration sites (TAJ QA037)
Compiled by: Habib Kamolidinov, ADB Tajikistan
Date: 04th May 2011 updated 08th Jul 2011

Classification

Land use problems: This geographic area is strongly dependent on the extremely limited flat, valley bottom land for the production of cut and carry' fodder, orchards and vegetable production. 95% of this land is covered in stones that require removal before any productive capacity can be achieved. Even when cleared of stones the soil is still very shallow (< 20cm) and requires irrigation to ensure plants survive the hot summer months

Land use	Climate	Degradation	Conservation measure
			
Other: wastelands,extremely rocky pasture (before) intensive fodder, fruit trees, construction timbers and vegetables (after) Mixed rainfed - irrigated	semi-arid, temperate	Soil erosion by water: loss of topsoil / surface erosion, Biological degradation: reduction of vegetation cover, Biological degradation: loss of habitats, Biological degradation: quantity / biomass decline, Biological degradation: loss of soil life	Vegetation/soil cover, Tree and shrub cover, Grasses and perennial herbaceous plants, Walls / barriers / palisades, Change of land use type, Change of management / intensity level, Layout according to natural and human environment, Major change in timing of activities, Control / change of species composition

Stage of intervention	Origin	Level of technical knowledge
□ Prevention □ Mitigation / Reduction ■ Rehabilitation	■ Land user's initiative: recent (<10 years ago) □ Experiments / Research □ Externally introduced	Agricultural advisor: low Land user: high

Main causes of land degradation:

Main technical functions:
- improvement of ground cover
- improvement of topsoil structure (compaction)
- increase in organic matter
- increase in nutrient availability (supply, recycling)
- increase of infiltration
- increase / maintain water stored in soil
- increase of biomass (quantity)
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:
- control of dispersed runoff: impede / retard

Environment

Natural Environment

Average annual rainfall (mm)	Altitude (m a.s.l.)	Landform	Slope (%)
□ > 4000 mm	□ > 4000	□ plateau / plains	□ flat
□ 3000-4000 mm	□ 3000-4000	□ ridges	□ gentle
□ 2000-3000 mm	□ 2500-3000	□ mountain slope	▒ moderate
□ 1500-2000 mm	□ 2000-2500	■ hill slopes	□ rolling
□ 1000-1500 mm	□ 1500-2000	□ footslopes	□ hilly
□ 750-1000 mm	■ 1000-1500	□ valley floors	■ steep
□ 500-750 mm	□ 500-1000		□ very steep
■ 250-500 mm	□ 100-500		
□ < 250 mm	□ <100		

Soil depth (cm)
- □ 0-20
- ■ 20-50
- □ 50-80

Growing season(s): 180 days (April to September)
Soil texture: medium (loam)
Soil fertility: high
Topsoil organic matter: high (>3%)
Soil drainage/infiltration: medium

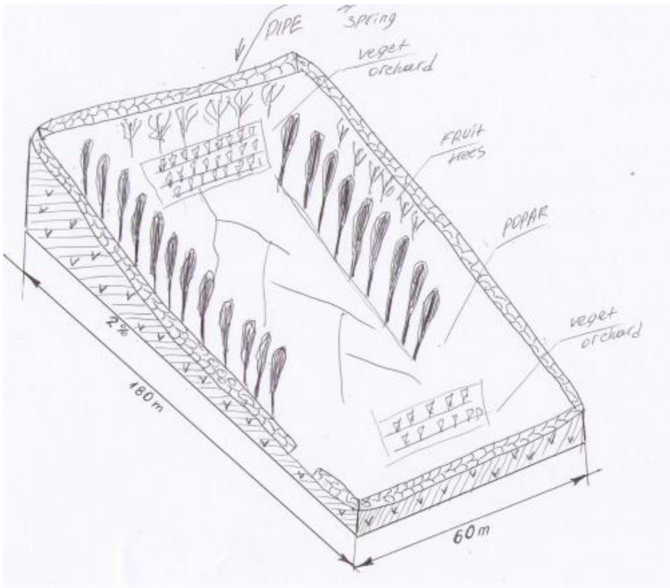
Soil water storage capacity: medium
Ground water table: 5 - 50 m
Availability of surface water: good, medium
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
Sensitive to climatic extremes: no
If sensitive, what modifications were made / are possible: The Technology (stone clearing, wall building, tree planting, vegetable and fodder production is vastly more tolerant to extremes of climate than what existed before – almost bare, intensely rocky land.

Human Environment

Land user: Individual / household, Small scale land users, common / average land users, mainly men
Population density: < 10 persons/km2
Annual population growth: 1% - 2%
Land ownership: state
Land use rights: individual
Water use rights: Not yet an issue – as he is the only one with access to the spring water
Relative level of wealth: poor - 100% of land users; own 0% of the total land area

Importance of off-farm income: 10-50% of all income: The issue is that the older and the very young family members (ie the farmer and his wife are in their late 50s) stay on the farm. The rest (18 to 50 yrs) have paid employment in Dushanbe and Russia, and only visit the farm, occasionally. However, it is believed they part-finance (contribute) to the upkeep of the family farm.
Access to service and infrastructure: low: health, technical assistance, energy, drinking water and sanitation, financial services; moderate: education, employment, market, roads & transport
Types of other land:



Technical drawing

The drawing shows a 1.5m high stone wall, lined with poplar trees on a gentle slope. The site is located in the valley floor and has access to a naturally occurring spring for gravity irrigation. The enclosed land is now used mainly for fodder production, intercropped with fruit trees and vegetable patches. (Des McGarry)

Implementation activities, inputs and costs

Establishment activities

- Irrigation pipe (m)
- Labour days for Stone clearing
- Labour days for Wall building
- Plants (vegetables) many
- Trees
- Tree planting
- Vegetable garden
- Wall building

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	550.00	100%
Equipment		
- tools	20.00	100%
Agricultural		
- seedlings	66.00	100%
- trees	150.00	100%
- Irrigation pipe	450.00	100%
TOTAL	**1236.00**	**100.00%**

Maintenance/recurrent activities

- Animal husbandry
- Fertilising and cultivating (garden vegetables)
- Stone clearing
- Tree planting
- Vegetable garden
- Tree planting
- Vegetable planting
- Random stone removal

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	40.00	100%
Agricultural		
- seedlings	27.00	100%
- trees	112.00	100%
TOTAL	**179.00**	**100.00%**

Remarks: The human labour costs involving the family were nothing as they willingly gave of their time to clear the land and build the wall, plant trees and create vegetable gardens. The real labour costs were the few days when the farmer paid 3 men to help build the wall. The cost of the wall was also nothing as all materials came from on-site. Trees – there was an initial start up cost and the farmer said he tries to plant at least 20 new trees each year to maintain and enhance productivity. Grasses (fodder) – are self regenerating and local. The farmer has never bought grass seed or used fertiliser on the grass. Wall – all money spent in first 1 or 2 years. Trees – initial start up and annual costs, now ongoing. Vegetable seeds – annually.

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased crop yield
+++ increased fodder production
+++ increased fodder quality
+++ increased wood production
+++ reduced risk of production failure
+++ increased drinking
+++ increased water availability quality
+++ increased irrigation water availability quality
+++ reduced expenses on agricultural inputs
+++ increased farm income
+++ diversification of income sources
+++ increased production area
+++ increased product diversification

Production and socio-economic disadvantages

++ hindered farm operations

Socio-cultural benefits

+++ knowledge conflict mitigation
+++ improved food security self sufficiency
+++ improved health

Socio-cultural disadvantages

Ecological benefits

+++ increased water quantity
+++ increased water quality
+++ improved harvesting collection of water
+++ increased soil moisture
+++ reduced evaporation
+++ reduced surface runoff
+++ improved excess water drainage
+++ reduced hazard towards adverse events
+++ improved soil cover
+++ increased biomass above ground C
+++ increased nutrient cycling recharge
+++ reduced soil loss
+++ reduced soil crusting sealing
+++ reduced soil compaction
+++ increased plant diversity

Ecological disadvantages

Off-site benefits

+++ increased water availability
+++ improved buffering filtering capacity

Off-site disadvantages

Contribution to human well-being/livelihoods

+++ The primary aim of the farmer in introducing the technology was to improve the family's lifestyle (livelihoods) and well being. He has easily achieved this and it seems to be getting better, year on year.

Benefits/costs according to land user

The establishment and ongoing costs are very small compared to the returns both long and short term gained from introducing the Technology

Benefits compared with costs	short-term:	long-term:
Establishment	very positive	very positive
Maintenance/recurrent	very positive	very positive

Acceptance/adoption: 100% of land user's family (1 family; 100% of area) have implemented the technology voluntary. There is a small trend towards (growing) spontaneous adoption of the technology. There seem to be quite a few enclosures in this area – but we have not conducted a formal survey.

Concluding statements

Strengths and →how to sustain/improve

Specialists' opinion:

1) The stone clearing and wall building underpins the whole SLM initiative. That it was achieved by only 3 or 4 people, in under a year and at such a low cost (with minimal paid labour) adds to the strengths. The wall is also critical to keep animals out of this now richly vegetated area, not only sheep and goats but also wild pigs and even wolves. The stone clearing "created" soil which is critical for the greatly enhanced vegetation growth within the walled area. The farmer is in the process of expanding the stone cleared area, and is using the stone to build a larger perimeter fence, aiming for a larger plot of 2 or 3 ha to extend fodder, fruit and vegetable production

2) Bringing water to the site (at his own cost) by poly pipe was a critical part to the technology. The walled agro-forestry area would have struggled without this extra and constant water supply – as the soil is so shallow (all the rock remains below the soil surface). Now he can have good fodder grass, trees, orchard and vegetables with a guaranteed regular water supply. Getting the plants and trees through the hot summer months is the key use of the water →The farmer wishes to source a 2nd spring to water the extended (2 - 3 ha) site.

3) The rich mix of vegetation on the site (trees, perennial grasses and vegetable production) not only ensures the intervention remains viable but also ensures a continuous, rich, healthy food supply to the family and their animals year round. →The farmer has already started to plant new fruit trees outside the original walled area, in readiness for moving the fence to encompass a 2 -3 ha site.

Land users' opinion:

1) As above, as these words were transcribed during the farmer interview, on site.

Weaknesses and →how to overcome

Specialists' opinion:

1) What the farmer has achieved is most impressive. Particularly as his Technologies were all self-financed and conducted slowly and carefully, hence with no financial burden to the family and no interruption or lessening of their food supply. If costs / budget permit (unlikely) it may be possible to bring some power-type assistance to stone removal (like a small tractor) or a solar powered pump to increase irrigation water pressure. However, the farmer may not wish to be reliant on such items, as if they breakdown, his whole enterprise (currently so successful) may suffer.

Land users' opinion:

1) As above; as these were the sentiments of the farmer during the on site interview.

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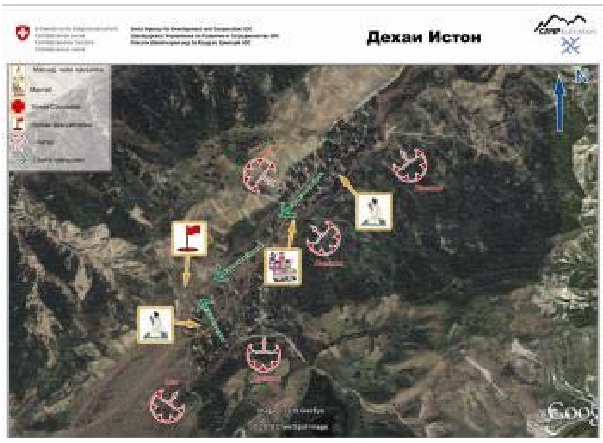


left: Community Natural Disaster Risk Management Workshop. (Photo: Mirzo Pochoev)
right: A hazard map of the village showing all the key information and areas of increased risk from natural disasters. (Photo: CAMP Kuhiston)

Selection of SLM Technologies for Natural Disaster Risk Mitigation

Tajikistan - CAMP Kuhiston

Community Based Natural Disaster Risk Management Workshops for identification of locations for the implementation of SLM technology to reduce the risk to the village from natural disasters.

Aim / objectives: The main objective was to use a community based participatory approach to evaluate the risk from natural hazards and aid in the effective selection of location and types of SLM Technologies that could be implemented. The workshop systematically works through the natural disaster risk assessment process which includes evaluation of the natural and human triggers that can causes and contribute to specific natural disasters and subsequently rank the risk as either high/medium/low based upon a predetermined criteria. The assessment is repeated with the assumption the SLM mitigation has been implemented to evaluate whether the natural disaster risk would be reduced.
Methods: Several methodologies are used in this approach, these include the, display of posters and photos, watching documentary style DVD's, playing awareness raising training games, and distribution of brochures to educate the communities on the causes and impacts of natural disasters so that they can then complete a systematic risk assessment process. This is undertaken within the community using interactive participatory training modules and experienced teachers. Once the technologies are decided upon a proposal form is completed and copies submitted to funding agencies and the local government. A Memorandum of Understanding is signed with the local government to endorse the approach and any subsequent implementation activities. The proposal is vetted by experts for modification and approval to ensure best practice and sustainable results.
Stages of implementation: The communities are selected based upon natural disaster statistics and a natural disaster workshop conducted for up to twenty members of the community. At the completion of the workshop the community produce several proposals for the implementation of SLM technologies that will reduce the risk from specific natural disasters. The proposals are reviewed by experts from the soil institute and horticulture institute to ensure they are practical, viable and effective before final submission to the donor for funding. The local government remains informed of the activities throughout the process and is provided with copies of the proposals.
Role of stakeholders: NGO CAMP Kuhiston were the overall project managers. CAMP designed and conducted training on Disaster Risk Reduction and developed the natural hazard risk assessment process that leads to the formulation of the SLM mitigation proposals. CAMP are also responsible for engaging the experts and providing information to the local government who are asked to support the process. The community has to actively be involved and design their own proposal and decide how they will contribute to the implementation process.
Although this could potentially be a lengthy process it is important that the communities understand why they have chosen a specific SLM technology and the desired impact that will help secure their livelihoods.

Location: RRS, Nurabad
Approach area: < 10 ha
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ020e
Related technology(ies): Planting of fruit trees to increase slope stabilization (QTTAJ111).
Compiled by: Shane Stevenson
Date: 2011-04-19

WOCAT

Problem, objectives and constraints

Problems

The stabilisation of degraded slopes that increased the risk to communities from natural disaster such as mud flows, landslides, and avalanches.

Aims/Objectives

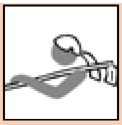
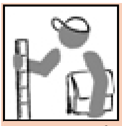
The main objective was to educate the communities on the causes and triggers of natural disasters and how these triggers can be combated by SLM technologies. The approach concentrated on making the link between SLM technologies and causes of natural disasters. The risk assessment process helped communities understand how to evaluate the risk to their community from different types natural disasters and how these proposals would help reduce the risk presented by these types of natural disasters and also where is was the most effective and efficient use of time, finance and resources to reduce this risk.

Constraints addressed

	Constraint	Treatment
legal / land use and / water rights	There was no formal documentation to show who was the owner of the land.	There was an informal agreement between the land user, village members and Jamoat.
financial	There was initial concern that the farmers would not have finance to maintain the technology in the first year. The project was also conscious that fruit trees are subject to tax after three years.	Farmers were provided with a minimal payment at different stages as the SLM technology developed.
institutional	The Jamoat wanted to have more say in the land owners who received the trees.	The Jamoat were taken on site visits and were explained that the land was selected because of the hazard risk, not the land owner.
social / cultural / religious	There were major problems incorporating women into the initial disaster risk management workshops and trainings. Therefore, there was limited input into the mitigation proposal development process.	In some villages workshops were held separately from the men using female trainers. However, due to low educational backgrounds there was a limited the level of participation. The field training during the implementation stage managed to capture the women

Participation and decision making

Stakeholders / target groups

		
land users, individual	land users, groups	SLM specialists / agricultural advisors

Approach costs met by:

international non-government	5%
international	90%
local community / land user(s)	5%
Total	**100%**
Annual budget for SLM component: US$10,000-100,000	

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): NGO CAMP Kuhiston

Approach designed by: national specialists, international specialists

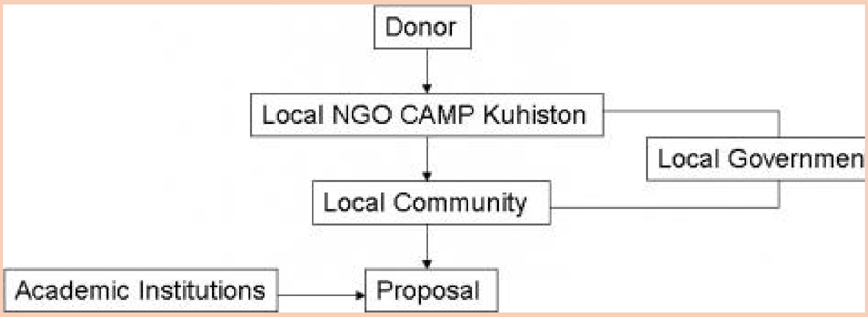
Implementing bodies: local community / land users, local government (district, county, municipality, village etc), national non-government, government, international

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	None	
Implementation	Interactive	Involved in the workshops and the development of the proposals
Monitoring/evaluation	None	

Differences between participation of men and women: Yes, great. This area of Tajikistan is Islamic conservative, with traditional views on the role of women in society. There are noticeable gaps in the education levels of the genders and women fulfill a more traditional role centered around the household.

Involvement of disadvantaged groups: Yes, great. This area suffers from high levels of labour migration with many of the men working abroad in countries such as Russia. In particular separate workshops were held for women to ensure that they participated in the approach.



Organogram: Organisation chart showing how the proposal for the SLM technology developed.

Technical support

Training / awareness raising:
Training provided for 20 members of five communities received training.
The training on the risk assessment process included all members of the community, although due to the conservative nature of the community some training was divided between women and men.
Training was courses, on-the-job
The initial training was on natural disasters, their causes and impacts. Subsequent training for the communities covered soil and water conservation and fruit cultivation.

External material support / subsidies

Contribution per area (state/private sector): No.

Labour: Voluntary.

Inputs:
- Construction material (stone, wood, etc). Partly financed
- Training materials - posters, stationery, teachers salary. Fully financed

Credit: Credit was not available.

Support to local institutions: Yes, little support with training. Two academic institutions were financially supported to undertake the review and evaluation process. Local NGO camp was supported by international finance to implement the approach and subsequent activities.

Monitoring and evaluation

Monitored aspects	Methods and indicators
no. of land users involved	Ad hoc observations by project staff - The level of involvement in the workshops by the land users.
socio-cultural	Ad hoc observations by project staff - The level of engagement of the government and of the women in the process.
management of Approach	Ad hoc observations by project staff - International staff provided informal monitoring of the approach.
technical	Ad hoc observations by other - The academic institutions reviewed the proposals.

Changes as result of monitoring and evaluation:
There were few changes in the approach. The risk assessment process was simplified and the format of the proposals was made more understandable to the participants. There were few changes in the technology. The monitoring of the SLM technology means that for replication of the technology there would be changes in tree species selected.

Impacts of the Approach

Improved sustainable land management: Yes, great; The approach provided the land users with training, saplings and construction material to use the land in a more sustainable way.

Adoption by other land users / projects: Yes, few; Trainings were provided to other NGO's on the Natural Disaster Risk Assessment process and the development of proposals. The success of this has not been monitored.

Improved livelihoods / human well-being: Yes, little; It improved their knowledge through training on Natural Disaster and on fruit cultivation and through the distribution of accompanying brochures.

Improved situation of disadvantaged groups: Yes, moderate; In some communities the women received specific training on the risk assessment process.

Poverty alleviation: Yes, little; If the subsequently implemented technologies should help safeguard houses, land and livelihoods.

Training, advisory service and research:

- Training effectiveness - The training provided in the approach was participatory, inclusive and interactive. All three training modules involved field visits, hands on work and supportive materials.

  Land users* - excellent

- Advisory service effectiveness

  Land users* - excellent

- Research contributing to the approach's effectiveness

Land/water use rights: Hinder - moderately in the implementation of the approach. Although there are land use certificates available for farms, there are problems with allocating specific parcels of land to one particular land user. Therefore this issue needs to resolved before a technology can be implemented. The approach did reduce the land/water use rights problem (greatly). Where the technology was implemented, it made the community address the issue of land user rights. It is now apparent who is responsible for the SLM technology and for payment taxes on the land.

Long-term impact of subsidies:

Positive long-term impact - Low
Negative long-term impact - Low
The land users received a small amount of money over the first twelve months to sustain the SLM technology. It would be expected that the SLM technology will bring in financial rewards after 3-5years.

Concluding statements

Main motivation of land users to implement SLM:

Environmental consciousness, moral, health - To decrease the communities exposure to natural disasters.

Well-being and livelihoods improvement - SLM technology should improve the livelihood of the land users.

Prestige / social pressure - Government decree to plant trees

Increased profit(ability), improve cost-benefit-ratio - land previously had limited economic output.

Production - fruit crops within 3-5 years

Sustainability of activities:

No the land users can't sustain the approach activities. The land users are not in a position to mobilise all the parties involved in the approach.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The approach involved a range of stakeholders and experts who were all able to actively contribute. → This could be enhanced by continued collaboration between all parties. approach included a community training element that benefited a broader range than just the land users.
2) The approach involved mobilisation of local government and community participation. → Further collaboration on technologies between the community and local government. The government to initiate replication in other communities.
3) The approach helped link the prevention of natural disaster with SLM practices. → The community developing further proposals for technologies and seeking funding to implement them.

Land users' opinion:

1) The training improved my understanding of human and environmental causes of natural disasters. The process allowed me to make decisions concerning my own village.

Weaknesses and → how to overcome

Specialists' opinion:

1) The approach covers only a one year period, therefore if the SLM technology has difficulties, such as disease which is highly prevalent in this area, the land owner may not be in a financial position to rectify the issue. → A longer monitoring and support period.

Land users' opinion:

1) To provide more support on alternatives for SLM technologies. There must be new technologies that we are not aware of. → Further develop the module to provide further illustrations of best practice.

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left: Participants assessing their natural resource use and energy consumption for the previous year 2010. (Photo: Shane Stevenson)
right: Participants assessing their natural resource needs for heating, cooking and lighting. (Photo: Shane Stevenson)

Participatory Cost Benefit Analysis for Energy Efficiency Measures

Tajikistan – CAMP Kuhiston

The use of a cost benefit analysis approach to assess the financial and natural resource needs for energy consumption at community level, and further attribute costs to SLM practices to meet this need, and subsequently improve rural livelihoods.

Aim / objectives: To collate quantitative data on the amount of energy used within the community in terms of financial expenditure and natural resource use. Through the use of a participatory workshop the attendees determine which natural resources are being utilised, in the form of wood, bush and organic materials. The objective is to use this quantitative data to encourage through cost benefit demonstrations, the implementation of Sustainable Land Management technologies to reduce the amount of natural resources exploited, and the expenditure on energy consumption.
Methods: An energy specialist organises a community based workshop with up to 15 participants. In the 2-3hr workshop the participants complete, under guidance, a pre prepared flip chart on energy use (electric, tapak, wood, coal, brush). The information is collected in financial expenditure and weight. Once the energy assessment is completed a subsequent discussion is encouraged on how to more effectively meet this need at a community level. The moderator also takes this oppoprtunity to demonstrate several technologies including solar lights, improved stove design, thermal insulation, and the development of energy forests. The information is collated and used as a baseline assessment for evaluation of implemented technologies.
Stages of implementation: The stages of implementation are relatively straight forward. First you must select the community that you wish to work in, and inform a community mobiliser, in this case the head of the village that you wish to conduct a 2-3 hr workshop for up to 15 participants, and that the participants must be the person in the households who is responsible (or has knowledge of) the energy use within the household. The moderator prepares a flip chart with a table of fuel types used in the village and uses this as the basis of the workshop to extract information on energy use within the community. Once the information is collated, a discussion is encouraged to review the information and devise means by which this amount can be reduced. The moderator then takes this opportunity to demonstrate several low cost energy efficiency measures that may appeal to the community.
Role of stakeholders: The community is expected to attend the workshop, engage in active discussions on their energy use and ways in which it can be reduced. The workshop needs to be supported by the local government; this provides gravitas, and a platform to launch the approach in other communities. The final stakeholder is the implementer, in this case a local NGO who organises the workshop, demonstrates the technologies and provides ongoing support during the implementation of the technologies.
It is important to understand the spending habits of the participants, if they are used to spending on a day to day basis and not used to financial planning, it is important to recognise this fact in the implementation of the technology.

Location: RRS, Nurobod, Shaftuti Bolo
Approach area: 0.1-1 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ026e
Related technology(ies): Energy efficiency measures to increase the application of organic fertilizers (QTTAJ354), Two room stove (QTTAJ551)
Compiled by: Shane Stevenson
Date: 2011-04-27

Problem, objectives and constraints

Problems

This approach was designed to make the participants evaluate and assess the amount of money, time and effort that goes into meeting their energy needs. It is also a clear and precise way to collate information on the amount of natural resources that are been used to meet this need. These natural resources can be in the form on bushes, wood, dung, cotton sticks etc. These resources are being redirected from other purposes such as construction, but also as natural fertilisers, mulch and compost. This directly impacts on agricultural production, household finance and ultimately livelihoods. The reduction in resource use can reduce the risk of conflicts between villages, and reduce pressure on natural resources allowing them to rejuvenate, and increase soil fertility and quality.

Aims/Objectives

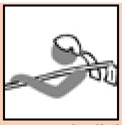
There were two main objectives to this approach, the first was to raise awareness on energy use with respect to types of energy, cost and accessibility, and to use this as a platform for encouraging the implementation of low cost energy efficiency measures in the community. The second was to collate baseline data to allow an assessment of how the implemented technologies impacted on energy (and by association natural resources) use and how the expenditure and amounts were reduced in real terms.

Constraints addressed

	Constraint	Treatment
social / cultural / religious	Rural communities emerging from the soviet system have very low business awareness. Even when there are seemingly obvious savings to be made in finance and natural resources there is a lack of appreciation of the potential savings that could be made.	Discussion on the issue of savings in time, money and resources helps promote better understanding. The concept of pay back had to be repeatedly explained.
other	In many of the households the men are working away in Russia. This leaves the women in charge of the household, however, many of the energy costs are organised by the men before they leave or on their return.	Many of the labour migrant leave in the springtime, therefore it would be more effective to organise the workshops at the end of the winter before they leave.
workload	There are times of year when the village participants are otherwise distracted by sowing seeds, harvesting, Ramadan etc.	The most effective time would be at the end of the winter period when resources are scarce, money constraints are more apparent and energy use is a household priority issue.

Participation and decision making

Stakeholders / target groups



land users, individual

Approach costs met by:

international non-government	100%
Total	**100%**
Annual budget for SLM component: US$< 2,000	

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: international specialists, national specialists

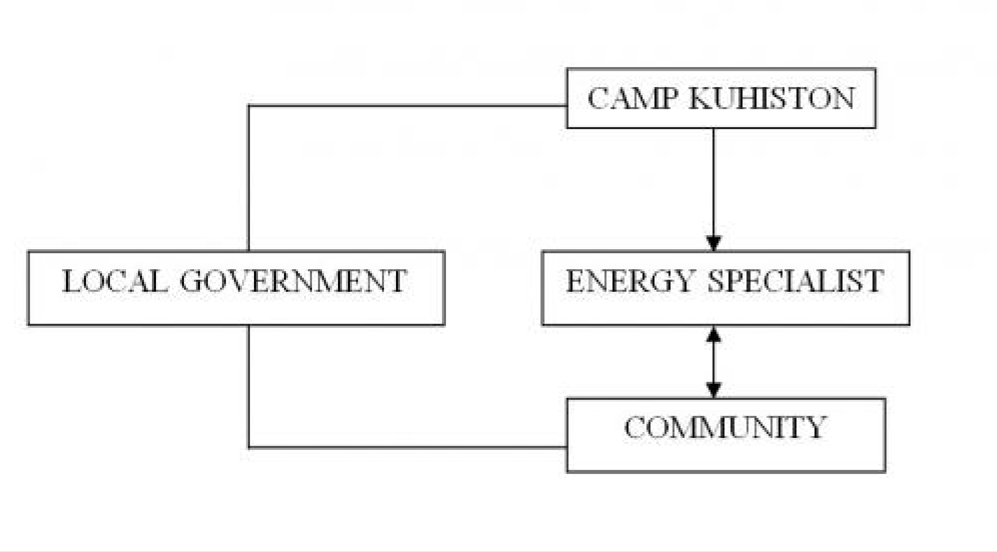
Implementing bodies: national non-government, local community / land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	None	
Implementation	Self-mobilisation	they were active in the participation in the workshops and the collation of data.
Monitoring/evaluation	Payment/external support	Active in providing follow-up data to evaluate the success of the project.
Research	None	

Differences between participation of men and women: Yes, great
Women hold a traditional role in the society and did not participate in the workshops. The men pay all the bills and see their role as that of the provider for the family. Only men participated in the collation of data and the demonstration of different energy saving technologies.

Involvement of disadvantaged groups: Yes, great
The entire village suffers from mass labour migration, with nearly all households reliant upon remittances from Russia.



Organogram: The project employs an energy specialist to conduct a participatory workshop. The process is supported by the local government.

Technical support

Training / awareness raising:
Training provided for land user
The initial training was for all the households in the village, however, only the men attended due to the religious and cultural position of the region.
Training was courses.
The training included raising awareness on stove adaptation, indoor two room stove construction, solar power, and low cost thermal insulation for rooms.

Research:
Yes, research was conducted. Topics covered include sociology, economics / marketing
Mostly on-farm research.
CAMP Kuhiston collated data on energy usage and by association natural resource use. In addition to the participatory workshop CAMP conducted a household questionnaire to assess the suitability of different energy efficiency technologies, and the social vulnerability of the inhabitants, to identify the most effective households to implement energy saving activities.

External material support / subsidies

Contribution per area (state/private sector): No.

Inputs:
- Construction material (stone, wood, etc) - Metal sheets, demonstration material. Fully financed.
- Equipment (machinery, tools, etc) - Posters and stationery. Fully financed.

Credit: Credit was not available.

Support to local institutions: Yes, moderate support with financial.
The Jephcott Foundation financed local NGO CAMP Kuhiston to implement the approach.

Monitoring and evaluation

Monitored aspects	Methods and indicators
socio-cultural	Regular observations by project staff - Observations of participants understanding of economic benefits.
management of Approach	Ad hoc observations by - international staff monitor the set up of the workshops and levels of participation.

Changes as result of monitoring and evaluation:
There were few changes in the approach. The timing of the workshops (i.e the time of year) will be changed to the end of the winter when energy use is more of a priority issue, e.g. cold weather, poor electric supply, lack of easily accessible natural resources. There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, little; The extent to which it will reduce the amount and type of natural resource use will be re assessed at the end of the project. It is estimated that there will be a 20% reduction.

Adoption by other land users / projects: No;

Improved livelihoods / human well-being: Yes, little; The stove adaptation should lead to a 10-20% reduction in natural resources used for cooking, and the solar lights could make a $100/year saving.

Improved situation of disadvantaged groups: Yes, little; The approach was implemented in a socially disadvantaged area.

Poverty alleviation: Yes, little; It should help reduce spending on energy, dependence on natural resources, and increase the amount of organic materials for agricultural purposes.

Training, advisory service and research:

- Training effectiveness - This was the first time that participants had quantified the amount of natural resources used and economic outlay for their household needs. Land users* - good
- Advisory service effectiveness - CAMP Kuhiston was effective in mobilising the communities and will continue to work in this area, and will continue to support the implementation of the technologies

  Land users* - excellent
- Research contributing to the approach's effectiveness - Greatly
  The research element through the questionnaire helped develop the approach further for identifying vulnerable households that would benefit the most from low cost energy efficiency, and have the greatest impact in improving their livelihoods. The research analysed socio economic data, house structures and income, as well as overall expenses on energy to identify households for implementation of the technologies.

