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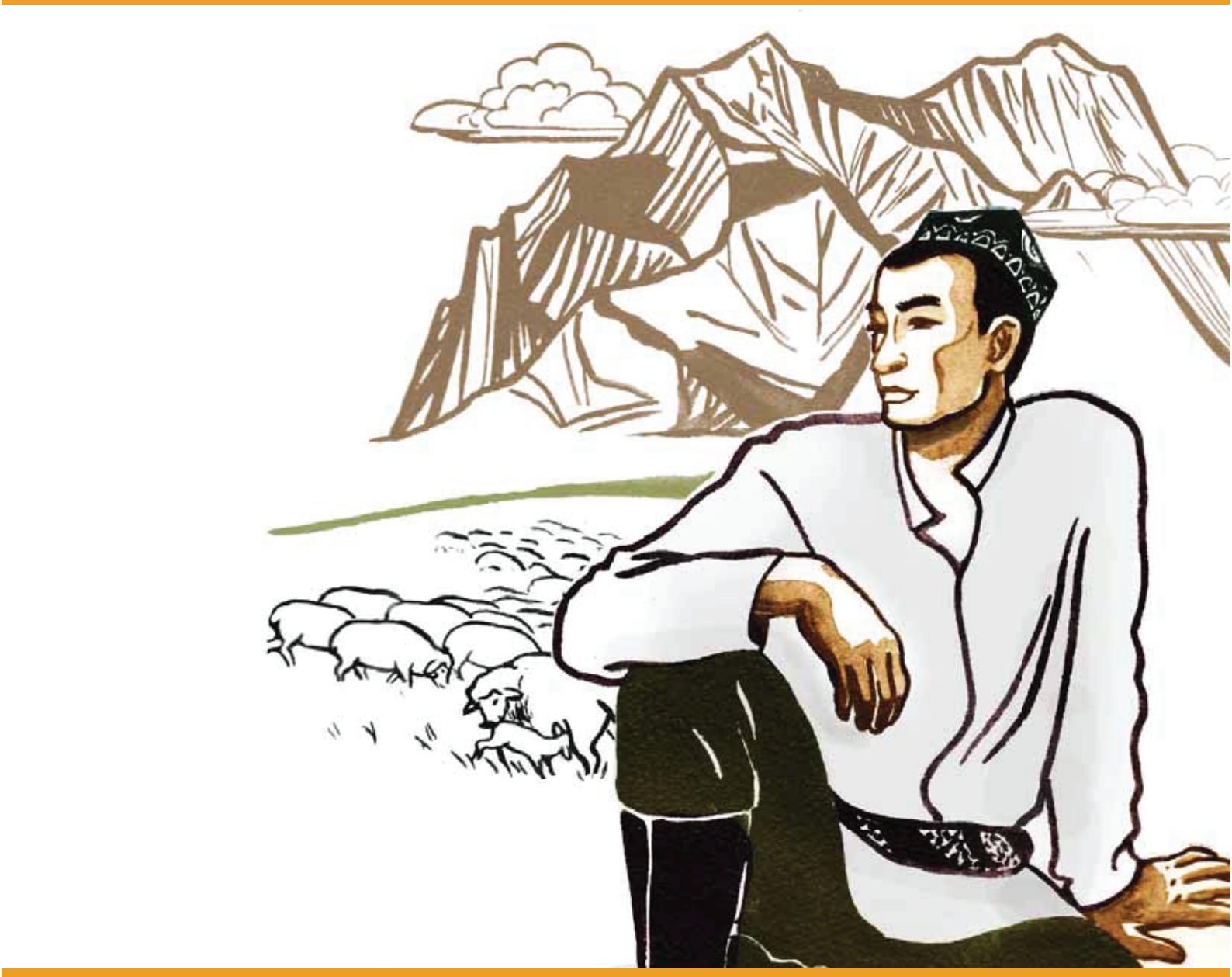

Herders' manual for Western Pamir

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December 2012

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This project was made possible with support from the GEF/UNEP/UNU Project on Sustainable Land Management in the High Pamir and Pamir-Alai Mountains and the Mountain Partnership.
The manual was developed to facilitate capacity development of village institutions, herders and other stakeholders by sharing knowledge and promoting the adaptation of innovative and sustainable practices for pasture and livestock management. Researchers consulted herders, village committees and community members to gather information on pasture plants, pasture monitoring and pest control, as well as livestock breeding, health and production management, and the manual blends traditional and scientific knowledge to provide simple, effective tools for improving animal and pasture productivity.

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Foreword

Over the past 150 years, the herders in Tajik Pamir have faced many changes, and adapted to the Tsarist and the Soviet Union regimes which challenged and eroded traditional herding practices. Since independence in 1991, they have faced the new challenge of collective farms being dissolved and the assets distributed among family households. The result of this policy was the abrupt ending of many Soviet large-scale features and services of livestock rearing, including veterinary services, winter fodder supply from neighboring countries and transportation to and from summer pastures. Many families were overwhelmed at handling their own smaller stock of animals in an efficient, economic and ecologic manner, leading to major destocking, overgrazing of near-village pastures and the underutilization of distant pastures. Many households were forced to revert to self-subsistence and many lack the necessary experience for herding and pasture management. Unclear regulations and mechanisms to access pasture resources further accentuated pastoral resource degradation.

During the recent past Mountain Societies Development and Support Program has facilitated village level organizations. Such organizations have the potential to contribute to sustainable management of pastures at village level. However, a simple and appropriate monitoring tool and pasture improvement techniques are lacking to be used by such organizations to better manage and efficiently monitor pastures and livestock.

This manual intends to fill this gap. The author and research team have collected remaining traditional and practical knowledge and skills from experienced herders, and combined this knowledge and practice guidelines with relevant, current scientific knowledge and best practices. The manual includes important and localized information, ideas and guidelines, presented in a concise and clear manner. Versions are available in Tajik, Russian and English.

Ultimately, it is anticipated that this manual will enable current and future herders to become the custodians of pastures and livestock as a national resource and heritage of great importance, and to improve both pasture quality and livestock output.

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Introduction

This manual consists of several complementary parts.
Part A is dedicated to the 85 most important and desired pasture plants and to the 25 least wanted but frequent weeds or toxic plants. The classification is based on the assessment of experienced herders throughout Tajik Pamir. Through participatory appraisals plants were identified, ranked and ultimately selected as belonging to one of the two categories. The plants were assessed with respect to their desirability by different livestock, their habitat and tolerance to grazing, drought, and frost as well as their seasonal appearance.
Part B presents a pragmatic approach to sustainable pasture management by shedding light on concepts such as grazing behavior of livestock, explaining the importance of appropriate grazing and herding or how to assess and regularly monitor pasture quality. This part also includes explanations along with tips and tricks on how to improve pastures e.g. through weed, pest and rodent control as well as seeding and fertilization.
Finally Part C addresses concrete measures for an improved livestock management. It contains tips for estimating livestock weight, and improved feeding, breeding, and housing. A table provides a detailed overview of the most important and frequent diseases including suggestions for treatment and preventive measures. An additional table explains how to vaccinate and de-worm livestock.
Part D encompasses different forms.

Part A

Pasture plants

Local name(s)	Tezkand
Scientifc / Russian name	Ctratoides papposa Botsch et Ikonn. / Терескен серый
Main grazing season	Autumn / Winter
Main habitat	Dry, barren places
Geographical distribution / Altitudinal range	The upper reaches of the Western Pamir / 2500-4150 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★
Biomass	★★★★
Other use	Fuel

Local name(s)	Rusht puhtagulak
Scientifc / Russian name	Hedysarum Lemannianum Bunge / Копеечник Лемана
Main grazing season	Spring / Summer / Autumn
Main habitat	Dry places and slopes
Geographical distribution / Altitudinal range	Garmchashma r., Bogushdara gorge, Chandim r. and others / 1800-2700 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★
Biomass	★★★★
Other use	Decorative

Local name(s)	Nahudak
Scientifc / Russian name	Oxytropis pagobia Bunge / Остролодочник ледниковыйт
Main grazing season	Summer / Autumn
Main habitat	Meadows
Geographical distribution / Altitudinal range	Kokbai r., Tokuzbulak, shore of Sarez lake / 3600-4500 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★
Frost tolerance	★★★★★
Palatability	★★★★
Biomass	★
Other use	None

Local name(s)	Rupsdumak
Scientifc / Russian name	Alopecurus pretense L. / Лисохвост луговой.
Main grazing season	From spring to autumn
Main habitat	Meadows, riverbanks and lakes
Geographical distribution / Altitudinal range	in all areas / 2600-4150 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	
Frost tolerance	★★★★★
Palatability	★★★★★
Biomass	★★★★★
Other use	Landscaping (lawns)

Local name(s)	Nahudak
Scientifc / Russian name	Astragalus alitschuri B. Fedtsch./ Астрагаль аличурский
Main grazing season	Spring / Summer / Autumn
Main habitat	Dry slopes
Geographical distribution / Altitudinal range	Drum r., Lyangarsu, Maz, Langar v., Vrang / 3300-4100 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★★
Palatability	★★
Biomass	★★
Other use	None


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Local name(s)	Losakvohak
Scientifc / Russian name	Carex pseudofoetida Kuk.Осока ложновонючая
Main grazing season	Spring / Summer / Autumn
Main habitat	Riverbanks
Geographical distribution / Altitudinal range	in all areas / 2700-4500 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	
Frost tolerance	★★★★★
Palatability	★★★
Biomass	★★★
Other use	None


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Local name(s)	Losakvohak
Scientifc / Russian name	Carex stenofhylloides V.Krecz./ Осока ложноузколистная
Main grazing season	Spring / Summer
Main habitat	Dry barren places
Geographical distribution / Altitudinal range	in all areas of Western Pamir / 2000-4000 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★★
Biomass	★
Other use	None


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Local name(s)	Mahorlak
Scientifc / Russian name	Oxytropis puberula Boriss./Остро-лодочник пушистый.
Main grazing season	Spring / Summer
Main habitat	Meadows and moist places
Geographical distribution / Altitudinal range	Sumdjiv v., Yamchun , Manem Vankala and others / 1800-2800 m
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★
Other use	None


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Local name(s)	Hinvohak
Scientifc / Russian name	Oxytropis glabra(Lam.)DC./ Остролодочник голый.
Main grazing season	Spring / Summer
Main habitat	Moist meadows
Geographical distribution / Altitudinal range	Bogushdara, Barshor, Padrud and others / 1800-2700 m
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★
Frost tolerance	★★★★
Palatability	★★
Biomass	★
Other use	None

Local name(s)	Guli bunavsh
Scientifc / Russian name	Primula pamirica Fed./Первоцвет памирский
Main grazing season	Spring
Main habitat	Sedge – kobresia meadows, near springs
Geographical distribution / Altitudinal range	Sarez sea, Western Pamir / 3200-3700 m
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★
Frost tolerance	★★★★
Palatability	★★
Biomass	★
Other use	Medicinal plant

Local name(s)	Chushchvohak
Scientifc / Russian name	Hordeum turkestanicum Nevski/ Ячмень туркестанский.
Main grazing season	Spring / Summer / Autumn
Main habitat	Stony slopes and steppes
Geographical distribution / Altitudinal range	Maz r., Gudara, Kokbai, Tokuzbulak / 3000-4000 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	
Frost tolerance	★★★★★
Palatability	★★★★★
Biomass	★★★★★
Other use	Hay making


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Local name(s)	Zagvohak
Scientifc / Russian name	Kobresia pamiroalaica Ivanova/ Кобрезия памироалайская
Main grazing season	All seasons
Main habitat	Meadows and swamp
Geographical distribution / Altitudinal range	in all areas / 3200-4600 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	
Frost tolerance	★★★★★
Palatability	★★★
Biomass	★★★
Other use	None


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Local name(s)	Tezkand
Scientifc / Russian name	Ctratoides ewerstmanniana Botsch. Et Ikonn./ Терескен Эверсмана
Main grazing season	Autumn / Winter
Main habitat	Sands and slopes
Geographical distribution / Altitudinal range	Langar v., Vrang, Darshai, Tusien, Suchan, Roshtkala / 2500-3500 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★
Biomass	★★★
Other use	Fuel

Local name(s)	Rogzvohak
Scientifc / Russian name	Leymus lanatus (Korsh.) Tzvel./ Колосняк шерстистый
Main grazing season	Spring / Winter
Main habitat	Dry stony slopes
Geographical distribution / Altitudinal range	in all areas / 3200-4100 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	Mat

Local name(s)	Kyi
Scientifc / Russian name	Leymus pubescens Ikonn./Колосняк пущистоколосый
Main grazing season	Spring / Winter
Main habitat	Sagebrush-kobresia deserts
Geographical distribution / Altitudinal range	in all areas, sometimes at a height of 2000 m / 3000-4100 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★★
Palatability	★★★
Biomass	★★★★
Other use	Mat

Local name(s)	Shugni / Shaftal: Toliki / sebargai surh
Scientifc / Russian name	Trifolium pratense L. /Клевер луговой
Main grazing season	Spring / Summer / Autumn
Main habitat	Meadows, on the banks of irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3000 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Vanj district, Chihoh v. (2000-2500 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★
Other use	Hay making, medicinal plant

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Local name(s)	Shugni / gorj: Vanj / Rishka: Tochiki / Yunuchka
Scientifc / Russian name	Medicago sativa L. / Люцерна синяя
Main grazing season	All seasons
Main habitat	Meadows, on the banks of irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2400 m), Vanj district, Chihoh v. (1700-2500 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★★★
Other use	Hay making