Land/water use rights:
None of the above in the implementation of the approach.

Concluding statements

Main motivation of land users to implement SLM:

Prestige / social pressure - Social pressure ensured all the households participated.

Increased profit(ability), improve cost-benefit-ratio - The approach is designed to highlight to households how much of their income they spend on energy.

Well-being and livelihoods improvement - Improvement in living conditions and saving of finance and natural resources.

Sustainability of activities: It is uncertain whether the land users will be able to sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The approach needs minimal resources and is relatively easy to implement. → It would be easy to replicate and easy to teach others how to undertake the approach.
2) It makes participants evaluate what they need to run their households, and puts an economic and natural resource value on the process.
3) It helps focus the participants on how much time, effort and money are being used to run their household. → To follow up, to see how effective the implementation of the technologies was in reducing their energy needs.
4) The scope of the level of participation is flexible and can be adapted to the contexts. It allows for direct comparison for before and after the implementation of the technology. → It could be further developed to put an economic value on SLM technologies.

Land users' opinion:

1) Quick and simple way to put an economic cost on fuel use.

Weaknesses and → how to overcome

Specialists' opinion:

1) It requires participants to have good quality data available to be effective. → Complete follow up visits to households to check data quality.

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Eligibility Criteria and Environmental Planning Tools for SLM

Tajikistan –Community Agriculture Watershed Management Project (CAWMP)

Using eligibility criteria and participatory environmental analyses for selecting and assessing SLM investments.

Aim / objectives: As part of the Community Agriculture and Watershed Management Project (CAWMP), tools were developed to ensure farmers chose appropriate SLM technologies while preparing Community Action Plans (CAPs) and to improve environmental assessments during CAP preparation and in rural investment activities.
Methods: Eligibility Criteria: CAWMP financed small grants for three types of rural production investments: farm productivity, rural infrastructure, and land resource management (the largest type). The eligibility criteria for these grants included meeting at least one of the following impacts on fragile lands: • Prevent/reduce soil erosion • Increase vegetative cover through perennial crops and pasture • Provide soil and moisture conservation • Improve soil quality • Improve water use efficiency • Increase sustainable fodder/wood supply • Increase sustainable renewable energy supply • Increase integrated pest management These criteria ensured an environmental focus, and kept the grant proposals consistent with a list of eligible activities which is critical for a large-scale, community-driven project such as CAWMP. The criteria helped avoid diversion of grant funds to investments not directly related to land sustainability. Combining income-generating investments with environmental criteria encouraged sustainable land use by addressing vital interests of local people. The criteria were used to monitor local environmental impacts. Project arrangements provided for land use right certificates to beneficiaries with Project-financed investments on sloping lands, giving them a stake in the sustained productivity of their land. Traditionally such land use right certificates were issued only for irrigated and other valley areas. The Project financed a total of almost US$ 5.3 million in grants for land resource management, through almost 2,300 subprojects, benefitting over 43,000 households.
Stages of implementation: Participatory environmental analyses. A review of investment proposals and field activities in 2007 revealed that farmers were not capable of properly assessing their local land management problems, identifying the most environmentally appropriate investments or actions, nor monitoring their effectiveness. Tools were developed for project partners and officials to address these concerns including: 1) Developing Conceptual Models of Local Environments/Watersheds; 2) Mapping Local Environments/Watersheds and Associated Threats; 3) Identifying and Ranking Environmental Threats; and 4) Community Environmental Assessment. More than 50 persons attended the two-day interactive training course on the use of the tools. Detailed guidelines for facilitators and trainers to use the tools were prepared in Tajik and Russian. While the training could not influence many of the SLM-related investments already submitted for funding, participants urged that similar training be conducted at the inception of SLM-related projects and that the tools be requirements of SLM planning.

left: Project partners learn new ways of analyzing environmental factors and relationships that contribute to land degradation. (Photo: Nandita Jain)

Location: Sughd, RRS, Khatlon, GBAO, Jirgital, Tajikibad, Vanj, Aini, Matcha, Penjikent, Danghara
Approach area: 1’000-10’000 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ045e
Related technology(ies): Numerous technologies implemented under CAWMP: TAJ368, TAJ402, TAJ403
Compiled by: Nandita Jain
Date: 2011-05-24

Problem, objectives and constraints

Problems

Inappropriate investments with questionable SLM benefits proposed in CAPs. Uneven, sometimes, missing focus on environmental risks and benefits in small grant proposals for rural production investments. Lack of skills in and knowledge of participatory environmental appraisals.

Aims/Objectives

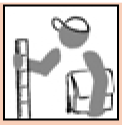
Application of the criteria and tools to help ensure that proposed rural investments in Community Action Plans kept their environmental management focus.

Constraints addressed

	Constraint	Treatment
technical	Lack of appropriate analyses of environmental relationships, threats, risks and impacts in choice and design of investment proposals at the village level	Establishing eligibility criteria, development of participatory learning tools on environmental issues, training for project partners and stakeholders.
institutional	Legacy of command-economy focus on infrastructure investments for improving land management and agriculture	Tools to analyse a range of environmental aspects of land management and propose alternative technologies and approaches, training for project implementers and stakeholders.

Participation and decision making

Stakeholders / target groups

 SLM specialists / agricultural advisors	other (specify)

Approach costs met by:

international	95%
government	5%
Total	**100%**

Annual budget for SLM component: US$10,000-100,000

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: national specialists, international specialists

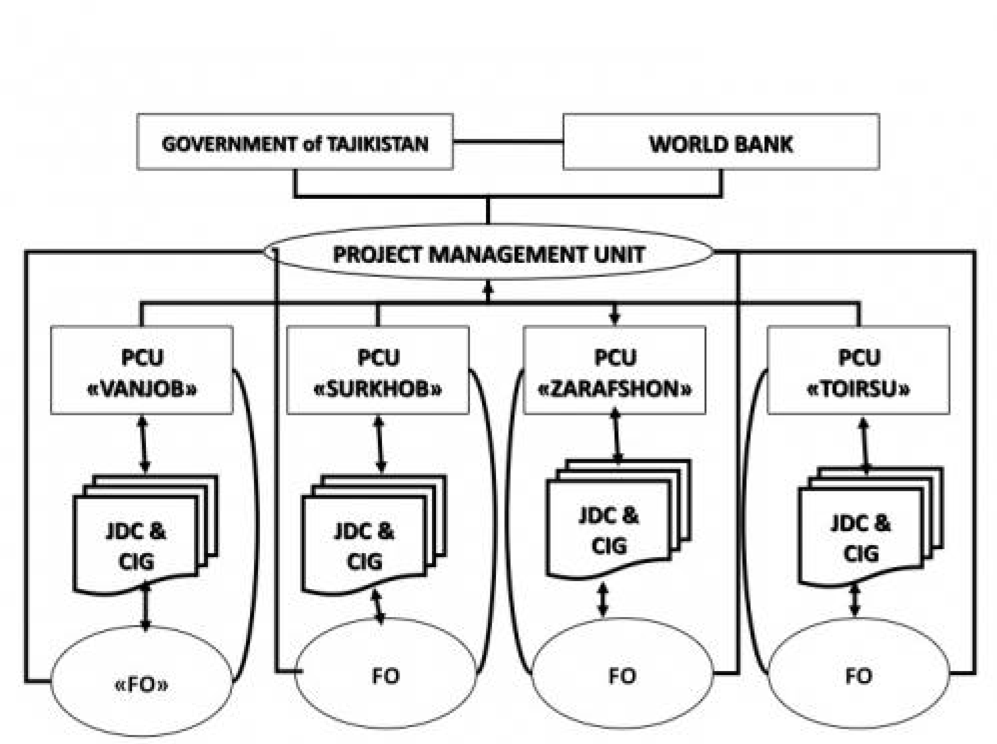
Implementing bodies: government, other

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	None	
Implementation	Interactive	Villagers used criteria for selecting and designing rural investments. JDCs received training in environmental tools
Monitoring/evaluation	Interactive	Local JDCs assisted in assessment of rural production investments using eligibility criteria as well as other factors.
Research	None	

Differences between participation of men and women: Yes, great
Low representation of women in technical fields resulted in limited participation in training. Female representation in JDCs was generally low (see TAJ047 as well) for cultural and social reasons.

Involvement of disadvantaged groups: No
Not directly relevant to the approach.



Organogram: CAWMP - Implementation Arrangements and Project Partners

Technical support

Training / awareness raising:
Training provided for Jamoat (sub-district) Development Committees, field staff/agricultural advisor
Training focused on Participatory environmental analyses, assessing rural investments including use of eligibility criteria.

Advisory service:

Research:
No research.

External material support / subsidies

Credit: Credit was not available.

Support to local institutions: Yes, moderate support with
See TAJ047 on the role and activities of Jamoat (sub-district) Development Committees

Monitoring and evaluation

Monitored aspects	Methods and indicators
Use of tools	Ad hoc observations by project staff - Types of investments proposed, Quality of proposals,
Application of criteria	Regular observations by project staff - Types of proposals, use in assessment of rural investments

Changes as result of monitoring and evaluation:
There were no changes in the approach.
There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, moderate; More appropriate investments chosen, criteria contributed to environmental monitoring of rural investments.

Adoption by other land users / projects: Yes, few; Interest shown by organisations and projects in participatory tools.

Improved livelihoods / human well-being: ; Not directly relevant

Improved situation of disadvantaged groups: ; Not directly relevant

Poverty alleviation: ; Not directly relevant

Training, advisory service and research:

- Training effectiveness - Jamoat (sub-district) Development Committees' feedback on training indicates shifts in understanding of environmental issues.

  SLM specialists - fair

  Agricultural advisor / trainers - fair

  JDCs - good

- Advisory service effectiveness
- Research contributing to the approach's effectiveness

Land/water use rights:
None of the above in the implementation of the approach.

Long-term impact of subsidies:

Concluding statements

Main motivation of land users to implement SLM:

Production

Affiliation to movement / project / group / networks

Environmental consciousness, moral, health

Well-being and livelihoods improvement

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Criteria were understandable and integrated into monitoring of project rural investments. → Disseminate formats for investment monitoring. Criteria can be also be integrated into appraisal stages for rural investments.
2) Tools highlighted environmental issues neglected during initial participatory rural appraisals. → Continue dissemination of tools, and further refine some tools as needed.
3) JDCs learned more about environmental relationships, impacts beyond immediate areas, as well as biodiversity aspects of SLM. Also resulted in shifts in thinking about causes of degradation and effects, and so the choice of appropriate activities → Ensure that training in the tools, monitoring and related activities are given at the start of projects and programmes.

Weaknesses and → how to overcome

Specialists' opinion:

1) Limited impact of tools training due to project implementation schedule. → Provide training in initial stages of projects.

Contact person: Mott, Jessica. Tajikistan World Bank Country Office, Ayni street 48, Dushanbe, Tajikistan, Business Center "Sozidanie", 3rd floor. Tel. (48) 701 58 08, 93 588 99 76. www.worldbank.org.

Village-level participatory planning for sustainable agriculture and land management

Tajikistan – Community Agriculture Watershed Management Project (CAWMP)

Design and implementation of participatory planning for village-level sustainable agriculture and land management investments through small grants for groups of upland farmers.

Aim / objectives: As part of the CAWMP, participatory planning aimed to generate village-based community action plans (CAPs) that identified priority investments and beneficiaries for small grants to sustainably increase rural production. A total of 402 three-year plans were developed, through which about 4000 investments in four upland project sites were funded that resulted in increased livelihood assets for over 43,000 households and more than 96,000ha under improved land management practices.

Methods: Under supervision of a government-appointed Project Management Unit (PMU), four international facilitating organisations (FOs) were contracted to work closely with local field coordination units and Jamoat ("sub-district") Development Committees (JDCs). An operational manual laid out guidelines for developing CAPs and the management of rural production investments. Activities could be proposed for three types of investment that would increase/improve: a) farm productivity, b) land resource management and c) small-scale infrastructure to support rural production. CAPs were required to include: (i) identifiers such as a location map, numbers of beneficiaries, area covered; (ii) an indicative list of investments and associated Common Interest Groups (CIGs) by investment type and cost; (iii) estimate of labour and materials needed; (iv) estimates of beneficiary contribution for each investment and (v) list of beneficiaries resulting from the improvements, and (vi) signed agreements to participate in the cost sharing, labour provision and subsequent operation and maintenance. Within each village, fixed amounts of funding were available and were exceeded by the value of proposed investments. Thus villagers considered the available budget, number of beneficiaries and associated risks when selecting investments (see TAJ044 for details). A beneficiary contribution of at least 25% of the value of the grant was required. In some cases, FOs and JDCs obtained other financing for activities outside of CAWMP.

Stages of implementation: Key steps in the implementation included: 1) Training of facilitators in participatory planning 2) Open village assembly introducing CAWMP and the CAP guidelines; 3) Participatory rural appraisals (PRA); 4) Sharing of findings in village assembly and identification of potential rural investments; 5) Prioritising proposals and formation of CIGs; 6) Circulation of CAP, e.g., public display in JDC offices; 7) Preparation and submission of rural investment proposals with assistance from FOs and PCUs to JDCs/JRCs for initial screening and approval; and 8) Periodic meetings to review CAPs.

Role of stakeholders: Within villages, vulnerable households were identified and appraised through the use of PRA tools, such as wealth ranking and villager consultations and often were selected as priority recipients of initial investments. During the course of the project, environmental appraisal aspects of the planning process were strengthened through additional training in tools for participatory analysis.

left: Participatory planning and decision-making at the village level have been critical to the success of the project. Participatory rural appraisal tools have been used to engage poor and marginal groups

Location: Sughd, Region of Republican Subordination, Khatlon, Gorno Ba, Jirgital, Tajikibad, Vanj, Aini, Matcha, Pendjikent, Danghar
Approach area: 1'000-10'000 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ046e
Related technology(ies): Numerous technologies implemented under CAWMP: TAJ368, TAJ402, TAJ403
Compiled by: Nandita Jain
Date: 2011-05-24

Problem, objectives and constraints

Problems

Little prior experience in communities and organisations in participatory planning for sustainable agriculture and land management, particularly in the context of limited budgets. Marginalisation of poor and vulnerable groups and lack of transparency in decision-making over allocation of funding for investments.

Aims/Objectives

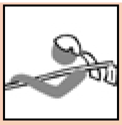
Community action plans for villages generated from a planning process that was participatory, transparent and identified and prioritised fair and feasible options for increasing rural production in ways that are environmentally sustainable.

Constraints addressed

	Constraint	Treatment
legal / land use and / water rights	Absence of land use rights will affect sustainability of technology investments.	Requirement that all CIGs have use rights nominally allocated. Project then assists in issuance of certificates.
technical	Little experience among specialists and beneficiaries with an integrated participatory process for planning SLM and related investments.	Tools for environmental, economic and social appraisals included in planning and further strengthened by training in additional topics, e.g., environmental analysis, financial management.
social / cultural / religious	Poor and vulnerable groups not active participants in appraisals and decision-making and do not adopt SLM practices.	Open meetings, PRA tools to encourage active participation.
financial	Individual households unable to adequately invest in SLM investments.Few mechanisms to foster fairer distribution of resources along with feasible SLM options.	Households are formed into CIGs. Transparent budget limits for types of investment encourage participants to propose fairer and feasible SLM options.

Participation and decision making

Stakeholders / target groups


land users, individual


land users, groups

Approach costs met by:

international non-government	5%
government	5%
international	90%
local community / land user(s)	0%
other	0%
Total	**100%**
Annual budget for SLM component: US$> 1,000,000	

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: national specialists, international specialists

Implementing bodies: local community / land users, government, international non-government, international, other

Land user involvement

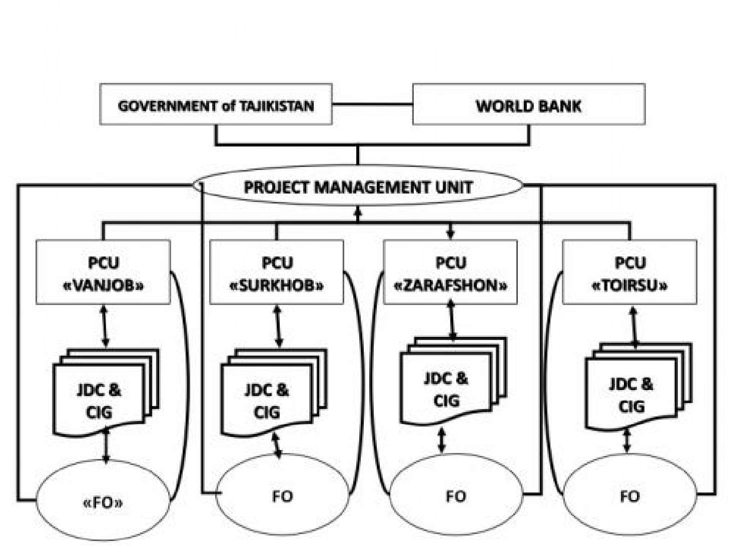
Phase	Involvement	Activities
Initiation/motivation	None	
Planning	Passive	Potential beneficiaries consulted for social assessment during project design. Findings used for developing planning approach.
Implementation	Interactive	Villagers participated in development of CAPs, formation of CIGs and choice of SLM activities.
Monitoring/evaluation	Interactive	Villagers participated in monitoring of CAPs and the impacts of rural investments.
Research	None	

Differences between participation of men and women: Yes, moderate.

In some locations, cultural practices significantly limited female participation in planning. Generally, at least one third of women in villages participated in the planning processes. It should be noted that due to male migration, the number of female-headed households is increasing and depending on the location, their numbers can be significant.

Involvement of disadvantaged groups: Yes, great.

Project population is generally considered poor or very poor. Within this population, PRA tools identified poor and vulnerable groups, who were then sometimes chosen as priority participants for certain types of rural investments.



Organogram: CAWMP Implementation Arrangements and Project Partners

Technical support

Training / awareness raising:

Training provided for field staff/agricultural advisor, land user, JDCs

Training was public meetings

Training focused on Participatory rural appraisal, monitoring and evaluation, participatory environmental analysis, various SLM technologies eligible for support in CAWMP. The overall approach focuses on participatory learning by stakeholders including land users as part of the planning process. Land users learned through participation in rural appraisal tools.

External material support / subsidies

Inputs: Facilitation, training and technical assistance - .

Credit: Credit was not available.

Support to local institutions: Yes, great support with training

See TAJ047 for role of sub-district/JDC organisations in CAWMP at the sub-district and village-levels.

Monitoring and evaluation

Monitored aspects	Methods and indicators
no. of land users involved	Regular measurements by project staff - At least 50% of villagers should participate in investments.
Community Action Plans	Regular observations by project staff - Number of CAPs, CAP implementation (CAWMP portion), Quality of proposals,

Changes as result of monitoring and evaluation:

There were few changes in the approach. Weak environmental appraisals in proposals resulted in additional training for facilitators in additional PRA tools (see TAJ045 for details on training). Changes made in rural investment proposal format since initial submissions were of variable quality. There were few changes in the technology. Clearer set of eligible and ineligible activities for each investment type since some initial proposed investments did not adequately address environmental, economic and social feasibility (see TAJ045 for details on eligibility criteria).

Impacts of the Approach

Improved sustainable land management: Yes, moderate; Almost 4000 rural production investments that integrated SLM practices into the management of over 96,000ha have been implemented in 402 villages and 39 Jamoats.

Adoption by other land users / projects: Yes, some; Other internationally funded projects and some country-based organisations have adopted elements of the planning approach, e.g., environmental appraisal tools, use of village-level budget limits.

Improved livelihoods / human well-being: Yes, moderate; An overall assessment (as of 2009 and being updated in 2011) indicates that at least 80% of investments implemented are successful in terms of economic, environmental and social parameters.

Improved situation of disadvantaged groups: Yes, great; As part of CAWMP, and within a generally poor project population, participatory planning identified poor and vulnerable groups as beneficiaries. Women comprised 40% of rural investment beneficiaries.

Poverty alleviation: Yes, moderate; The approach contributed to increasing the proportion of people above poverty from 3% to 16% (as of 2009 and being reassessed as part of a project evaluation in 2011) in the participating villages.

Training, advisory service and research:

- Training effectiveness - Training impacts for the planning process varied, with JDC members experiencing largest changes in skills and knowledge, and villagers benefiting from increased knowledge as a result of participating in rural appraisals during planning.

SLM specialists - fair

Land users* - good

Agricultural advisor / trainers - fair

JDCs - good

Land/water use rights:
Hinder - low in the implementation of the approach. Very few Land Use Rights Certificates had been issued at start of project for arable land in upland areas. There was no provision for allocation of use rights to non-arable sloping lands suitable for horticulture, woodlots and other restricted access uses. However, project provisions (see 3.2.4.2) to assist in issuance of land use rights helped overcome this constraint.

Concluding statements

Main motivation of land users to implement SLM:

Well-being and livelihoods improvement

Affiliation to movement / project / group / networks

Production

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Working with budget limits was an effective mechanism for villagers to prioritize and assess risks of various options. → Document process and results, disseminate to government, donors and other implementing agencies.
2) Open disclosure of available funds and amounts allocated to investments improved accountability. → Ensure similar measures are included in future planning processes.
3) Awaiting project evaluation due in 2011

Weaknesses and → how to overcome

Specialists' opinion:

1) Flexibility given to FOs in planning methods led to some investment proposals of variable quality → Future efforts should specify core minimum planning elements but still provide some flexibility to foster innovation and accommodation of local contexts.

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WOCAT

left: Thirty-nine Jamoat Development Committees with elected officers provide critical financial and technical support to more than 3,500 Common Interest Groups (CIGs) implementing rural investments **right:** Training JDC members in technical and financial aspects of CAWMP. (Photo: UNDP)

Sub-district (Jamoat) level support for sustainable land management

Tajikistan – Community Agriculture Watershed Management Project (CAWMP)

Provision of technical and financial management assistance through Jamoat ("Sub-District") level organizations to farmers in a large small grants programme.

Aim / objectives: The Tajikistan - Community Agriculture & Watershed Management Project (CAWMP), aimed to use a sub-district level organisation to provide more efficient, transparent and accountable services to farmers for the project duration. CAWMP financed small grants to farmer groups for agricultural production in environmentally sustainable ways in Tajikistan's uplands. The sub-district level support for this initial six year period, together with support from other project partners, helped (a) enable project implementation, and (b) build farmer capacity to sustain the investments after the end of six-year project, even in the absence of continued outside support.

Methods: In four project sites 39 Jamoat ("sub-district") Development Committees (JDCs) operated as NGOs with elected officers and helped organize 43,000 households into groups to implement 4,000 rural production investments that included varied SLM technologies in 402 villages. JDCs managed $7.4 million in small grants. Use of the JDC built upon existing initiatives to strengthen local governance. The JDCs collaborated and received support from a government-appointed Project Management Unit (PMU), field-based Project Coordination Units (PCUs), and four contracted Facilitating Organisations (FOs). These partners helped train JDCs in financial, organisational, and technical aspects (e.g. fund flow, participatory planning, SLM technologies), and assisted villages to form new JDCs where none existed.

Stages of implementation: JDCs, with FOs and PCU specialists, undertook activities including: 1) preparation of participatory village-based Community Action Plans (CAPs) that included proposed rural production investments and formation of Common Interest Groups (CIGs) of households [See TAJ046}; 2) participation in sub-district and project-site/watershed level screening and approval of rural production proposals from CIGs to ensure economic, environmental and social feasibility [See TAJ045]; 3) management and disbursement of grant funds from the PMU to CIGs [See TAJ 044]; 4) overseeing formal investment agreements with participating CIGs; 5) monitoring, evaluation and reporting; and 6) liaison with other villages and relevant government agencies to facilitate permissions, resource use agreements, issuance of land use rights, etc.

Role of stakeholders: JDCs comprised elected village representatives and the government's sub-district officials. Generally, JDC members have relatively higher levels of education and relevant knowledge and experience than the local population. A JDC chairperson and secretary were elected and a qualified accountant/bookkeeper appointed. JDCs met monthly and established committees, (e.g., gender, environment, financial management and social). CAWMP paid an honorarium for the accountant and incremental travel costs for all JDCs. For newly established JDCs, CAWMP also provided funds for office facilities, plus an honorarium for the chairperson, and an additional honorarium for another officer if one was female.

Location: Sughd, Khatlon, RSS, GBAO, 7 districts and 39 sub-districts
Approach area: 1'000-10'000 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ047e
Related technology(ies): Numerous technologies implemented under CAWMP: TAJ368, TAJ402, TAJ403
Compiled by: Nandita Jain
Date: 2011-05-24

Problem, objectives and constraints

Problems

Use of sub-district organisations provided an efficient, transparent and accountable way of providing essential services to farmers for the period of initial investment, i.e., the six-year period of project implementation. Alternatives ways of providing this support would have had disadvantages: such support at a village level would have been too expensive and faced human capacity constraints, while using the centralised government system or relying solely on large NGOs would have been less transparent, less participatory, and less accountable to the interests of local people.

Aims/Objectives

Efficient and responsible sub-district institutional arrangements for a fixed-term project that are able to assist upland farmers in adopting practices to increase agricultural production in sustainable ways.

Constraints addressed

	Constraint	Treatment
technical	Lack of technical capacity among farmers in participatory processes and SLM technologies and methods.	Extensive training for JDCs in order to assist farmers. Trainings for local government specialists to facilitate local approvals for CIG activities.
financial	Poor transparency and accountability in financial transactions between government and farmers in rural development. Upland farmers lacked financial capital.	JDC support services for managing about 4000 small grants, including participatory planning and streamlined fund transfers from PMU to farmer groups through JDCs.
institutional	Limited financial and technical resources for upland agriculture given government focus on lowland crop, especially cotton, production. Remoteness restricts access to available services.	Access to technical and financial services through establishment and capacity building of 39 JDCs in upland areas.
legal / land use and / water rights	Slow issuance of land use rights certificates for upland family farms - poor incentives to invest household assets and adopt SLM practices. No rights allocation for horticulture, woodlots and other uses with restricted access on sloping lands.	Legal agreements governing CAWMP permitted issuance of certificates (including for sloping lands) to project participants on the basis of adopting SLM practices.

Participation and decision making

Stakeholders / target groups

land users, groups	land users, individual

Approach costs met by:

international non-government	5%
government	5%
international	90%
Total	**100%**

Annual budget for SLM component: US$> 1,000,000

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: international specialists, national specialists

Implementing bodies: other, government, international non-government, international

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	Passive	Local communities consulted for social assessment during project design.
Implementation	Interactive	JDC members (village representatives) provided a range of services to villagers and other functions such as liaison with government for the purposes of CAWMP.
Monitoring/evaluation	Interactive	JDCs and CIGs were signatories of formal agreements governing grants for rural production. JDCs released funds based on agreed benchmarks and with PCUs and FOs monitored and reported on environmental, economic and social aspects.

Differences between participation of men and women: Yes, moderate.
Most JDCs had women members, but overall levels of female participation were less than 25%. Social and cultural circumstances, especially in the more remote upland areas, place restrictions on the extent to which women can actively participate in organisations such as JDCs. Among the four project sites, there were also differences in the number of women represented in JDCs.

Involvement of disadvantaged groups: Yes, little.
There was some representation in JDCs of poor, vulnerable households, as well as single female-headed households.

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor, JDCs
Training was on-the-job, site visits / farmer to farmer, demonstration areas, public meetings
Training focused on organisational Management, Book-keeping, Participatory rural appraisal, Participatory environmental planning and analysis, a range of SLM technologies, monitoring and evaluation, gender awareness.

Advisory service:
Name: Informal advice and facilitation support by JDCs, in collaboration with other project partners.
Key elements:
1. Project design and procedures
2. Technical, financial and institutional considerations of proposed investments for grant financing
3. Fostering increased knowledge and changes in attitudes and practices among farmers to identify advice needed, and for ongoing learning during the post project period.

Nominal government advisory services exist at district level, and even less in sub-districts. Technical capacities for SLM are lacking. Staff are poorly paid, positions are unfilled and finances are inadequate. Little orientation toward client service and governance problems are common. Conditions unlikely to change in foreseeable future. JDCs and project partners provided informal advisory services during investment period, created demand among farmers to seek advice in post-project period. See comments in 2.4.2.1. for information on government advisory services

External material support / subsidies

Contribution per area (state/private sector): No.

Credit: Credit was not available.

Support to local institutions: Yes, great support with financial, training, equipment. Support of sub-district local institutions is the focus of the Approach.

Monitoring and evaluation

Monitored aspects	Methods and indicators
management of Approach	observations by project staff - Quality of CIG proposals and implementation, rate of fund disbursement to CIGs, timeliness of report

Changes as result of monitoring and evaluation: There were few changes in the approach. Poor initial attention to environmental aspects of SLM and other investments in CIG proposals led to increased training for JDCs, FOs, PMU, PCU and local government officials in participatory environmental analysis. There were few changes in the technology. Based on field observations and measurements in some cases, CIGs with the assistance of JDCs, FOs and project staff adjusted various SLM technologies that had been implemented as part of rural production investments during the course of implementation, e.g., composting procedures, irrigation techniques.

Impacts of the Approach

Improved sustainable land management: Yes, great; Providing sub-district-level support was critical for implementing almost 4000 rural production investments that integrated SLM practices into the management of over 96,000ha.

Adoption by other land users / projects: No; JDCs existed prior to the project, and CAWMP built upon this arrangement. Institutions similar to JDCs continue to be supported in some regions of the country. However, in accordance with the CAWMP design and the initial risk assessment, land users who have received CAMWP-financed grants are not necessarily dependent on the sustainability of JDC support during the post project period. These farmers should have the capacity, incentives, and the responsibility to sustain their investments.

Improved livelihoods / human well-being: Yes, moderate; An overall project assessment indicates that about 80% of investments implemented with the support of JDCs and other project partners, and in conjunction with other project activities are successful.

Improved situation of disadvantaged groups: Yes, moderate; JDCs helped target vulnerable groups during community mobilization and preparation of CAPs. Women comprised 40% of project participants benefiting from rural production investments.

Poverty alleviation: Yes, moderate; As part of the CAWMP, the approach contributed to increasing the proportion of people above poverty from 3% to 20% in the participating villages (to be updated with 2011 evaluation data).

Training, advisory service and research:

- Training effectiveness - Skills and knowledge among the target group of JDC members have generally improved, although there is considerable variation among sub-districts. Skills and knowledge have improved among farmers that have implemented rural production investments.

  Land users* - good

  Agricultural advisor / trainers - fair

  JDCs - good

- Advisory service effectiveness - See explanation in 2.4.2.

  Land users* - good

- Research contributing to the approach's effectiveness: See comments in 2.4.3.

Land/water use rights: Hinder - low in the implementation of the approach. Very few Land Use Rights Certificates had been issued at start of project for arable land in upland areas. There was no provision for allocation of use rights to non-arable sloping lands suitable for horticulture, woodlots and other restricted access uses. The approach did reduce the land/water use rights problem (moderately). Legal agreement for CAWMP permitted issuance of use rights certificates for sloping lands for horticulture, woodlots and other restricted access uses based on adoption of SLM practices. JDCs assisted project staff in processing certificates for participating households, linking farmers, project staff and government officials. Another project accelerated issuance of arable land certificates.

Concluding statements

Main motivation of land users to implement SLM:

Affiliation to movement / project / group / networks - availability of investment capital, technical assistance

Production - potentially more sustainable production

Well-being and livelihoods improvement - opportunity to increase livelihood assets

Sustainability of activities: Yes the land users can sustain the approach activities.