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Local name(s)	Shugni / Esparset
Scientifc / Russian name	Onobrychis laxiflora Baker / Эспарцет рыхлоцветковый
Main grazing season	Spring / Summer / Autumn
Main habitat	Steppe slopes, reservoir
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3000 m), Ishakashim district, Langar v. (2600-3000 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (3000), Vanj district, Chihoh v. (3000 m), Roshtkala district, Djavshangoz valley (3000-3200 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★
Palatability	★★★★
Biomass	★★★
Other use	Bee honey

Local name(s)	Shugni / Shigorchak: Tochiki / Rishka
Scientifc / Russian name	Melilotus oficinalis (L.) Pall. / Донник лекарственный
Main grazing season	Spring / Summer
Main habitat	Crop and boundary places, sunny places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v., (1800-2500 m), Roshtkala district, Djavshangoz v. (2600-2800 m), Vanj district, Chihoh v. (2000-2500 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	Medicinal plant


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Local name(s)	Shugni / Narmvohak: Tochiki / Achrik
Scientifc / Russian name	Bothrichloa ischaemum(L.) Keng. / Бородач кровоостанавливающий
Main grazing season	Spring / Summer / Autumn
Main habitat	Hayfields, meadows, on the banks of irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2400 m), Vanj district, Chihoh v. (1700-2500 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★★
Frost tolerance	★★★★
Palatability	★★★
Biomass	★★★★
Other use	Hay making


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Local name(s)	Shugni / Shiggulak, Tochiki / Koku
Scientifc / Russian name	Taraxacum sp. Одуванjик
Main grazing season	Spring / Summer / Autumn
Main habitat	Lawns, gardens and slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1900-3200 m), Ishakashim district, Langar v. (3000 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (3200), Vanj district, Chihoh v. (3200 m)
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★
Frost tolerance	★★
Palatability	★★★★
Biomass	★★
Other use	Medicinal plant, food, bee honey


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Local name(s)	Rushon (Bartang) /Hazortum, Tochiki / Push
Scientifc / Russian name	Artemisia vulgaris L. / Полынь обыкновенная
Main grazing season	Spring / Summer / Autumn
Main habitat	Near irrigation ditches, near roads, gravels and riparian forests
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-2600 m), Ishakashim district, Langar v. (2600-2800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2800 m), Vanj district, Chihoh v. (2400-2600 m)
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★
Other use	Medicinal plant


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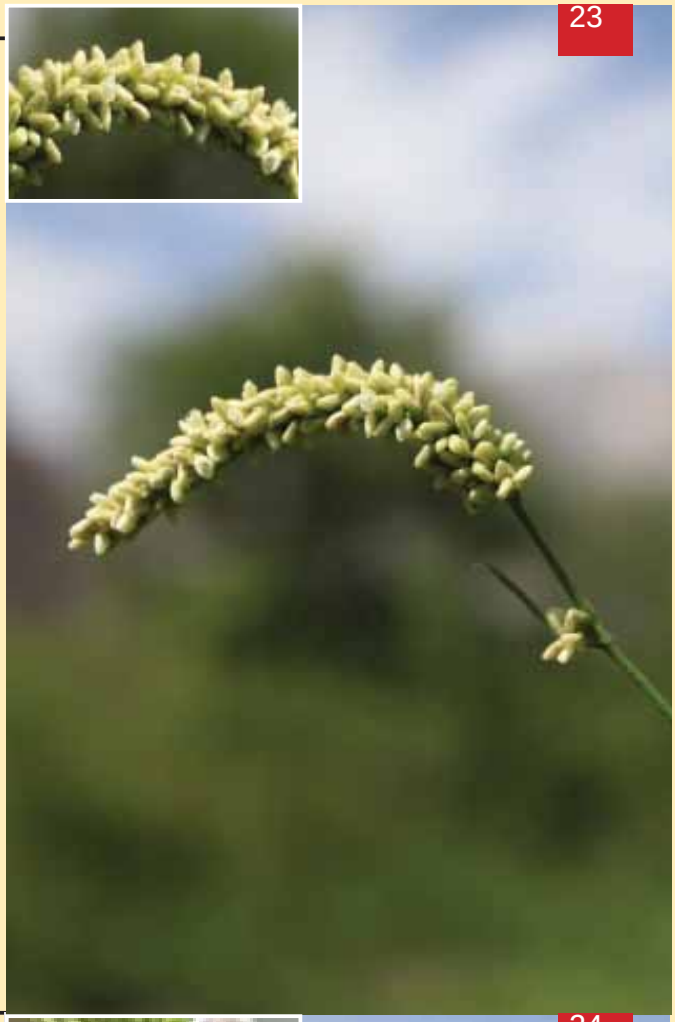
Local name(s)	Shugni / Tuhpvohak
Scientifc / Russian name	Polygonum amphibium L. / Горец земноводный
Main grazing season	Spring / Summer / Autumn
Main habitat	Near rivers
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3000 m), Ishakashim district, Langar v. (2600-3000 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (3000), Vanj district, Chihoh v. (2000-3000 m), Roshtkala district, Djavshangoz valley (2600-3000 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★
Other use	Medicinal plant



Local name(s)	Shugni / Zagvohak
Scientifc / Russian name	Euphrasia fedtschenkoana Wettst. ex Juz / Очанка Федченко
Main grazing season	Summer / Autumn
Main habitat	Marshy soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3800 m), Roshtkala district, Djavshangoz v. (2600-3500 m), Vanj district, Chihoh v. (2300-3400 m), Ishakashim district, Langar v. (2600-3800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★★
Other use	None

Local name(s)	Shugni (Bartang) / Saragoch, Tochiki /
Scientifc / Russian name	Lepidium latifolium L. / Клоповник широколистный
Main grazing season	Spring / Summer / Autumn
Main habitat	Sandy places, stony slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Vanj district, Chihoh v. (1700-2400 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★
Other use	Food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Local name(s)	Shugni / Muthg, Tochiki / Shirinbiya
Scientifc / Russian name	Glycyrrhiza uralensis Fisch. / Солодка уральская
Main grazing season	Spring / Summer / Autumn
Main habitat	Hayfields, riparian forests, shrubs, forests
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Kalai Humb v., Sagirdasht v. (Hirsdara) (2000-2800 m), Vanj district, Chihoh v. (2000-2400 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	Medicinal plant


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Local name(s)	Shugni / Salomalek, Thesakvoh
Scientifc / Russian name	Dactylis glomerata L. / Ежа сборная
Main grazing season	Spring / Summer / Autumn
Main habitat	Riparian forests, shrubs, forests and hayfields
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1700-2300 m), Kalai Humb v., Sagirdasht (Hirsdara) (2000-2300 m), Vanj district, Chihoh v. (2000-2300 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★
Other use	Hay making


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Local name(s)	Rushon (Bartang) / Bunavsh
Scientifc / Russian name	Glaucium elegans Fisch. et Mey / Глациум изящный
Main grazing season	Spring / Summer
Main habitat	Dry mountain places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1700-2300 m), Kalai Humb v. (2700 m), Vanj district, Chihoh v. (2000-2900 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★
Other use	None


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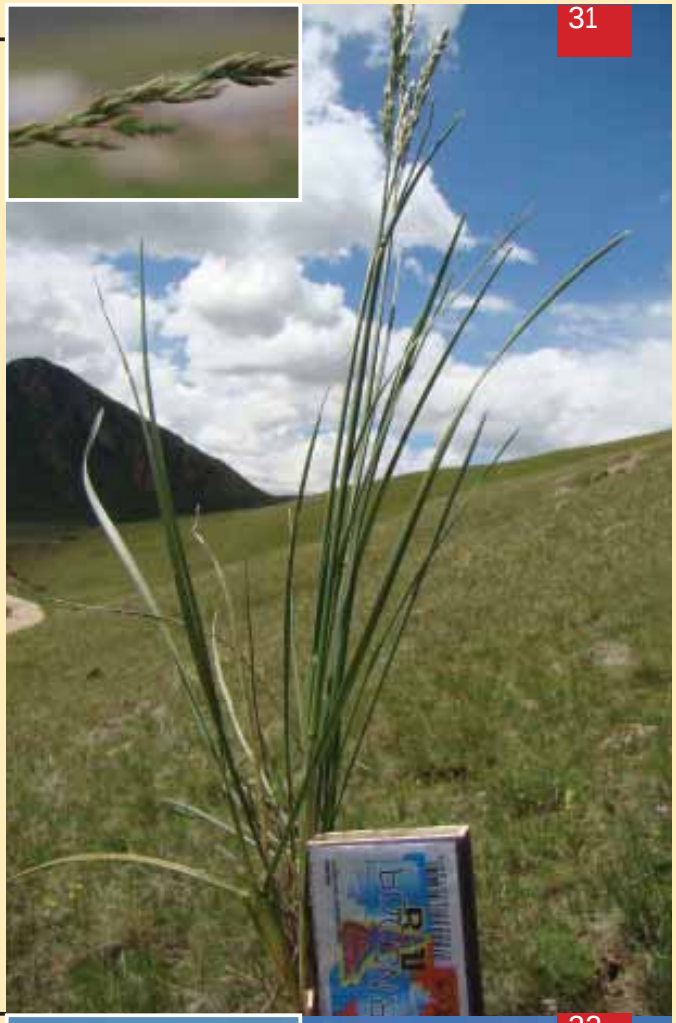
Local name(s)	Shugni / Chehchak: Rushon (Bartang) / Savs
Scientifc / Russian name	Artemisia dracunculus L. / Полынь эстрагон
Main grazing season	Spring / Summer / Autumn
Main habitat	Riparian forests, reservoir and near roads
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2500-3000 m), Vanj district, Chi-hoh v. (2200-2800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2000-2500 m), Ishakashim district, Langar v. (2600-2800 m), Roshtkala district, Djavshangoz v. (2800-3000 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★
Palatability	★★★★
Biomass	★★
Other use	Medicinal plant

Local name(s)	Shugni / Shabar vokh: Tochiki / Alafi botloki
Scientifc / Russian name	Kobresia capilliformis Ivan. / Кобрезия волосолистная
Main grazing season	Spring / Summer / Autumn
Main habitat	Alpine meadows
Geographical distribution / Altitudinal range	Roshtkala district, Djavshangoz v. (3200-3600 m), Rushan district, Bartang valley (3000-3800 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★
Palatability	★★★★
Biomass	★★★
Other use	None

Local name(s)	Shugni / Rushtgalak: Tochiki / surhsarak
Scientifc / Russian name	Festuca rubra L. / Овсяница красная
Main grazing season	Spring / Summer / Autumn
Main habitat	Alpine meadows
Geographical distribution / Altitudinal range	Roshtkala district, Djavshangoz v. (2800-3000 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★
Other use	Hay making



Local name(s)	Shugni / Kahtvohak: Tochiki / Gandumalaf
Scientifc / Russian name	Koeleria gracilis Pers. / Тонконог тонкий
Main grazing season	Spring / Summer / Autumn
Main habitat	High-altitude sites
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2800-3000 m), Roshtkala district, Djavshangoz v. (2800 m), Ishakashim district, Langar v. (2800-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★
Other use	Hay making

Local name(s)	Shugni / Kushchak
Scientifc / Russian name	Codonopsis clematidea (Schrenk) Clarke / Кодонопсис ломоносовидный
Main grazing season	Summer
Main habitat	Near the water
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3100 m), Vanj district, Chihoh v. (2000-2500 m), Ishakashim district, Langar v. (2600-2700 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-2700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Chakvochak
Scientifc / Russian name	Epilobium subnivale M. Pop. ex Pavl. / Кипрей высокогорный
Main grazing season	Spring / Summer / Autumn
Main habitat	Near rivers
Geographical distribution / Altitudinal range	Roshtkala district, Djavshangoz v. (2600-3200 m), Rushan district, Bartang valley, Basid v. (2500-3100 m), Vanj district, Chihoh v. (2500-2600 m), Ishakashim district, Langar v. (2400-2800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2500-2700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Rushtkalak
Scientifc / Russian name	Elymus shugnanicus (Nevski) Tzevl. / Пырейник шугнанский
Main grazing season	Spring / Summer / Autumn
Main habitat	Gravelly scree
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (3000-4200 m), Roshtkala district, Djavshangoz v. (3000-4500 m), Vanj district, Chihoh v. (3000-4200 m), Ishakashim district, Langar v. (3000-4300 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★★
Other use	None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Local name(s)	Shugni / Gorchvohak
Scientifc / Russian name	Trigonella adscendens (Nevski) Afan. & Gontsch. / Мелисситус приподнимающийся
Main grazing season	Spring / Summer / Autumn
Main habitat	Steppes and dry slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-4000 m), Roshtkala district, Djavshangoz v. (2600-4100 m), Vanj district, Chihoh v. (2000-3800 m), Ishakashim district, Langar v. (2600-3900 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-3800 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★
Other use	None


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Local name(s)	Shugni / Thevmahorchak
Scientifc / Russian name	Vicia tenuifolia Roth. / Вика тонколистная
Main grazing season	Spring / Summer / Autumn
Main habitat	Reservoir and shrubs
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-2400 m), Vanj district, Chihoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2000-2600 m), Ishakashim district, Langar v. (2600-2800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★
Other use	Hay making


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Local name(s)	Shugni / Pushakvidirim
Scientifc / Russian name	Calamagrostis anthoxanthoides (Munro) Regel / Вейник пахучеколосковидный
Main grazing season	Spring / Summer / Autumn
Main habitat	Moraines, near rivers and lakes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (3000-3500 m), Roshtkala district, Djavshangoz v. (2600-3300 m), Vanj district, Chihoh v. (2700-3200 m), Ishakashim district, Langar v. (2900-3300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	None