Strengths and how to sustain/improve

Specialists' opinion:

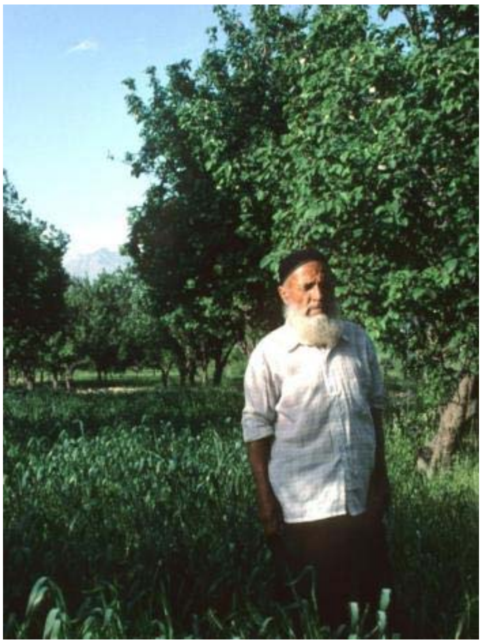
1) Scale and scope of JDC mandates is effective for delivering services to upland, and often remote, farmers. Maintain a focus on strengthening sub-district level support to farmers.
2) Sub-district level organisations can be an effective component of scaling-up strategies for SLM in a challenging physical landscape. Scaling-up strategies will require investment in institutional arrangements.
3) Participatory processes help ensure that organisations such as JDCs can work effectively with government units to deliver technical and financial resources to farmers. Ensure that participatory processes, including financial management mechanisms, are well integrated into SLM programmes.
4) To be added based on project evaluation due in late 2011

Weaknesses and how to overcome

Specialists' opinion:

1) Uncertain financial sustainability of JDCs during the post-project period in the absence of donor funding. → 1) Continue to emphasize the importance of farmers having the capacity, incentives, and the responsibility to sustain their investments on their own, in the event that ongoing support from JDC is not available post-project. 2) Until more sustainable Jamoat-level support system is established and proven to be effective in Tajikistan (i.e., meeting transparent, accountable, efficient, and capacity requirements), clarify fixed term nature of JDC support in order to avoid misunderstandings and unrealistic expectations. 3) Highlight JDC functions for the fixed term (6 years) under CAWMP and explore opportunities to include similar functions in current efforts of other donors to establish sub-district representative government bodies.

Contact person: Mott, Jessica. Jmott@worldbank.org. Tajikistan World Bank Country Office, Ayni street 48, Business Center "Sozidanie", 3rd floor. Dushanbe, Tajikistan. Tel. (48) 701 58 08, 93 588 99 76.



Transition from a centralised regime to a local initiative

Tajikistan – Swiss National Centre for Competence in Research (NCCR) North-South

A land use system established during the previous authoritarian regime of the Soviet Union is now being adapted to the farmer's needs via their own initiatives.

Aim / objectives: This case study compares two approaches which both contributed to the development of the current orchard-based agroforestry system: (1) Soviet approach: the previous state-run dictatorial system of the soviet times and (2) Farmers initiative: the current bottom-up approach. Farmers from the hilly Faizabad region with its deep and highly erodible loess soils had traditionally combined the cultivation of beans and wheat with fruit trees. During the 1980s the Soviet administration decided to intensify apple production in this area and to establish orchards on a large scale, making use of the well suited environmental conditions. The system introduced, comprised of densely planted purestand orchards, mechanically constructed terraces (where the slopes required this), and an irrigation system. Establishment was conducted through a top-down/authoritarian approach, and all inputs for implementation and maintenance were provided by the state. Farmers worked as employees on the state farms and received cash wages.
Methods: After the collapse of the Soviet Union and the start of the civil war, Tajikistan suffered from acute food shortages. In 1993, the Tajik government lifted the prohibition on planting wheat in rainfed areas. Farmers renting the land of the former state farms began to revert to intercropping annual crops, mainly wheat and beans, between thinned rows of apple trees. This was for both household use and for sale at the market. The initiative came from the farmers, and reflected the traditional system of production. However the pumping station and irrigation system have not been working for the last 10 years and therefore supplementary irrigation has not been available. In contrast to former times, decision-making, management activities, and provision of inputs/finance are all carried out by the land users themselves. In some cases, marginal farmers received incentive support from NGOs or from the World Food Programme. Systematic assistance from extension services, financial support to purchase pesticides or fertilisers, and investment to restore the irrigation system would all help to improve the agroforestry system and thus increase yields.

left: Farmer bringing fodder home from the field: grass is cut between the fruit trees.
right: The farmer and his agroforestry system: a combination of pear trees and wheat.

Location: Faizabad,
Approach area: 45 km^2
Type of Approach: traditional/indigenous
WOCAT database reference: TAJ003e
Related technology(ies): Orchard-based agroforestry (QTTAJ03)
Compiled by: Sanginboy Sanginov
Date: 2009-01-13

Problem, objectives and constraints

Problems

Soviet times: the original problems addressed by the authorities during the soviet era were how to increase agricultural production, without consideration of the needs of the local rural population. Post-soviet period: in 1993, when the soviet era ended, and the prohibition on cultivation of wheat was lifted, the underlying problem was a shortage of food, especially of wheat.

Aims/Objectives

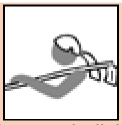
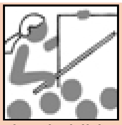
The previous Soviet approach aimed to increase apple production in a region with ideal environmental conditions. The current approach used by farmers aims to make more intensive use of agricultural lands through an agroforestry system, and especially to provide food security by growing annual crops between the trees.

Constraints addressed

	Constraint	Treatment
financial	Soviet Approach: The establishment and maintenance of the irrigation system, terraces and the orchards themselves required high financial input.	Equipment, seedlings and salaries were all provided by the central Soviet state.

Participation and decision making

Stakeholders / target groups

 land users, individual	 teachers / school children / students

Approach costs met by:

local community / land user(s)	100%
Total	**100%**

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: national specialists, land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	None	Involvement during the Soviet approach: none Involvement during the current approach: farmer's are fully involved using their own initiatives.
Implementation	None	
Monitoring/evaluation	None	Involvement during the Soviet approach was interactive, via observations, public meetings, workshops, etc. Involvement during current farmer's initiative: includes self-mobilisation, interactive, responsibility for all the steps, technical assistance from external sources.

Differences between participation of men and women: No. During the Soviet times, decisions within the collective farms were mainly made by men, though both men and women worked in the field. Nowadays a large number of men migrate to other countries to earn extra income. Therefore most of the work completed during the summer is done by the women. During the spring, and some of the autumn, men are around and able to assist in the work in the fields.

Involvement of disadvantaged groups: No

Technical support

Training / awareness raising: Training focused on Training was provided on-the-job, by public meetings and through courses. Training focused on improving irrigation, tree planting practices and tree management. Training conducted during the establishment of the orchards was useful and adequate. No training was given (naturally) in intercropping of wheat and other cereals between the rows of apple trees to support the farmers initiative.

Advisory service: Key elements: For running the orchards during Soviet times a top-down/authoritarian approach was used.

Research: During the original establishment of the orchards, research was conducted. For the new system of intercropping with wheat, research contributed by providing support with respect to choice of varieties.

External material support / subsidies

Credit: Credit was available at interest rates (999% per year) the market rates. For the original establishment of the orchards loans were provided by the state at a very low interest rate. Currently, for cultivating cereals and legumes, farmers have access to loans, but the interest rate is very high.

Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
bio-physical	Ad hoc observations by -
technical	Regular measurements by -
economic / production	Regular measurements by -
area treated	Regular measurements by -
no. of land users involved	Ad hoc observations by -

Changes as result of monitoring and evaluation: There were no changes in the approach.

Impacts of the Approach

Improved sustainable land management: Yes, moderate; Currently: moderately positive impact on soil and water conservation through the agroforestry system.

Adoption by other land users / projects: No; None known.

- Training effectiveness - However in order to manage and adjust the land use system to the present situation, more training is needed.

Long-term impact of subsidies: The fruit trees were established under the Soviet system through paid labour, and thus represent an asset that can be used profitably. With respect to the new initiatives, there are no incentives involved.

Concluding statements

Main motivation of land users to implement SLM: Production, Well-being and livelihoods improvement

Sustainability of activities:

No the land users can't sustain the approach activities. The Soviet approach of orchards managed through state farms effectively died out with the collapse of the Soviet Union: the irrigation system ceased to function and inputs were not provided anymore by the state. Furthermore, the land use system was not adequate.

Strengths and → how to sustain/improve

Specialists' opinion:

Farmer's initiative: Farmers get diversified and additional products (grain, apples, beans, hay, etc). → The government should support the farmer's initiatives. The marketing system for selling fruits should be better developed.
Farmer's initiative: Farmers themselves are finding a way out of the poverty trap. → Land reform should be improved and every farmer should be eligible for land certificates/titles.
Soviet approach: Well managed and controlled land use system with efficient irrigation system, high production, ensured maintenance, provision of fertilisers and technical assistance.

Weaknesses and → how to overcome

Specialists' opinion:

1) Farmer's initiative: Further extension of the agroforestry system is limited without support from the extension service → The extension service should provide more inputs.
2) Farmer's initiative: Land use rights: as long as the land still belongs to the state, people have very little motivation to improve it →Privatise the land.
3) Soviet approach: No diversity, mono-cropping system aimed at maximised production; as soon as state support ceased, the system collapsed.

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left: The son of the innovator (centre, without hat) who manages the conserved area, discussing technical impact with researchers from the NCCR North-South Programme (see research).
right: Cutting grass in the fenced plot: land use was changed from open access grazing to cut and carry.

Farmer innovation and self-help group

Tajikistan – Swiss National Centre for Competence in Research (NCCR) North-South

An innovative land user, assisted by a self-help group has overcome many administrative and technical problems to establish a fruit garden on previously degraded communal grazing land.

Aim / objectives: Although in the 1980s the soviet government supported the establishment of private gardens in specified areas, the lack of irrigation water and suitable land often restricted this process. That was the case for Khagatai village, situated on the narrow valley floor of the Varzob River, below steep loess slopes. This marginal area is used for grazing and shows severe signs of water erosion; the hillsides are considered to be of little agricultural value. In the early 1980s, widespread unemployment evidently had the effect of stimulating people to use their own initiative. In 1982, one innovative farmer started to fence-off an area of half a hectare to establish a private fruit garden on the degraded grazing land. Some say that the fencing of plots for private fruit and hay production is a traditional practice - abandoned after the 1950s - but taken up again recently to re-establish rights to individual plots. The practice is widespread in the higher villages of Varzob, where the farmer noted it and decided to set up his own plot. When it came to practical implementation, despite the land user having five sons, the labour-intensive terracing was only completed thanks to the voluntary assistance of relatives and friends, a tradition locally known as 'hashar'. At first, when his initiative began to take shape on land officially owned by a state farm, no action was taken. However, the change in land management quickly showed positive productive results, and it may have been through jealousy that the people of Khagatai village then reported the case to the authorities. The watering of the garden on the unstable loess slope in the immediate vicinity of the village, and the consequent risk of landslides, was put forward as the reason for the complaint. The authorities opened an investigation and a number of newspaper articles were written about the case.
Methods: Since independent decision making was not common in the soviet states, and rapid degradation of newly irrigated lands on the loess deposits was a big issue, the case of this fruit garden attracted a lot of attention. However, when they observed the improved state of the vegetation on the plot, the authorities finally allowed the farmer to continue. In 1993 the prohibition on private cultivation of land was lifted in order to reduce problems of food shortage caused during the civil war that followed independence. It was during this time that four other land users from Khagatai village spontaneously began to imitate this practice.

Approach area: 0.15 km^2
Type of Approach: traditional/indigenous
WOCAT database reference: TAJ004e
Related technology(ies): Conversion of grazing land to fruit and fodder plots (TAJ004)
Compiled by: Murod Ergashev, Tajik Soil Institute
Date: 2009-01-13

Problem, objectives and constraints

Problems

The land in question is part of a communal grazing area and property rights are officially with Khagatai village (in Soviet times with a state farm). Uncontrolled grazing on communal lands has resulted in overgrazing, and thus to progressive water erosion on the steep loess deposits. No attention was paid by the local authorities to soil and water conservation measures in areas considered to be of low agricultural potential.

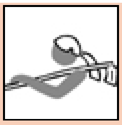
Aims/Objectives

To establish an orchard with grape vines, fruit trees and fodder crops for private use.

Constraints addressed		
	Constraint	**Treatment**
technical	For the establishment of the orchard irrigation water was needed. This had to be brought 200 m up a steep slope.	Water in old inner tubes was transported to the orchard by donkey.
legal / land use and / water rights	No individual property rights.	In soviet times the land belonged to a state farm. Today the land belongs to Khagatai village: efforts to achieve official
institutional	Private initiatives on state land were not encouraged under the soviet system.	Activities tended to start on marginal land that was of little agronomic interest to state farms.
financial	All inputs had to be provided by the land user himself.	Creative ways were developed to provide material for fencing, for transportation of irrigation water and for access to manure.
social / cultural / religious	Jealousy of other village members, who didn't like another land user fencing off a plot in communal grazing land.	Others became convinced after the change in land use. Newspaper articles on the case also helped to form public opinion.
other	Availability of labour: Construction of terraces for tree planting is very labour intensive.	Voluntary work of relatives and friends.

Participation and decision making

Stakeholders / target groups



land users, individual

Approach costs met by:

other	100%
Total	**100%**

Decisions on choice of the Technology(ies): by land users* alone (self-initiative / bottom-up)

Decisions on method of implementing the Technology(ies): by land users* alone (self-initiative / bottom-up)

Approach designed by: land users

Implementing bodies: local community / land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Self-mobilisation	individual land user; the initiative was initiated by an individual land user
Planning	Self-mobilisation	step by step
Implementation	Self-mobilisation	land user; the project was implemented by the individual land user, relatives and neighbours participated voluntarily in terrace construction
Monitoring/evaluation	Self-mobilisation	by the individual land user; the project is monitored and evaluated by the individual land user
Research	Interactive	post-implementation documentation (participatory)

Differences between participation of men and women: Yes, great
Mainly men participated: women are not usually expected to carry out field activities for cultural reasons. The coffee harvest is the only activity where men and women work together in the field.

Involvement of disadvantaged groups: No

Technical support

Training / awareness raising:
No

Advisory service:
Name:
Key elements:
1. observation
2. farmer-to-farmer exchange of ideas.

Research:
There had been no research until the identification and documentation of this initiative through a Tajik-Swiss project under the framework of the National Centre of Competence in Research (NCCR) North-South (coordinated by the Centre for Development and Environment, Switzerland).

External material support / subsidies

Contribution per area (state/private sector):

Labour: Voluntary

Inputs: -

Credit: Credit was not available.

Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
bio-physical	Ad hoc observations
economic / production	Ad hoc observations
no. of land users involved	Ad hoc observations

Changes as result of monitoring and evaluation:
There were few changes in the approach. There were a few changes due to the observations made by the land user: he started to apply supplementary irrigation to the tree seedlings, as well as applying manure each year.

Impacts of the Approach

Improved sustainable land management: Yes, little; There has been a significant, though localised, improvement in soil and water management.

Adoption by other land users / projects: Yes, some; Other land users from Khagatai village have adopted the system on the same hillside. They started fencing-off plots in the 1990s during the civil war. At that time many people were unemployed, and labour was therefore available. Furthermore there was a shortage in food supplies.

Improved livelihoods / human well-being: Yes, little

Improved situation of disadvantaged groups: No

Poverty alleviation: Yes, little

Training, advisory service and research:

- Training effectiveness
- Advisory service effectiveness
- Research contributing to the approach's effectiveness

Land/water use rights:

Long-term impact of subsidies:
No incentives were available.

Concluding statements

Main motivation of land users to implement SLM:

Production

Environmental consciousness, moral, health

Well-being and livelihoods improvement

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Bottom-up approach: independent decision making by the individual land user based on dynamic and flexible responses as required. → Give property rights to land users to motivate further investments in soil and water conservation/production.
2) Rehabilitation of marginal land for production and generation of additional income. → Give property rights to land users to motivate further investments in soil and water conservation/production.

Weaknesses and → how to overcome

Specialists' opinion:

1) Current systems of land ownership, currently the land belongs to Khagatai. → Provide land ownership to the farmers.
2) Not all farmers can apply this technology since it is location specific. → Identify if fodder production (cut-and-carry) would be more attractive than open grazing; allocate land to the farmers. Only families with sufficient labour resources can establish such a garden by themselves. → Incentives from the state or other organisations are needed.
3) Since it is an initiative of an individual land user, the SWC technology has not been documented so far, nor evaluated, and lessons learned have not been spread among the land users. → Documentation and spreading of lessons learned.

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Voluntary Labour Assistance

Tajikistan – Swiss National Centre for Competence in Research (NCCR) North-South

Voluntary labour assistance for labour intensive activities whereby community members help each other in contributing labour on the basis of mutual understanding.

Aim / objectives: Members of the labour exchange group (often relatives and neighbours) can ask for assistance when labour intensive farm activities need to be performed. A farmer asks fellow land users individually for support. The request is made one or two weeks beforehand, informing individual farmers about the programme. During these informal land user exchanges, farmers share experiences and technical know-how on soil-and water conservation technologies and discuss details of the planned work. On the specified date, participants equip themselves with all necessary farm implements required for the activity. The farmer who seeks assistance should host the participants and prepare food and drinks. The objective of the approach is to alleviate labour shortages and to strengthen the relationship between community members.

Location: RRS, Faizabad
Approach area: extensively used all over Tajikistan
Type of Approach: traditional/indigenous
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ005e
Related technology(ies): Orchard-based Agroforestry (establishment of orchard) (QTTAJ08), Terrace with Tree Barrier (QTTAJ05)
Compiled by: Erik Bühlmann
Date: 2009-01-13

Problem, objectives and constraints

Problems

Shortage of work force, since most farmers send their sons (or go themselves) to Russia to earn money.

Aims/Objectives

To overcome labour constraints.

Constraints addressed

	Constraint	Treatment
other	Lack of able work force since many male villagers left to work in Russia.	Gathering of available work force to carry out labour intensive farming activities.
financial	Lack of finance to hire labour	mutual voluntary labour assistance is independent from the financial situation of land users

Participation and decision making

Decisions on choice of the Technology(ies): by land users* alone (self-initiative / bottom-up)

Decisions on method of implementing the Technology(ies): by land users* alone (self-initiative / bottom-up)

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Self-mobilisation	
Planning	Self-mobilisation	work is planned with advice of friends and elderly members
Implementation	Self-mobilisation	
Monitoring/evaluation	None	
Research	None	

Differences between participation of men and women: Yes, moderate
Whilst decision making, planning and implementation of SWC technologies is mainly carried out by men, women assist mainly only for harvesting activities.

Involvement of disadvantaged groups: No

Technical support

Training / awareness raising:
No

Advisory service:
Name: informal land user extensions

The extension system is quite adequate to ensure continuation of activities.

Research:
No research.

External material support / subsidies

Contribution per area (state/private sector): .

Labour: Voluntary, food-for-work. The provision of food for voluntary assistance workers should be seen more as a part of traditional hospitality, rather than a food for work payment.

Inputs:

Credit: Credit was not available.

Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
economic / production	Ad hoc measurements
area treated	Ad hoc observations

Changes as result of monitoring and evaluation:
There were no changes in the approach.

Impacts of the Approach

Improved sustainable land management: Yes, moderate; Through the approach, land users shared skills and knowledge, but could benefit from experiences of other farmers before establishment of an SWC technology.

Adoption by other land users / projects: Yes, some; The approach has evolved and developed within a Tajik rural community. Labour assistance can be requested by any farmer who is willing to help others as well.

Training, advisory service and research:

- Training effectiveness
- Advisory service effectiveness - While farmers consult fellow land users during the planning and implementation stage, the approach is as a result of individual initiative.

  Land users* - fair

- Research contributing to the approach's effectiveness - Not at all
  no research contribution

Land/water use rights:
Hinder - moderately in the implementation of the approach. Presently, all land in Faizabad Rayon is rented from the state. Farmers are often not willing to implement labour intensive SWC technologies if they do not o
wn the land they farm.
The approach did reduce the land/water use rights problem (low). The approach eases the problem of labour shortages; the decision to implement substantial SWC technologies is still taken by the individual land user and his family.

Long-term impact of subsidies: -

Concluding statements

Main motivation of land users to implement SLM:

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Experiences and knowledge are shared.
2) Stronger social relationships among community members.
3) SWC technologies can be implemented more easily.
4) Eases labour shortages. → The approach is sustainable in itself, as long as the approach is based on a mutual understanding.
5) Farming activities can be carried out according to their seasonal calendar.

Land users' opinion:

1) Eases the labour problem with very little costs.

Weaknesses and → how to overcome

Specialists' opinion:

1) If no means are available to host participants, farmers cannot request assistance.
2) Only those farmers who have sufficient means to support other can participate in the approach.

Land users' opinion:

1) When assisting others, sometimes their own work cannot be carried out on time.

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www.north-south.unibe.ch

Joint Land User Initiative

Tajikistan – Swiss National Centre for Competence in Research (NCCR) North-South

Joint initiative of neighboring land users to prevent soil erosion in steep sloping cropland.

Aim / objectives: There was an agreement between neighboring land users, on a measure they could implement jointly to prevent soil erosion in steep sloping cropland, and to prevent disputes between them about inappropriate land use and land management practices. The decision was made that a grass strip should be left uncultivated on the field boundary between upslope and downslope land users when the pasture was turned into cropland. Farmers decided to contribute equally to the establishment of the technology.

Location: RRS
Approach area: unknown
Type of Approach: recent local initiative / innovative
Focus: on conservation only
WOCAT database reference: TAJ006e
Related technology(ies): Grass Strip on Steep Sloping Cropland (QTTAJ06)
Compiled by: Erik Bühlmann
Date: 2009-01-13

Problem, objectives and constraints

Problems

Land losses in connection with soil and water conservation are too costly to be borne by a single land user alone.

Aims/Objectives

To reduce soil erosion and the downslope washing of seeds, and also to help avoid disputes between neighbouring land users about land use and land management practices.

Constraints addressed

	Constraint	Treatment
other	Lack of land available for implementation of grass strip.	Sharing of land losses.

Participation and decision making

Decisions on choice of the Technology(ies): by land users alone (self-initiative / bottom-up)

Decisions on method of implementing the Technology(ies): by land users alone (self-initiative / bottom-up)

Approach designed by: land users

Implementing bodies: local community / land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Self-mobilisation	
Planning	Self-mobilisation	upslope and downslope land users decided together about the location and the size of the grass strip
Implementation	Self-mobilisation	
Monitoring/evaluation	None	
Research	None	

Differences between participation of men and women: No
Decision making in connection with SWC is traditionally carried out by men.
Only men participated in the approach.

Involvement of disadvantaged groups: No

Technical support

Training / awareness raising:
No

Advisory service:
Name: informal land user extension

Research:
No research.

External material support / subsidies

Labour: Voluntary. joint action of neighbouring land users

Credit: Credit was not available.

Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
technical	Ad hoc observations by
economic / production	Ad hoc measurements by
area treated	Ad hoc observations by

Changes as result of monitoring and evaluation: There were no changes in the approach.

Impacts of the Approach

Improved sustainable land management: Yes, moderate; Through sharing of the land lost to the strip, a larger area can be used for the implementation of the SWC technology, which ultimately enhances its effectiveness in reducing soil erosion

Adoption by other land users / projects: No; According to the farmers involved, there is no reason why other farmers could not adopt their approach since they consider it to be a big advantage. However, there may be a general reluctance among other land users to sacrifice valuable cropland for implementation of a grass strip.

Improved livelihoods / human well-being: Yes, little

Improved situation of disadvantaged groups: No

Poverty alleviation: No

Training, advisory service and research:

Research contributing to the approach's effectiveness - Not at all
no research contribution

Land/water use rights: Hinder - moderately in the implementation of the approach.
Poor farmers rent cropland from the state. The area which is occupied by the grass strip is classified as cropland which is much more expensive than renting of grazing land. Farmers may be reluctant to implement grass strips if they have to rent the area at the cropland rates.
The approach did not at all reduce the land/water use rights problem.

Concluding statements

Main motivation of land users to implement SLM:

Production

Prestige / social pressure

Environmental consciousness, moral, health

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Joint initiative helps to avoid possible disputes between neighbouring land users.
2) No inputs required.
3) Land losses can be shared between farmers.

Land users' opinion:

1) Approach helps reduce conflicts between land users.
2) The land occupied by the SWC technology is shared between land users.
3) Strong ownership of the approach.

Weaknesses and → how to overcome

Specialists' opinion:

1) Poor spreading of approach.
2) Poor collaboration and institutional linking. → Promote interaction at community level.

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left: Resource use in the Microwatershed, The Project Natural Resource Specialist of the Welthungerhilfe provides training to farmers. (Photo: Manuchehr Rakhmatdzhonov)
right: Resource use in the Microwatershed, The Project Natural Resource Specialist of the Welthungerhilfe provides training to farmers. (Photo: Manuchehr Rakhmatdzhonov)

Facilitation of microwatershed management for farmers

Tajikistan - Welthungerhilfe

Relying on integrated watershed management principles, farmers were assisted by the project to implement soil and water conservation measures in a microwatershed.

Aim / objectives: To strengthen the capacity of the community to plan and implement integrated natural resource management approaches, at micro watershed level in sustainable ways. These include; conserving soil by introducing actions to rehabilitate the eroded land, stop gully formation resulting from water run-off; enable water retention to secure soil moisture for a longer time period; mitigate effects of overstocking resulting in overgrazing; hoof erosion and soil compaction; reverse inappropriate agriculture practices towards more efficient and environmentally friendly management types; enable better employment and higher income generation to improve the livelihood standards and food security.
Methods: The project facilitated the following activities: Farmer participation, and using their initiative, community involvement in the planning, fundraising and implementation. Farmers increased their own contribution for material inputs, and a greater than 50% rate of adoption of the innovation was seen. The project also funded 'on the job' training, technical support, consultancy, and mediation of communication between parties.
Stages of implementation: 1. Awareness raising, 2. On the job training, 3. Watershed management activity planning, 4. Implementation, 5. Monitoring, 6. Evaluation, 7. Readjustment based on results, 8. Further replication in new area
Role of stakeholders: The DWHH Project had a leading role in initiation, orientation, awareness raising, mobilisation, training, consultancy, input provision and mediation of communication to land committee. Farmers have been actively participating, have provided labour input / financial contribution, provided indigenous knowledge and skills. Local authorities - providing land titles, participation in planning and decision making process Village Development Committee (VDC) - community mobilisation, information dissemination, input / finance documentation, fund raising.
There are 5 households in the microwatershed. Almost 40 people live in all HH, all are Tajiks. Members of all households took part in discussion rounds and training. Non of HHs were strong enough to implement measures on own funds. One HH has rejected implementation of measures, due lack of capacity and lack of trust of the project's success. Women: farmers came to the discussions together with their wives, women took part in training, in implementing almost all of the adoption measures, and equally benefited from the project. However, they were not involved in decision making.

Location: Tajikistan, Khatlon, Baljuvon / Khirob
Approach area: 0.112 km^2
Type of Approach: recent local initiative / innovative
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ029e
Related technology(ies): Gradual Development of Bench Terraces from Contour Ditches
Compiled by: Manuchehr Rakhmatdzhonov
Date: 2011-04-30

Problem, objectives and constraints

Problems

Lack of land tenure rights implementation. Nominal state farm reorganisation. Low agricultural production - lands depleted of nutrients, very low yields, no crop rotation, overgrazing. Soil degradation, progressing land mass transport, gully formation. Lack of technical knowledge and awareness of soil & water conservation measures. Lack of cash to invest in development of land - just limited capacity to invest but need external financial input. Conflict over land use - livestock owners are against land enclosures. Poverty - underlying cause of general lack of potential to invest in development.

Aims/Objectives

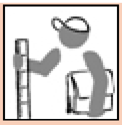
To assist farmers in the planning and implementation of activities for the conservation and improvement of the local land, to enable conditions for replication of the approach/technology, and to improve food production, and in the long run provide income generation.

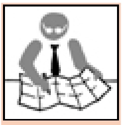
Constraints addressed

	Constraint	Treatment
financial	Technology implementation has required a major investment for imported materials, like a metal net for fencing or fuel. Most farmers could not afford themselves to buy costly inputs. Moreover such inputs were rarely available on the local market.	The INGO covered the costs of 50% of each action, here mainly higher price inputs were paid off. The low-cost approach fits the financial capacity of the target group.
institutional	Capacities of communities and local authorities to jointly plan and implement SLM activities at micro-watershed level was weak.	Knowledge improved on the complex interrelations in natural ecosystems (farmers and staff of local authorities). Project cooperation was not limited to those interested, there was inclusion of gov. structures (agriculture, land committee, ecology) commit
legal / land use and / water rights	Implementing the land tenure law and the privatisation of state farms is still a difficult process with many inconsistencies for people claiming a land title in the area.	There are a few instances where the project was able to support farmers in getting land-titles to degraded land plots which they then had to rehabilitate using SLM technologies.

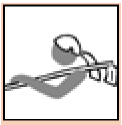
Participation and decision making

Stakeholders / target groups


SLM specialists / agricultural advisors


planners


land users, groups


land users, individual

Approach costs met by:

international non-government	50%
local community / land user(s)	0%
other	50%
Total	**100%**
Annual budget for SLM component: US$2,000-10,000	

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: national specialists, international specialists, land users

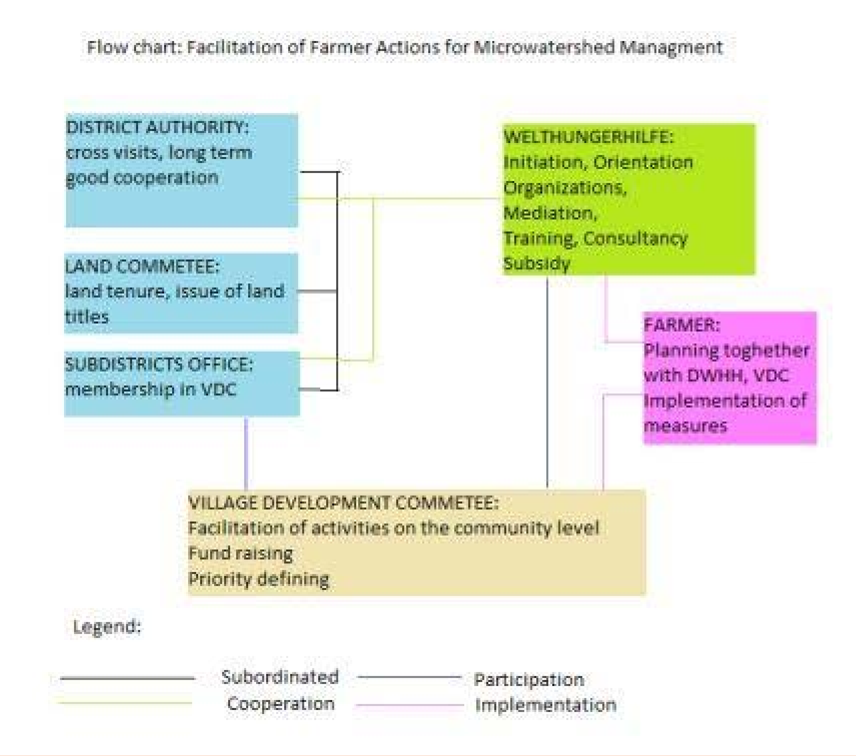
Implementing bodies: local community / land users, local government (district, county, municipality, village etc), international non-government

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Interactive	farmers meeting through VDC, orientation explaining goals, objectives, advertising in the local news paper, information boards in 6 watersheds
Planning	Interactive	on site planning with farmers
Implementation	Interactive	training on the job, material input and labour provision, cross visits
Monitoring/evaluation	Interactive	data input, open to monitoring, communication on ongoing activities, collaboration while monitoring and evaluation
Research	Interactive	collaboration in the test for Acacia seed germination on the plot

Differences between participation of men and women: Yes, little
men and women have both played an equal part in the orientation and planning sessions
men have played bigger role in the organisation of activities, in the implementation of more manual work, whereas, women took part in the lighter work and in routine maintenance.

Involvement of disadvantaged groups: Yes, little
Most of the participating households live below the poverty line.



Organogram: Flow chart depicts the major actors involved during implementation of the approach. The relationship between stakeholders and primary functions is described as well.

Technical support

Training / awareness raising:
Training provided for local land and agriculture departments, village development committee, field staff/agricultural advisor, land user
Land users: 5 men, 5 women, 30 to 50 years old, all Tajiks, all families.
Training was public meetings, demonstration areas, on-the-job
Training focused on use of the A-frame, watershed model, tree planting in contour ditches, intercropping

Advisory service:
Name: a chain of meetings with international consultants from India and Nepal
Key elements:
1. consultation on watershed concepts and watershed choice
2. capacity building in strategy design
3. draft development plan for watershed management

The consultants were : Yashvant Tkhakur, India; Jaganat Joschi, Nepal
The extension system is inadequate to ensure continuation of activities. The government branches need more development and organisation to become able to manage land conservation activities; an independent advisory service is not in place, the only potential still exists within the DWHH Project.

Research:
Yes, little research. Topics covered include technology
Mostly on station and on-farm research.
Tests were completed on the germination of Acacia seeds in two different setups: on the demo plot of the project and on the farmers plot.

External material support / subsidies

Contribution per area (state/private sector): Yes. 50% of activities were subsidised by the DWHH Project TAJ1068

Labour: Voluntary, rewarded with other material support.

Inputs:
- Construction material (stone, wood, etc) - metal net. Fully financed
- Agricultural (seeds, fertilizers, etc) - seeds, manure. Partly financed
- Equipment (machinery, tools, etc) - hand tools. Partly financed
- Infrastructure (roads, schools, etc) - school, 2 rooms thermo isolated . Partly financed
- Fuel, diesel, oil - 1/4 of the need. Partly financed

Credit: Credit was not available.

Support to local institutions: Yes, little support with training. Village development committee (VDC), use of locally available resources, focus on low cost

Monitoring and evaluation

Monitored aspects	Methods and indicators
area treated	Ad hoc observations by land users - space used for technology
economic / production	Regular measurements by project staff - fodder produced cent/ha, vegetables
socio-cultural	Ad hoc observations by project staff - labour availability, health status
technical	Ad hoc observations by project staff - tree planting
bio-physical	Ad hoc observations by project staff - soil degradation, gully formation
no. of land users involved	Ad hoc observations by project staff - monthly trends, how hardworking they were, gender
management of Approach	Ad hoc observations by land users - technology adaptation based on own experience

Changes as result of monitoring and evaluation:
There were no changes in the approach.
There were few changes in the technology. Change of the design - adjustment of the contour boundary based on experience on the plot; Adjusting of tree planting in contour ditches according to the topography

Impacts of the Approach

Improved sustainable land management: Yes, great; Most of the previous types of damage caused by water runoff were prevented. Trees grew in a landscape where they didn't before, due to long dry periods and high livestock pressure from grazing. There was a change in the farmer's attitudes, who prior to witnessing the technology were highly sceptical

Adoption by other land users / projects: Yes, some; Farmers from the neighbouring watershed, came repeatedly to observe the plot. Three of these farmers adopted the technology themselves in the following year.

Improved livelihoods / human well-being: Yes, moderate; Vegetables could be grown to supply more food to the family, a good amount of hay could be prepared for winter time, more benefits could be seen in the long run with extra fruits and fire wood

Improved situation of disadvantaged groups: Yes, little; Only four families out of five in the microwatershed were able to receive the opportunity to improve their socio-economic status in the long term as a result of the project.

Poverty alleviation: Yes, little; This was a pilot project, and only looked at poverty alleviation on a small scale. This technology has the potential to reduce poverty in the long term on a bigger scale.

Training, advisory service and research:

- Training effectiveness -

  Land users* - good

  SLM specialists - good

  Planners - fair

  Politicians / decision makers - good

  Village Development Committee - good

- Advisory service effectiveness - Increased the farmer's capacity in planning, designing and implementing conservation measures within a microwatershed. Farmers may be able to use this knowledge in other areas.

  Land users* - good

  Technicians / conservation specialists - good

- Research contributing to the approach's effectiveness - Moderately
  Tests with the germination of Acacia tree seeds could help to find the optimum conditions and solutions to problems encountered.

WOCAT

Land/water use rights:

Help - moderately in the implementation of the approach. Ongoing legislative development in land tenure and farming provides good opportunities for implementation of the approach. But, ongoing nominal farm reorganisation and corruption at the local level, together with farmers reduced awareness of their land use rights requires more effort, time and funds in the application of SLM approaches. In this situation, DWHH has a good reputation in the district administration and with locals and so this helped overcome many barriers more easily.
The approach did reduce the land/water use rights problem (moderately). The approach has added to the farmers self belief, ensured that they will effectively use existing land resources, and following the sustainable improvement of soil conditions, should add good potential for their own economic growth.

Long-term impact of subsidies:

Positive long-term impact – Moderately.
Without subsidies none of the farmers would have been able to implement the conservation measures. They need the outside assistance in order to set up such a technology.

Concluding statements

Main motivation of land users to implement SLM:

Production

Increased profit(ability), improve cost-benefit-ratio

Payments / subsidies

Reduced workload

Environmental consciousness, moral, health

Well-being and livelihoods improvement

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The approach enabled the use of both international and local knowledge. Attention was given to capacity building and sustaining the organisation, as well as the mobilisation structure (VDC) at the grass roots level. → All the knowledge experience gained from the project has to be documented and disseminated for replication.
2) The reputation of DWHH, and long term collaboration with the Baljuvon district administration played a very positive role in the successful implementation of the conservation approach. → Members of the local authority should be continuously involved in training, capacity building and planning measures.

Land users' opinion:

1) The approach to share the implementation costs, consideration of general social needs, good project communication. → More donor funding would be required to support more local farmers in the future. The approach has enabled a range of innovations that were never used before: contour lines, mulching etc.
2) The approach has helped to reveal the local problems related to technology implementation. It has helped participants to learn about the strength and potential of local land users in the implementation of the SLM approach and technology. → Lessons learned must be applied in the future implementation of SLM actions and replication.

Weaknesses and → how to overcome

Specialists' opinion:

1) The approach required a lot of funding until the majors actors were trained and had the capacity to implement the conservation measures.

Land users' opinion:

1) Sometimes the approach enabled unproductive discussions during the planning and designing phases. → Project ambitions and objectives have to be adjusted to the local situation and farmer capacity and needs.
2) Farmers were facing situations where their other social and economic needs were strongly competing with the objectives of the project. → Some additional funds, may need to be provided and more awareness of the farmer's situations need to be taken into account.

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Joint Forestry Management (JFM)

left: Local forest user gets legal contract (Photo: Anke Gaude)
right: Workshop on Joint Forces Management (Photo: Anke Gaude)

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Protection and rehabilitation of state forests based on joint long term agreements set up between the State Forestry Agency and local forest users.

Aim / objectives: In Soviet times, the Gorno Badakhshan Autonomous Region (GBAO) had been highly dependent on subsidised fuel for heating and cooking. After independence, as fuel could no longer be imported from the former Soviet Union, more pressure was exerted on the flood plain forests, leading to severe degradation of the resources through illegal felling and livestock grazing. The State Forestry Agency does not have the financial means nor adequate capacity to implement a sustainable forestry management system adapted to the changed political, socio-economic and ecological conditions. The main aim of this approach is the rehabilitation of degraded floodplain forests in collaboration with the local users. This can only be achieved, if local users can see that they will benefit from conserving and developing the forest. Also, the State Forestry Agency is supported in its restructuring and gets an opportunity to achieve the protection of the forest, and economic goals through forest products and income from the rented forest plots.
Methods: 'Joint Forestry Management' (JFM) means that governmental organisations and local users are involved in forest management on the basis of a contract with a duration of 20 years, valid under Tajik law, which defines the rights and obligations of all the parties. As a first step, and in order to ensure the protection of the plot, a fence has to be built to protect reforestation activities from livestock (see Technology TAJ366). Adequate irrigation of the forest areas is also supported. Forest tenants as well as Forestry Agency staff are also trained in sustainable forest management techniques. Progresses and challenges are regularly being monitored and technical advice is being given to forest tenants.
Stages of implementation: The implementation includes eight steps: (1) field check and meeting with village representatives, (2) information workshop, (3) general agreement with the whole community, (4) selection of tenants, (5) division of the plots, (6) signing of contracts with the individual tenants, (7) elaboration of management plans and annual plans for each tenant, and (8) monitoring of annual plans.
Role of stakeholders: The annual plan is based on a 5-year management plan for the respective plot. It determines the amount of work undertaken by the forest tenant as well as harvests and their shares to be obtained from the rented area in one year. The rental contract, the management plan, and the annual plan are mutually agreed on by the forest tenants and the Forestry Agency. Forest tenants develop a sense of ownership and responsibility for the sustainable use of forests and forest resources on their plot. The State Forestry Agency is responsible for control and technical advice.

Location: Gorno Badakhshan Autonomous Region (GBAO): Ishkashim, Roshtkala, Shugnan
Approach area: 20 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ015e
Related technology(ies): Establishment of living seabuckthorn fences for the protection of reforestation sites (QTTAJ366)
Compiled by: Roziya Kirgizbekova, GIZ
Date: 2011-02-02

Problem, objectives and constraints

Problems: Limited management and control capacities of the State Forestry Agency, combined with a sudden increasing need for firewood resulted in an uncontrolled 'open access' situation in the floodplain forests of GBAO. People were using forest resources in an unsustainable manner, including uncontrolled felling and livestock pasture. This resulted in a large scale degradation of the floodplain forest resources.

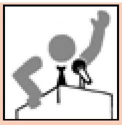
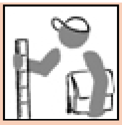
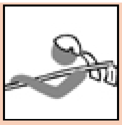
Aims/Objectives: Protection and rehabilitation of state forests based on joint long term agreements set up between the State Forestry Agency, and local forest users.

Constraints addressed

	Constraint	Treatment
other	The State Forestry Agency lacks finances and capabilities to manage forest resources.	Support of the Agency for internal reforms and the introduction of a sustainable forest management scheme (JFM).
financial	No funds available for the rehabilitation of irrigation infrastructure.	Initial set up investments co-financed by international NGOs (GIZ).
institutional	No organisational structures for overall local management of rented state forests in place, including conflict solving mechanisms between stakeholders from different administrative levels.	Establishment of Joint Forest Management council at local level.
legal / land use and / water rights	User rights for state forest were exclusively with the State Forestry Agency. Locals used the forests illegally.	Contracts with individual tenants providing them with long-term user rights and responsibilities.
workload	After the collapse of the Soviet Union, the Forestry Agency had insufficient financial and human resources to manage the state forests.	Responsibilities and workload are shared with the local population.

Participation and decision making

Stakeholders / target groups

			
politicians / decision makers	SLM specialists / agricultural advisors	land users, individual	land users, groups

Approach costs met by:

local community / land user(s)	10%
government	10%
international	80%
Total	**100%**
Annual budget for SLM component: US$10,000-100,000	

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: national specialists, international specialists

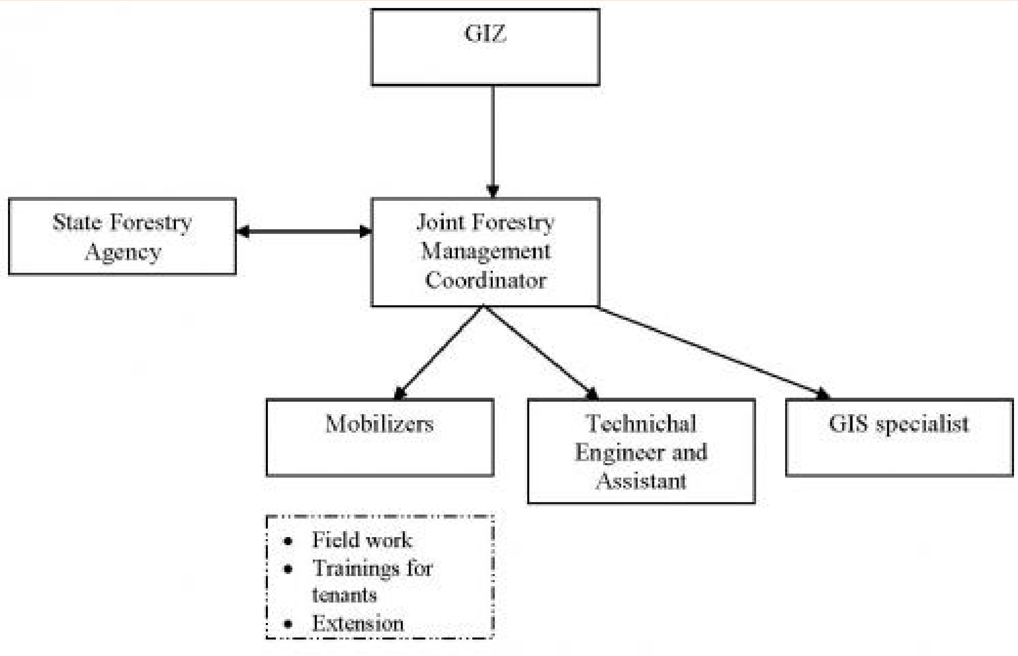
Implementing bodies: international non-government, local government (district, county, municipality, village etc), government, local community / land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Interactive	Field visits, talks with village representatives, information seminar for the whole community.
Planning	Interactive	5-year Management Plans and 1-year Annual Plans are developed for each forest plot, jointly by the land users and State Forestry Agency staff.
Implementation	Interactive	Live fence construction, irrigation rehabilitation, sharing of harvest.
Monitoring/evaluation	Interactive	Completed via the close cooperation between the State Forestry Agency and GIZ, using interviews completed by project mobilisers, as well as monitoring of annual achievements.

Differences between participation of men and women: No

Involvement of disadvantaged groups: Yes, moderate
Women and men, rich and poor are involved equally.



Organogram: Organisational chart shows how the project staff work with the State Forestry Agency.

Technical support

Training / awareness raising:
Training provided for field staff/agricultural advisor, land user
At first, so called 'community mobilisers' were trained, who further provided training for forest users.
Training was courses, public meetings, demonstration areas, on-the-job
Training focused on Sustainable natural resources management, technical forestry knowledge (planting, thinning) and elaboration of management plans.

Advisory service:
Name: Forestry training for tenants and forestry staff
Key elements:
1. Sustainable natural resource management and use
2. Technical training in forestry management (planting and harvesting, fencing etc.)

The extension system is quite adequate to ensure continuation of activities. Government saw the good results gained from the Joint Forest Management approach, and is interested in continuing this approach.

Research:
No research.

External material support / subsidies

Contribution per area (state/private sector): No.

Labour: Voluntary, rewarded with other material support.

Inputs:
- Infrastructure (roads, schools, etc) - Rehabilitation of some irrigation infrastructure . Fully financed
- Equipment (machinery, tools, etc) - Provision of excavator. Fully financed

Credit:

Support to local institutions: Yes, great support with training, financial
The State Forestry Agency's building was renovated and computers were provided for the Agency. Mobilisers were trained to conduct advisory services. Transport for field works was provided. The State Forestry Agency is being supported in its restructuring towards becoming a sustainable institution

Monitoring and evaluation

Monitored aspects	Methods and indicators
area treated	Regular observations by - GIS and data base systems were established
no. of land users involved	Ad hoc observations by project staff - based on the number of contracts, registered in data base
area treated	Regular measurements by project staff - GIS and data base systems were established
bio-physical	Regular observations by project staff - annual monitoring (autumn)
no. of land users involved	Ad hoc measurements by project staff - based on the number of contracts
management of Approach	Regular observations by project staff - regular planning, reporting and evaluation

Changes as result of monitoring and evaluation:
There were several changes in the approach. Regular adaptation of the approach after evaluation and analysis of field work results and occurring challenges.
There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, great; The vegetation cover of the forest plots under JFM was improved through better protection and planting. No open access to forests was allowed, which prevents illegal and uncontrolled use of forest resources.

Adoption by other land users / projects: No

Improved livelihoods / human well-being: Yes, moderate; As a result of better protection and rehabilitation, people can legally sell the surplus of harvested firewood, non-timber forest products etc., which adds to their family's income.

Poverty alleviation: Yes, little; Good sites allow for immediate sale and own consumption of fire wood and non-timber forest products. Heavily degraded sites will produce income in about 5 years after rehabilitation and maintenance.

Training, advisory service and research:

- Training effectiveness - It is important that the mobilisers are well trained, considering that they are present in the field to support the forest users in protecting and managing their forest plots. They also train the forest tenants and local foresters in the field, according to the training they received.

  Agricultural advisor / trainers - excellent

  SLM specialists - good

  Land users* - good

- Advisory service effectiveness - Based on their training, the mobilisers and forestry staff give advice to the forest tenants, to consider sustainable amounts to harvest, forestry techniques etc. This advisory service is crucial for the approach, as sustainable management cannot be guaranteed without it. So far this advisory service was very successful, but has to be continued and monitored regularly.

  Land users* - good

  Technicians / conservation specialists - good

- Research contributing to the approach's effectiveness

Land/water use rights: Hinder - greatly in the implementation of the approach.
The forest land is in State property, the State Forestry Agency has exclusive user rights, however open access leads to uncontrolled use of forest resources by the local people. Restricting access can help create clear regulations, but these are not always accepted by villagers who prefer illegal open access to natural resources.
The approach did reduce the land/water use rights problem (greatly). User rights are clearly assigned according to the law of the Republic of Tajikistan. Tenants and local people developed a sense of ownership and responsibility for the sustainable use of forests and forest resources.

Concluding statements

Main motivation of land users to implement SLM:

Rules and regulations (fines) / enforcement - Contract based legal access to forest

Well-being and livelihoods improvement - Possibility to have revenues from selling forest products (and products for own consumption)

Production - Firewood

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Improved forest protection and management → Forest users have a sense of ownership and responsibility for the sustainable use of forests and forest resources. Close collaboration of the Forestry Agency with the forest tenants will be crucial.
2) Benefit through legal access to forest products (firewood, construction, wood, fruits. etc) → Contract guarantees user rights for 20 years. Good management assured through regular advice and monitoring by the Forestry Agency (twice a year in spring and autumn).

Land users' opinion:

1) Trusting Forestry Agency → Follow the rules established in the contracts and management plans.
2) Benefit through legal access to forest products (firewood, construction, wood, fruits, etc).

Weaknesses and → how to overcome

Specialists' opinion:

1) Financing of the approach without project (INGO) support is not possible → In the future, by increasing the productivity of the forest areas, more finances can possibly be made available to forest users and the forest department.

Land users' opinion:

1) At the beginning of the project, benefits seen to be gained from the forest are not high (especially wood) → Planting of fast growing bushes and trees, perennial, fodder crops.

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Village school participation and involvement

Tajikistan - Welthungerhilfe

A competitive tendering process for project grant money to implement identified SLM practices within a community, and on completion of the implementation activities the village school will be assigned ownership and responsibility for the maintenance and sustainability.

Aim / objectives: The objective of the approach is to find a mechanism by which you can involve large sections of the community, allocate land for the communities benefit, provide a mechanism for long term maintenance, and establish a demonstration area for cross site visits and educational training.

Methods: Several methods were employed to implement the approach, these included community and local government workshops, seminars on proposal writing followed by subsequent proposal development in conjunction with local experts and community mobilization. The project staff used the approach to train active community members on suitable land management practices that would benefit identified degraded lands and develop sustainable competitive proposals to be reviewed by a selection panel. The community was encouraged to provide substantial input into the funding of their proposed project if they wanted to be successful. A predetermined condition was set on awarded grants that the degraded land had to be officially allocated to the school for a twenty year period.

Stages of implementation: The INGO Welthungerhilfe announced a competition amongst the local communities in targeted region to submit project proposals for addressing community environmental problems. The local government were involved from the outset, were encouraged to help suggest communities that should compete. The communities were provided with workshops on how to develop sustainable land management proposals with support from local agronomists. The proposals had to outline the commitment of the community, the area of land to be re-established and how, and finally the level of community contribution towards the project. The terms of the competition dictated that the area of rejuvenated land would be officially signed over to the school for a period of twenty year and the school community would thereby be responsible for the maintenance and upkeep of the land and entitled to invest any profits back into the school, hence indirectly supporting many families in the community. The projects were selected based on a predetermined criterion and the winning projects received part funding in the form of fuel, machinery, fencing etc up to 50% of the final costs. The people were mobilized to implement the project though community days of action known as a ‘Hashar’ and on completion the school assumed responsibility for the plot of land.

Role of stakeholders: Although the approach is project driven it required buy in from the local authorities, and the heads of collective dehkan farms who dedicate land use right to village schools, however it was the school community that had to be the real driving force to see the proposal developed into a tangible outcome.

left: School teachers establishing and testing different barriers in gulley to plug (Photo: Daler Domullojonov)

Location: Tajikistan / Khatlon, Khovaling / Dorobi
Approach area: 0.017 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ022e
Related technology(ies): gulley plugging (QTTAJ356)
Compiled by: Daler Domullojonov
Date: 2011-04-09

Problem, objectives and constraints

Problems

Poor land management practices compounded by a lack of knowledge and funds that have resulted in continued land degradation and loss of fertility.

Aims/Objectives

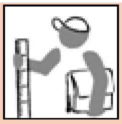
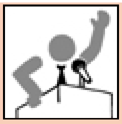
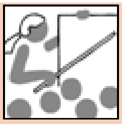
Environmental restoration by community involvement to prevent soil erosion, gulley expansion and land degradation; to convert barren land to agroforestry system. To create capacity of villagers and young generation to protect environment and effective use of locally available natural resources.

Constraints addressed

	Constraint	Treatment
workload	There is extensive work required in the successful implementation and maintenance of the chosen technologies.	The plot was divided into 3 parts to assign specific responsibilities.
technical	There is a lack of technical knowledge within the community.	A series of cross visits and practical trainings were organized by the project to neighboring communities.
financial	limited availability of funds	Project provided support funding to match contributions provided by the community.
legal / land use and / water rights	There were no formal documented land user rights on the land selected for the implementation of technologies.	Before the implementation started the plot of land was officially assigned to the school for a period of 20 years.

Participation and decision making

Stakeholders / target groups

			
SLM specialists / agricultural advisors	land users, groups	politicians / decision makers	teachers / school children / students

Approach costs met by:

local community / land user(s)	60%
international non-government	40%
Total	**100%**
Annual budget for SLM component: US$2,000-10,000	

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: international specialists, national specialists

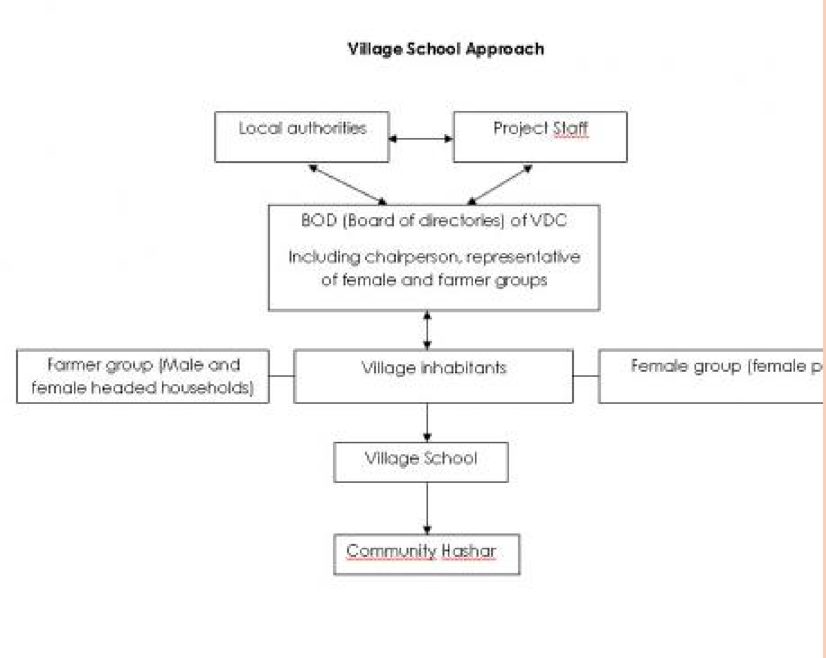
Implementing bodies: local community / land users, local government (district, county, municipality, village etc), international non-government

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Self-mobilization	community members leading by teacher presented project proposal to receive support of project realization to WHH project
Planning	Interactive	teachers together with project staff look through and updated plan
Implementation	Interactive	in the beginning it was really good and active labor and in-kind contribution of activity, once additionally in cash contribution was required teacher continued alone
Monitoring/evaluation	Payment/external support	joint (project staff and villagers) monitoring of activities were realized during activities implementation and finalizing
Research	None	

Differences between participation of men and women: Yes, great. Mainly heavy activities like organic fertilizers carry, ploughing and planting was carried by males. Women supported with feeding of workers.

Involvement of disadvantaged groups: Yes, moderate. All interested community members were involved in all stages of activities implementation and final beneficiary of action is school.



Organogram: The organizational set up instigated by the project staff with the involvement of the local authorities resulting in a community day of action for implementation of the technologies.

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor
To approach provided training on proposal writing and during the technology implementation stage on basic soil c conservation techniques.
Training was public meetings, demonstration areas, site visits / farmer to farmer, on-the-job
Training focused on Proposal writing, soil conservation techniques and cross site visits.

Advisory service: The extension system is quite adequate to ensure continuation of activities. Heads of Jamoat (sub district), collective dehkan farm and village

Research: No research was conducted under the approach.

External material support / subsidies

Contribution per area (state/private sector): Yes. In the implementation EC TACIS financed the Welthungerhilfe project support in form of materials and seeds

Labour: Voluntary. The village organized a “hashar” i.e. a community action day.

Inputs:
- Agricultural (seeds, fertilizers, etc) - seedlings, seeds, fencing material, fuel. Partly financed
- Logistics - initial discussion groups and trainings. Partly financed

Credit: Credit was not available.

Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
area treated	Regular observations by project staff - covered area
no. of land users involved	Ad hoc observations by land users -
technical	Regular observations by land users - progress of used techniques
management of Approach	Ad hoc observations by project staff -

Changes as result of monitoring and evaluation: There were no changes in the approach. There were few changes in the technology. Check dams with plastic sacks were covered after observing short durability, The size of contour trenches were adjusted after rainy season, additionally to rain water harvesting pounds establishment of conservation pound was added upstream.

Impacts of the Approach

Improved sustainable land management: Yes, great; First of all the approach was discussed with all community members.

Adoption by other land users / projects: Yes, some; The approach was implemented in another 15 communities.

Improved livelihoods / human well-being: Yes, moderate; It was good example of integration low cost soil and water conservation measures to restore existing problems instead of complaining about lack of funds and extra support.

Improved situation of disadvantaged groups: Yes, little; The project was focused on providing for the community schools.

Poverty alleviation: Yes, moderate; non productive land was converted to agro forest, and for the future a well managed orchard can provide substantial support to the school.

Training, advisory service and research:

- Training effectiveness - Based on gained knowledge practical activities were undertaken in private and community land. Capacity of project local staff was built.

Agricultural advisor / trainers - good

Land users* - good

Teachers - good

Land/water use rights: Help - greatly in the implementation of the approach. The state was very supportive of the allocation of land to the schools. The approach did not at all reduce the land/water use rights problem.

Long-term impact of subsidies: Positive long-term impact – Greatly. Negative long-term impact – None. Land use changed, instead of highly degraded barren area an orchard was established. First it can profit school with fruits, fodder and fuel i.e additional income, whilst used as a source of education for land users.

Concluding statements

Main motivation of land users to implement SLM:

Prestige / social pressure - can be proud of their achievements among other schools

Payments / subsidies - to get support for address environmental problem

Increased profit(ability), improve cost-benefit-ratio - to convert non profitable land to orchard

Well-being and livelihoods improvement - to support school

Sustainability of activities:

It is uncertain whether the land users will be able to sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) A major problem was to connect the land tenure with the final beneficiaries within the community. This issue was solved through handing over all rights to village school. → The approach may benefit from the involvement of legal land specialist.
2) It is a low cost, holistic, approach involving all community through village school. → It could be further enhanced with extra support of local authorities
3) The approach provides a source of income for the school and provides a place of learning for the children. → Further sites with different SLM practices could be developed into school demonstration plots.

Land users' opinion:

1) Additional income source for school budget. → Pupils could be taught how to optimize the use of the land.
2) Improvement in the quality of land and has reduced the risk from natural disasters. → The technologies could be adapted as the land improves in the future.

Weaknesses and → how to overcome

Specialists' opinion:

1) In the beginning the school did not benefit too much. → Additional crops can be planted
2) It required continuously cultivation activities in the beginning. The community became tired of volunteering after several days. → Responsible person /s has to be in charge to mobilize the people

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Tugai forest management through village committees

Tajikistan - Central Asian Countries Initiative for Sustainable Land Management (CACILM)

left: Village committee representative in his plot of Tugai forest (Photo: Julie Zähringer)
right: Riparian Tugai Forest Ecosystem (Photo: Julie Zähringer)

Location: Khatlon, Nuri Vakhsh Jamoat
Approach area: 1.26 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ025e
Related technology(ies): not documented
Compiled by: Firdavs Faizulloev
Date: 2011-04-27

The described approach facilitates the establishment of contracts between village committees and local authorities for decentralised management of Tugai forest areas on State Reserve Land.

Aim / objectives: Tugai forests are riparian forest ecosystems situated in the continental, deserts of Central Asia. These flood plain forests are severely threatened by overexploitation for fire wood and by overgrazing. The 253 ha of Tugai forest in Nuri Vakhsh Jamoat along the Vakhsh river in southern Tajikstan were suffering due to their de facto status as open access resources. The district environmental department that was supposed to monitor the forest was unable to effectively carry out this work. Therefore the UNDP project on "Demonstrating Local Responses to Combating Land Degradation and Improving Sustainable Land Management in SW Tajikistan" saw the protection of this Tugai forest as a priority and an opportunity to engage local land users to help protect the forest.
Methods: UNDP project representatives held discussions with forest users living in villages next to the Tugai forests, regarding the establishment of community-based forest management institutions. UNDP proposed that these institutions enter into agreement with the Hukumat (local district-level government) to protect and exclusively use well defined forest areas on nearby State Reserve Land.
Stages of implementation: As a first step, UNDP obtained permission from the Hukumat to conduct sanitary felling of dry and infected trees, to help improve the forest structure under supervision of the Jamoat (local municipality-level government). The removed tree material was distributed to schools and hospitals as fire wood. Next, a leasehold agreement was formed between a representative of each of the three village committees and the Hukumat. These leasehold agreements covered a total of 126 ha out of 253 ha of Tugai forest existing in the area and they are valid for five years. The remaining forest area, which is not under an agreement, is not threatened as it is situated on an island in the middle of a strong stream that cannot be crossed. The committee has to pay about or 1.73 USD / ha (per year) of leased forest land as a tax to the district. The tax paid is collected from contributions by members of the villages who pay for each head of cattle (big cattle and goats are prohibited) that they send for grazing at a cost of 1 USD / head of cattle, per month. The area is used for grazing purposes only 3-4 months per year.
Role of stakeholders: The village committees are headed by one representative who is responsible for regulating access to the forest plots. The local Jamoat supervises the activities carried out by the village committees on their respective plots. UNDP provides consulting services for the process of establishing contracts between village committees and the local authorities and is carrying out regular monitoring of the forest management activities.

Problem, objectives and constraints

Problems

uncontrolled access and degradation of Tugai forest, overgrazing, cutting of trees, no firewood resources available

Aims/Objectives

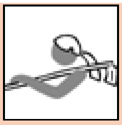
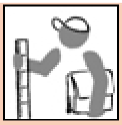
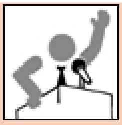
The main aim of the approach is to help prevent the degradation of Tugai forest, and the disappearance of this threatened ecosystem, while giving the local population the chance to manage and use it in a sustainable way.