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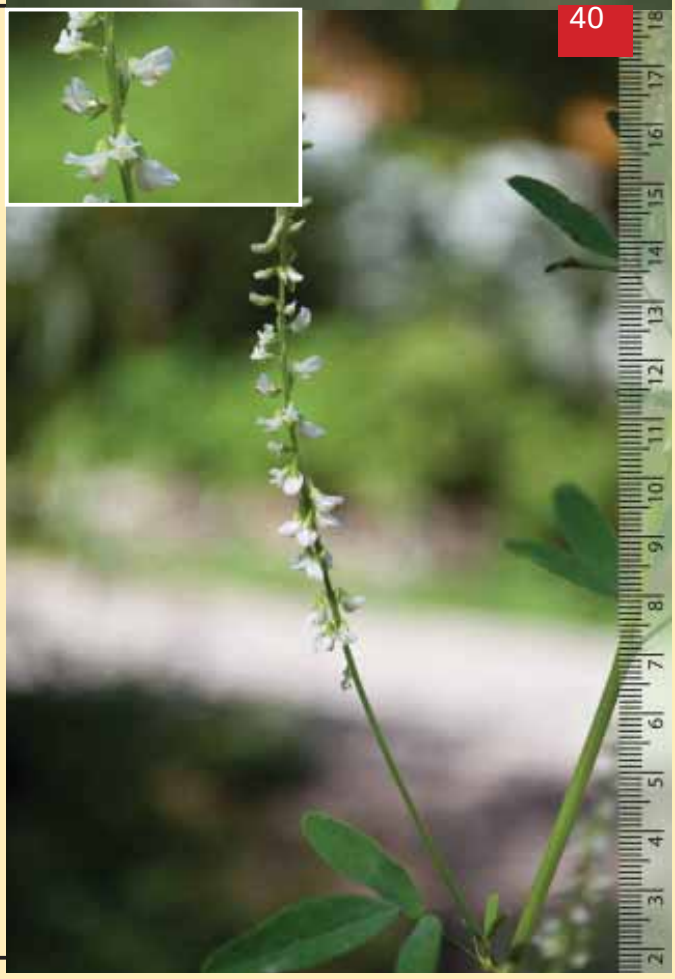
Local name(s)	Shugni / Safedgulak
Scientifc / Russian name	Lepyrodiclis holosteoides (C. A. Mey) Fisch. et Mey / Пашенник костянецевидный
Main grazing season	Summer / Autumn
Main habitat	Crops, reservoir
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3500 m), Roshtkala district, Djavshangoz v. (2600-3300 m), Vanj district, Chihoh v. (1700-3200 m), Ishakashim district, Langar v. (2600-3300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Shigorak :Tochiki / Govrishga
Scientifc / Russian name	Melilotus albus Medik / Донник белый
Main grazing season	All seasons
Main habitat	Reservoir, crops, on the banks of irrigation ditches and near roads
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2700 m), Roshtkala district, Djavshangoz v. (2600-2700 m), Vanj district, Chihoh v. (2000-2500 m), Ishakashim district, Langar v. (2600-2700 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1600-2700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	None



Local name(s)	Shugni / Boogin kuthm
Scientifc / Russian name	Artemisia vulgaris L. / Полынь обыкновенная
Main grazing season	Summer / Autumn
Main habitat	Riverbanks
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3100 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Vanj district, Chihoh v. (1700-3000 m), Ishakashim district, Langar v. (2600-3000 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	None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Local name(s)	Shugni / Sidhoonakvoh
Scientifc / Russian name	Leptorhabdos parviflora (Benth.) Лепторабдос мелкоцветковая
Main grazing season	Summer / Autumn
Main habitat	Stony slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-2800 m), Roshtkala district, Djavshangoz v. (2600-2900 m), Ishakashim district, Langar v. (2600-2900 m), Vanj district, Chihoh v. (1700-2800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-2700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	None


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Local name(s)	Tochiki / Hoklesi siehbarra
Scientifc / Russian name	Carex melanantha C.A. Mey. / Осока черноцветковая
Main grazing season	Spring / Summer
Main habitat	Mountain places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2800-3000 m), Vanj district, Chihoh v. (2800-3200 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2800-3200 m) , Roshtkala district, Djavshangoz v. (2800 m), Ishakashim district, Langar v. (2800-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★
Other use	None

Local name(s)	Shugni / Chirchirak
Scientifc / Russian name	Incarvillea olgae Regel / Инкарвиллея Ольги
Main grazing season	Spring / Summer
Main habitat	Gravels, alluvial fans
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2600 m), Roshtkala district, Djavshangoz v. (2500-2700 m), Vanj district, Chihoh v. (1700-2700 m), Ishakashim district, Langar v. (2600-2800 m) Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-2700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Parvoch
Scientifc / Russian name	Lindelofia macrostyla (Bunge) M. Pop. / Линделофия длиностолбиковая
Main grazing season	Spring / Summer / Autumn
Main habitat	Gravels, alluvial fans
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3400 m), Roshtkala district, Djavshangoz v. (2600-3200 m), Ishakashim district, Langar v. (2600-3000 m), Vanj district, Chihoh v. (1700-3200 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Varh: Tochiki / Yugan
Scientifc / Russian name	Prangos pabularia Lindl. / Юган кормовой
Main grazing season	Spring / Summer / Autumn
Main habitat	Sandy slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2400 m), Vanj district, Chihoh v. (1700-2400 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-2500 m) , Roshtkala district, Djavshangoz v. (2600 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★
Frost tolerance	★★
Palatability	★★★
Biomass	★★★
Other use	Medicinal plant

Local name(s)	Shugni / Ragak vokh: Vanj / Binishi-kanak / Tochiki / Bargi zuf
Scientifc / Russian name	Plantago lanceolata L. / Подорожник ланцетный
Main grazing season	Spring / Summer / Autumn
Main habitat	On the banks of irrigation ditches, taluses and riparian forests
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2800 m), Vanj district, Chihoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-2600 m), Roshtkala district, Djavshangoz v. (2600 m), Ishakashim district, Langar v. 2800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★
Other use	Medicinal plant

Local name(s)	Shugni / Kuthm, Tochiki / Push
Scientifc / Russian name	Artemisia vachanica Krasch. ex Poljak. / Полынь ваханская
Main grazing season	All seasons
Main habitat	Stony slopes and dry places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3200 m), Roshtkala district, Djavshangoz v. (2400-3000 m), Ishakashim district, Langar v. (2600-3000 m), Vanj district, Chihoh v. (1700-2800 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★★★
Frost tolerance	★★★★
Palatability	★
Biomass	★★
Other use	Fuel

Local name(s)	Shugni / Ragaki vokh: Tochiki / Filgush
Scientifc / Russian name	Plantago major L. / Подорожник большой
Main grazing season	Spring / Summer / Autumn
Main habitat	Hayfields, along the irrigation ditches and gardens
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2400 m), Vanj district, Chihoh v. (1700-2400 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-2500 m), Roshtkala district, Djavshangoz v. (2600 m) , Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★
Palatability	★
Biomass	★★
Other use	Medicinal plant

Local name(s)	Shugni / Shag
Scientifc / Russian name	Cousinia buphtalmoides Regel / Кузиния воловьеглазая
Main grazing season	
Main habitat	Stony soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3500 m), Roshtkala district, Djavshangoz v. (2600-3400 m), Vanj district, Chihoh v. (2000-3500 m), Ishakashim district, Langar v. (2600-3400 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2000-3200 m)
Main consuming speecies	None
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	None

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Local name(s)	Shugni / Shalha, Tochiki / Shulha, Turshak
Scientifc / Russian name	Rumex paulsenianus Rech. Fil. / Щавель Паульсена
Main grazing season	Spring / Summer / Autumn
Main habitat	Hayfields, riverbanks and irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Vanj district, Chihoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2500 m),
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★★★
Other use	Food

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Local name(s)	Shugni / Sidakh: Rushon (Bartang) / Kuh, Tochiki / Push
Scientifc / Russian name	Artemisia sieversiana Willd. / Полынь Сиверса
Main grazing season	Spring / Summer / Autumn
Main habitat	Raw fields, near roads and irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Vanj district, Chihoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2500 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★★★
Other use	Medicinal plant

Local name(s)	Shugni / Kabutgul
Scientifc / Russian name	Dracocephalum bipinnatum Rupr. / Змееголовник дважды-перистый
Main grazing season	Spring / Summer / Autumn
Main habitat	Dry mountain places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2200-2400 m), Vanj district, Chihoh v. (2000-2500 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2000-2400 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	None

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Local name(s)	Rushon (Bartang) / Pishtum
Scientifc / Russian name	Setaria viridis (L.) Beauv / Щетинник зеленый
Main grazing season	Spring / Summer / Autumn
Main habitat	Crops, near roads, along the irriga-tion ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2400 m), Vanj district, Chihoh v. (1700-2500 m), Ishakashim district, Langar v. (2500-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2500 m),
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★
Other use	None

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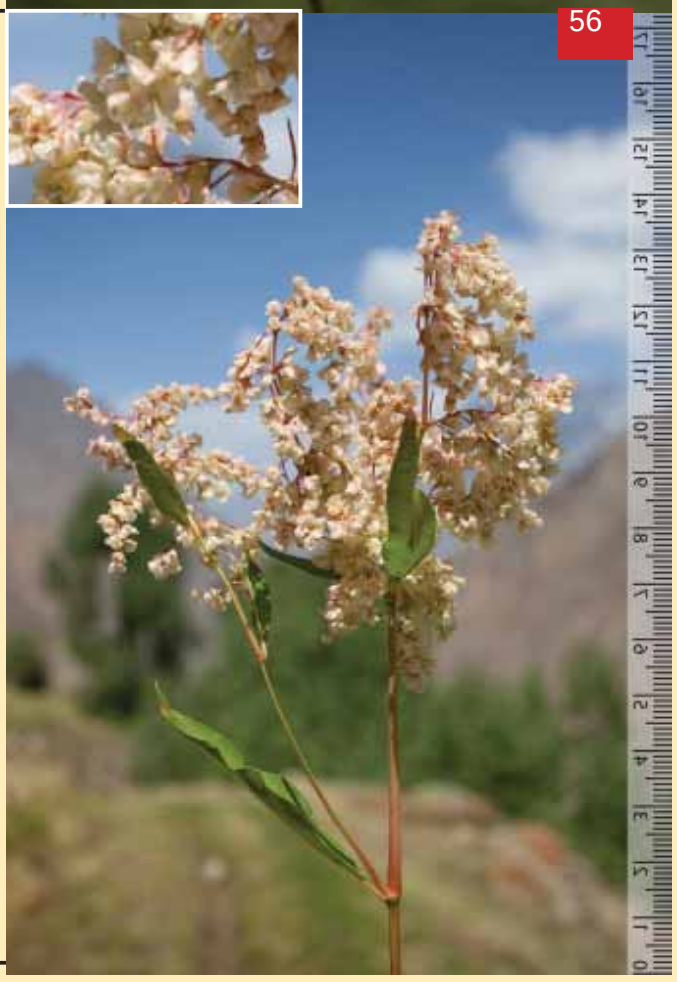
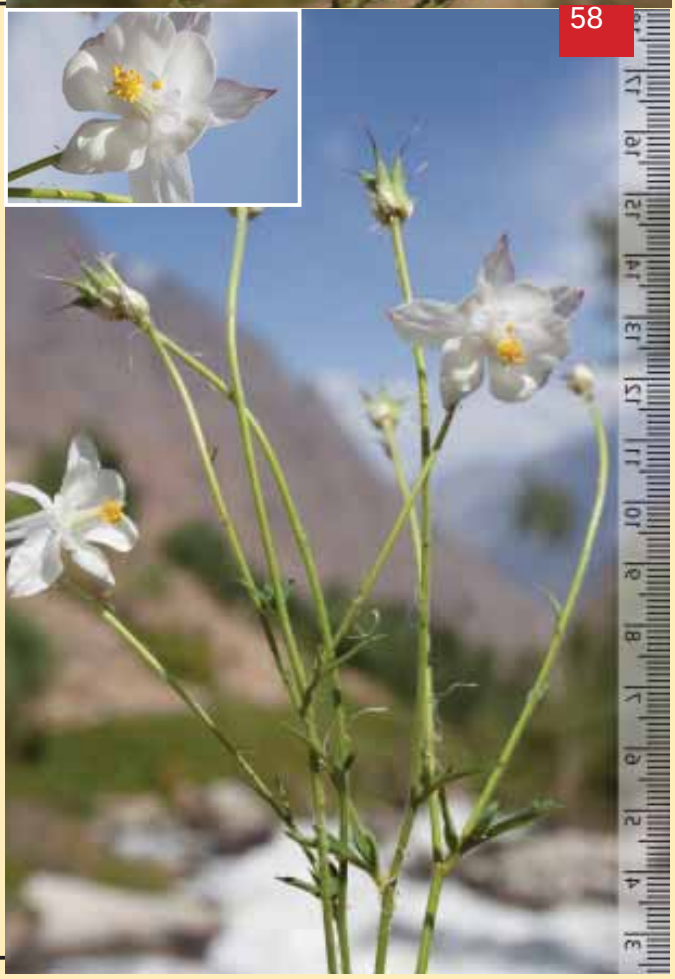
Local name(s)	Shugni / Mahorgvohak
Scientifc / Russian name	Hedysarum flavescens Regel et Schmalh. / Копеечник желтоватый
Main grazing season	Summer / Autumn
Main habitat	Meadows and shrubs
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-3200 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Vanj district, Chihoh v. (2000-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Misk, Tochiki / Torun
Scientifc / Russian name	Aconogonon coriarium (Grig.) Sojak / Торон дубильный
Main grazing season	Spring / Summer / Autumn
Main habitat	Dry and moist slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3700 m), Roshtkala district, Djavshangoz v. (2600-3500 m), Vanj district, Chihoh v. (1700-3600 m), Ishakashim district, Langar v. (2600-3500 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-3700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★★★
Other use	None