Constraints addressed

	Constraint	Treatment
technical	overgrazing and overexploitation of Tugai forest for firewood	the forest leasehold agreement defines that no cutting of trees is allowed during the first 5 years, apart from sanitary felling, and grazing is limited to a certain number of cattle
legal / land use and / water rights	no defined forest use or management rights and responsibilities	user agreement between village committees and district administration
institutional	no implementation of control and punishment measures regarding the overexploitation of Tugai forest	clearly defined rights and responsibilities for forest users and village and local government institutions
social / cultural / religious	lack of local level structures enabling collaboration between village organisations and Jamoat or Hukumat	UNDP assistance and consulting to improve collaboration and enabling the establishment of leasehold agreements

Participation and decision making

Stakeholders / target groups

			
land users, groups	land users, individual	SLM specialists / agricultural advisors	politicians / decision makers

Approach costs met by:

international	100%
Total	**100%**

Annual budget for SLM component: US$

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: international specialists

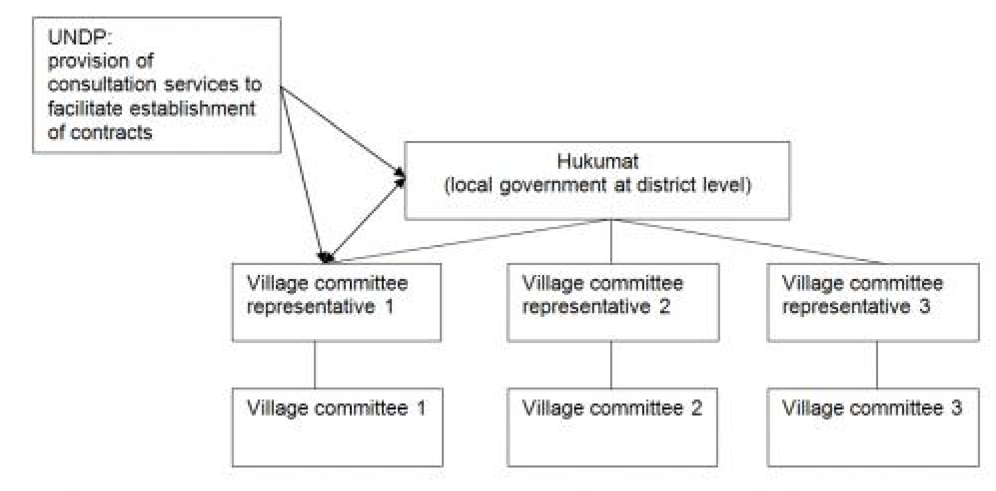
Implementing bodies: international

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	Consultants from UNDP initiated the approach and started discussions with villages next to the forest
Planning	None	
Implementation	Interactive	establishment of village committees, managing access for livestock herders
Monitoring/evaluation	None	monthly monitoring through UNDP consultant
Research	None	

Differences between participation of men and women: Yes, moderate. Village committees were all represented by men.

Involvement of disadvantaged groups: No



Organogram: UNDP facilitates the process of establishing contracts between village organisations and the Hukumat for decentralised forest management and supports the committee on development of Annual Tugai Forest Management Plan.

Technical support

Training / awareness raising:
Training provided for land user
Training was public meetings
Training focused on forest conservation, sustainable grazing management, sanitary cutting

Advisory service:
The extension system is quite adequate to ensure continuation of activities. The forest leasehold agreements were established for a duration of 5 years. After this, the Hukumat should be in an adequate position to renew or adjust those agreements if necessary.

Research:
Yes, little research. Topics covered include ecology
Studies about presence of plant and bird species

External material support / subsidies

Contribution per area (state/private sector): No.

Labour: Voluntary.

Inputs:
- Agricultural (seeds, fertilizers, etc) - seeds for riverbank afforestation. Fully financed.
- Costs associated with training and meetings - . Fully financed.

Credit: Credit was not available.

Support to local institutions: Yes, moderate support with training for Jamoat.

Monitoring and evaluation

Monitored aspects	Methods and indicators
bio-physical	Regular measurements by project staff - plant and bird species, number of cases connected with illegal cutting of trees
bio-physical	Regular observations by project staff - visual assessment of rehabilitation of grass, bushes and trees, number of wild animals and birds

Changes as result of monitoring and evaluation: There were no changes in the approach. There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, great; protection of biodiversity, improved fodder availability.

Adoption by other land users / projects: No; the experience has not yet been disseminated.

Improved livelihoods / human well-being: Yes, moderate; improved pasture quality within the forest plots and high aesthetic value of the forest.

Improved situation of disadvantaged groups: No

Poverty alleviation: No

Training, advisory service and research:

- Training effectiveness - The topics of forest conservation, sustainable grazing management and sanitary felling of trees were covered.

  Land users* - good

- Advisory service effectiveness

  Land users* - good

- Research contributing to the approach's effectiveness - Moderately

Land/water use rights:

Help - moderately in the implementation of the approach. As the land is classified as State Reserve Land, and is under the control of the forestry department within the Hukumat, the establishment of an agreement between village organisations and the Hukumat was possible.

Concluding statements

Main motivation of land users to implement SLM:

Aesthetic

Well-being and livelihoods improvement

Environmental consciousness, moral, health

Rules and regulations (fines) / enforcement

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Protection of a highly endangered ecosystem, while allowing for improvement of grazing for local herders.
2) Protection of plant and animal diversity.
3) Increasing the capacity of the community on legal issues.

Land users' opinion:

1) Aesthetic value of the beauty of this landscape - quote from land user responsible for a 41 ha forest plot 'Every morning when I open the window and I see the beautiful landscape of the Tugai forest I feel happy'.

Weaknesses and → how to overcome

Land users' opinion:

1) No tenure security as the government could sell off the land at any time. → Issue land user certificates.

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left: Workshop on Energy Efficiency Use and Cooking Stove Modification (Photo: Odinashoev, Sa)
right: Women weighing the amount of wood that was saved after the modification of cooking stove. (Photo: Odinashoev, Sa)

Implementation through the government's Women's Affair Officers

Tajikistan – CARITAS Switzerland

The use of the government appointed District Womens Affair Officer to mobilise women throughout the community to implement technologies.

Location: Khatlon, Muminabad
Approach area: < 0.1 km^2
Type of Approach: other (specify): governmental
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ038e
Related technology(ies): not documented
Compiled by: Sa'dy Odinashoev
Date: 2011-05-07

Aim / objectives: The aim of the approach was to empower women through support from the government's Women's Affairs Officer (WAO), to implement low cost energy efficient technologies within individual households. Women being the primary users of energy within the household, can become the main agents for change in applying more efficient methods to the use of natural resources to meet their cooking, heating and energy needs. Therefore, reducing fuel costs, and dependence upon local natural resources. The district local government employs a WAO, who is the government representative for women's issues in the district. Once the WAO became supportive of the idea, she was able to engage the Women's Affairs Officers at the Jamoat level.
Methods: This approach is fundamentally a training pyramid approach. An expert conducted a series of training sessions to interested women on the details of the technology. The training involves demonstrations of the technology, it's benefits, information on how to purchase or make the material required, and how to implement the technology. The first session is a 'Training of Trainers'. The participants are then provided with training materials, and are invited to replicate the training in their own community. The process is continuously repeated, subsequently broadening the target audience. Zamzam, the local women's association of the district helped suggest potential community candidates for trainers, and provided practical training sessions on energy efficiency measures through the TOT.
Stages of implementation: The implementation of the project started with an inception meeting with the District Women's Affairs Officer to sell the idea, and to gain the local government's support. Once she was supportive of the idea, a district level meeting was held with all the Women's Affairs Officers at the local level (i.e. Jamoat) and two women representatives from each Jamoat. At this meeting the ladies were introduced to the technology i.e. cooking stove modification and heat exchangers. The meeting further discussed on how each Jamoat would receive training, and what training materials were to be distributed to the communities. The meeting enabled issues with the technology, logistics, monitoring and overall set up of the approach to be discussed. Afterwards an expert trained a group of women from each Jamoat on the technology and provided them with materials so that the training could be repeated within their own communities.
Role of stakeholders: This is a women's led approach, the Women's' representative within the government, who are also Women's association members, were responsible for organisation of the trainers, logistics and government documentation support. With support from Zamzam, the active women in the community were selected as trainers to receive training from the experts and provide subsequent outreach training to their communities.

Problem, objectives and constraints

Problems

The average household in the Muminabad area uses several tones of tapak (dung and straw mix) and firewood each year for cooking, baking and heating. This puts excessive strain on the local natural resources, and significantly reduces the amount of organic fertiliser used in land management, as well as the removal of tree and shrubs that stabilise the land and help prevent erosion from wind, surface water runoff and livestock grazing.

Aims/Objectives

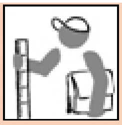
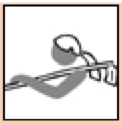
The aim of the approach was to mobilise the women within the community through the use of the government appointed District Women's Affairs Officer. Once the government appointee was engaged in the promotion of the technology, she was able to use her position to mobilise the Women's Representative at the local government level (Jamoat), and subsequently women's representatives within each village level. The approach exploits the existing government's women's network to empower women to implement technologies, whilst also gaining government support and assistance.

Constraints addressed

	Constraint	Treatment
institutional	The women have been using the same style of outdoor cooking stove for many years and did not consider or were open to changing the design.	A group workshop created an open environment in which the women could think about their energy use, their cooking equipment and discuss potential changes.
financial	At the beginning women did not know that modification of the cooking stoves were not expensive, and were initially not interested in learning about the adaptation.	Demonstration of the technology and explanation of the costs.

Participation and decision making

Stakeholders / target groups

 SLM specialists / agricultural advisors	 land users, groups	 land users, individual

Approach costs met by:

government	10%
international non-government	90%
Total	**100%**
Annual budget for SLM component: US$2,000-10,000	

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: national specialists, international specialists, land users

Implementing bodies: local community / land users, local government (district, county, municipality, village etc), international non-government

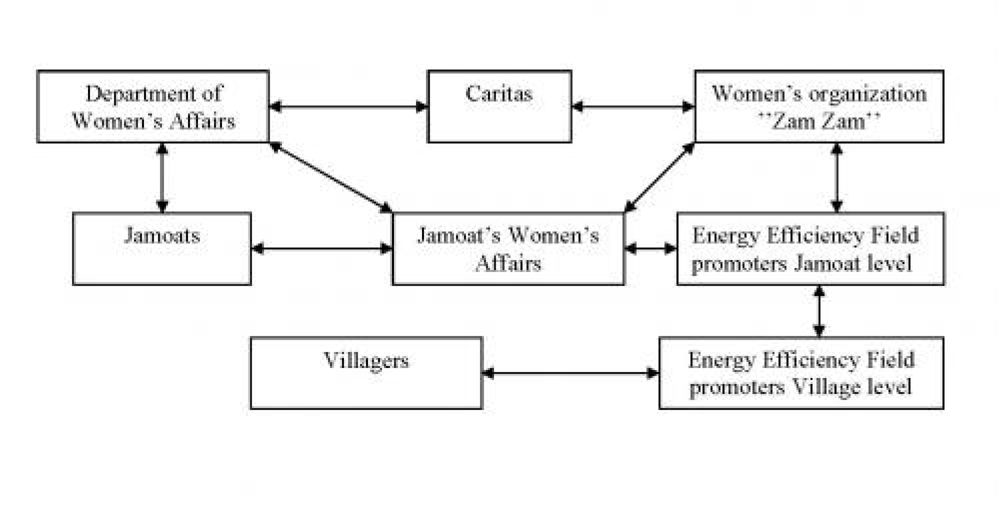
Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Self-mobilisation	It was members of the local community that thought of the idea and approached the governments Women's Affair Officer.
Planning	Interactive	The local stakeholders organised an initial meeting to plan the implementation of the approach.
Implementation	Self-mobilisation	Implementation was entirely through the local community, including government representatives at district and local level.
Monitoring/evaluation	Payment/external support	This was undertaken by the donor and at the district level.

Research	None

Differences between participation of men and women: Yes, great
The entire approach was developed to engage women, as they would be the ones that would benefit most from the technology.

Involvement of disadvantaged groups: Yes, great
Many women in Tajikistan are left to run the households due to the mass labour migration of the working age, able bodied men in the community.



Organogram: An organisational chart showing how all the organisations worked together on the project.

Technical support

Training / awareness raising:
Training provided for Women's groups, field staff/agricultural advisor
The project personnel provided the initial training to the women, who in turn then trained within their own communities.
Training was demonstration areas, site visits / farmer to farmer
Training focused on The training was on energy efficiency measures, and how to reduce the amount of organic material used as fuel.

Advisory service: The extension system is totally inadequate to ensure continuation of activities.

External material support / subsidies

Contribution per area (state/private sector): Yes. The state provided personnel support and facilities for meetings.

Labour: Voluntary.

Inputs:
- Equipment (machinery, tools, etc) - metal door. Partly financed
- Transport cost - fuel, taxi, Fully financed

Support to local institutions: Yes, great support with training
Local NGO Zamzam, a women's network, was used to conduct the training.

Monitoring and evaluation

Monitored aspects	Methods and indicators
no. of land users involved	Regular measurements by project staff - The number of women that received training was monitored.
no. of land users involved	Regular observations by project staff - The quality of the training was observed.

Changes as result of monitoring and evaluation: There were no changes in the approach. There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, little; The approach helped raise awareness on how to reduce the amount of organic material needed to meet the domestic fuel needs, and the saved material could be used as organic fertiliser.

Adoption by other land users / projects: No;

Improved livelihoods / human well-being: Yes, moderate; The associated technology helped reduce smoke in the kitchens and a reduction in the amount of time, resources and finance that was spent on household fuel.

Improved situation of disadvantaged groups: Yes, moderate; It improved the cooking conditions of women, and reduced their workload in the collation of natural resources to meet the household fuel needs.

Poverty alleviation: Yes, little; It helped reduce the amount of money spent on fuel and helped preserve natural resources.

Training, advisory service and research:

- Training effectiveness - The training was targeted to the key beneficiaries who could implement the technology. It provided them with the main materials, and provided them with practical demonstrations to assist with implementation.

  Land users* - excellent

  Agricultural advisor / trainers - excellent

Land/water use rights:

None of the above in the implementation of the approach.
The approach did not at all reduce the land/water use rights problem.

Long-term impact of subsidies:

Positive long-term impact - None
Negative long-term impact - None

Concluding statements

Main motivation of land users to implement SLM:

Well-being and livelihoods improvement - Hopefully improvement in health from less smoke, less money spent on fuel and less workload.

Environmental consciousness, moral, health - Reducing the amount of smoke in the outdoor kitchen.

Reduced workload - The associated technologies helped reduce workload.

Affiliation to movement / project / group / networks - To a degree there was empowerment of women.

Prestige / social pressure - The approach tried to include as many women as possible, the social pressure to participate grew.

Increased profit(ability), improve cost-benefit-ratio - Reduce money spent on fuel.

Rules and regulations (fines) / enforcement - The endorsement by the district government helped influence adoption rates.

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The approach is easy to replicate and has the potential to reach many beneficiaries. → It could be replicated in other areas and regions.
2) The approach incorporates government support. → It may mean that further approaches and endorsements will have government support and generate further interest from the authorities.
3) The approach is designed specifically for the target beneficiaries. → Other technologies that specifically benefit women could adopt this approach.

Land users' opinion:

1) It is easy to train a group of women, it is much harder to train men. → The women could benefit from further instructions on how to train.

Weaknesses and → how to overcome

Specialists' opinion:

1) Because the approach is specifically for women it could limit the uptake by men. → Maybe subsequent training sessions could be held for men.
2) Some of the poorer households were not in a position to contribute to buying the materials or to implement the technology. This, therefore, excluded the poorest in the community. → Other members of the community could provide support. It should be noted that any contribution no matter how small puts a financial worth on the technology.

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Livestock Committee at Village Level

Tajikistan – CARITAS Switzerland

Livestock committees were established with the goal to improve livestock health as well as natural resource management in the watersheds where the village pastures were situated. Livestock committees in the Muminabad district are organised at village level and coordinate their activities through the registered livestock association at district level.

Aim / objectives: This approach applied by Caritas Switzerland, aimed to improve natural resource management in the watersheds through an organised effort of livestock owners. It encourages preventive measures against soil erosion by providing incentives for beneficiaries at community level. The process is managed by the livestock committees, who represent the animal owners at village level. The committees are responsible for organising livestock owners and managing the village pastures by applying rotational grazing principles, establishment of water points and rest places, ensuring safe paths for animals and easy access to pasture lands.

Stages of implementation: The project encompasses the following steps: 1) Competitive call for project proposals to improve livestock and pasture management through villager's efforts, 2) Expression of interest from community members to participate in the competition, 3) Development of project proposals from villagers with assistance of technical staff from the implementing agency (Caritas), 4) Selection and notification of winners, confirmation of village funding commitments, 5) A village general meeting for the inception of project and laying the foundation for the livestock committee, 6) Formalisation of partnership agreement with donor (signed agreements for project implementation), 7) Project implementation transfer into livestock committee's responsibility, 8) Technical assistance through training and workshops, monitored by the implementing agency (Caritas), 9) Strengthening of the livestock committee as a community based organisation, 10) follow up and continued activity of livestock committee through other projects and self organised activities among livestock owners.

Role of stakeholders: Various locals and village members are essential is assisting with the success of the project; The religious head (mullah) acts as a promoter of idea and mobilises the community through developing villager's interest; the village informal leader (vakil), helps to coordinate the activities; local organisations assist in informing and bringing people together for the meetings. The livestock committee consists of five members, including the appointed head shepherd. This has proven to be an effective size group. The main tasks of this committee include; mapping the pasture lands, organising rotational schemes, informing and training livestock owners of methods to improving pasture grazing, keeping villagers informed, establishing and collecting membership fees, keeping the accounts for the organisation, and application of funds (own or donor's), develop new ideas and project proposals for further land improvement projects.

The villagers are responsible for the labour contribution during the construction of water points or paths/roads. They pay membership fees, which cover the shepherd's salary and the committee's activities. They are kept informed of pasture grazing schemes, and control the performance of the committee.

left: Practical workshop on rotational grazing in the pasture. (Photo: Sa'dy Odinashoev)

Location: Khatlon, Muminabad
Approach area: 93 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ013e
Related technology(ies): Rotational grazing supported by additional water points (QTTAJ100)
Compiled by: Sa'dy Odinashoev
Date: 2010-12-23

Problem, objectives and constraints

Problems

Implementation of pasture projects and their sustainability. Little awareness and capacity in the field of sustainable pasture management among villagers, which hampers implementation of pasture projects.

Aims/Objectives

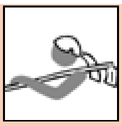
To implement a responsible body to manage the common pasture land in the village, and improve conditions for livestock husbandry.

Constraints addressed

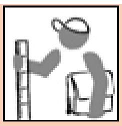
	Constraint	Treatment
institutional	no formal organisation for management of the common pasture land at the village level	village livestock committees
financial	no funds available to pay a herder	monthly contributions from the villagers
social / cultural / religious	hierarchical society, individual villagers wait for the religious or governmental leader to make decisions	Livestock committee to coordinate with the leaders of the society
workload	pasture improvement projects are too large for single people or families	joint effort of the whole village
technical	limited access to technical knowledge regarding the setup of a water distribution system	technical advice provided by specialists from Caritas Switzerland
legal / land use and / water rights	unclear situation with regard to water use rights	village negotiations are facilitated by Caritas Switzerland and the livestock committee

Participation and decision making

Stakeholders / target groups



land users, individual



SLM specialists / agricultural advisors

Approach costs met by:

international	80%
local community / land user(s)	20%
Total	**100%**

Annual budget for SLM component: US$2,000-10,000

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: international specialists

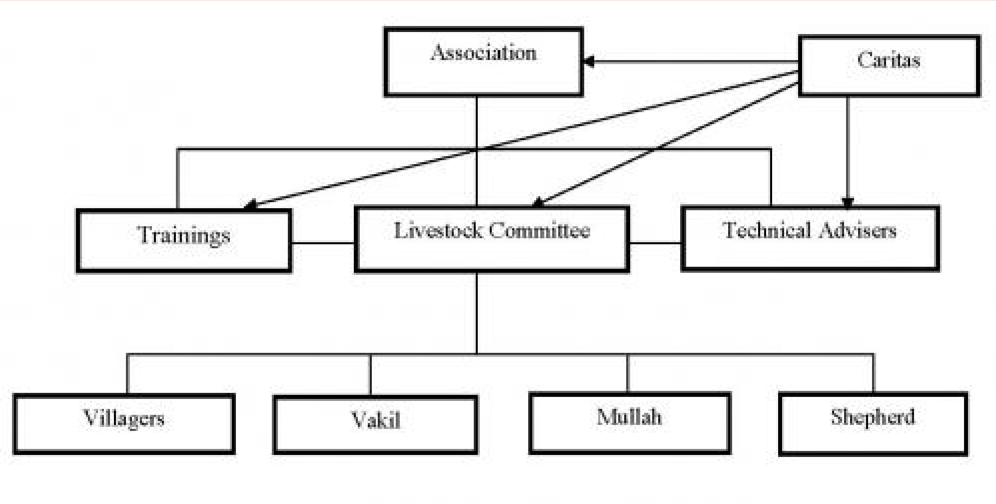
Implementing bodies: local community / land users, international non-government

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Interactive	Projects are elaborated by villagers with support of an international NGO
Planning	Interactive	Village meetings, district meetings and proposal presentations
Implementation	Payment/external support	Cost sharing is from 80:20 up to 50:50. The village contributes the work force, stones and seedlings. Pipes and knowledge are provided externally.
Monitoring/evaluation	Interactive	Members of the livestock committee and international NGOs
Research	None	

Differences between participation of men and women: Yes, little
different functions within the livestock committee are typically carried out by women or by men

Involvement of disadvantaged groups: Yes, moderate
everybody can participate, disadvantaged groups have equal access



Organogram: This organisational chart shows how the approach works at village level.

Technical support

Training / awareness raising:
Training provided for land user
Training was site visits / farmer to farmer, demonstration areas, public meetings
Training focused on Training in pasture management, rotational grazing, natural resource management and soil erosion.

Advisory service:
Key elements:
1. theoretical and practical workshop
2. monitoring visits

The extension system is quite adequate to ensure continuation of activities. Government and other advisory service are now quite adequate to ensure the continuation of land conservation activities. The government saw the examples of good pasture management and is interested to continue with such approaches in collaboration with the livestock association.

Research: No research.

External material support / subsidies

Labour: Rewarded with other material support. Labour input by land users was rewarded with pipes, maps and technical support.

Inputs:
- Equipment (machinery, tools, etc) - shovels, spades; provided by village
- Agricultural (seeds, fertilizers, etc) – seedlings; from household gardens
- Construction material (stone, wood, etc) – stones; collected from the field
- Infrastructure (roads, schools, etc) – roads; fully financed
- Infrastructure – pipes; fully financed

Credit: Credit was not available.

Support to local institutions: Yes, great support with training. There were trainings for this Approach

Monitoring and evaluation

Monitored aspects	Methods and indicators
technical	Regular observations by project staff - water distribution system
management of Approach	Ad hoc observations by project staff - participation in committee meetings
pasture rotation	Regular observations by project staff - daily observations by the shepherd from the livestock committee

Changes as result of monitoring and evaluation: There were no changes in the approach.
There were few changes in the technology. small changes on the road construction

Impacts of the Approach

Improved sustainable land management: Yes, great; The soil cover improved, the milk production increased and the cows became fatter and healthier.

Adoption by other land users / projects: No; But other organisations and the government have shown interest in these ideas.

Improved livelihoods / human well-being: Yes, great; Improvement in pastures, and milk production. Livestock has high importance as it is a large financial investment.

Improved situation of disadvantaged groups: Yes, great; Everybody is benefitting in the same way.

Poverty alleviation: Yes, moderate; With this Approach the cows become heavier and produce more milk. These animals then achieve higher prices on the market.

Training, advisory service and research:

- Training effectiveness - In each training session, a maximum of twenty people should participate. But when the training started, there were twenty-two to twenty-five people present.

  Land users* - good

- Advisory service effectiveness - When the adviser conducted a meeting, or explanation during the monitoring visits with SLM specialists, the land users showed a great deal of interest.

  Land users* - good

- Research contributing to the approach's effectiveness
  no research

Land/water use rights: Help - greatly in the implementation of the approach. Common management of common land by the livestock committee. The approach did reduce the land/water use rights problem (greatly). Livestock committee negotiated access to water.

Concluding statements

Main motivation of land users to implement SLM:

Increased profit(ability), improve cost-benefit-ratio - better food, less distance to walk for the animals

Production - milk, meat

Reduced workload

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Workshops in the villages → The livestock committees are integrated in an association and this will assure continued access to information.

Land users' opinion:

1) Financial contributions of each village household creates ownership → Financial contributions per villager are low and can be afforded also by poor households. This assures ongoing contributions.

Weaknesses and → how to overcome

Specialists' opinion:

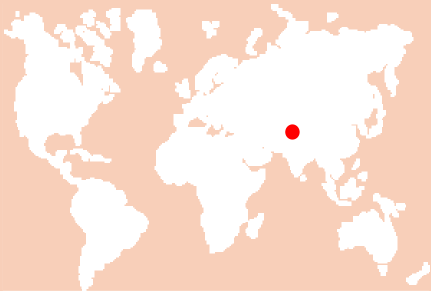
1) Less participation of the women in the workshops → To explain to the men that women should also attend.

Contact person: Odinashoev, Sa'dy, CARITAS, 20 Pavlova street, www.caritas.ch, Dushanbe, mob: 985-170-125, e-mail: sady.dc@mail.ru

District Wheat Seed Association

Tajikistan – Caritas Switzerland

left: The photo shows the association's agronomist training farmers on seed varieties. (Photo: Sady Odinashoev)
right: Preparation of the wheat field for sowing after crop rotation. (Photo: Sady Odinashoev)



Location: Tajikistan, Khatlon, Muminabad
Approach area: 1-10 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ024e
Related technology(ies): not documented
Compiled by: Sa'dy Odinashoev
Date: 2011-04-26

The Seed Association was established with the aims of improving the living conditions, food security, land management and crop rotation systems in irrigated and rain fed areas. The Seed Association in Muminabad is registered at a district level and coordinates the activities of the farmers and members.

Aim / objectives: The aim of this approach is to provide a long term wheat seed bank to improve food security in the district of Muminabad, Tajikistan. Previously, there was a lack of readily available good quality seed that was appropriate to the soil, and climatic conditions of the area. The aim of the approach was to provide cost effective, appropriate wheat seeds to farmers with more than 5h.a. of land. The farmers receive training and onsite support during the cultivation period, and in return have to adopt a crop rotation system, and give back to the Association 150% of the originally received seed stock. The Association continues to cultivate, and test, high quality seeds on its own land for distribution, and for selling at the local market to generate revenue to cover its operational costs.
Methods: The Association's members have to stick to a set of pre-determined conditions in order to join, and so operations can be controlled. The members must implement changes in agricultural practices, to support the work of the Association. In return the members receive high quality tested seed, training and a support network.
Stages of implementation: The initial set up of the Wheat Association was provided by INGO (Caritas Switzerland) who provided the initial funding and support, which was supplemented by the provision of a 150h.a of arable land by the government. The initial five members of the Association were provided with training in organisational set up and business development, they employed the services of an agronomist to help acquire appropriate seeds and develop a seed bank on the arable land. The Association registered as a legal entity, and the INGO provided co-funding for agricultural machinery and fuel, for the development of the seed bank. Once sufficient seed was accumulated to start distribution, farmers with just 5h.a. of irrigated land were invited to become members. The members had to provide land user documentation, accept to undertake crop rotation techniques, and follow the advice of the Association's agronomist in return for free seed.
Role of stakeholders: The role of the stakeholders is to follow all the rules of the Association, which include the strict compliance with a set of pre-determined conditions laid out in a contract. There is a strong element of trust among the Association and its members. Such an environment helps make the wheat growing in the district successful.
The approach is highly reliant on effective communication between the Association's specialists and it's members. The members communicate with specialists regarding technological issues, land management and other issues that are not clear in the process. In return, the Association through the agronomist provides timely support, advice and materials (e.g. fertiliser, pesticides). If the members are very successful and produce high quality seed from the Association's batch, the Association will buy all the seed the farmer cultivated, and use it to improve the seed stock of the district.

Problems, objectives and constraints

Problems

The main issues that were addressed included a lack of availability of wheat seeds and the fact that those available were of poor quality so produced low yields. The final wheat harvest was of such a low standard that majority of the harvest ended up as cattle feed. Some of the wheat seeds purchased outside the district were not appropriate for the climatic soil conditions of this district. The land users also had a fundamental lack of knowledge about wheat production, which was compounded by labour migration of many of the skilled male population to Russia.

Aims/Objectives

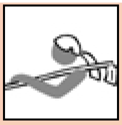
To establish an organisation that would be able to provide easily accessible, reasonably priced, high quality wheat seed to the local land users. To ensure that the organisation was sustainable through the testing of the seed, creating a local seed bank, and by providing practical training to farmers on wheat cultivation and harvesting. The long term goal was to continue to build the capacity of the seed bank so that the Association could increase the number of beneficiaries/members.

Constraints addressed

	Constraint	Treatment
other	The Wheat Association needed 150 ha to act as a seed bank.	This land was provided by the local government. However, this could also be overcome by renting the land required.
technical	The Association was provided with 150 ha to produce seed, however it needed materials, labour and equipment to cultivate wheat on this land.	Initial support was provided through funding provided by an INGO.
financial	The farmers sometimes do not return seeds to the Association as per their contract.	A contract is signed between the Wheat Association and the land user. The Association writes a letter to the farmer stating that if the farmer does not bring back the seeds, the Association will write a letter to the district court.
institutional	The staff of the Wheat Association lacked experience in organisational set up and operation.	A series of business training sessions were provided for the staff, and an agronomist monitored the seed production.
legal / land use and / water rights	The Wheat Association has to ensure that the land user has a land user certificate, or a contract to rent the land.	The relevant documentation is checked before seeds are issued.

Participation and decision making

Stakeholders / target groups



land users, individual

Approach costs met by:

government	20%
international non-government	80%
Total	**100%**

Annual budget for SLM component: US$10,000-100,000

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: international specialists, national specialists, land users

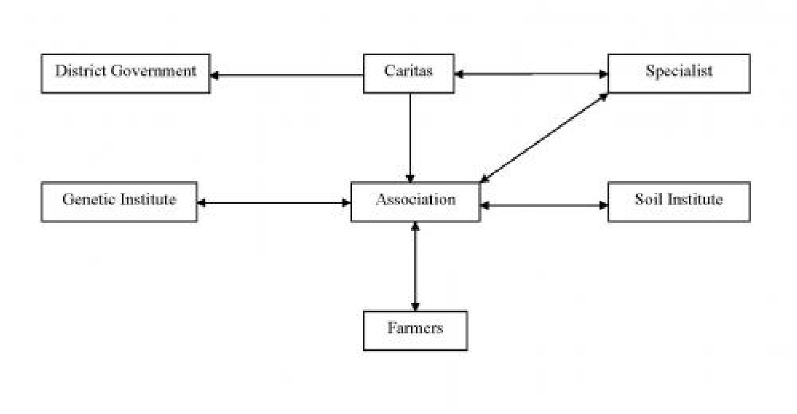
Implementing bodies: local government (district, county, municipality, village etc), international non-government, local community / land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Passive	Land users developed the original concept and ideas.
Planning	Payment/external support	Local agronomists and local government were involved in the planning stage.
Implementation	Self-mobilisation	The members of the Association are responsible for the implementation of the project.
Monitoring/evaluation	Self-mobilisation	The agronomist continues to check cultivated plots.
Research	Payment/external support	Research was undertaken on the suitability of different seed types for the agro-climatic zone.