Local name(s)	Shugni / Parvakh
Scientifc / Russian name	Cicer acanthophyllum Boriss. / Нут колючелистный
Main grazing season	Summer / Autumn
Main habitat	Stony slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2800-4200 m), Roshtkala district, Djavshangoz v. (2600-4500 m), Vanj district, Chihoh v. (2700-4200 m), Ishakashim district, Langar v. (2600-3800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2600-4200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Chakchamukun
Scientifc / Russian name	Aquilegia microphylla (Korsh.) Ikonn. Водосбор мелколистный
Main grazing season	Spring / Summer
Main habitat	Riverbanks and irrigation ditches and shrubs
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (3000-4200 m), Roshtkala district, Djavshangoz v. (3000-4500 m), Vanj district, Chihoh v. (3000-4200 m), Ishakashim district, Langar v. (3000-4300 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★
Other use	None



Local name(s)	Tochiki / Zardgulak
Scientifc / Russian name	Ligularia thomsonii (Clarke) Pojark / Бузульник Томсона
Main grazing season	Summer / Autumn
Main habitat	Meadows and slopes
Geographical distribution / Altitudinal range	Kalai Humb v., Sagirdasht valley (Hirsdara) (2700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★
Other use	None

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Local name(s)	Shugni / Kruh, Ishkoshim / Kmood
Scientifc / Russian name	Heracleum lehmannianum Bunge / Борщевик Лемана
Main grazing season	Spring
Main habitat	Shrubs, riparian forests, riverbanks and irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Roshtkala district, Djavshangoz v. (2600-2800 m), Vanj district, Chihoh v. (2000-2500 m), Ishakashim district, Langar v. (2600-2800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2600-3100 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★★★★
Other use	Medicinal plant

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Local name(s)	Shugni / Shirchorgak :Tochiki / Govrishga
Scientifc / Russian name	Olgae nivea (C. Winkl.) Iljin / Ольгея снежная
Main grazing season	Summer / Autumn
Main habitat	Mountain places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (3000-3400 m), Vanj district, Chihoh v. (3000-3200 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2800-3200 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	None

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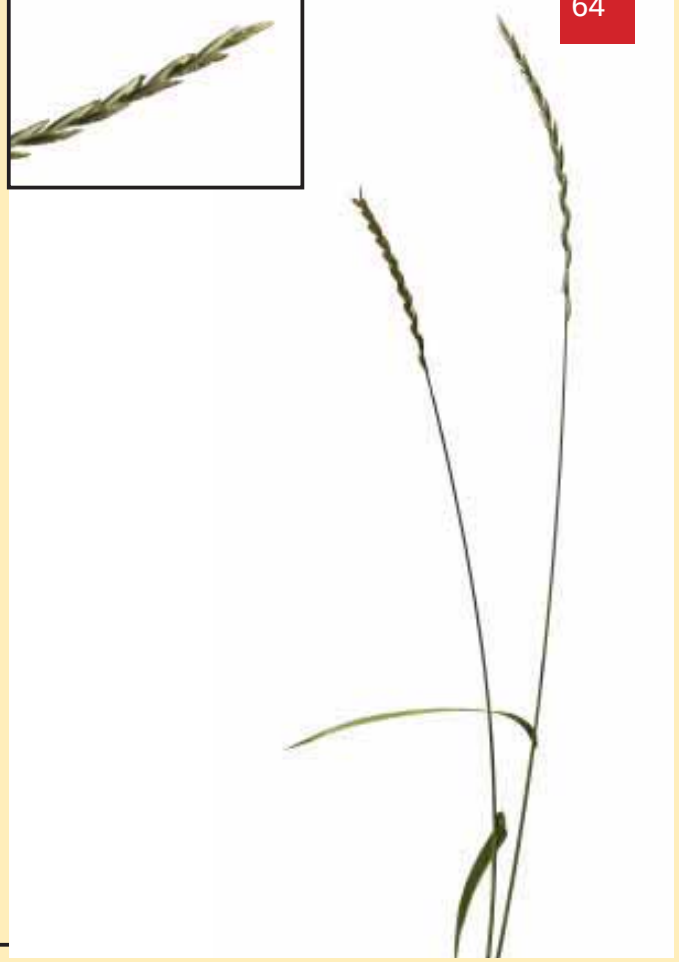
Local name(s)	Shugni / Parvarkh, Tochiki / Pechak
Scientifc / Russian name	Convolvulus arvensis L. / Вьюнок полевой
Main grazing season	Spring / Summer / Autumn
Main habitat	Near roads, fields and on gravel
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Vanj district, Chihoh v. (1700-2400 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★
Frost tolerance	★★
Palatability	★★★
Biomass	★★★
Other use	Decorative

62

63

Local name(s)	Tochiki / Guli gulobi
Scientifc / Russian name	Geranium himalayense Klotzsch. / Герань гималайская
Main grazing season	Spring / Summer / Autumn
Main habitat	Rocky and stony slopes
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Vanj district, Chi-hoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2500 m), Roshtkala district, Djavshangoz v. (2800-3200 m), Ishakashim district, Langar v. (2600-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★
Other use	Decorative, bee honey

64



Local name(s)	Rushon (Bartang) / Gifs
Scientifc / Russian name	Elymus dahuricus Turcz. Ex Griseb. / Колосняк даурский
Main grazing season	Spring / Summer / Autumn
Main habitat	Lawns, on the banks of irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Vanj district, Chi-hoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2600 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Ishakashim district, Langar v. (2800-3000 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Palohvohak : Tochiki / Kamishalaf
Scientifc / Russian name	Calamagrostis epigeios (L.) Roth. / Вейник наземный
Main grazing season	Spring / Summer / Autumn
Main habitat	Near rivers, sandy soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2200 m), Vanj district, Chihoh v. (1800-2600 m), Ishakashim district, Langar v. (2400-2600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★
Frost tolerance	★★
Palatability	★★★
Biomass	★★★
Other use	Hay making

Local name(s)	Shugni / Zirdvochak : Tochiki / Zardalaf
Scientifc / Russian name	Sisymbrium brassiciforme C. A. Mey / Гулявник капустовидный
Main grazing season	Spring / Summer / Autumn
Main habitat	Gravels and Rocky
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3500 m), Roshtkala district, Djavshangoz v. (2600-3600 m), Vanj district, Chihoh v. (1700-3200 m), Ishakashim district, Langar v. (2500-3300 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Nichorgulak
Scientifc / Russian name	Gentianopsis stricta (Klotzsch) Ikonn. / Горечавковидка прямая
Main grazing season	Summer / Autumn
Main habitat	Meadows, shrubs and riparian forests
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (3000-4000 m), Roshtkala district, Djavshangoz v. (3000-4200 m),Vanj district, Chihoh v. (3000-4300 m), Ishakashim district, Langar v. (3000-4300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1900-4200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Piez : Tochiki / Piez
Scientifc / Russian name	Allium ramosum L. / Лук душистый
Main grazing season	Spring / Summer / Autumn
Main habitat	Shallow soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2800-3000 m)
Main consuming speecies	None
Grazing tolerance	★★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★
Palatability	★★★
Biomass	★
Other use	None

Local name(s)	Tochiki / Kabdugulak
Scientifc / Russian name	Mulgedium tataricum (L.) DC. Молокан татарский
Main grazing season	Spring / Summer / Autumn
Main habitat	Near roads, on the banks of irrigation ditches and field boundaries
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3600 m), Roshtkala district, Djavshangoz v. (2600-3300 m), Vanj district, Chihoh v. (1700-3200 m), Ishakashim district, Langar v. (2500-3300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Choivokhak
Scientifc / Russian name	Chamerion angustifolium (L.) Holub, Хамерион узколистный, иван-чай
Main grazing season	Summer / Autumn
Main habitat	Stony soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3500 m), Roshtkala district, Djavshangoz v. (2600-3400 m), Vanj district, Chihoh v. (1800-3500 m), Ishakashim district, Langar v. (2600-3500 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2700-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None

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Local name(s)	Shugni / Tochiki / Mehchagul
Scientifc / Russian name	Silene schugnanica B. Fedtsch. / Смолевка шугнанская
Main grazing season	Summer
Main habitat	Rocky
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2500 m), Kalai Humb v. (2400 m), Vanj district, Chihoh v. (1700-2400 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★
Other use	Insecticide

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Local name(s)	Shugni / Zardgul, Tochiki (Vanj) / Zardgulak
Scientifc / Russian name	Sisymbrium loeselii L. / Гулявник Лезеля
Main grazing season	Spring / Summer / Autumn
Main habitat	Fields, near roads and gravels
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2300 m), Kalai Humb v., Sagirdasht (Hirsdara) (2000-2800 m), Vanj district, Chihoh v. (2000-2400 m), Ishakashim district, Langar v. (2700 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★
Other use	Traditional medicine

Local name(s)	Tochiki / Kabudgulak
Scientifc / Russian name	Nepeta longibracteata Benth. / Котовник длиннoприцветниковый
Main grazing season	Summer / Autumn
Main habitat	Gravelly scree
Geographical distribution / Altitudinal range	Kalai Humb v., Sagirdasht valley (Hirsdara) (2800-3800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	Medicinal plant

Local name(s)	Shugni / Kavar: Bartang / chaber, Tochiki / Kavar
Scientifc / Russian name	Capparis herbacea Willd. / Каперсы колючие
Main grazing season	Summer
Main habitat	Stony slopes and rocky places
Geographical distribution / Altitudinal range	Kalai Humb v. (2400), Vanj district, Chihoh v. (1700-2400 m), Rushan district, Bartang valley, Basid v. (1800-2500 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★
Other use	Medicinal plant, food

Local name(s)	Shugni / Norinchgul
Scientifc / Russian name	Scrophularia incisa Weinm. / Норичник вырезной
Main grazing season	Summer / Autumn
Main habitat	Stony soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2100-3500 m), Roshtkala district, Djavshangoz v. (2600-3300 m), Vanj district, Chihoh v. (2000-3200 m), Ishakashim district, Langar v. (2600-3300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2000-3200 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Pithafgulak
Scientifc / Russian name	Picris similis V. Vassil. / Горлюха похожая
Main grazing season	Summer / Autumn
Main habitat	Shrubs and on the banks of irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3200 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Vanj district, Chihoh v. (1700-2800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None

Local name(s)	Shugni / Vithm, Tochiki / Pudina
Scientifc / Russian name	Mentha asiatica Boriss. / Мята азиатская
Main grazing season	Spring / Summer / Autumn
Main habitat	On the banks of irrigation ditches, near streams, willows and birches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2800 m), Ishakashim district, Langar v. (2600-2800 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2800 m), Vanj district, Chihoh v. (1700-2800 m)
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★
Other use	Medicinal plant, food

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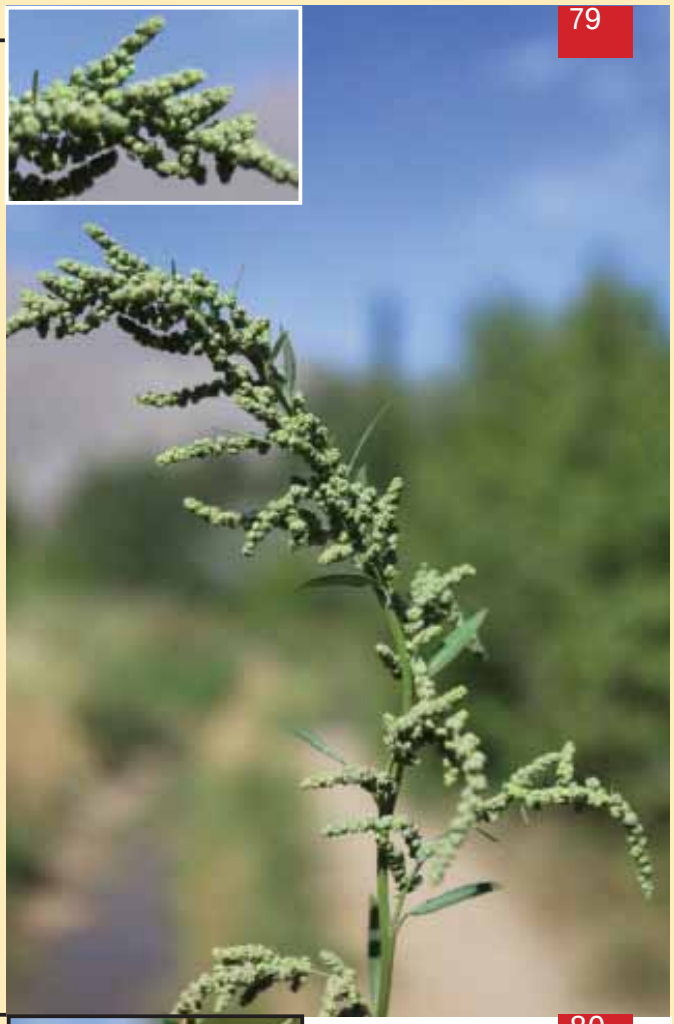
Local name(s)	Shugni / Hushruigulak
Scientifc / Russian name	Parnassia palustris L. / Белозор болотный
Main grazing season	Summer / Autumn
Main habitat	Moist meadows, riverbanks and irrigation ditches
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3500 m), Roshtkala district, Djavshangoz v. (2600-3300 m), Ishakashim district, Langar v. (2600-3300 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★
Other use	None

78

Local name(s)	Tochiki (Vanj) / Shoork, Ishkoshim (Langar). Sivg
Scientifc / Russian name	Chenopodium botrys L. / Марь душистая
Main grazing season	Spring / Summer
Main habitat	Stony slopes and taluses
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2300 m), Kalai Humb v., Sagirdasht (Hirsdara) (2000-2800 m), Vanj district, Chi-hoh v. (2000-2400 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★
Frost tolerance	★★★
Palatability	★
Biomass	★★
Other use	None



Local name(s)	Tochiki (Vanj), Rahdavak, Shugni / Magvohak
Scientifc / Russian name	Polygonum aviculare L. / Горец птичий
Main grazing season	Spring / Summer / Autumn
Main habitat	On the banks of irrigation ditches , fields and near roads
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1700-2400 m), Kalai Humb v., Sagirdasht (Hirsdara) (2000-2800 m), Vanj district, Chi-hoh v. (2000-2400 m), Ishakashim district, Langar v. (2600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	Medicinal plant

Local name(s)	Shugni / Choivohak: Tochiki / Choikahak
Scientifc / Russian name	Hypericum perforatum L. / Зверобой продырявленный
Main grazing season	Spring / Summer / Autumn
Main habitat	Shrubs, slopes and sandy soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-2400 m), Vanj district, Chihoh v. (1800-2500 m), Kalai Humb v., Sagirdasht (Hirsdara) (2000-2600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★
Other use	Medicinal plant, natural dye

Local name(s)	Rushon (Bartang) / Chirk
Scientifc / Russian name	Chondrilla juncea / Хондрилла седоватая
Main grazing season	Spring / Summer / Autumn
Main habitat	Gravels and taluses
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2800 m), Vanj district, Chihoh v. (1700-2800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★
Other use	None

Local name(s)	Sudm
Scientifc / Russian name	Artemisia wachanica Krasch.ex Poljak. / Полынь ваханская
Main grazing season	Autumn
Main habitat	Dry slopes
Geographical distribution / Altitudinal range	Langar v., Darshai, Chartym, Rivak and many other places / 1800-3300 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★
Other use	Fuel

Local name(s)	Sudm
Scientifc / Russian name	Arntemisia rutifolia Stefh.ex Spreng. / Полынь рутолистная
Main grazing season	Autumn / Winter
Main habitat	Dry slopes
Geographical distribution / Altitudinal range	in all areas of Western Pamir / 2900-4400 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★
Other use	Fuel

Local name(s)	Sudm
Scientifc / Russian name	Artemisia santolinifolia (Pamp.) Turcz.ex Krasch. Полынь сантолинолистная
Main grazing season	Autumn / Winter
Main habitat	Detrital and stony places
Geographical distribution / Altitudinal range	in all areas of Western Pamir / 2600-4400 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★
Palatability	★
Biomass	★★
Other use	Fuel


3

Local name(s)	Hinvohak
Scientifc / Russian name	Christolea crassifolia Cambess./ Христолея толстолистная.
Main grazing season	Summer / Autumn
Main habitat	Stony slopes
Geographical distribution / Altitudinal range	Darshai, Western Pshart, Bartang, Ussoy avalanche / 3100-3850 m
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★★
Palatability	★
Biomass	★
Other use	None


4

Local name(s)	Hipahanak
Scientifc / Russian name	Cysticorydalis fedtschenkoana (Regel.) Fedde ex Ikonn. / Вздуто-хохлатка Федченко
Main grazing season	Summer / Autumn
Main habitat	Gravelly scree
Geographical distribution / Altitudinal range	Djavshangoz v., Djelondy, Tokuzbulak, Western Pshart, upper reaches of Bartang / 3800-4500 m
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★★
Palatability	★
Biomass	★
Other use	None


5

Local name(s)	Hinjashak
Scientifc / Russian name	Cousinia schugnanica Juz. / Кузи-ния шугнанская
Main grazing season	Autumn / Winter
Main habitat	Stony slopes
Geographical distribution / Altitudinal range	Bogivdara gorge, Shorvdara, Akbai, Odudy / 3450-4000 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★
Other use	None


6

Local name(s)	Buivohak
Scientifc / Russian name	Dracocephalum paulsenii Brig. / Змееголовник Паульсена.
Main grazing season	Spring / Summer
Main habitat	Stony slopes
Geographical distribution / Altitudinal range	Maz r., Darshai, Kokbai, Tokuzbulak, Western Pshart. / 3555-4600 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★★
Other use	Medicinal plant


7

Local name(s)	Niligulak
Scientifc / Russian name	Gentiana karelini Griseb. / Горе-чавка Карелина
Main grazing season	Summer / Autumn
Main habitat	Meadows
Geographical distribution / Altitudinal range	in all areas / 3400-4200 m
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★
Frost tolerance	★★★★
Palatability	★★
Biomass	★★★★
Other use	None


8

Local name(s)	Kurvohak
Scientifc / Russian name	Lindelofia stylosa Brand/ Линделофия столбыковая
Main grazing season	Spring / Autumn
Main habitat	Dry and stony places
Geographical distribution / Altitudinal range	in all areas / 3000-3600 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★
Other use	None

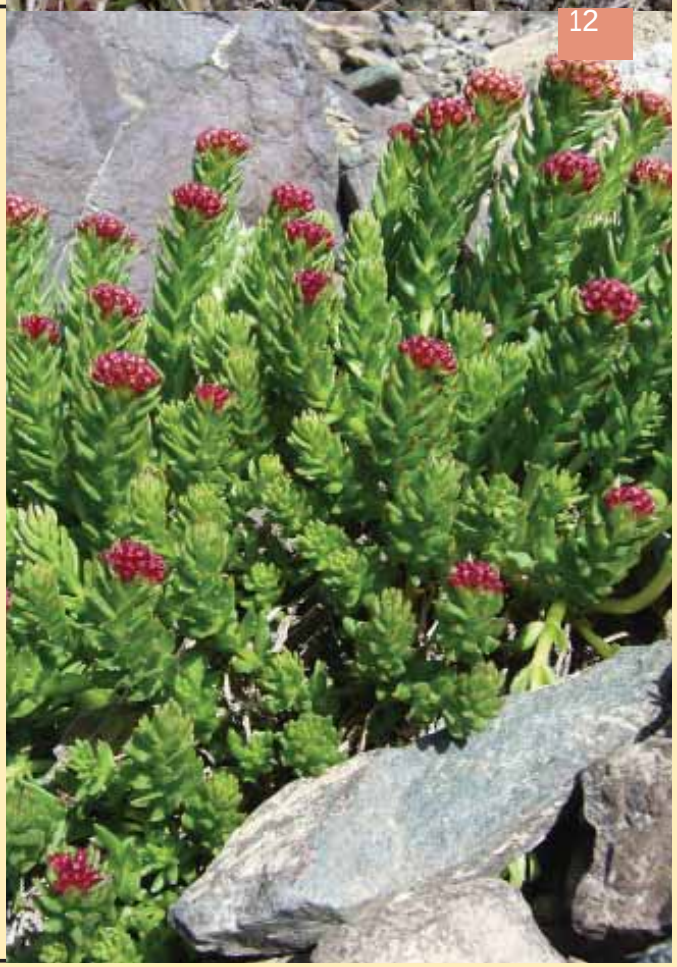

9

Local name(s)	Niligulak
Scientifc / Russian name	Pedicularis rhinanthoides Schrenk / Мытник погремковый
Main grazing season	Spring / Autumn
Main habitat	Moist meadows
Geographical distribution / Altitudinal range	in all areas / 3200-4200
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★
Other use	None


10

Local name(s)	Zirdgulak
Scientifc / Russian name	Ranunculus turkestanicum Franch. / Лютик туркестанский.
Main grazing season	Spring / Summer
Main habitat	Snow meadows and moraine
Geographical distribution / Altitudinal range	Bizhundara, Bodomdara, Tusiendapa, Yazgulyam and others / 3000-4000 m
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★
Frost tolerance	★★★★
Palatability	★
Biomass	★★
Other use	Decorative

Local name(s)	Tilloii viiesh
Scientifc / Russian name	Rhodiola pamiroalaica Boriss. / Радиола памироалайская
Main grazing season	Spring / Summer
Main habitat	Dry slopes and taluses
Geographical distribution / Altitudinal range	Shitharv, Yamchun, Bizhundara, Sangovdara, Bogivdara and others / 2100-4300 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★
Other use	Medicinal plant



Local name(s)	Shufurchak
Scientifc / Russian name	Salsola oreophila Botsch./ Солян-ка горолюбивая
Main grazing season	Spring
Main habitat	Mountain and barren slopes
Geographical distribution / Altitudinal range	Djavshangoz, Djelondy, Ussoy avalanche / 3000-3700 m
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★★
Frost tolerance	★★★★★
Palatability	★★
Biomass	★★
Other use	None


13

Local name(s)	Нилигулак
Scientifc / Russian name	Saussurea salsa (Pall.)Spreng./ Горькуша солончаковая.
Main grazing season	Spring
Main habitat	Salt marshes, salt licks of lowland rivers
Geographical distribution / Altitudinal range	Garmchashma r.,Abharv, Vrang, Anderob / 2400-2900 m
Main consuming speecies	
Grazing tolerance	★★
Drought tolerance	★
Frost tolerance	★★★★
Palatability	★
Biomass	★★
Other use	Decorative


14

Local name(s)	Niligulak
Scientifc / Russian name	Sausurrea glacialis Herd. / Горькуша ледниковая
Main grazing season	Spring
Main habitat	Moraines, near the glacier and snowfields.
Geographical distribution / Altitudinal range	Trumtaikul gorge, Grundy / 4500-4700 m
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★★★
Palatability	★★
Biomass	★
Other use	None

Local name(s)	Hinsudm
Scientifc / Russian name	Artemisia leucotricha Krasch. Ex Ladyg. / Полынь беловолосистая
Main grazing season	Autumn / Winter
Main habitat	Stony slopes, steppes
Geographical distribution / Altitudinal range	in the upper boundaries of the Western Pamir / 3400-4400 m
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★
Frost tolerance	★★★★★
Palatability	★
Biomass	★★
Other use	None

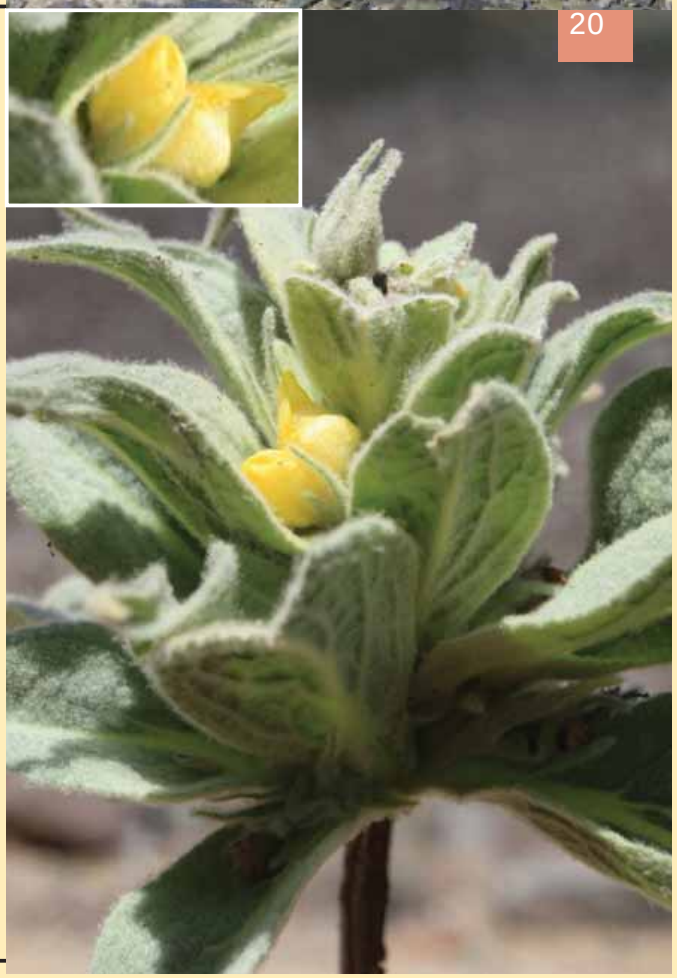
Local name(s)	Puhtalosakvoh
Scientifc / Russian name	Stipa pamirica Roshev. / Ковыль памирский
Main grazing season	Spring / Summer
Main habitat	Stony slopes
Geographical distribution / Altitudinal range	Langar, Vrang, Zung, Sejd, Vir, Chartym / 3100-4900 m
Main consuming speecies	
Grazing tolerance	★★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★★
Biomass	★★★★
Other use	None

Local name(s)	Puhtalosakvoh
Scientifc / Russian name	Stipa caucasica Schmalh. / Ковыль кавказский
Main grazing season	Spring / Summer
Main habitat	Detrital slopes
Geographical distribution / Altitudinal range	The upper reaches of the Western Pamir / 3200-3500 m.
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★★
Biomass	★★★★
Other use	Decorative

Local name(s)	Puhtalosakvoh
Scientifc / Russian name	Stip orientalis Trin. / Ковыль восточный
Main grazing season	Spring / Summer / Winter
Main habitat	Stony slopes and rocky places
Geographical distribution / Altitudinal range	Darshai r. , Abharv, Kokbai, Tokuzbulak and others
Main consuming speecies	
Grazing tolerance	★★★★
Drought tolerance	★★★★★
Frost tolerance	★★★★★
Palatability	★★★★
Biomass	★★★★
Other use	None