Differences between participation of men and women: Yes, great. There are currently contracts in place with around 90 men and 9 women. This is due to the stipulation that the land user is required to have 5h.a of irrigated land before they will be provided with seed by the Association.

Involvement of disadvantaged groups: No



Organogram: Organisational Chart showing the establishment set up of the Wheat Association

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor.
Training was courses, demonstration areas, site visits / farmer to farmer, on-the-job.
Training focused on Workshops were conducted on wheat cultivation, crop rotation techniques, and seed types to the land users.

Research: Yes, great research. Topics covered include technology. Mostly on station and on-farm research. Research was conducted by the INGO on the most appropriate seed types for this agro-climatic zone.

External material support / subsidies

Contribution per area (state/private sector): Yes. The state provided 150h.a of land, and a building for running the operations and storage of seed stocks.

Labour: Voluntary.

Inputs:
- Agricultural (seeds, fertilizers, etc) - seeds, fertilisers, pesticides. Fully financed.
- Equipment (machinery, tools, etc) - Tractors, fuel, ploughs, seed cleaning equipment. . Fully financed.

Support to local institutions: Yes, great support with training. Local laboratory, government agricultural department.

Monitoring and evaluation

Monitored aspects	Methods and indicators
area treated	Regular observations by project staff -
no. of land users involved	Regular observations by project staff -
economic / production	Regular measurements by project staff - Statistics on amount of seed produced.
no. of land users involved	Regular measurements by project staff - Number of members of the Association.
economic / production	Regular observations by project staff - Site visits to check on production
technical	Regular observations by project staff - The land cultivated by the members is checked regularly.
management of Approach	Ad hoc observations by other - INGO monitoring progress.

Changes as result of monitoring and evaluation: There were no changes in the approach. There were many changes in the technology. Changes in the cultivation methodologies are frequently made based upon the site visits, and the advice provided by the agronomist working for the Association.

Impacts of the Approach

Improved sustainable land management: Yes, great; The quality of the soil improved due the requirement of the Association to introduce crop rotation methods to the areas used for wheat cultivation.

Adoption by other land users / projects: No

Improved livelihoods / human well-being: Yes, great; The land users are sustaining a higher yield from their plot and subsequently experiencing higher returns in the local markets.

Poverty alleviation: Yes, great; The Association sells higher quality seed to land users with smaller plots, ensuring quality and fair prices. It also means that many families have sufficient wheat to meet their own needs.

Training, advisory service and research:

- Training effectiveness - A range of workshops, on site visits, and visits to demonstration plots have improved the knowledge base within the community.

  Land users* - good

Land/water use rights: Help - moderately in the implementation of the approach. Land owners with 5h.a. of agricultural land have certificates of use. However, if the minimum area was reduced from 5h.a. it could present issues where no formal documentation is currently in place.

Long-term impact of subsidies: Positive long-term impact – Moderately. If the government decided to take back the land from the Association this would cause considerable disruption, but if the current situation remains then there should be no future issues.

Concluding statements

Main motivation of land users to implement SLM:

Production - To improve wheat production in the area.

Increased profit(ability), improve cost-benefit-ratio - To improve yields and have a product to sell on the local markets.

Affiliation to movement / project / group / networks - The network allows for the sharing of ideas and lessons learnt.

Well-being and livelihoods improvement - Increase in productivity, leads to increased disposable incomes and food stocks.

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) It provides an opportunity to women who have arable land to learn about wheat production and crop rotation so that they can use their land more effectively. This is in direct response to the amount of male skilled labour migration. → More women land users could be encouraged to use the Association, maybe the membership conditions could be reduced so that more women would be eligible to join.
2) Seed testing ensures the high quality of the seed. → Further training and support on seed testing.
3) The approach involves active participation from the local government. Therefore there is an appreciation of the operations of the Association. → The government could encourage participation of the state owned farms.
4) It provides a quality seed bank for small farmers who do not meet the membership requirements for which they can purchase seed. → The membership requirements could be reviewed, possibly different levels of membership could be established.
5) Improvement in the wheat seed stock in the region, and less dependence upon outside seed stocks that may not be the most appropriate for the soil and climatic conditions. → It could be established in different districts.
6) It forces farmers to adopt improved farming practices through crop rotation. → Farmers should be encouraged to adopt crop rotation for other crops other than wheat.

Land users' opinion:

1) Free advice and training were very useful. → To be in contact with Association
2) Less expensive wheat production and their associated products in the district → More land users should work with the Association.
3) No need to go to other regions in search of wheat seed → To be a member of the Association

Weaknesses and → how to overcome

Specialists' opinion:

1) There are extensive initial set up costs. → Through donor money, or through loans possibly based upon the selling of percentages of the seed bank in subsequent years.

Land users' opinion:

1) The Association members need personal competence in business operation and wheat production. → A series of training sessions could be conducted before the establishment of the Association, also cross visits to other Associations to observe their operations.

Contact person: Odinashoev, Sa'dy, CARITAS, 20 Pavlova street, Dushanbe, www.caritas.ch, mob: 985-170-125, e-mail: sady.dc@mail.ru

left: Training on Potato Growing to increase productivity and therefore the income generation ability of the women (Photo: Tojinisso Odinaeva, executive director Zamzam)
right: Shows a chicken breeding farm - one of the open sector income generating activities (Photo: Tojinisso Odinaeva, executive director Zamzam)

Public Women's Organisation Zamzam - enhancing incomes for poor women through income generating activities

Tajikistan – CARITAS Switzerland

The development of a women's network to disseminate information, provide training, and provide support to other women in the community to help them improve their livelihoods, and provide a forum by which women's issues can be raised at a local level.

Aim / objectives: The overriding objective of the creation of a women's group was to provide an approach, by which activities could be implemented to improve the livelihoods of women in this rural region. Women are considered a vulnerable group due to high rates of labour migration by many men to Russia. This leaves the women behind, to care for the children, tend the kitchen garden, rear animals and other duties that they have limited experience and training in completing. The creation of a women's network was seen as an opportunity to unite women, and provide them with trainings, skills and livelihood opportunities so that they could improve not only their standard of living but also that of their families. Zamzam was also designed to act as a focal point for voicing women's issues with local representatives and local government, and to help raise the profile of women in the decision making process.
Methods: The organisation, Zamzam was set up initially with funding from an INGO, via a project, however to remain as a viable women's network, they have several paid staff, secure funding through membership fees and sell dairy products on the local market. The core staff have received support from Caritas and Voluntary Services Overseas (VSO) on areas like business planning, organisational development and marketing to encourage autonomy and sustainability in the future as financial support is withdrawn. In addition Zamzam members are taught technical skills in dairy production, energy efficiency, soil conservation, basic farming techniques etc which are then taken back to the respective communities and conveyed back to the women of the community. This network creates a safe environment for learning, discussing and planning using the most active women members as conduits for the transfer of information and ideas.
Stages of implementation: The establishment of Zamzam follows a basic business model, whereby a board of directors is established to oversee the daily running of the organisation, periodically meeting to discuss planning, finance, reporting, employment etc. This is supplemented by a bi-annual members meeting whereby all the members of Zamzam meet, and are provided with information on the network performance. This ensures that the members are fully briefed and that the operations remain transparent. This is also an opportunity to vote for new board members, suggest new directions, discuss membership fees, and provide feedback on implemented activities. Zamzam has also developed a business strategy and charter to provide guidelines and direction for its members.
Role of stakeholders: There are three main types of stakeholders; the first are the board and paid staff of the organisation, who oversee the day to day running, the second are the members who participate in training and income generating activities, and act as information points in their respective communities to the third set of stakeholders; the women who are not members but who can still benefit from improved knowledge and support.

Location: Khatlon, Muminabod
Approach area: 10-100 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ036e
Related technology(ies): not documented
Compiled by: Lisa Gampp
Date: 2011-05-04

Problem, objectives and constraints

Problems

To improve the sustainable livelihoods of women, one of the more vulnerable members of society. Increasingly since the collapse of the Soviet Union, the position of women within the community has become restricted. Previous social structures have diminished, and many male family members are working in Russia, taking with them their knowledge and labour skills. As a result women are left to bring up and support families, tend to the land and livestock and deal with day to day financial issues. This increased responsibility combined with a lack of knowledge, finance and experience has meant that the position of women in the community has become more exposed and subsequently vulnerable.

Aims/Objectives

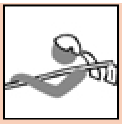
To improve the sustainable livelihoods of women within the community by increasing their knowledge and providing opportunity for income generation (e.g. dairy production, crop production, food processing, poultry production). In addition, to establish a women's network to share ideas and resources, and provide a viable platform by which the specific concerns of women can be raised and presented to local decision makers.

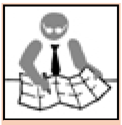
Constraints addressed

	Constraint	Treatment
financial	Women have very little access to money, with many not having regular incomes or viability to access finance.	Zamzam provides low cost training through outreach workers and materials and equipment for the implementation of improved livelihood measures.
legal / land use and / water rights	Zamzam needed to secure some sort of legal status to be able to strengthen and incorporate income generating activities.	Zamzam registered as a legal entity.
technical	The women did not have the technical knowledge to enhance the livelihoods of other women.	Training was provided on key technical aspects such as energy and soil conservation by the project.
institutional	The women have a low level of education, which hinders activities such as planning, budgeting and implementation of activities.	The key staff were provided with external support and training to aid staff development, this was supplemented with the development of an organisational strengthening plan for the first year.
social / cultural / religious	There are large scale labour migration issues, leaving women with limited skill sets to run the family households. When the male members of the family return they resume their original tasks and the women resort to a more traditional roles.	The women's organisation encourages and supports women in continuing with their new tasks and responsibilities.

Participation and decision making

Stakeholders / target groups


land users, individual


planners

other (specify)

Approach costs met by:

international	100%
Total	**100%**
Annual budget for SLM component: US$100,000-1,000,000	

Decisions on choice of the Technology(ies): by SLM specialists alone (top-down)

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: international specialists

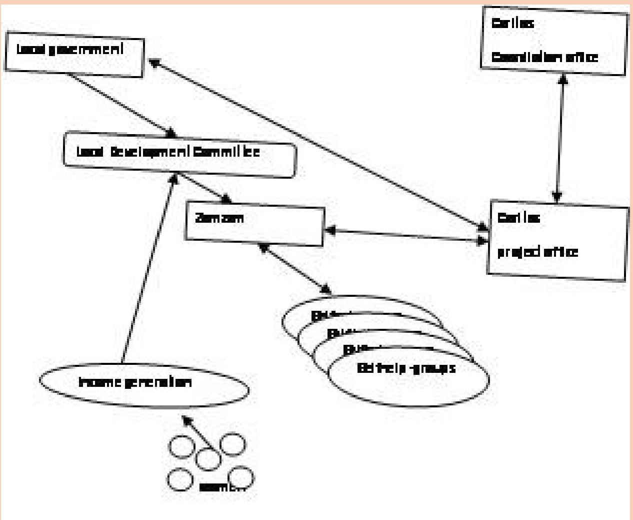
Implementing bodies: local government (district, county, municipality, village etc), international non-government

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Passive	The creation of the initial concept was provided by an INGO, however, some more active women supported its conception.
Planning	None	The planning of the network was undertaken by INGO staff and a few women representatives.
Implementation	Self-mobilisation	Zamzam was established in response and the wishes of the local women to create a network to promote income generating activities. Caritas field office staff had the capacity and knowledge to provide technical advice to the self-help groups.
Monitoring/evaluation	Interactive	Zamzam have to monitor and evaluate their own performance and provide information to donors who have supported them.
Research	Passive	Market specialists are responsible for the research in order to enhance the market potential of the products, to increase income.

Differences between participation of men and women: Yes, great
It is a women's group designed to support women, therefore the involvement of men was peripheral.

Involvement of disadvantaged groups: Yes, great
The approach is targeted at women, this included women who have been abandoned by their husbands, and others who are now responsible for the household due to the fact that the male members of the family are working away in Russia. These women are considered to be a vulnerable group who need support, training, information to help themselves to improve their livelihoods.



Organogram: An overview of the organisational set up of Zamzam.

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor
Training was on-the-job, courses
Training focused on Proper care for cattle, milk collection, hygiene and sanitation in the milk sector, growing and collecting herbs, such as calendula, chamomile, etc

Advisory service:
Name: Voluntary Services Overseas
Key elements:
1. Training on marketing and business planning
2. Training on dairy production.

VSO supported Zamzam by providing international volunteers to help support their activities, and provide training and advisory services.
The extension system is quite adequate to ensure continuation of activities. Zamzam learnt much from the VSO support provided, and is now in a position to further help other networks.

Research: Topics covered include economics / marketing

External material support / subsidies

Contribution per area (state/private sector): Yes. Some equipment was provided such as milk processing and energy efficiency equipment which was provided by INGO, Caritas Switzerland.

Labour: Voluntary.

Inputs:
- Construction material (stone, wood, etc) - wood and materials to repair the office. Partly financed
- Agricultural (seeds, fertilizers, etc) - fertilisers and pesticides. Fully financed
- Equipment (machinery, tools, etc) - milk processing equipment and tools. Partly financed
- Seeds - seeds. Partly financed

Credit: Credit was not available.

Support to local institutions: Yes, moderate support with training.
NGO Zamzam hired a local training institution ATAC in Kulob to train Zamzam's members on various topics related to agriculture.

Monitoring and evaluation

Monitored aspects	Methods and indicators
economic / production	Ad hoc observations by project staff -
no. of land users involved	Regular measurements by project staff -
management of Approach	Ad hoc observations by project staff -

Changes as result of monitoring and evaluation: There were few changes in the approach. Since there was no market to sell certain items, Zamzam changed their focus and started investigating other products that the women could produce, and provide a respectable return on their invested time and effort. Zamzam consulted market specialists as part of this process. There were few changes in the technology. Instead of focusing on dried fruits they refocused their efforts on medicinal herbs as a result of the market research.

Impacts of the Approach

Improved sustainable land management: Yes, little; The members were provided with training on energy efficiency measures, soil and water conservation and improved agricultural techniques to improve their land management skills.

Adoption by other land users / projects: No; So far there was an exchange of knowledge and ideas, but the women's network approach is to be adopted in other regions.

Improved livelihoods / human well-being: Yes, great; 150l of milk is now processed on a daily basis, and there were significant reductions in the organic material used for fuel purposes.

Improved situation of disadvantaged groups: Yes, great; Poor and vulnerable women were given a voice and an income generating activity.

Poverty alleviation: Yes, great; Due to the income generation activities women were able to start setting up their own small businesses and therefore were able to generate their own income by selling their milk or other products.

Training, advisory service and research:

- Training effectiveness

  Land users* - excellent

  Agricultural advisor / trainers - good

- Advisory service effectiveness - Zamzam have developed as an organisation and can provide help and support to its members.

  Land users* - excellent

- Research contributing to the approach's effectiveness

Land/water use rights:
None of the above in the implementation of the approach.

Long-term impact of subsidies:
Positive long-term impact - Low
Support was provided in the form of machinery and training.

Concluding statements

Main motivation of land users to implement SLM:

Well-being and livelihoods improvement - women could see the benefits within the community and other households.

Production - milk, dried fruits etc

Increased profit(ability), improve cost-benefit-ratio - A variety of dairy products have a higher return than just milk.

Prestige / social pressure - as more women joined it became socially acceptable to join the network.

Affiliation to movement / project / group / networks

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The approach is inclusive of a pre selected vulnerable group of the community. → The approach could be replicated in other districts, this could then involve cross visits and further lobbying potential.
2) The approach is developed for long term sustainability and can be used to implement a variety of different projects and schemes. → This mechanism can be used to select and implement different SLM technologies benefiting a vulnerable sector of society.
3) The approach is market based and provides invaluable commercial skills to the members. → New markets, products and places to sell will make the organisation even more successful and sustainable and at the same time generate income for women

Land users' opinion:

1) Through this organisation it was possible to reduce poverty and increase the income of women → Continued support and training for the leaders of the organisation, to improve their capacity and ability.
2) Each sector includes experienced specialists → Diversification of specialists will help the organisation develop different practices and income streams to help their members.
3) NGO Zamzam has lots of experience working with milk and dairy products → It can be enhanced through support of the Government to provide an adequate environment, such as drinking water and electricity supply, appropriate building and area, legislative documents, collaboration with tax agencies, etc. Besides, the financial support from governmental and non-governmental sources, Zamzam has to improve its fund raising and financial management skills
4) NGO Zamzam has developed extensive experience in mobilising local women → Zamzam has to ensure that members continue to contribute to the running costs of the organisation.

Weaknesses and → how to overcome

Specialists' opinion:

1) So far the organisation still depends on external finance, training and support. → Training on securing funds and generating income from the sale of services and products.
2) The lack of market capacity and the small area where the products can be sold. → There are already plans to extend the distribution area to make Zamzam a brand and therefore more able to sell products in Dushanbe or other regions.

Land users' opinion:

1) The management members of the organisation are unskilled and mostly uneducated. Therefore, it takes lots of effort to train them → More training will be conducted and they will learn by doing

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left: Training of Trainers through expert (Photo: MSDSP Khorog)

Facilitation of community-based pasture management initiatives

Tajikistan - Mountain Societies Development Support Programme (MSDSP, AKDN) / Sustainable Land Management in the High Pamir and Pamir-Alai Mountains (PALM)

Initiation of community-based solutions to slow down pasture degradation, and to improve pasture use and management in three pilot Jamoats of upland Tajikistan.

Aim / objectives: During the Soviet times land users in Tajikistan were allowed to keep very little livestock individually and this was mainly in the vicinity of rural settlements. The majority of the livestock were managed by collective agricultural farms, which utilised different seasonal pastures. After the collapse of the Soviet Union, the previously state-owned livestock was distributed among individual farmers, most of whom had limited knowledge and experience with pasture management (PM), and capacities to access the distant pastures used by the collective farms. As a consequence, the amount of livestock kept in the vicinity of rural settlements increased, leading to overgrazing and severe degradation of nearby pastures. In the framework of a project on sustainable land management in the Pamir-Alai region (PALM), funded by the Global Environment Facility (GEF), MSDSP facilitated the initiation of community-based solutions to the problem of pasture degradation at three pilot Jamoats in Jirgital, and three in Gorno-Badakhshan Autonomous Oblast (GBAO).
Methods: 1. Awareness raising and capacity building of PM issues. 2. Integration of PM issues in village development plans. 3. Grant support and community co-financing for implementation of targeted measures. 4. Monitoring of the impacts of the implemented measures as a basis for up-scaling.
Stages of implementation: 1. National pasture management experts from the Pamir Biological Institute held a training of trainers (ToT) session for MSDSP facilitators and district specialists, who conducted follow-up training on PM at the pilot communities in 2009. 2. Pilot communities identified key problems related to PM in the process of Village Development Planning facilitated by MSDSP, and prioritised targeted measures for improved PM. 3. A set of micro-project proposals were developed based on the prioritised measures, which focused on (re-) construction of roads and bridges for improved access to pastures, and construction of stables during spring/autumn, as well as summer pastures. 4. Monitoring of the impacts of the implemented measures as a basis for up-scaling.
Role of stakeholders: Community members were engaged in identifying and implementing targeted measures for addressing pasture use and management issues. Jamoat level non-governmental organisations called Social Unions for Development of Village Organisations (SUDVOs), coordinated and supported the identification and implementation of the selected projects in several village organisations. Governmental agricultural extension agents were engaged in training, and consulted in the review process. MSDSP staff facilitated the overall process and engaged in monitoring progress with implementation. PALM project staff engaged in the review, monitoring and assessment of the impacts of the supported measures.

Location: Jirgital region (Jirgital, Pildon and Yangishar), and Gorno-Badakhshan Autonomous Oblast (GBAO), (Shitharv, Vankala and Alichur)
Approach area: exact area unknown
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ040e
Related technology(ies): not documented
Compiled by: Mizrob Amirbekov
Date: 2011-05-12

Problem, objectives and constraints

Problems

pasture degradation, overgrazing, restricted pasture area and too many cattle grazing, lack of infrastructure (bridges, roads, shelters), lack of knowledge about pasture management

Aims/Objectives

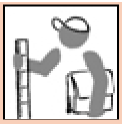
The main aim of the approach was to initiate the improved use and management of pastures, by raising awareness and knowledge on issues regarding pasture degradation and sustainable pasture management, mobilising community action, and pilot-testing selected technologies and measures for improving pasture management in highly degraded areas.

Constraints addressed

	Constraint	Treatment
legal / land use and / water rights	Limited clarity regarding responsibilities and lack of incentives for sustainable pasture management	MSDSP and PALM project members recommended the development of a pasture management law that addresses those legal constrains
technical	technical knowledge about pasture management was lacking as during Soviet times people were not allowed to keep a lot of livestock	Community members of village organisations and relevant government experts were trained in various issues of pasture management
financial	communities were lacking funds for infrastructure development and could therefore not invest in the construction of roads and bridges	GEF funds were used to support communities in financing infrastructural improvements which allowed for more productive and sustainable use of available pasture resources
institutional	Lack of capacity to deal with pasture degradation problems	Engagement of village organisations, and social unions of village organisations (SUDVO) in addressing pasture management issues at six pilot Jamoats

Participation and decision making

Stakeholders / target groups


SLM specialists / agricultural advisors


land users, groups

Approach costs met by:

international	70%
national non-government	30%
Total	**100%**
Annual budget for SLM component: US$2,000-10,000	

Decisions on choice of the Technology(ies): pilot communities

Decisions on method of implementing the Technology(ies): pilot communities and facilitators

Approach designed by: national specialists, international specialists

Implementing bodies: government, national non-government, international

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	Interactive	Members of village organisations were involved in training and planning on pasture management, and actively participated in discussions
Implementation	Self-mobilisation	The village organisations developed their own project ideas and submitted those proposals to MSDSP and other funders
Monitoring/evaluation	Interactive	Land users were engaged in the monitoring and evaluation of the impacts of the implemented projects
Research	Interactive	The Pamir-Biological Institute and the Institute of Botany under the Academy of Sciences were engaged in research and technical consultations

Differences between participation of men and women: Yes, moderate
Only 20% of the participants were women, since men are responsible for managing the livestock, while women are concerned with livestock products only.

Involvement of disadvantaged groups: Yes, moderate
Elderly members of the communities were engaged in discussions on the possible solutions

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor
Training was courses
Training focused on Short training courses were provided for land user, field staff/agricultural advisors

Advisory service:
Name: Engineering support and technical consultations
The extension system is quite adequate to ensure continuation of activities.

Research:
Yes, little research. Topics covered include pasture management
Mostly on-farm research.
Aimed at problem, option and impact assessment

External material support / subsidies

Contribution per area (state/private sector): No.

Labour: Voluntary.

Inputs:
- Infrastructure (roads, schools, etc) - roads, bridges, shelters. Partly financed
- Equipment (machinery, tools, etc). Partly financed

Support to local institutions: Yes, great support with training
village organisations were trained

Monitoring and evaluation

Monitored aspects	Methods and indicators
economic / production	Regular observations by project staff - changes in economic benefits for households before and after implementation of project
bio-physical	Regular observations by project staff - changes in vegetation coverage, edible grass species, etc.
area treated	Regular observations by project staff - Established at the start of project implementation

Changes as result of monitoring and evaluation:
There were several changes in the approach. Some areas were grazed although they should not have been, project staff then talked to the responsible people in the village to ask about the causes for this and to try and initiate changes in practice.

Impacts of the Approach

Improved sustainable land management: Yes, great; Reduced pressures on pastures in the vicinity of rural settlements

Adoption by other land users / projects: Yes, few; Strong interest by other communities but limited financial means for replication

Improved livelihoods / human well-being: Yes, great; Improved access to fodder, reduced loss of livestock, etc

Improved situation of disadvantaged groups: Yes, moderate; Elderly herders with improved access to health facilities

Poverty alleviation: Yes, moderate; The primary beneficiaries are the groups with a medium income

Training, advisory service and research:

- Training effectiveness

  Land users* - good

  Agricultural advisor / trainers - good

- Advisory service effectiveness

  Land users* - good

- Research contributing to the approach's effectiveness - Moderately
  limited with respect to identifying solutions due to timing constraints; good with respect to impact monitoring

Land/water use rights:

Hinder - moderately in the implementation of the approach. There is no law about pasture management in Tajikistan, therefore it was difficult to regulate the process.

The approach did reduce the land/water use rights problem (low). Talks with the government were started to make way for a law on pasture management

Concluding statements

Main motivation of land users to implement SLM:

Well-being and livelihoods improvement - Improved convenience, reduced conflicts over livestock tramping and grazing of croplands

Environmental consciousness, moral, health - increased awareness of the degradation of pastures

Production - Increased pasture area and livestock productivity, reduced loss of livestock, reduced labour inputs

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Reduction of conflicts over resource use and strengthened social capital → Utilise the improved social capital for addressing other pressing environmental and community development issues
2) Improved income from livestock provides a strong incentive for sustaining the established infrastructure → A proportion of the obtained income should be reinvested in maintenance e.g. through collection of user fees
3) Improved environmental conditions in the vicinity of rural settlements, and reduced labour inputs into livestock breeding → Capitalise on those environmental improvements through the development of alternative income-generating activities such as bee-keeping and eco-tourism that will limit the need for further increases in livestock numbers

Weaknesses and → how to overcome

Specialists' opinion:

1) Improved access to new pastures and possible further increases in livestock numbers may lead to their degradation in the future → Community members and village organisations have to make sure that the new pastures are being used in a sustainable manner e.g. through controlled grazing and pasture rotation, designation of no-grazing areas in pristine forests in the vicinity of new pastures, etc.
2) The approach contributes to improve the well-being of the medium income groups of the communities in question, as accessing distant pastures is most often not a problem for the better-off, while the poor often have only limited or no livestock → Use as part of the generated additional income in the community for support of poor households
3) The approach is economically beneficial but difficult to up-scale due to the high initial investment costs → Identify appropriate mechanisms for stimulating replication through relevant legal and policy incentives or alternative financing

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left: Strongly degraded pilot site for the Savings Book Approach in Vuzh, before implementation of the approach (Photo: Aline Rosset)
right: Construction of sea buckthorn fence around the pilot site for the Savings Book Approach in Vuzh (Photo: Aline Rosset)

Savings Book Approach

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Reforestation of deserted state forest plots through a financial incentive system for the labour intensive first years of forest establishment, after which harvests of forest products from the plot provide income opportunities for the forest tenants and the State Forestry Agency.

Aim / objectives: The main objective of the approach is the reforestation of a completely deserted former forest area in collaboration with the local population. However, as reforestation is highly labour intensive especially in the initial phases, this approach was developed as an incentive system to overcome this high-labour/low-income phase.

Methods: The underlying method is the implementation of Joint Forestry Management (JFM) on severely degraded forest plots (For JFM see approach TAJ015). In order to enable reforestation on such plots, an incentive system has been developed to bridge the gap when the initial workload is high, but no forest resources can yet be harvested. Therefore, selected forest tenants receive a savings book with a total amount of money to be obtained for forest rehabilitation work within the next six years. Every year clear planting and rehabilitation goals are formulated, which have to be completed by an agreed deadline. All tenants who completed their annual tasks will get access to a share of the total amount in the savings book. The annual shares gradually decreases over a period of six years, after which access to forest resources on the rehabilitated plot will be substantial enough to provide income opportunities and forest resources for their own consumption. According to the JFM contract, forest tenants hold a plot for a period of 20 years. This also applies for the savings book tenants, who act as regular JFM tenants after the subsidised reforestation period of six years is over.

Stages of implementation: The savings book approach is designed to cover a period of six years, and includes the following; (1) Before implementation; the willingness of the local population to participate needs to be assessed, the feasibility of reforestation, costs for irrigation, possibilities and the need for fencing and possible conflicts and challenges that might occur. (2) In the first year a living fence (seabuckthorn) has to be established, and the irrigation system has to be fully rehabilitated. (3) During the first three years of the approach implementation tenants will reforest one third of their plot each year (1-2 ha per household), introducing a rotation system that will be used for harvesting. (4) During years 4-6, mainly maintenance work will be conducted (pruning, fence and irrigation maintenance).

Role of stakeholders: The JFM rental contract is valid for 20 years and defines the rights and duties of the forest tenants and the State Forestry Agency. While the tenant is responsible for the agreed annual reforestation tasks, the Forestry Agency provides the required planting material, technical support and monitoring. The Micro Loan Organisation MADINA, facilitates the financial transactions required for the implementation and management of the savings books.

Location: Tajikistan, Gorno Badakhshan Autonomous Region, Shugnan
Approach area: 0.2 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ030e
Related technology(ies): Establishment of living seabuckthorn fences for the protection of reforestation sites
Compiled by: Roziya Kirgizbekova
Date: 2011-05-01

Problem, objectives and constraints

Problems

The forest area close to the village was completely destroyed during the civil war to meet urgent fuelwood needs. At the same time the State Forestry Agency does not have the necessary financial, management and control capacities to reforest degraded areas. Despite the presence of a forested area close to the village, local inhabitants do not have the labour force and the financial resources to rehabilitate the plot and the irrigation infrastructure on their own. These highly degraded or deserted forest plots aim to be re-established through the savings book approach, by combining long-term rental contracts for individual plots, financial incentives for the initial reforestation efforts, and user rights to the resources growing on the plot in future.

Aims/Objectives

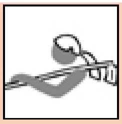
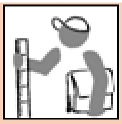
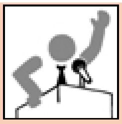
Reforestation and protection of severely degraded state forest plots in cooperation with the local forest users. At the same time, providing an incentive system for the initial reforestation phase, when a high workload is required but no forest products can be harvested. The main objective is therefore to combine forest rehabilitation with livelihood improvement (increased income generation and forest resource accessibility) and to directly involve the local population in the management and rehabilitation of the State forest resources close to their village. The approach will be implemented within the framework of Joint Forestry Management (see approach TAJ015).

Constraints addressed

	Constraint	Treatment
workload	After the collapse of the Soviet Union, the State Forestry Agency had insufficient financial and human resources to manage the state forests.	Through Joint Forestry Management and hence also through the savings book approach the workload in the forest (but also the incomes from forest products) is shared with local forest tenants.
institutional	The State Forestry Agency lacks the institutional capabilities to implement, manage and control reforestation and forest management activities.	Income opportunities are handed over to local forest tenants. Forestry Agency staff are also trained in monitoring and sustainable management of the rented plots.
legal / land use and / water rights	Local inhabitants had no official user rights to the state forest plots close to their village and were using the plots illegally. Hence there is no real interest in rehabilitating the plots.	The forest plots are rented and contracts, management and annual plans are established for each plot. Additionally, the major costs for reforestation are covered for the first few work intensive years.
financial	On highly degraded plots the initial labour and financial input for reforestation is very high and cannot be met neither by forest tenants nor by the State Forestry Agency.	The plots are rented to local forest tenants, who receive a savings book with a certain amount of money for rehabilitation activities for six years. The work is strictly monitored and money can be accessed only if the annual tasks are completed.
technical	The State Forestry Agency lacks financial and technical resources to rehabilitate degraded forest areas and the respective irrigation infrastructure.	Shortcomings in irrigation are analysed and improved at the beginning of rental agreements with local villagers. Technical and financial support from the project is provided where infrastructure needs much assistance.