19

Local name(s)	Tochiki / Margi mohi
Scientifc / Russian name	Verbascum bactrianum Bunge / Коровняк бактрийский
Main grazing season	Spring / Summer / Autumn
Main habitat	Dry mountain places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-2700 m) , Roshtkala district, Djavshangoz v. (2600-2700 m), Vanj district, Chihoh v. (2000-2500 m), Ishakashim district, Langar v. (2600-2700 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1600-2700 m)
Main consuming speecies	None
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★
Biomass	★★★★
Other use	None


20

21

Local name(s)	Shugni / Spandona: Tochiki / Hazorispand
Scientifc / Russian name	Peganum harmala L. / Гармала обыкновенная
Main grazing season	Autumn
Main habitat	Sandy places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2000-2400 m), Vanj district, Chihoh v. (1700-2600 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (2000-2600 m), Ishakashim district, Langar v. (2600-2800 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★★
Other use	Medicinal plant

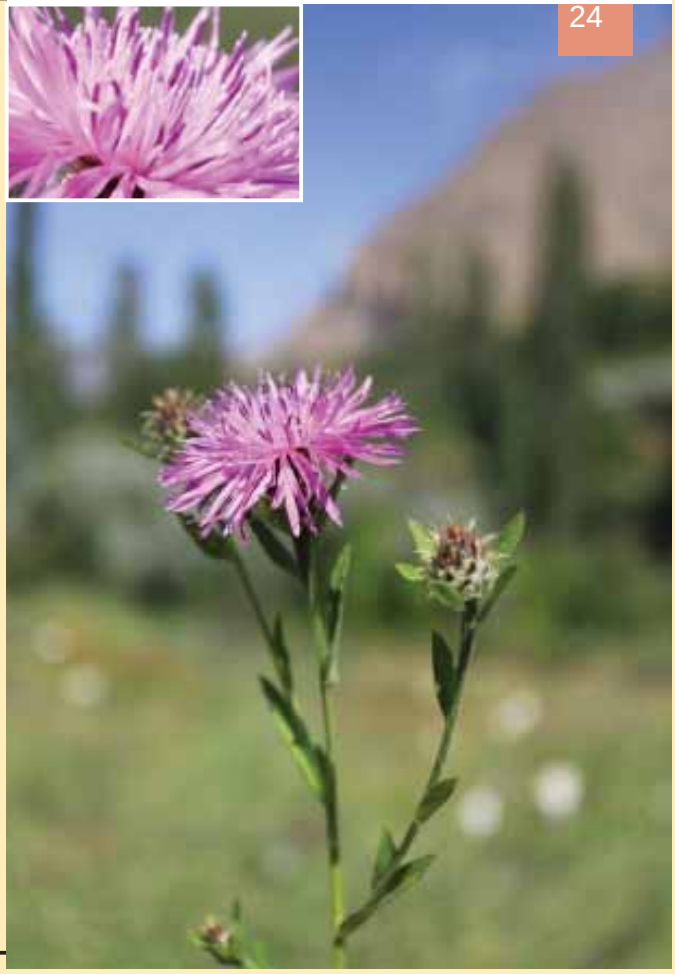
22

Local name(s)	Tochiki (Vanj) / Chizhorak
Scientifc / Russian name	Cirsium turkestanicum (Regel) Petrak / Бодяк туркестанский
Main grazing season	
Main habitat	Rocky
Geographical distribution / Altitudinal range	Vanj district, Chihoh v. (1900-2600 m)
Main consuming speecies	None
Grazing tolerance	★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★★★
Other use	None

Local name(s)	Shugni / Roopkthumak
Scientifc / Russian name	Eremurus robustus Regel / Ширяш мощный
Main grazing season	
Main habitat	Shallow soil
Geographical distribution / Altitudinal range	Kalai Humb v., Sagirdasht valley (Hirsdara) (2700-3200 m)
Main consuming speecies	None
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★★★
Other use	None

23

Local name(s)	Shugni / Shuthgulak
Scientifc / Russian name	Hyalea pulchella (Ledeb) C. Koch / Гиалия красивая
Main grazing season	
Main habitat	Sandy places
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3200 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Vanj district, Chihoh v. (1700-3200 m), Ishakashim district, Langar v. (2500-3300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1900-3200 m)
Main consuming speecies	None
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None



24

Local name(s)	Shugni / Strakhm
Scientifc / Russian name	Anaphalis darvasica Boriss / Анафалис дарвазский
Main grazing season	
Main habitat	Stony soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3400 m), Vanj district, Chihoh v. (1700-3200 m), Ishakashim district, Langar v. (2600-3300 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★
Other use	None


25

Local name(s)	Shugni / Zirdosk
Scientifc / Russian name	Handelia trichophylla (Schrenk) Heimerl / Ханделия волосолистная
Main grazing season	
Main habitat	Dry soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (1800-3200 m), Roshtkala district, Djavshangoz v. (2600-3000 m), Vanj district, Chihoh v. (1700-3200 m), Ishakashim district, Langar v. (2500-3300 m), Kalai Humb v., Sagirdasht valley (Hirsdara) (1900-3200 m)
Main consuming speecies	None
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★★★
Biomass	★★★★
Other use	None


26

Local name(s)	Shugni / Piez, Tochiki / Piezi kuhi
Scientifc / Russian name	Allium polyphyllum Kar. et Kir / Лук многолистный
Main grazing season	Spring / Summer / Autumn
Main habitat	Dry places and Sandy soil
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2600-3600 m), Vanj district, Chihoh v. (2800-3500 m), Ishakashim district, Langar v. (3600 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★
Biomass	★★
Other use	Food

Local name(s)	Shugni / Kuhchivir, Tochiki /
Scientifc / Russian name	Pyrethrum pyrethroides (Kar. & Kir.) B. Fedtsch. ex Krasch. / Пиретрум перитовидный (ромашник)
Main grazing season	Summer / Autumn
Main habitat	Taluses, rocky places and gravels
Geographical distribution / Altitudinal range	Rushan district, Bartang valley, Basid v. (2300-3500 m), Vanj district, Chihoh v. (2400-3500 m), Ishakashim district, Langar v. (2600-3500 m)
Main consuming speecies	
Grazing tolerance	★★★
Drought tolerance	★★★
Frost tolerance	★★★
Palatability	★★★
Biomass	★★★★
Other use	Medicinal plant

Part B

Pasture management

B 1 Balancing livestock and pastures

B 1.1 Appropriate grazing

Grazing livestock and pasture plants adapt to each other and should remain in a healthy balance for sustainable use of pasture resources. If the pressure of livestock is above or below a certain limit, overuse or under-use of a pasture occurs. Over-use commonly leads to land degradation and reduced productivity, while underuse can lead to the dominance of shrubby vegetation.

Sustainable pasture management therefore requires avoiding both overuse and underuse of pasture plants. The appropriate grazing pressure is achieved by regulating the number of livestock and the duration of grazing during a certain period of the year. This allows for a sustainable utilization of the biomass and for optimal livestock production or output.

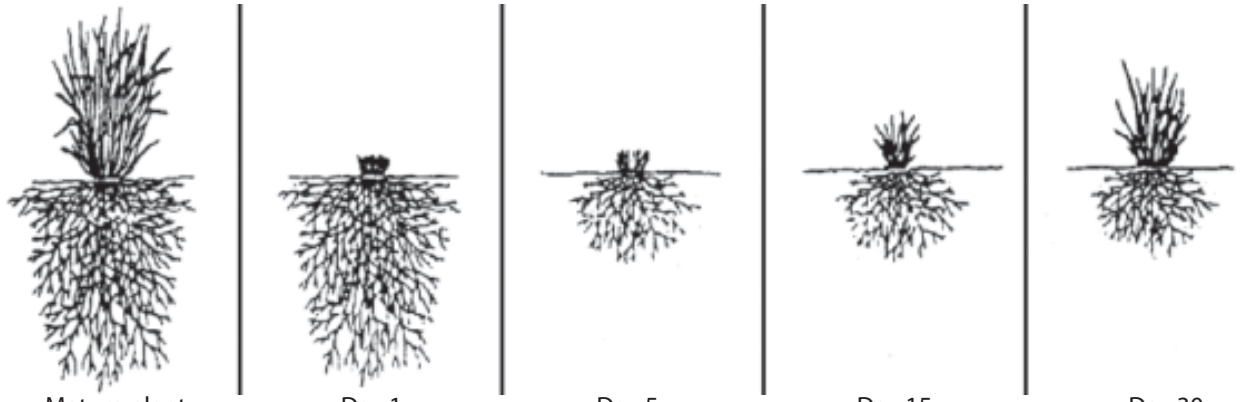


Figure-1 Relation between plant and grazing animals

To avoid inappropriate pasture use:

- Do not allow next grazing before the leaves and the roots of pasture plants are re-established.
- Do not allow animals to turn too early to the pastures in spring when plants are still in their sprouting stage; this will also prevent compaction of wet soils.
- Do not allow animals to stay too long on autumn pastures to preserve the residual biomass necessary for re-growth in spring.

B 1.2 Appropriate herding and stocking

Livestock often heavily graze riparian areas, while abundant forage remains ungrazed in less accessible areas. Appropriate herding ensures a balanced grazing and

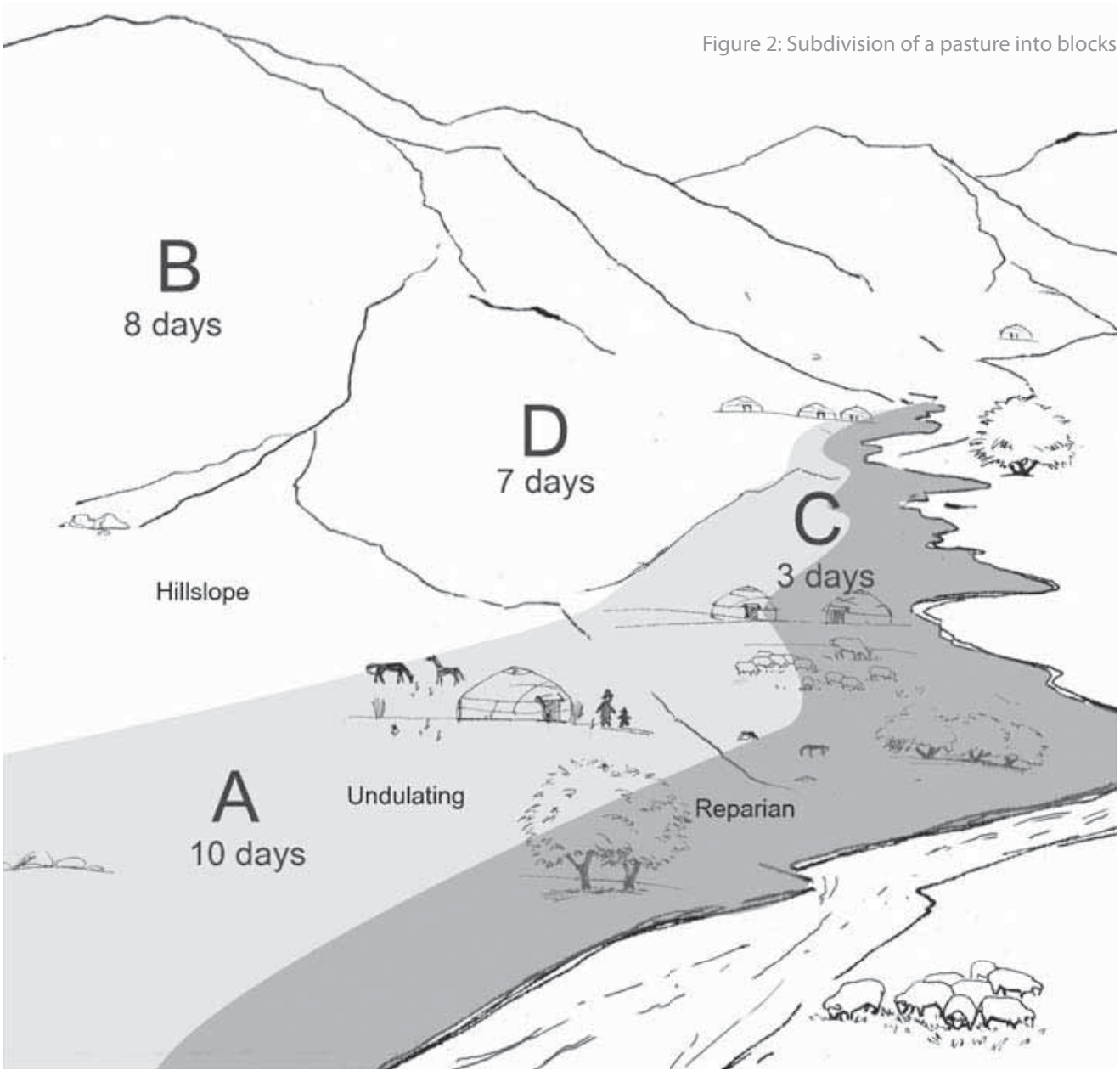
utilization of different pastures. The distribution of watering points and the placement of salt blocks play an important role for appropriate herding. The following steps are helpful to ensure such a pasture management:

1. Divide the pasture unit (i.e. the area used by one herder or by a group of herders) into 4 blocks for grazing during one season
2. Use natural boundaries such as ridges, streams and gullies for easier division and implementation (see Figure 2).