Participation and decision making

Stakeholders / target groups

			
land users, groups	land users, individual	SLM specialists / agricultural advisors	politicians / decision makers

Approach costs met by:

local community / land user(s)	10%
international	80%
private sector	5%
local government (district, county, municipality, village etc)	5%
Total	**100%**
Annual budget for SLM component: US$10,000-100,000	

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: national specialists, international specialists

Implementing bodies: local government (district, county, municipality, village etc), local community / land users, private sector, international

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Interactive	Initial field visits, information seminars, discussions, involvement of the whole community.
Planning	Interactive	The technical planning of the approach was mainly conducted by forestry specialists, whereas the local villagers were consulted in an interactive way in order to adapt the approach to the specific conditions on site (e.g. solution of irrigation problem, planting techniques etc.).
Implementation	Payment/external support	After the initial reforestation phase the tenants will be involved in the participatory JFM system.
Monitoring/evaluation	Interactive	Progress and results are monitored in close cooperation between the State Forestry Agency, the plot tenants and project staff. Successes and challenges are documented and discussed, which if needed lead to an adaptation in the approach design.
Research	Passive	Research is currently being conducted at a the local level, involving the local population as well as Forestry Agency staff for interviews and field visits.

Differences between participation of men and women: Yes, moderate
Although women and men were equally invited and encouraged to participate in the information seminars, most of the women felt that the work that would need to be done would need to be carried out by men.
As the work to be conducted was described as hard and strenuous, no women wanted to hold a forest plot under the savings book approach. However, women participated in discussions on the implementation of the approach and sometimes also took the place of men regarding decision making and implementation.

Involvement of disadvantaged groups: Yes, moderate
The approach is open to all economical categories within the village, regardless of age, status or ethnicity.

Technical support

Training / awareness raising:
Training provided for field staff/agricultural advisor, land user
As for JFM (see approach TAJ015), in the first step 'mobilisers' and Forestry Agency staff were trained as field staff. In the second step, they provided training, information and advice for the forest tenants.
Training was on-the-job, demonstration areas, public meetings, courses
Training focused on Sustainable natural resource management, technical forest management (cutting and planting of trees, maintenance of a forest area, building of living seabuckthorn fences), elaboration of management plans and annual plans for a sustainable and joint management of the forest plot between forest tenants and the State Forestry Agency.

Advisory service:
Name: Forestry training for tenants
Key elements:
1. Sustainable natural resource management and use
2. Technical training in forestry management (planting and harvesting, fencing etc.)

The extension system is quite adequate to ensure continuation of activities. Strong interest from tenants as well as State Forestry Agency to continue with this approach. However, due to the short time the approach is being implemented, still more training and practice will be needed to ensure an experienced, effective and reliable advisory service by Forestry Agency staff.

Research:
Yes, moderate research. Topics covered include socio-economic, on-site situation analysis
Mostly on station and on-farm research.
A Tajik Masters student enrolled at the university of Bayreuth is currently conducting transdisciplinary field research on the perception, willingness to participate and opportunities for further distribution of the approach in GBAO. The results will help to develop a model for further evaluation of potential sites for the approach and to identify areas of difficulty.

External material support / subsidies

Contribution per area (state/private sector): Yes. As the approach aims to reforest strongly degraded forest areas, the forest tenants are rewarded with financial compensation for the initial years without direct income opportunities from the plot.

Labour: Voluntary, paid in cash.

Inputs:
- Equipment (machinery, tools, etc) - partly excavator work, hand tools. Partly financed.
- Agricultural (seeds, fertilizers, etc) - seedlings for planting. Partly financed.
- Infrastructure (roads, schools, etc) - rehabilitation of irrigation channel and fence. Fully financed.
- Transport costs (planting and fencing material) - Fuel and rent of lorry. Fully financed.

Credit: Credit was not available.

Support to local institutions: Yes, moderate support with financial, training. The State Forestry Agency is being trained and supported to implement and monitor the approach on their own, and to offer advisory services. Additionally the forest tenants are encouraged and supported to act as a group and to advocate their needs and problems as a local civil society organization.

Monitoring and evaluation

Monitored aspects	Methods and indicators
technical	Ad hoc observations by project staff - condition of the irrigation and fencing infrastructure
socio-cultural	Ad hoc observations by project staff - discussion of problems and challenges
economic / production	Regular observations by project staff - control of planting process, technical advice
economic / production	Regular measurements by project staff - control of seedlings planted (first 4 years), amount of harvested forest products (from 5th year on)
area treated	Regular measurements by project staff - monitoring of area planted at the end of planting period, enable withdrawal of money if satisfactory
management of Approach	Ad hoc observations by project staff - monitoring of successes and challenges, adaptation of approach if needed
management of Approach	Regular measurements by project staff - allocated funds to forest tenants, overall performance of approach: reforestation achieved

Changes as result of monitoring and evaluation:
There were several changes in the approach. As the Saving Book Approach is implemented as a pilot project, results from monitoring and evaluation were mainly collected as lessons learnt which will be highly helpful to adapt and to bring to perfection this approach for further implementation sites. There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, great; The deserted forest area is being reforested for the benefit of the villagers and the State Forestry Agency. Due to the establishment of contracts with the local population they acquire ownership and responsibility for the forest areas close to their village.

Adoption by other land users / projects: No; As the pilot project is still running no other sites have been started yet. However, there is strong interest from the forest tenants as well as the State Forestry Agency to further disseminate the approach.

Improved livelihoods / human well-being: Yes, moderate; So far no increase of income or own consumption of forest products from the plot has been reached. But forest tenants get income from their savings book according to the amount of work they have done

Improved situation of disadvantaged groups: Yes, little; As disadvantaged groups are more dependent on the diversification of income sources, the most susceptible households could benefit from generated income through reforestation work.

Poverty alleviation: Yes, little; Income from the savings book reduces economic vulnerability during hard times.

Training, advisory service and research:

- Training effectiveness - The training mentioned here applies to Joint Forestry Management as well as for the savings book approach, as there was no individual training for the SBA. In a first step mobilisers were trained, who in turn are training the forest tenants.

  Land users* - good   SLM specialists – good   Agricultural advisor / trainers - excellent

- Advisory service effectiveness - As in 3.2.3.1 the trainings concern both the SBA and JFM.

  Land users* - good

  Technicians / conservation specialists - good

- Research contributing to the approach's effectiveness - Greatly
  At the time of writing this study is still being implemented, but so far the results seem to be good and likely to be further disseminated in the GBAO area.

Land/water use rights: Hinder - moderately in the implementation of the approach. Before the implementation of this approach the deserted forest area was governed by open access, although it formally belonged to the State Forestry Agency. Local villagers used it intensely as winter pastures. Therefore, not everybody was happy to restrict access to the area. However, it is clear to the local land users, that reforestation and irrigation rehabilitation will enable better access to forest products and fodder in the long run. The approach did reduce the land/water use rights problem (moderately). Via the approach clear property and user rights have been established. Of course conflicts have so far appeared during the whole implementation process, which are being discussed whenever they occur. However, clear user rights have stopped the open access scenario and provide incentives for labour investments in conservation and reforestation activities.

Concluding statements

Main motivation of land users to implement SLM:

Well-being and livelihoods improvement - Income for reforestation and access to fresh resources improve local livelihoods

Payments / subsidies - Payments of incentives for initial reforestation contribute to livelihood

Rules and regulations (fines) / enforcement - Contract based legal access to forest resources

Production - Increased wood production for own consumption and market

Aesthetic - A green forest area improves attractiveness of the village surroundings

Sustainability of activities:

It is uncertain whether the land users will be able to sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) Completely deforested former forest plots can be reforested and livelihoods sustained at the same time. → Foster trust between the State Forestry Agency and the local forest tenants.
2) Sustainable management of the plot in future is enabled through JFM. → Support ownership creation for the reforested area among tenants and the Forestry Agency.

Land users' opinion:

1) A financial incentive system bridges the period where a lot of work input is required, but the plot still doesn't provide any benefit. → Provide advisory and regular monitoring in order to allow the tenants to achieve the fixed annual goals and get access to their annual share of money.
2) In the long run, forest tenants have a benefit from the reforested plot in the form of legal access to forest products (firewood, timber, hay, fruits and berries etc.). → Support the creation of marketing opportunities for forest products.

Weaknesses and → how to overcome

Specialists' opinion:

1) Through the high initial labour input the costs for the implementation of this approach are rather high. → Document and promote experiences of the pilot project, enable dissemination, as the establishment of larger areas reduce the costs per ha.
2) The approach is designed for a time period of a minimum of six years, at the end of which there might be less external technical support. → Continue and improve training of Forestry Agency staff to enable a sustainable continuation.

Land users' opinion:

1) Benefits from the forest plot will be possible only after 5 to 6 years. → Bridge the initial phase with income from the savings book, build up marketing opportunities for the forest products to be harvested in future. The plot will no longer be freely accessible for other land use types such as grazing of livestock. → Provide platforms to discuss arising conflicts, show and support opportunities for winter fodder production on the forest plot.

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left: Representatives of MLO Madina meet with a local household head to initiate the micro loan (Photo: Zubayda Kirgizbekova)
right: well insulated window produced by trained craftsmen to reduce heat loss in houses (Photo: Zubayda Kirgizbekova)

Access to thermal insulation through micro loans

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Provision of small scale loans for private households to ensure access to thermal insulation.

Aim / objectives: In GBAO as in most parts of Tajikistan, natural resources such as firewood from riparian forests and teresken shrubs, remain the main source of fuel for heating and cooking. Due to poor insulation of local houses, and inefficient cooking stoves, much fuel is burned. The aim is to ensure access to energy efficient technologies through the provision of a micro loan 'Warm comfort' is one of the ways to improve house thermal insulation, reduce fire wood consumption, improve the living standards of residents and reduce pressure on the environment.
Methods: On the basis of financial and technical documentation prepared by field officers and clients MLO Madina made the decision to allocate up to US$500, (2.5% interest rate to be reimbursed within 12 months) to the project. The thermal insulation loan is given in kind and not in cash. The client receives all necessary materials and services for the value it has to reimburse in accordance with the micro loan contract and individual repayment schedule.
Stages of implementation: The process of a micro loan for thermal insulation consists of the following steps: 1) Meeting with the rural population and interviews; 2) information event on energy efficient products and micro loan; 3) Financial analysis to explain micro loans, procedures, household income and expenses analysis; 4) Technical analysis of potential houses to specify types of material needed, type of work, prepare outline of the house; 5) Decision by the MLO Committee to allocate loan; 6) Micro loan contract and work plan; 7) Preparation of thermal insulation works; 8) Implementation of thermal insulation works; 9) Reimbursement of micro loan
Role of stakeholders: The role of each participating stakeholder is indispensable to ensure a smooth flow for the whole process. The funding organisation assists the micro loan organisation with increasing its portfolio and provides loans for thermal insulation. The micro loan organisation develops the micro loan product for thermal insulation, it is responsible for monitoring and it is also part of the committee, which decides to allocate loans. Micro loan field officers in the villages provide financial information on households, which serves as basis for the committee to make the decision. They also regularly monitor the loan reimbursement. Agreement is established with suppliers of quality doors and windows, as well as suppliers of insulation materials such as cement, reflective foil, etc. to have a stable supply of required products. Qualified construction workers trained on thermal insulation install quality doors and windows, improve insulation of existing doors, windows, floors and ceilings. Recipients of the micro loan must show a willingness and an ability to repay the loan.
Apart from thermal insulation measures, the micro loan is also available for other energy efficiency products such as: ram pumps, swimming pumps, rain water catchment systems, drip irrigation systems, winter heating and cooking stoves, summer cooking stoves.

Location: Tajikistan, Gorno Badakhshan Autonomous Oblast (GBAO), Roshtala
Approach area: > 10'000 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ031e
Related technology(ies): Reduced pressure on forest resources by improved thermal insulation in private houses (QTTAJ102)
Compiled by: Roziya Kirgizbekova
Date: 2011-05-03

Problem, objectives and constraints

Problems

Use of large amounts of firewood/teresken, thus depleting natural resources, to provide heat due to poor house insulation. Lack of sufficient finances to improve house insulation.

Aims/Objectives

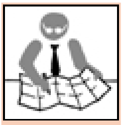
The aim is to ensure easier access to micro loans in order to make it more affordable for the local households to improve their house thermal insulation, and thus reduce fire wood consumption, mitigate health risks, improve general well being and in the longer term, reduce pressure on the environment.

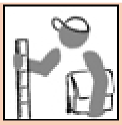
Constraints addressed

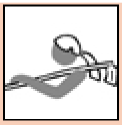
	Constraint	Treatment
technical	Lack of technical knowledge on thermal insulation techniques	Technical support, recommendations and conducting thermal insulation
workload	Households spend a large amount of time on collecting fuel resources to burn for heating and cooking	Less workload due to reduced required amount of fuel
financial	Households do not have enough financial resources available to buy afford thermal insulation for their houses.	Offer micro loans with a low interest rate to be repaid within 12 months
other	Lack of knowledge about the correlation between poor insulation and fuel consumption.	Awareness raising about positive effects of thermal insulation and product promotion

Participation and decision making

Stakeholders / target groups


planners


SLM specialists / agricultural advisors


land users, individual

Approach costs met by:

local community / land user(s)	90%
private sector	1.5%
international	3.5%
other	5%
Total	**100%**

Annual budget for SLM component: US$2,000-10,000

Decisions on choice of the Technology(ies): by SLM specialists alone (top-down)

Decisions on method of implementing the Technology(ies): by SLM specialists alone (top-down)

Approach designed by: national specialists, international specialists

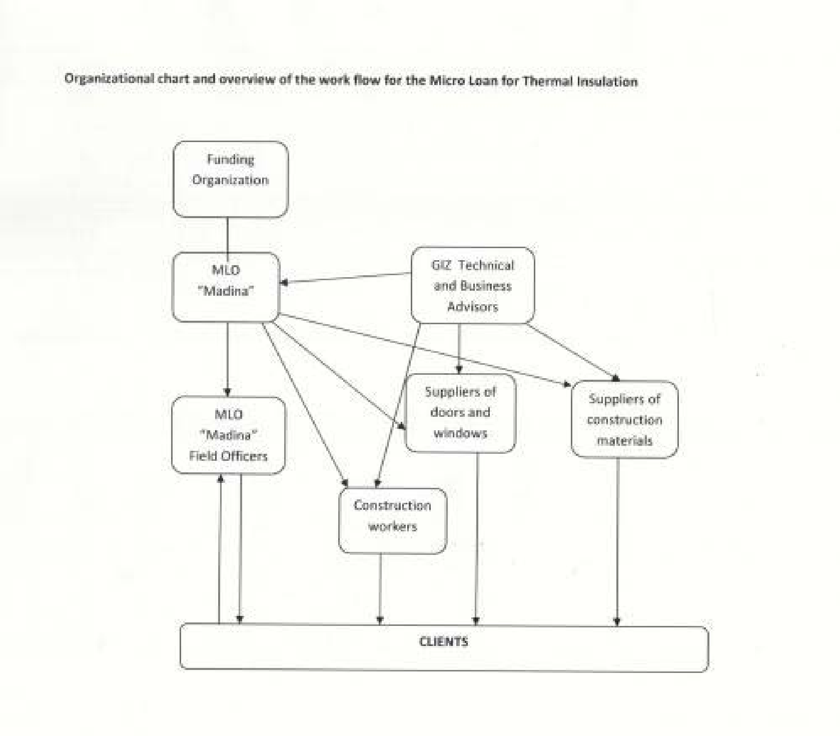
Implementing bodies: international, national non-government

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Interactive	Household members take part in public meetings and awareness raising workshops
Planning	Interactive	Household members jointly with technical and financial specialists prepare a work plan for implementing the insulation works
Implementation	Passive	
Monitoring/evaluation	Interactive	The users and specialists assess the efficiency of the micro loan and its procedures
Research	None	

Differences between participation of men and women: No

Involvement of disadvantaged groups: Yes, great
Households which cannot afford thermal insulation costs in one go, as it is a big financial burden for them, make use of the micro loan. Especially, female-headed households that have very little income.



Organogram: Organisational chart of micro loan for thermal insulation

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor, Craftsmen
Training was demonstration areas, public meetings, courses
Training focused on Awareness raising among the local population on the reasons for, and the effects of bad insulation of houses. The advantages and disadvantages of thermal insulation. Information on existing funding opportunities for thermal insulation. Training of local craftsmen on thermal insulation technologies, and the production of quality and well-insulated doors and windows.

Research:
No research.

External material support / subsidies

Contribution per area (state/private sector): .

Inputs:
- Construction material (stone, wood, etc) - doors, windows, insulation materials. repayable loans.

Credit: Credit was available at interest rates (30% per year) lower than the market rates. Repayment should be completed within 12 months, with 1 month grace period allowed. This equates to a 2.5% interest rate per month.
The credit receiver was Individual households receive credit to implement house thermal insulation

Monitoring and evaluation

Monitored aspects	Methods and indicators
no. of land users involved	Regular measurements by project staff -
economic / production	Ad hoc measurements by project staff -
economic / production	Regular observations by land users -
technical	Regular measurements by project staff -
technical	Regular observations by land users -
management of Approach	measurements by project staff -

Changes as result of monitoring and evaluation: There were few changes in the approach. Initially the micro loan was provided in cash directly to the households, but the results of monitoring showed that not the full amount of the loan was used for thermal insulation purposes. Therefore the MLO decided to allocate the loan for thermal insulation in kind; in the form of products and services, which proved to be more efficient. There were few changes in the technology. Following ongoing discussions with craftsman and construction workers a follow-up seminar was conducted, where problems and possible changes were discussed in order to improve the quality of thermal insulation products. E.g. the roof hatch window had an opening, but it was not possible to open it from inside the room. As consequence every subsequent roof hatch window will have a lever connected to a string in order to open the window more easily.

Impacts of the Approach

Improved sustainable land management: Yes, moderate; Micro loans were given so people could afford to thermally insulate their houses, which reduces fire wood consumption and thus contributes to the preservation and improvement of natural vegetation.

Adoption by other land users / projects: Yes, few; Following MLO Madina, other MLOs in Tajikistan started to include "Micro loans for thermal insulation" into their portfolio. One is MLO Ishkashim in GBAO, a second one is MLO Haqiq in the Baljuvon District of the Khatlon Region.

Improved livelihoods / human well-being: Yes, little; The household living conditions were improved as they now live in warmer and more comfortable houses with reduced health risks

Improved situation of disadvantaged groups: Yes, little; Households save time and money on fuel, and can use this money for other purposes.

Poverty alleviation: Yes, little;

Training, advisory service and research:

- Training effectiveness - The craftsmen were trained on thermal insulation technologies and the production of well-insulated, quality products.

Land users* - good Agricultural advisor / trainers – good Politicians / decision makers - excellent

Land/water use rights: None of the above in the implementation of the approach.

Long-term impact of subsidies:
Positive long-term impact – Moderately. The subsidies were in the form of loans, they allowed the participants to purchase the materials immediately and implement the technologies in the households.

Concluding statements

Main motivation of land users to implement SLM:

Environmental consciousness, moral, health - Fear to fully destroy the surrounding nature

Reduced workload - Less time is spent on collecting fire wood

Well-being and livelihoods improvement - Well-insulated houses allow households to save money and live more comfortably

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:
1) Financial source with low interest rate
2) Improved living conditions
3) There was control of the whole process to ensure efficiency
4) Less harm to the environment

Land users' opinion:
1) Improved knowledge on thermal insulation and micro loans
2) Access to thermal insulation
3) Reduced costs for fuel consumption

Weaknesses and → how to overcome

Specialists' opinion:
1) Costs for training and awareness raising → Initial investments as MLO cannot finance these activities
2) Whether MLO can sustain the interest rates without support coming from grants → The interests rates are still high, there could be a reduction in interest rate or the further payment holidays.
3) Some households still cannot afford the loan →Search for donor funding to establish a separate loan for the most poor

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Community Actions Plans which are publicly displayed in Jamoat Development Committee offices outline village investments, number of participating households, costs and beneficiary contributions.

SLM small grant allocation mechanisms

Tajikistan – Community Agriculture Watershed Management Project (CAWMP)

Mechanisms to facilitate participatory decision-making about grant allocation among land users and improve transparency and accountability in flow of funds to beneficiaries in small-grant programmes for SLM.

Aim / objectives: As part of the Community Agriculture & Watershed Management Project (CAWMP), this approach helped beneficiaries and project partners allocate grants and manage the flow of funding while promoting fairness, transparency, and ownership. It facilitated appropriate SLM choices across the highly variable agricultural, climatic and geographic conditions. Almost 4000 rural investments including SLM technologies were implemented, resulting in over 96,000ha under improved land management practices and benefits for more than 43,000 households in Tajikistan's uplands.
Methods: This approach set a fixed budget per village, limited the grant value received per household as well as the total size of any one grant, required minimum levels of beneficiary contributions, and provided grant money to beneficiaries, enabling them to purchase the inputs.
Stages of implementation: Fixed village budget: In their Community Action Plans (CAP) villages assigned priorities to grants within a set budget amount for the entire village. Project guidelines specified a formula for this budget based on amounts per investment type per household excluding beneficiary contributions ($30/household for farm productivity, $74/household for land management, and $30/household for rural infrastructure). The number of households in a village multiplied by these per-household-amounts determined the overall size of the grant funding for that village. Grant allocation limits. The villages were informed of their overall budget as well as the household limits for each category. They chose investments for groups of households (Common Interest Groups, CIGs) and allocated grant funds to subprojects accordingly. The household limits ensured that collectively at least 50% of the families would benefit directly. In practice, about 75%, of a total of about 57000 households in the project sites participated in the farm productivity and land resource management investments, and 60% in rural infrastructure investments. Grant size. Except in a few cases requiring special approval, the Project-financed grants for each subproject were lower than US$5,000, which reduced risks of the funds being used for purposes for unrelated to the Project. Beneficiary Contribution. Beneficiaries were required to contribute a minimum of 25% of the grant amount in labour, materials or cash which increased their stake in the investment, thereby strengthening ownership and sustainability. At least 5% of the grant amount for rural infrastructure had to be contributed in cash at the start in order to demonstrate financial sustainability.
Role of stakeholders: Fund flow. Once a grant proposal was approved, the PMU transferred the grant amount to the local savings bank according to the schedule specified in the agreement between Jamoat Development Committee (JDC) and CIGs. The JDC accountant transferred the funds from the bank to the CIGs. The CIGs then had the responsibility for purchasing inputs, which created an incentive for selecting cost-effective inputs.

left: Community Actions Plans which are publicly displayed in Jamoat Development Committee offices outline village investments, number of participating households, costs and beneficiary contributions.

Location: Sughd, Region of Republican Subordination, Khatlon, GBAO, Jirgital, Tajikibad, Vanj, Aini, Matcha, Penjikent, Danghara
Approach area: 1'000-10'000 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ044e
Related technology(ies): Numerous technologies implemented under CAWMP: TAJ368, TAJ402, TAJ403
Compiled by: Nandita Jain
Date: 2011-05-24

Problem, objectives and constraints

Problems

Prior to CAWMP, no practical incentives in donor-funded grant programmes for beneficiaries to consider how to optimise returns according to local conditions. Limited choice of technologies, elite capture of resources, requests for large grants and absence of beneficiary contributions led to inappropriate investments for local agro-climatic conditions, and poor returns and investments not maintained in subsequent years.

Aims/Objectives

Practical and feasible mechanisms for beneficiaries and project partners for: a) grant allocation and fund flow that promote fairness, transparency, and beneficiary ownership in the context of Tajikistan; and b) facilitate appropriate SLM choices across the highly variable agro-climatic and other geographic conditions of the country.

Constraints addressed

	Constraint	Treatment
social / cultural / religious	Grant allocations vulnerable to elite capture and/or political influence. Time taken to address such pressures.	Participatory planning and full disclosure at the start of planning to villagers of available funding and its calculation at village and household levels.
technical	Participatory planning processes lacked consideration of multiple factors, e.g., grant amount, choice of technologies, local context, beneficiary contribution, selection of beneficiaries.	Inclusion of participatory rural appraisal, formulae and rules governing grant allocations in CAP preparation. First 3 proposals for each investment category in project sites reviewed to assess understanding of guidelines. Random review thereafter.
institutional	Lack of active participation by beneficiaries in decision-making over grant amounts and choice of investments.	Innovative rules about grant allocations enabling villagers to consider various options of grant amounts and types of investments in a participatory manner, taking into account their local conditions.
financial	Beneficiary dependence on donors/implementing agencies since resources given were “in-kind” and not cash.	Adopted “good practice” from other countries with arrangements for direct cash transfers to beneficiaries organised as groups of farmers who then had responsibility for managing financial resources and procurement for chosen investments.

Participation and decision making

Stakeholders / target groups

land users, groups	other (specify)

Decisions on choice of the Technology(ies): mainly by land users supported by SLM specialists

Decisions on method of implementing the Technology(ies): mainly by land users supported by SLM specialists

Approach designed by: international specialists, national specialists

Implementing bodies: other, local community / land users, government

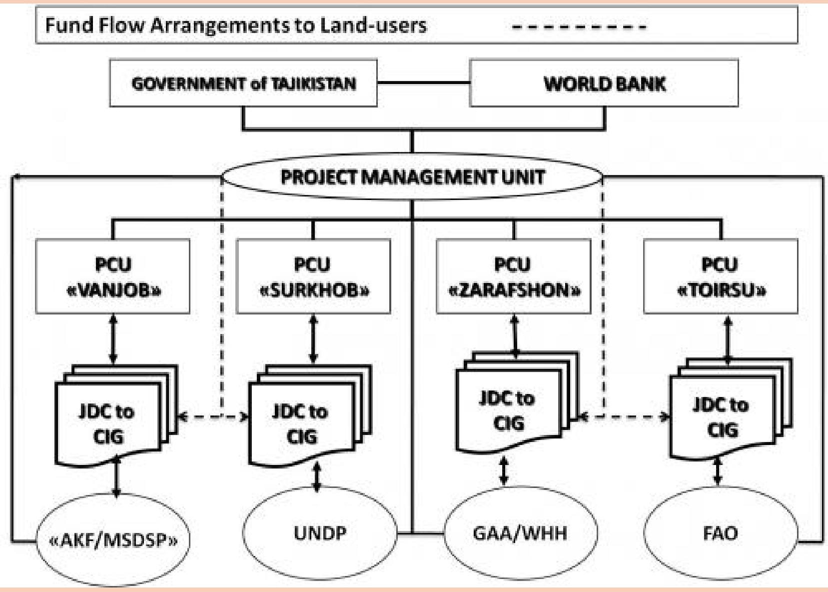
Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	Passive	Potential beneficiaries consulted for social assessment conducted during project design which then influenced project approaches.

Implementation	Interactive	Villagers made grant allocation decisions. CIGs managed grant funds and bought inputs.
Monitoring/evaluation	Interactive	JDCs release grant funds according to benchmarks in formal agreements with CIGs.

Differences between participation of men and women: Yes, moderate. Local cultural and social conditions determined the extent to which women took part in the grant allocation decision-making, and as members of CIGs managing small grant funds. In some more remote communities, it was not generally acceptable for women to be active participants. In other areas, women only CIGs were formed.

Involvement of disadvantaged groups: Yes, moderate. Marginal groups within a generally poor upland rural population participated in grant allocation decisions and as CIG members in managing small grant funds. In some villages, vulnerable and poor households were targeted as priority recipients of grants through the allocation mechanism.



Organogram: CAWMP - Implementation Arrangements and Fund Flow Arrangements to Land-Users

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor, JDCs
Training was public meetings
Training focused on grant allocation mechanisms. Fund flow arrangements and management.

External material support / subsidies

Contribution per area (state/private sector): No.

Credit: Credit was not available.

Support to local institutions: Yes, moderate support.
JDCs received financial support for certain staff, some equipment for their offices, and training (see also TAJ047 for more information on JDC roles in the project). Note-cannot select more than one type of support in the pull-down menu

Monitoring and evaluation

Monitored aspects	Methods and indicators
no. of land users involved	Regular measurements by project staff - Grant allocation – number of beneficiaries
Grant allocation	Regular observations by project staff - Grant allocation - Estimated costs of rural investments
Fund flow	Regular measurements by project staff - Fund flow - Timeliness of transfers from PMU to JDCs to CIGs,

Changes as result of monitoring and evaluation:
There were few changes in the approach. Delays in initial fund flow to CIGs due to a lack of details in financial

management arrangements. Elaboration of manuals and training addressed this problem.
There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, moderate; The grant allocation mechanism fostered multi-factor decision-making, including consideration of local environmental conditions, by villagers. Fund flow arrangements enabled JDCs to manage about $7.4 million in small grants to about 4000 CIGs for rural production investments.

Adoption by other land users / projects: Yes, few; : Portions of the approach and associated guidelines have been adopted in other donor-funded projects.

Improved livelihoods / human well-being: Yes, moderate; Mechanisms contributed to increased livelihood assets for more than 43,000 households through the implementation of about 4000 small grants.

Improved situation of disadvantaged groups: Yes, moderate; The project population is considered generally poor or very poor. Within this population, particularly vulnerable groups participated in rural production investments.

Poverty alleviation: Yes, moderate; Target population generally considered poor or very poor. Assessment of impacts on poverty are included in the project evaluation being conducted in 2011.

Training, advisory service and research:

- Training effectiveness - Generally correct application of grant allocation mechanism. Fund flows to field-level improved after training.

  Land users* - good   JDCs - good

- Advisory service effectiveness
- Research contributing to the approach's effectiveness

Concluding statements

Main motivation of land users to implement SLM: Production, Well-being and livelihoods improvement

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Specialists' opinion: 1) Grant allocation mechanism easily understood and perceived to be fair and transparent. → Document application and disseminate widely. 2) Multiple factors considered in decision-making including grant amount, choice of investment and number of beneficiaries, local conditions. → Improved environmental analyses in participatory planning would lead to more suitable choice of investments. 3) CIG management of funds contributed to improved accountability and incentives to sustain investments. → Document and disseminate methods and results. 4) To be added based on project evaluation in 2011	

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left: Field demonstrations for farmers attending the field school (Photo: UNDP Shaartuz)
right: Farmers attending a lecture during the field school (Photo: UNDP Shaartuz)

Farmer field schools

Tajikistan - Central Asian Countries Initiative for Land Management (CACILM)

Farmer Field Schools (FFS) are held to fill farmer's gaps in knowledge on the use of sustainable agricultural technologies, efficient irrigation water use and prevention of land degradation using trials tailored to local conditions.

Aim / objectives: Farmer field schools are part of the UNDP-GEF project on "Demonstrating Local Responses to Combating Land Degradation and Improving Sustainable Land Management in SW Tajikistan". They were established with the aim to address the dissemination of sustainable and new agricultural practices. Currently, many farmers in Tajikistan may not previously have been farmers during Soviet times and therefore may lack detailed agricultural knowledge and experience.
Methods: The FFS training is voluntary and the opportunities to attend are announced at Jamoat level. Each year 4 different groups, each comprising 10 to 20 farmers are formed in 4 different Jamoats. The learning comprises a range of activities from classroom teaching to hands-on field experience. The content of the training sessions are effectively adapted to the relevant season and crops as well as to the pests that may occur. The field school addresses some of the following topics; cultivation of winter wheat, potatoes, tomatoes and melons, adequate post harvest handling, use of trees and shelterbelts, generation of quality seeds, pest management, efficient use of irrigation water, etc. The field from which the FFS participants learn about agriculture in practice is a 0.5 ha plot provided by one of the farmers.
Stages of implementation: Before the start of the FFS, 4 local agronomists from target Jamoats were recruited by UNDP and sent on a study tour to Russia. These agronomists in their capacity as a Local FFS Consultant started running FFSs in each Jamoat. Initially, in conjunction with the National FFS Consultant of the SLM project, the local consultants organised several meetings with local farmers in order to identify their training needs. Taking into account the needs of farmers the curricula was prepared and the training schedule was agreed with the farmers/participants.
Role of stakeholders: The project engaged women who are generally considered landless and vulnerable. They were involved in the demo plots on the basis of agreement signed between a local women's group and a farmer, who owned the land. According to this agreement 70% of the harvest is distributed among the women, and 30% remains for farmer. In addition, many training sessions on pest management, planting of tomatoes, potatoes etc were delivered to women at the demo plot. To ensure food security at the household level training on canning, preparation of juice and how to make jam were conducted. However, more male than female farmers participated in the FFS. This is linked to the fact that the role of male farmers on Dehkan farms is to take decisions on cropping patterns and instruct other farmers. Therefore better dissemination of knowledge is expected from male farmers participating. The project has been efficient in providing micro-loans through an agreement with the micro-loan organisation "Rushdi Obshoron" for agricultural purposes in all four Jamoats, In total, 100,000USD has been distributed to 4 Jamoats.