Table 1: Pastur e rotation system

Season / year	A	B	C	D
I	1	2	3	4
II	4	1	2	3
III	3	4	1	2
IV	2	3	4	1

Figure 2: Subdivision of a pasture into blocks



Note: The blocks may not be uniform and the number of grazing days may vary according to the size and quality of a pasture.

3. Arrange the four blocks so that every year / season, grazing begins in a different block (see above table on pasture rotation system).
4. Divide each block into parts according to the number of days planned for grazing; e.g., if grazing is possible for 8 days, divide the block into 8 parts of one day each to ensure uniform grazin.
5. Drive the flock along a pasture area slowly (at a speed of about 200-300 m per hour), to prevent pasture from being trampled and to allow for more uniform grazing of the pasture vegetation.
6. Regulate flock movement in such a way, so that sun light falls from the back or the side to avoid a glare and disturbance of animals, which can hinder their ability to find sparse fodder plants.
7. In the morning when it is cold, graze flocks along the wind direction; when it is hot in the middle of the day, graze flocks against the wind.
8. Only graze a pasture when at least half of the vegetation is already flowering; this allows grazing of the maximum possible biomass and secures sufficient natural reseeding of desirable fodder species.

Appropriate herding has the following benefits:

- It increases the chance for revitalization of perennial forages after every four grazing seasons in each block.
- It prevents pastures from becoming a source of parasitic infestation by disrupting the reproductive cycle of parasites.

Appropriate herding requires a pasture grazing timetable that is well tailored to the availability of biomass i.e. its spatial and temporal distribution. It needs to be planned and herding labor should be allocated accordingly.

For appropriate stocking one needs to know:

- How much biomass is available for grazing on a specific pasture unit, and
- How many animals can be grazed for how many days on that specific pasture unit.

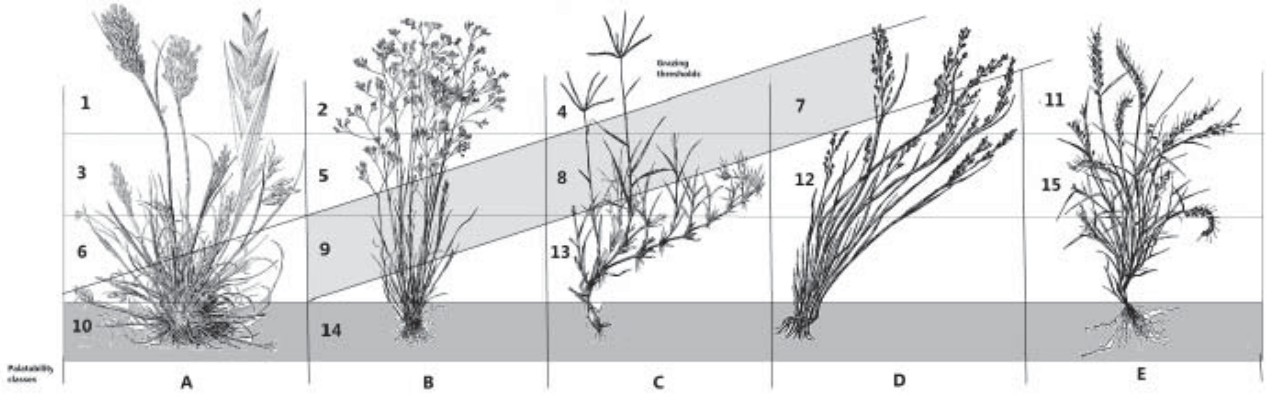
With this information under- or over-use of pastures can be avoided and the livestock can be provided with optimum fodder for good and sustainable productivity.

B 2 Pasture assessment

B 2.1 Consumption behavior

Livestock does not consume all fodder plants with equal relish. Some plants are preferred more than others, some are more palatable than others and some are even toxic or lethal for certain animals. Consequently, the entire biomass available at a pasture cannot and should not be consumed. To maintain high pasture productivity, the grazing behavior of livestock needs to be understood and considered when managing pastures.

Figure 3: Livestock consumption pattern and lower / upper thresholds



Highly Palatable Fresh Biomass (HPFB): main indicator species of good pasture conditions; these are preferred grazing plants.

Low Palatable Fresh Biomass (LPFB): buffer plants between HPFB and WFP.; these are less preferred than A and B, but are still edible.

Weed Fresh Biomass (WFB): utilized only in over grazed areas; these indicate pasture degredation and are not preferred; some may be toxic or even lethal.

Figure 3 illustrates the typical grazing behaviour of animals on pastures.

Note:

- Type A plants are the most preferred plants, considered as 'highly palatable'. Type B plants are also favored. Types C and D are less palatable, but still edible, and thus less preferred. Type E plants are normally avoided; they are considered as non-palatable and some may be toxic or even lethal.
- Type A and Type B plants jointly constitute the 'Highly Palatable Fresh Biomass' (HPFB). They are the main indicator species for good pasture conditions. Type C and Type D plants constitute the 'Low Palatable Fresh Biomass' (LPFB) and serve as buffer between the good and the non-palatable plants on a pasture. Type E plants constitute the 'Weeds Fresh Biomass' (WFB) which are only utilized in severely over grazed areas or when fodder gets short; their dominance is an in-

dicator of heavy pasture degradation.

- The attribution of a specific pasture plant to one of these types A-E is though relative and can differ from one place to the other. Palatability is context sensitive and varies with different livestock; it often changes in space and time.
- Shoots are always preferable to stems, so livestock will first graze on shoots of preferred and less preferred plants, before returning and grazing on the stems and roots of preferred plants.

When animals enter a new non-grazed locality, they naturally start consuming the shoots of Type A plants (1st move). However, before moving to the stems of a Type A plant, they will start consuming the shoots of Type B plants (2nd move). Figure 3 indicates how animals theoretically shift from one type of fodder plant to the other and from one part of a plant to another according to their preference.

To avoid overgrazing and the deterioration of pastures, one has to respect certain thresholds. After the 9th move - i.e. before grazing the shoots of the least palatable Type E plants - livestock will consume the roots of Type A plants as a 10th move. This 10th move should be avoided by all means to ensure that Type A plants will not disappear from a pasture.
To avoid excessive accumulation of dead litter and the appearance of taller and less productive shrubby vegetation, it is actually recommended that animals be prevented from going beyond the 7th move, the grazing animal be shifted to alternative grazing areas. If alternative grazing areas are not available, it may be necessary to reduce the number of livestock grazing in the area to avoid pasture degration.

Through such grazing management only half of the biomass of good fodder plants is consumed while the other half remains non-grazed, resulting in sustainable pasture management.

B 2.2 How to estimate the biomass of a pasture block

The assessment of available biomass according to highly palatable, low palatable and weed plant categories in pasture blocks is necessary to estimate how much grazing can be allowed without degrading a pasture. Similarly, an estimation of the daily biomass required to feed the herd is necessary. This helps determine the sustainable duration of grazing at a particular pasture block. To make the calculation easy and to maintain a record of pasture productivity and livestock output, a simple form to assess fresh biomass and another one to register livestock herd composition and the required biomass are provided (p. 79).

The procedure consists of 6 steps:

1. Divide each pasture block into similar sub-blocks.

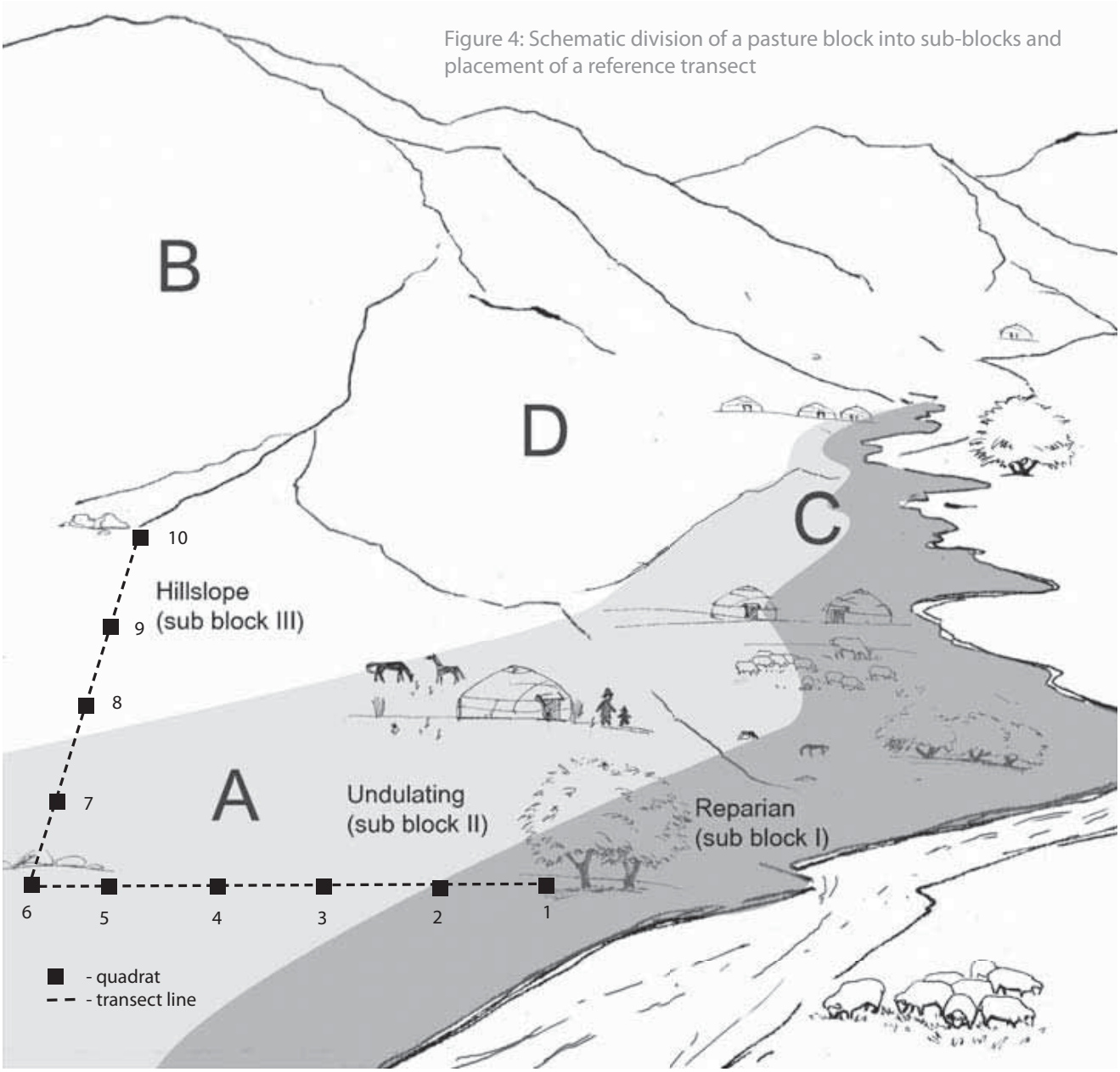


Figure 4: Schematic division of a pasture block into sub-blocks and placement of a reference transect

2. Place a permanent reference transect[1] across each sub-blocks.
3. Collect data along the transect using reference quadrat[2].
4. Clip all vegetation in each reference quadrat.
5. Separate the collected plant material according to the different fodder types A, B, C, D, and E.

[1] A reference transect is a virtual line that crosses a given surface in such a way, that it reflects its diversity. In a hilly terrain, the transect is often placed vertically i.e. from bottom to top. Transect is often placed using visible landmarks. It should not be too close to the borders of the surface concerned. For practical purposes, we propose using a rope at least 100 m long along which quadrate are laid at equal spaces for measuring different attributes of vegetation.
[2] Quadrates are reference squares placed at equal distances along the transect line to collect plant material. Its recommended size is 0.5m2 (50x100cm). It can be made of metal, wood or plastic and placed directly on top of the vegetation to isolate the reference sample.

6. Weigh the separated plant material for each type.
7. Enter the data into Form 1.

The scheme in Figure 4 shows the different sub-blocks within a single pasture block. The pasture block has been divided into three sub-blocks based on natural features: Sub-block "**I**" is the riparian area along the stream bank, sub-block "**II**" is the adjoining undulating area towards the hillside and sub-block "**III**" is the hill slope.
All three sub-blocks have a different vegetation composition mainly due to differences in moisture availability, soil depth, exposition and altitude.
Ideally a permanent reference transect - shown as dotted line – crosses all three sub-blocks of a pasture block according to their relative proportion. For example if the riparian sub-block covers 20%, the undulating sub-block covers 50% and the hill slope covers 30% of the area of a pasture block, then a transect line with 10 equally spaced reference quadrates may have 2 quadrates in sub-block "I", 5 quadrates in sub-block "II" and 3 quadrates in sub-block "III". If the diversity of the vegetation is higher, the total number of quadrates can be increased, for example, doubled to a total of 20, with the number of reference quadrates along the transect line also doubled (4, 6, 10).
Allowing for the general diversity of Pamir pastures, one reference quadrate of 50X100 cm is sufficient for five hectares. Hence for a pasture block of 50 hectares, a herder may draw a transect line with 10 reference quadrates while a pasture block of 100 hectares would need a transect line with 20 reference quadrates placed at equal distance from each other along the transect.

B 2.3 Placing reference quadrates along a transect

Take a 2 cm thick rope of 100 m length or more according to the total length of the reference transect or of its sections as shown in Figure 4 (i.e. I, II, III). Make permanent knots at a regular distance from each other depending on the spacing decision. Place the knotted rope tightly stretched along the line of the reference transect. Then place the reference quadrates along the rope with their lower right corner touching the knots (see Figure 5).