Location: Khatlon, Shaartuz
Approach area: 0.8 km^2
Type of Approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: TAJ018e
Related technology(ies): Pest management with pheromone insect traps (QTTAJ109), Rehabilitation of poor soils through agroforestry (QTTAJ113)
Compiled by: Firdavs Faizulloev
Date: 2011-04-15

Problem, objectives and constraints

Problems: lack of technical agricultural and ‘market economy’ knowledge, poverty

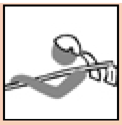
Aims/Objectives: The main aim of the approach is to support a change in mindset from a collective farming (Kolhoz) approach led by the state, onto private farmers putting more responsibility with the land users themselves. Since the collapse of the Soviet Union, many collective farms disintegrated and as a result of land reforms, the Dehkan farms came into being. People without an agricultural background could set up their own Dehkan farms and become farmers. However, a lack of knowledge and expertise frequently led to inappropriate land use which has contributed to land degradation. The objectives of FFS are to provide training sessions to farmers to improve their knowledge of better farming practices and the more rational use of land and water resources.

Constraints addressed

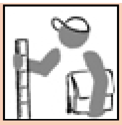
	Constraint	Treatment
social / cultural / religious	Many women in the region do not own their own land and can therefore be very vulnerable	They were involved in the FFS receiving special training on pest management, planting of tomatoes, potatoes, vegetable canning, preparation of juice etc. A benefit sharing agreement was signed between the women’s group and the farmer who owned the land
financial	Lack of financial resources to buy fuel, fertilisers, livestock etc.	A microloan organisation is providing credit loans from 2000-9000 Somoni (450-2,000 USD)
technical	In general farmer’s agricultural knowledge is weak. Especially as after the collapse of the Soviet Union anybody could get some land and become a farmer, even people who did not have a traditional farming background and therefore no agricultural knowledge	In the field schools farmers are receiving training about new agricultural technologies and have the chance to get advice about their particular problems
other	No quality seeds were available	UNDP provided seeds and ensured that a multiplication mechanism took place

Participation and decision making

Stakeholders / target groups



land users, individual



SLM specialists / agricultural advisors

Approach costs met by:

international	100%
Total	**100%**
Annual budget for SLM component: US$100,000-1,000,000	

Decisions on choice of the Technology(ies): mainly by SLM specialists with consultation of land users

Decisions on method of implementing the Technology(ies): mainly by SLM specialists with consultation of land users

Approach designed by: international specialists

Implementing bodies: local community / land users, international non-government, national non-government

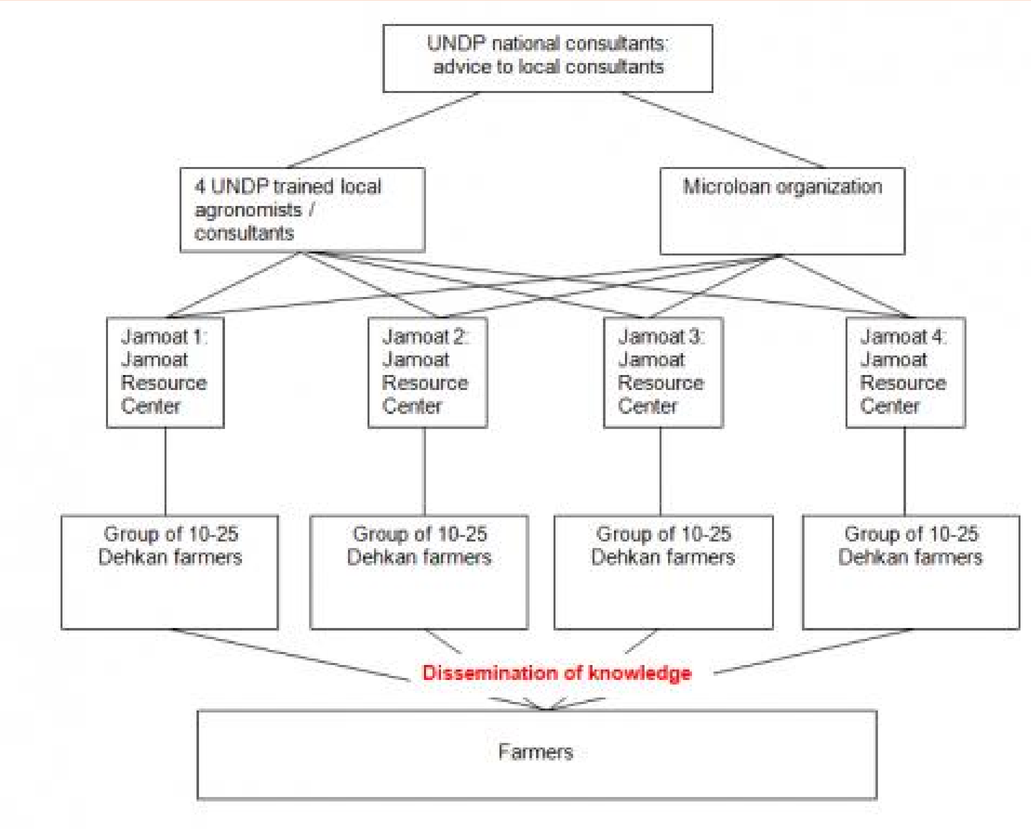
Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Passive	
Planning	Passive	
Implementation	Passive	Farmers only participated in FFS and were not involved in developing the content of training

Monitoring/evaluation	Interactive	No monitoring of the theoretical part of the approach took place, monitoring of land users success in applying the taught practices included interactive participation of land users.
Research	Interactive	Some research on crop performance was undertaken with interactive involvement of land users.

Differences between participation of men and women: Yes, moderate. Only 1/3 of the participants were women. This is linked to the fact that the role of male farmers on Dehkan farms is to take decisions on cropping patterns and instruct other farmers. Therefore better dissemination of knowledge is expected from male farmers participating.

Involvement of disadvantaged groups: Yes, moderate
Landless women who are very vulnerable.



Organogram: Before the start of the FFS 4 local agronomists from target Jamoats were recruited by UNDP and sent on a study tour to Russia. These local FFS consultants then started running a FFS in each Jamoat.

Technical support

Training / awareness raising:
Training provided for land user, field staff/agricultural advisor
Training was demonstration areas, site visits / farmer to farmer, on-the-job, courses
Training focused on sustainable irrigation water use, integrated crop management, tree planting for biodrainage, preventing gully formation, crop storage, effective seed production, pest management

Advisory service:
Name: Farmer Field Schools
Key elements:
1. Classroom courses
2. Farmer to farmer visits
3. Demonstration plots

Research is done on demonstration plots. Farmer to farmer visits are needed for an exchange of experience between different farmers.
The extension system is quite adequate to ensure continuation of activities. As they were provided with adequate training, the local level consultants are now able to continue holding training in farmer field schools. If the provision of micro-loans and the pay-back scheme keep working, funding will be available to ensure continuation.

Research: Yes, moderate research. Topics covered include ecology, economics / marketing, technology. Mostly on-farm research.
Experiments about intercropping of different crop species. Local consultants also undertook research on marketing of different crops, which crop should be grown, and when for example, in order to achieve the best prices.

External material support / subsidies

Contribution per area (state/private sector): No.

Labour: Voluntary.

Inputs:
- Agricultural (seeds, fertilizers, etc) - seeds. Fully financed
- Equipment (machinery, tools, etc) - machinery, tools. Not financed
- Infrastructure (roads, schools, etc) - classrooms. Fully financed
- Study trip for local consultants to Russia - travel, accommodation, per diems. Fully financed

Credit: Credit was available at interest rates (1.5% per month) lower than the market rates. A microloan organisation was established and equipped by UNDP with a starting capital of USD 30,000. The interest rate is 1.5% per month, which is considered low compared to credits provided by other financial institutions. Moreover, it requires very limited papers to be provided for get a loan. Farmers pay back loans in cash.

Support to local institutions: Yes, moderate support with training, financial, infrastructure, classrooms

Monitoring and evaluation

Monitored aspects	Methods and indicators
technical	Regular measurements by project staff - on farm productivity
bio-physical	Ad hoc observations by land users
economic / production	Regular observations by project staff - market situation
no. of land users involved	Regular measurements by project staff

Changes as result of monitoring and evaluation:
There were no changes in the approach.
There were several changes in the technology. Exchange of experiences between different Jamoats (Jamoats differed in types of crops cultivated).

Impacts of the Approach

Improved sustainable land management: Yes, moderate; More holistic thinking, including crop selection, cultural practices, conservation, integrated pest management etc. However, the number of farmers participating in field schools is still somewhat limited.

Adoption by other land users / projects: No; The approach has not yet been disseminated over the country.

Improved livelihoods / human well-being: Yes, moderate; higher crop yields

Improved situation of disadvantaged groups: Yes, moderate; Landless women were engaged in the field schools. The women groups kept 70% of the crop yield, while 30% was paid to the landowner of the demonstration plot. Food security increased for the women.

Poverty alleviation: Yes, moderate; Higher income through increased crop production.

Training, advisory service and research:

- Training effectiveness - agricultural advisors were trained in Russia

  Land users* - excellent

  Agricultural advisor / trainers - excellent

- Advisory service effectiveness

  Land users* - excellent

- Research contributing to the approach's effectiveness - Little

Land/water use rights:
Hinder - moderately in the implementation of the approach. Initially, farmers had no freedom to farm, meaning they were not allowed to choose which crops they would grow, however, after the economic crisis this changed.
The approach did not at all reduce the land/water use rights problem. The approach could not reduce the problem, it was a governmental decision.

Long-term impact of subsidies: No subsidies were used.

Concluding statements

Main motivation of land users to implement SLM:

Production

Prestige / social pressure

Well-being and livelihoods improvement

Agricultural knowledge

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The farmers are trained on the rational use of land and water resources which helps to reduce land degradation. → An emphasis has to be put on the prevention of land degradation.
2) Farmers from different backgrounds enrich their farming practices and fill gaps in agricultural knowledge topics taught in FFS should be diversified and continually updated. →Topics taught in FFS should be diversified and always be up to date.

Land users' opinion:

1) Increased crop yields lead to increased family budget → Ensure application of taught practices.
2) The farmers feel confident about what they do and are keen to disseminate their knowledge to other farmers → Dissemination of knowledge to other farmers so that more people can profit, for example through farmer to farmer visits.
3) The farmers know which crops to cultivate and how to adapt to the market conditions.
4) Integrated pest management helps to fight diseases and leads to better onion yield →Apply integrated pest management on all fields.

Weaknesses and → how to overcome

Specialists' opinion:

1) Until now the FFS were running free of charge to the participants, however, this should be changed in order to raise more money to continue with the field schools, but farmers might not be willing to pay immediately, it takes some time before the farmers realise the significance of the FFS → Farmers would be more willing to pay if they were asked for in kind contributions, rather than cash.

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left: Photo shows the enclosure with homestead at top, lucerne (bright green) on upper slope, fruit trees (mid slope) and stone piles at the bottom of the slope. Strong contrast in vegetation cover and lessened erosion inside. (Photo: Des McGarry and Habib Kamolidi)
right: Photo is taken inside the enclosure – showing lucerne (fodder), orchard trees and vegetable garden (right hand edge). (Photo: Des McGarry)

Enhancement of existing SLM technologies through demonstration sites

Tajikistan - GITEC/ADB/GEF/DMC Rural Development Project

Location: RRP, Varzob, Luchob
Approach area: < 10 ha
Type of Approach: other (specify): Local initiative enhanced by programme activity
Focus: on conservation only
WOCAT database reference: TAJ037e
Related technology(ies): Enclosed household
Compiled by: Habib Kamolidinov
Date: 2011-05-04

Enhancement of existing self developed SLM technologies into demonstration sites.

Aim / objectives: The farmer clearly stated that his prime, initial aim in taking over this "ruined and abandoned land" was to improve and better assure the quality of his family's lifestyle, through enhanced and assured food and fodder production. He also recognised the potential for future profit, through sale of his excess produce to market. Currently, the family has almost no need to buy food (and fodder) from nearby markets, apart from flour (for bread making). This is a large cost saving factor. In hindsight, the farmer sees that he has dramatically improved land quality within the enclosure through mitigating erosion and increasing year-round vegetation cover

Methods: The success of the enclosure is the result of using several methods. The fence construction was critical to keep out both domestic animals (cattle, goats and sheep) and wild ones, (pigs and wolves) from what was to become a vegetation rich "island" amongst the bare and degraded hillslopes. Stone clearing (by hand) of the whole area inside the enclosure greatly improved land quality due to enhanced soil depth and subsequent vegetative growth. Tree planting (apple, cherry, apricot, pear) was critical to provide family food. Lucerne planting provided food for the farmer's animals (1 cow, 10 goats) that provide milk and meat. A small area of land near the homestead (approx. 20 x 20 metres) was levelled into several small terraces for vegetable production (potatoes, garlic, onion, peppers, tomatoes). Irrigation is conducted within the upper part of the enclosure; water being provided by a 20mm polythene pipe that brings water from 1.5 km away where there is a permanent spring.

Stages of implementation: The family (Enomali) first occupied this land in 1984. The first task was tree planting – the first orchard trees – on 0.1 ha of the current enclosure. This was fenced, then after nine family members left (to work in Dushanbe) he expanded the fence to the current 0.2 ha and continued to plant trees. Stone removal continued through the 1990s and even to today. The lucerne and vegetable gardens were initiated in the 1990s and continue to be enriched. The fodder, trees and vegetable production is an ongoing task, as is feeding the animals with the home-grown fodder. He continues to plant orchard trees every year and currently has more than 100. He gained a "certificate" of ownership" in 2008.

Role of stakeholders: All of the work within the enclosure has been conducted by family members. The main two are the husband and wife, though in the early stone clearing and fence construction days his 1st cousin assisted. His son and daughter in law have also assisted (though the son now works in Dushanbe) – even the young grandchildren help.

Problem, objectives and constraints

Problems

The main problem to be addressed was reducing poverty, to help achieve a better and more sustainable lifestyle by producing better quality and more assured food and fodder.

Aims/Objectives

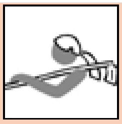
The prime, initial aim in taking over this “ruined and abandoned land” was to improve and better assure the quality of his family’s lifestyle through enhanced and assured food and fodder production. He also recognised the potential for future profit, through sale of his excess produce to market. Now, he wants to expand the area within the enclosure to 1 ha with extra fencing and supplementary irrigation supply from another spring.

Constraints addressed

	Constraint	Treatment
social / cultural / religious	This family was one of the first in this region to take over an area of “ruined” land and begin improvements. However, the farmer did not see this as arduous, rather he welcomed the chance to work hard and provide for his family	Family working together to improve land
workload	The family have worked consistently for 26 years, slowly but have created better land and vegetation conditions	
technical	The family provided their own solutions to any problems since the project began in 1984	
institutional	He has now gained a certificate of ownership that ensures ownership until his death. The government still owns the land and he pays $5 US a year in tax (total).	Application for land entitlement certificate
legal / land use and / water rights	Not applicable. The water (irrigation) is “free” and there are no current disputes over his use of the spring water	
financial	The farmer could improve his SLM but would need financial assistance	

Participation and decision making

Stakeholders / target groups



land users, individual

Approach costs met by:

local community / land user(s)	100%
Total	**100%**

Annual budget for SLM component: US$< 2,000

Decisions on choice of the Technology(ies): by land users* alone (self-initiative / bottom-up)

Decisions on method of implementing the Technology(ies): by land users* alone (self-initiative / bottom-up)

Approach designed by: land users

Implementing bodies: local community / land users

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Self-mobilisation	The extended family, when available
Planning	Self-mobilisation	Principally the husband and wife – Mr Enomali and wife
Implementation	Self-mobilisation	The family
Monitoring/evaluation	Self-mobilisation	Mr Enomali and his wife are continuously evaluating the production quantities and quality from their labours
Research	None	Not applicable

Differences between participation of men and women: Yes, little
The men focused on the heavier labour tasks of fence building and stone removal. The women focus on the garden, fruit production and bee keeping.

Involvement of disadvantaged groups: No

Technical support

Training / awareness raising:
No

Advisory service:
Name: No advisory services were ever requested by or given to the family

The extension system is inadequate to ensure continuation of activities. The family have acted quite independently of any advisory service. Generally they could be given advice on fertiliser use, better seed selection, irrigation practice. But these are rarely provided in the region where they live.

Research: No research.

External material support / subsidies

Contribution per area (state/private sector): Yes.

Labour: Voluntary. all labour was family-provided

Credit: Credit was not available.

Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
bio-physical	Ad hoc observations by land users - The family, generally, take note of the effect of their practices in terms of production
economic / production	observations by the family

Changes as result of monitoring and evaluation:
There were no changes in the approach.
There were no changes in the technology.

Impacts of the Approach

Improved sustainable land management: Yes, large; There is a dramatic visible difference in both the lessened degree of erosion and vegetative land cover between the enclosure and the surrounding land (see left picture, above). Also, the production quantity and quality of food and fodder from this enclosure has continued to increase.

Adoption by other land users / projects: Yes, some; The farmer says that several of his neighbours have been doing similar interventions to his – fencing, stone removal, planting orchards etc. What he has done is very visible from the main road through the valley, and many people have observed the results of his efforts over the years

Improved livelihoods / human well-being: Yes, large; His family eat well, plentiful and have very fresh/organic produce from their own household plots

Improved situation of disadvantaged groups: Yes, large; After fall of Soviet Union, many in Tajikistan experienced poverty, particularly food shortages. This farmer foresaw this and commenced his enclosure enrichment work. In this way he ensured quality food supply for his family and stopped dependence on market produce.

Poverty alleviation: Yes, great;

Training, advisory service and research:

- Training effectiveness - There was no training
- Advisory service effectiveness - There was no advisory service
- Research contributing to the approach's effectiveness
  There was no research

Land/water use rights:
Help - low in the implementation of the approach. There was no compelling need for the farmer to get a "entitlement certificate" but he did so anyway.

Long-term impact of subsidies:
No subsidies given

Concluding statements

Main motivation of land users to implement SLM:

Production

Environmental consciousness, moral, health

Well-being and livelihoods improvement

Sustainability of activities:

Yes the land users can sustain the approach activities.

Strengths and → how to sustain/improve

Specialists' opinion:

1) The farmer has achieved what he wanted; assured quantity and quality of food/fodder production to assure his family's livelihood. → He wants to increase his enclosure area by 5 times. To do this he will require fencing and pipe for irrigation.
2) Though not an initial objective, the farmer now recognises that he has dramatically improved land quality and vegetation cover within the enclosure, further assuring continued increased production through improved soil conditions → By continuing to do what he has been doing for 20+ years already.

Land users' opinion:

1) As above, as these words were transcribed during the farmer interview, on site

Weaknesses and → how to overcome

Specialists' opinion:

1) The (apparent) lack of micro credit schemes that the farmer could access. The farmer does not have sufficient financial means to purchase the additional fencing and irrigation pipe, required to extend the current enclosure area to 1 ha size → Involvement of local banks
2) The total lack of institutional support. This has not necessarily negatively impacted on the farmer – but rather has led to a reduced uptake of his (excellent) practices elsewhere, both locally and nationally → Immediate visits of local agronomic staff (governmental) to record the modalities of what has been achieved at this site, to help ensure the wider implementation for improved land quality and vegetative cover, at a more national level.

Land users' opinion:

1) As above, as these were the sentiments of the farmer during on site interview

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Technical Assistance Groups (TAG)

Tajikistan – GIZ/TAFF(DFID/EU/EBRD)

left: Photo shows a practical training on crop monitoring in the field (Photo: Laurie Kälin)
right: Photo depicts training on pesticide use in cotton (Photo: Laurie Kälin)

Technical advisory groups working on a 'fee for service' basis provide an effective service to farmers to achieve measurable yield increases, based on regular crop monitoring, crop management advice and effective use of inputs (fertilisers, water, pesticides, etc.)

Aim / objectives: The TAG concept is designed to achieve the following key objectives: (1) Provide an effective agronomic advisory service to farmers to achieve measurable yield increases, based on regular crop monitoring, crop management advice and effective use of inputs (fertilisers, water, pesticides, etc.), (2) Support the development of agricultural input supply and distribution, and (3) Operate as independent entities on a competitive 'fee for service' basis (fee per ha), working towards achieving self sustainability.

Methods: TAGs are the central component of the framework and follow a very simple operational structure, basically consisting of a “Senior Agronomist” (SA), a “Organisation Manager” (OM) and a defined number of “Field Agronomists” (FA). The SA will register an advisory business as well as the OM and FA. The cooperation will be regulated by cooperation contracts. The SA will engage directly into service contracts with farmer clients to whom they will provide crop management recommendations throughout the entire production cycles. TAGs will be based in defined geographic areas, operating with local staff (SA, OM, FA) and build up a customer base large enough for financial self sustainability.

Stages of implementation: (1) TAGs are registered as enterprises, (2) TAGs develop business plans, (3) TAGs develop work plans and field records, (4) each TAG signs contract with cooperation partners (TAFF and GIZ-PSD project), (5) TAGs get first payment from cooperation partners (555 USD per TAG), (6) TAGs sign consulting contracts for 500 ha, farmers pledge to pay for advisory service 24 TJS/ha in the whole season, (7) quality control of advisory contracts concluded: visit of contracted farms to ensure the farmers understand the TAG-system, (8) TAGs do market analysis for the regional availability of suppliers for pesticides, fertiliser etc., mechanisation contractors, banks, buyers, (9) second payment from cooperation partners, 5 TJS per ha up to 500 ha contracted area per TAG, (10) third payment from cooperation partners, same conditions as previous point, (11) fourth payment from cooperation partners, 12 TJS per ha contracted area (only if field advisors are contracted and have received first salary, first field records are made and filed to the TAG documentation), (12) first payment from clients/farmers, 12 TJS per ha contracted area, (13) second payment from clients/farmers, 12 TJS per ha contracted area, (14) fifth payment from cooperation partners, 5 TJS per ha contracted area (only if contracts are fully pay through clients, TAG must handover documentation of their work).

Role of stakeholders: Cooperation partners provide expertise and training, support to the organisational and sustainable development of TAGs and financial support. NGOs (Agricultural Extension Service Providers) will be invited to enter into contract agreements for the provision of training to TAGs. TAGs consist of a “Senior Agronomist” (SA), a “Organisation Manager” (OM) and a defined number of “Field Agronomists” (FA).

Location: Khatlon, Soghd, RSS, Yovon, Hissor, Vakhsh, Djomi, Konibodom, Zafar, Kuljob, Vose
Approach area: 160 km^2
Type of Approach: project/programme based
Focus: mainly on other activities
WOCAT database reference: TAJ043e
Related technology(ies): not documented
Compiled by: Julie Zähringer
Date: 2011-05-20

Problem, objectives and constraints

Problems: low agricultural production, lack of technical knowledge

Aims/Objectives

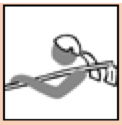
The main objectives of the approach were to: (1) Provide an effective agronomic advisory service to farmers to achieve measurable yield increases, based on regular crop monitoring, crop management advice and effective use of inputs (fertilisers, water, pesticides, etc). (2) Support the development of agricultural input supply and distribution. (3) Operate as independent entities on a competitive 'fee for service' basis (fee per ha), working from the start towards achieving self sustainability.

Constraints addressed

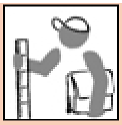
	Constraint	Treatment
institutional	weak capacity of governmental agricultural extension services	establishment of independent agricultural extension services
technical	little or no access of farmers to effective agronomic technical assistance services	establishment of technical advisory groups TAGs

Participation and decision making

Stakeholders / target groups


land users, individual


land users, groups


SLM specialists / agricultural advisors

Approach costs met by:

international	20%
national non-government	80%
Total	**100%**

Decisions on choice of the Technology(ies): by SLM specialists alone (top-down)

Decisions on method of implementing the Technology(ies): by SLM specialists alone (top-down)

Approach designed by: international specialists

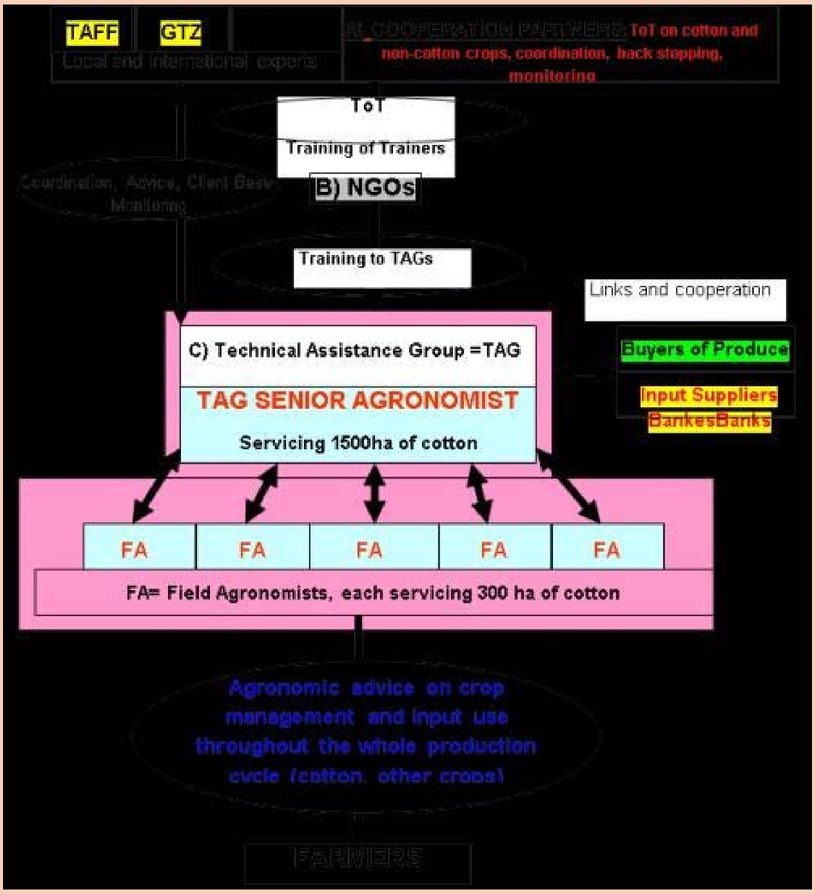
Implementing bodies: international, national non-government

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	None	
Planning	None	
Implementation	Passive	the land users pay the TAGs for their services with a service fee
Monitoring/evaluation	None	
Research	None	

Differences between participation of men and women: Yes, great. All senior agronomists are male. They were selected on the basis of their perceived experience and agronomy knowledge. Field agronomists were selected by their respective SA. Some of the field agronomists are female.

Involvement of disadvantaged groups: No



Organogram: The Technical Assistance Group (TAG) Framework

Technical support

Training / awareness raising:

Training provided for field staff/agricultural advisor
Training was technical advisory service
Training focused on Innovative approaches to crop management, effective use of agricultural inputs (fertilisers, pesticides, water, etc), basics of advisory work, cotton growing, modern ways of plant protection, cooperation with other service providers, improving the performance of the TAG team, and improving the TAG business were key focus points.

Advisory service:

Name: Technical Assistance Groups (TAGs)
Key elements:

1. TAGs provide know-how on modern crop production and crop management techniques to individual farmer clients.
2. TAGs establish links with input providers and buyers of produce
3. TAGs are financially self-sustainable through the service fee they collect from farmer clients

The extension system is quite adequate to ensure continuation of activities. The value of crop rotation to conservation and improvement of soil health is clear to the TAG. Problems associated with erosion and fertiliser leaching are being discussed in field training sessions.

Research: Yes, little research. Topics covered include economics / marketing. Market analysis of regional availability of suppliers of pesticides, fertiliser etc., mechanisation contractors, banks, buyers.

External material support / subsidies

Contribution per area (state/private sector): Yes. TAFF/GIZ-PSD project will provide a voucher to the senior agronomists to pay for additional NGO services, which they might need based on individual requirements. The voucher will cover 80% of the cost

Inputs: - Establishment of TAGs at the beginning - . Partly financed

Credit: Credit was not available.

Support to local institutions: Yes, great support with financial, training
The TAGs were registered as formal entities. They were supported by the coordination partners financially and through training sessions.

Monitoring and evaluation

Monitored aspects	Methods and indicators
economic / production	Regular measurements by project staff - Measurement of yields by TAG and farmers, accumulation of data over time
area treated	Regular observations by project staff - Approx. 17,000 ha being covered by TAG
no. of land users involved	Regular observations by project staff - Nearly 900 dehkan Farms serviced
management of Approach	Regular observations by project staff - Communication between TAG, land users, input suppliers and project staff
socio-cultural	Regular observations by project staff - gender of contracted farmers
technical	Regular measurements by project staff - Agronomic measurements of crop progress by TAG and staff
technical	Regular observations by project staff - Comprehensive collection of land use activities

Changes as result of monitoring and evaluation: There were several changes in the approach. Introduction of record keeping for field activities to serve as a decision making tool in the future. Introduction of systematic crop progress evaluations enabling much improved crop management. Communication between farmers and input suppliers is streamlined, with the expected outcome of improvements in quality and timing of input usage. There were several changes in the technology. New tools introduced for record keeping and crop progress monitoring. Improvements in timing and quality of field activities (cultivation, fertilisation, irrigation etc). Improved access regarding timeliness and quality of production inputs.

Impacts of the Approach

Improved sustainable land management: Yes, little; In the longer term land users benefit from agronomic advise to improve sustainable land management (e.g. fertiliser use, irrigation efficiency, crop rotation).

Adoption by other land users / projects: so far no

Improved livelihoods / human well-being: Yes, moderate; Employment of agronomists through TAG, is partly funded by the service receivers (farmers). Expected increases in land productivity as a result of this agronomy advice will lead to higher farm income.

Improved situation of disadvantaged groups: Yes, moderate; Employment of male and female agronomists through TAG, partly funded by service receivers (farmers). Expected increases in land productivity as a result of advice will lead to higher farm income.

Poverty alleviation: Yes, moderate; Employment of male and female agronomists through TAG, partly funded by service receivers (farmers). Expected increases in land productivity as a result of advice will lead to higher farm income.

Training, advisory service and research:

- Training effectiveness - TAG agronomists as well as local NGOs have adopted new technologies that have not been used previously

  Agricultural advisor / trainers - excellent

- Advisory service effectiveness - Overall, farmers report that the advisory service is of very high quality. The real benchmark will be the number of returning clients next season, and the increase in the amount of hectares serviced by the various TAGs.

  Land users* - excellent

Land/water use rights: None of the above in the implementation of the approach.

Concluding statements

Main motivation of land users to implement SLM:

Production - Farmers expect increased production as a result of agronomic advice

Increased profit(ability), improve cost-benefit-ratio - Framers expect increased farm income as a result of agronomic advice

Sustainability of activities: No the land users can't sustain the approach activities. Land users rely on agronomic advice and on timely access to good quality inputs. TAGs, if successful, can provide a service to the farmer for which he/ she is prepared to pay for. TAGs if successful however, are expected to continue and grow their advisory services businesses and become self sustainable.

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Specialists' opinion: 1) Networking between TAGs and input suppliers → Facilitation and improvement of communication, training 2) Systematic and professional approach to the provision of services → Ongoing training of TAGs and NGOs 3) TAGs are registered service providers → Return clients, increase in client numbers 4) Quality agronomic advice → Ongoing training und upskilling of agronomists. Establishment of a strong core of agronomic advisors who themselves will train new agronomists as their advisory businesses grow	

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