B 2.4 How to calculate fresh biomass

With a pair of clippers, clip all stems rooted inside the reference quadrat. Do not worry if they hang in or out of the frame.
Separate the different types of plants (HPFB, LPFB and WFB) and weigh their biomass separately in grams.
If the quantity is too small to be weighed appropriately for one quadrat, combine the material of several neighboring quadrates and insert the average per quadrat in the given form.

Multiply the added weight in grams of the HPFB, LPFB, WFB, and Total Fresh Biomass (TFB) by 20 and divide it by the number of reference quadrates included in the calculation. The obtained figures will equal the number of kilograms of biomass per hectare (kg / ha).
Multiply these figures by the number of hectares in a specific block to obtain the total fresh biomass of the different categories and the overall total.
Based on these calculations, allow grazing in the given pasture only if the HPFB constitute at least 30 % of the TFB. Otherwise let the pas-

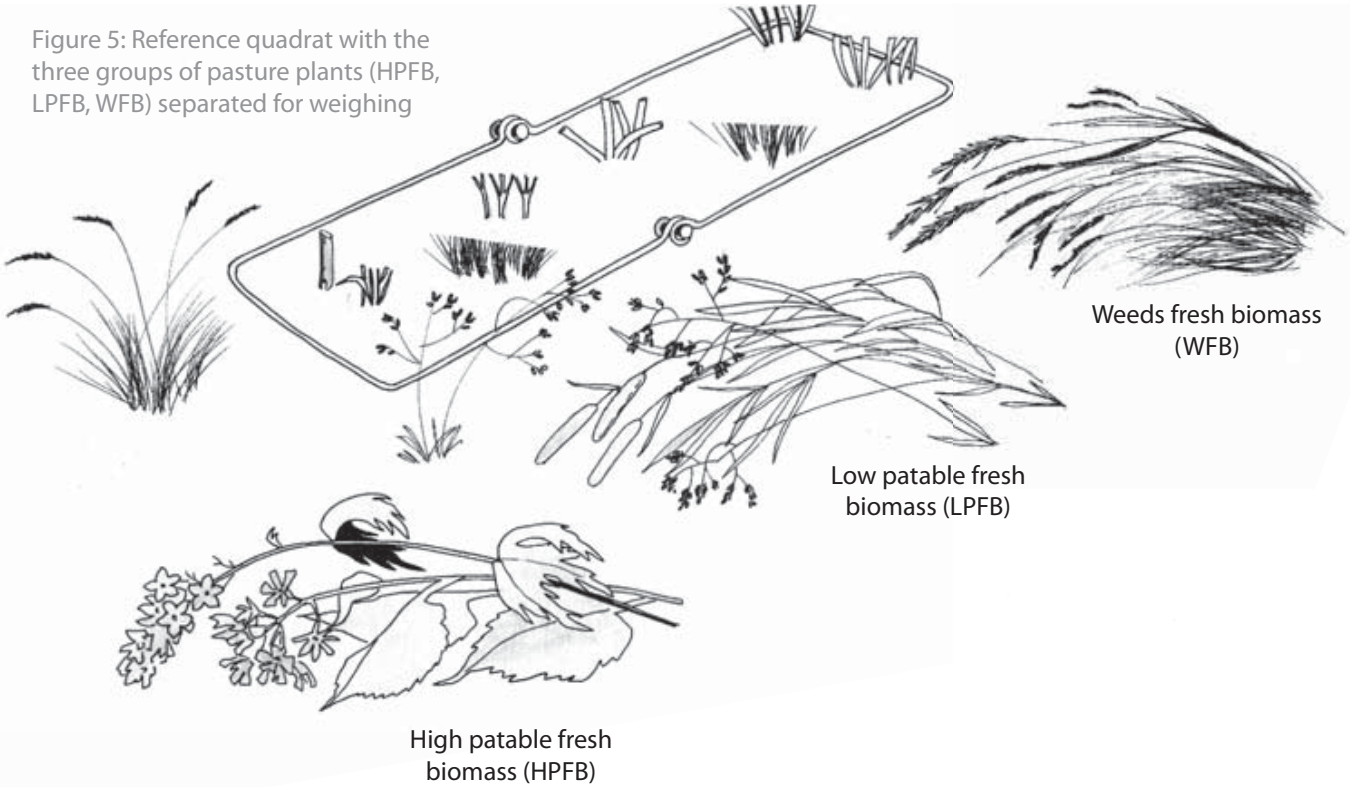


Figure 5: Reference quadrat with the three groups of pasture plants (HPFB, LPFB, WFB) separated for weighing

ture rest and regenerate; eventually remove non-palatable and toxic plants and introduce seeds of good fodder plants.

B 2.5 Biomass requirement of livestock

Daily, animals commonly consume about 3.0% (range 2.5-3.5%) of their body weight in dry biomass (hay) or about 10% of their body weight in fresh biomass. To calculate the necessary amount of daily fresh biomass for a flock it is important to estimate the animal weight as close as possible (see Part C).

Serial number of form[1]:
Date of data collection:

Name of Ayl-Okmotu: _____
Name of pasture unit: _____
Name of herders occupying the unit:
Name of data collectors
Total number of hectares in the unit:

Name of the village: _____
Name of pasture block: _____
1: _____ 2: _____ 3: _____
1: _____ 2: _____
(for every 10 hectares use 2 reference quadrates)

Form 1: Fresh Biomass Assessment

Quadrat	Fresh biomass (in grams)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
HPFB											
LPFB											
WFB											
Quadrat	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	Total of all quadrates
HPFB											
LPFB											
WFB											

	Number of quadrates used	Correction Factor CF: 20 / N	FB: TxCF [kg / ha]	Number of ha in the unit	Total Fresh biomass FBxha [kg / unit]
HPFB					
LPFB					
WFB					
TFB					

[1] This form is for 100 hectares, if the unit has 200 hectares, one may use 2 forms and so on

Local names of the 5 most frequent HPFB plants encountered
(1)
(2)
(3)
(4)
(5)
Local names of the 5 most frequent LPFB plants encountered
(1)
(2)
(3)
(4)
(5)
Local names of the 5 most frequent WFB plants encountered
(1)
(2)
(3)
(4)
(5)

Sample form filled out in Annex 1

B 3 Pasture monitoring

Regular monitoring of a pasture is key for effective planning and to assess possible shifts in plant composition and threats to animal health. It allows for appropriate pasture management and informed decision making. Monitoring allows herders to evaluate if a pasture is improving or degrading and whether its productivity is stable, increasing or decreasing. This helps determine the sustainable number of animals allowed for grazing for a certain period of time.
While the assessment of the stocking / carrying capacity is a tedious activity that should be repeated only every five years, pasture monitoring should be done annually and always at the same time of the year, prior to grazing.

B 3.1 Selecting key indicator species and assessing their frequency

Select two key palatable species from among HPFB plants (also known as 'Edible Indicator Species' or EIS) and do a visual assessment of the relative percentage of their cover and frequency in the quadrates laid along the transect. This has to be done prior to the clipping of vegetation or for biomass monitoring. Estimate their relative cover as part of the total cover of the reference area i.e. the reference quadrates.

Enter the data into the pasture monitoring form no. 2 (see below).

- For each of the two EIS put a separate tick ... mark (v) according to the relative coverage in each quadrat
- If the cover is 50% then tick both 40% and 10%; if it is 100% then tick all four, etc.
- Count the number of tick marks for each EIS separately and multiply that number with the tally value (= ranks 1-4)

- Add all four tally values in the weighted column to get weighted value
- To get % cover for each EIS multiply the weighted value by 10 and divide by the total number of quadrates examined along the reference transect
- For calculating the relative frequency (%) count the total number of quadrates with the EIS plant, multiply by 100 and divide by the total number of quadrates examined along the reference transect
- Collect and calculate monitoring data separately for each pasture block
- Collect data each year on the same dates (no more than 1 week variation if possible)
- Compare new and earlier data with the data to assess trends and any necessary action, such as avoiding grazing to allow the pasture to recover.

Herders may decide to use the same reference transect for pasture biomass assessment and pasture monitoring, or they may use different reference transects for monitoring across all the blocks.

Form 2: 'Pasture Monitoring'

Serial number of form[1]:
Date of data collection:

Name of Ayl-Okmotu: _____
Name of pasture unit: _____
Name of herders occupying the unit:
Name of data collectors
Names of 2 major 'Edible Indicator Species (EIS):

Name of the village: _____
Name of pasture block: _____
1: _____ 2: _____ 3: _____
1: _____ 2: _____

Relative cover												Tally value				Weighted	% Cover
EIS 1 / Quadrate	1	2	3	4	5	6	7	8	9	10	T	1	2	3	4		
10%																	
20%																	
30%																	
40%																	
EIS 2 / Quadrate	11	12	13	14	15	16	17	18	19	20	T	1	2	3	4		
10%																Weighted value (WV)	WV*10 / N
20%																	
30%																	
40%																	
Relative frequency (%)												Quadrates with EIS* 100 / N					

Sample form filled at annex 2

[1] This form is for 100 hectares, if the unit has 200 hectares, one may use 2 forms and so on

B 4 Improving pastures

B 4.1 Weed control

Weeds are plants which are less or undesirable for livestock grazing, and include:

- Toxic plants that cause sickness or even mortality among livestock, particularly young animals;
- Unpalatable plants with little or no fodder value that compete with good forage species and oppress their growth; and
- Bushy plants with thorns that can cause loss of wool or harbor harmful insects or parasites.

A single weed species can have one or more combine different of the above characteristics. At the same time, many weeds

- have medicinal and thus economic value;
- are part of the local small-scale ecosystem and its biodiversity and may contribute to biological pest control; and
- can play an important role in preventing soil erosion and land degradation.

All weeds should therefore not be eliminated, and weeding of pastures should be done carefully and selectively, with a particular focus on invasive plant species. These are recently introduced weeds which are not common to the local ecosystem that expand rapidly at the expense of good local forage plants. Through appropriate grazing (e.g. seasonal rotation) a good balance of palatable and non-palatable species can be maintained.

Mechanical removal of weeds

Mechanical removal is a traditional and effective, though labor-intensive, way of controlling weeds. To make it more sustainable, the removed weeds should be re-utilized as fuel, organic matter for composting or as source of bio-gas. Mechanical removal includes the following steps

- Cut or extract weeds in an early vegetative stage before dissemination.
- Repeat cutting or extraction 2 to 4 times during the growth season(s).
- Avoid burning the whole or even part of pasture area, as this measure is not selective enough and it may increase weeds and destroy useful fauna, such as small animals, disturbing the natural pasture plant composition and the functioning of ecosystems.

Chemical removal of weeds

The use of chemicals for removing excessive weeds requires careful handling, knowledge on appropriate and effective application, and the advice of a knowledgeable specialist. We generally recommend the following:

- Use particular weedicides in specific amounts and regularity for specific weed plants. For example, in grass-cereal and grass-forb meadows apply the weedicide 'Oktapon' at 1-1.5 liter / ha in pre-bloom stage. Repeat the application the following year, according to directions for use provided with the weedicide. In the case of hardy and creeping-rooted weeds apply 'Gliphosat' at 4-10 liter / ha and sow fodder grasses for replacement afterwards.
- Apply weedicides in spring at a pre-bloom stage, preferably on a sunny day, to avoid washing away by rain.
- Do not use weedicides near open water reservoirs, rivers, streams, forests and areas with abundant plants of medicinal value to prevent pollution of these resources.
- Do not use weedicides on shrubs that grow on steep slopes, to avoid unintended erosion.
- Do not allow livestock grazing for at least two months after applying weedicides to allow forage plants to grow and replace the weeds.

B 4.2 Pest control

Important pests that can affect both pasture and grazing animals include various types of locusts, grasshoppers, cutworms, bugs and ticks.

In the case of large-scale infestation continuous chemical treatment through fast-acting pesticides may be appropriate. You may choose between organo-phosphorous compounds (such as Malathion, Chlorpyriphos and Parathion commonly applied at a rate of 0.5-3 kg / ha) or synthetic pyrethroid compounds (such as Cypermethrin, Cyhalothrin, Cyfluthrin and Imiprothrin applied at a rate of 0.1-0.5 kg / ha) based on manufacturer's guidelines provided with the pesticides.

How to apply pesticides

There are three main methods to apply pesticides:

- Barrier or depression method: Place insecticides on a barrier like a repellent net or in a depression over the boundary of the area needing protection from pests such as locusts. The use of pesticides with a higher evaporation potential is more effective in this method.
- Bait method: Introducing poisoned baits in the bran or other appropriate hosts. The baits are spread near the colonies of pests or over the areas requiring protection from pests such as grasshoppers and cutworms.
- Spray method: Pesticides are sprayed as an aqueous solution, according to manufacturer's directions, in and around the barns or mangers to control pests like bugs and ticks.

Precautions

- It is always advised to consult with a specialist before using pesticides.
- Read and follow directions and precautions on pesticide labels regarding preparation, use and follow-up.
- Keep livestock, pets and people away from the area where you store, mix and apply pesticides.
- Mix pesticides exactly according to label instructions. Do not use more or less concentrate in the mixture than recommended. Mix only as much material as you need for one application.
- Time application carefully to have the greatest impact on the pest population.

B 4.3 Rodent control

Rodents in pastures may include different kinds of mice, moles, voles, and gophers. Rodents can cause considerable damage to pasture areas and agricultural crops. Many rodents also transmit different diseases to humans, livestock and wild animals. Rodent control is therefore necessary for both pasture and livestock health.

Mechanical control of rodents

There are different methods for mice, and for other rodents.

For mice:

- Take a polyethylene bottle, remove its neck with a knife and pour some sunflower oil into it. Prop the bottle into a slanting position with the help of a stone or piece of wood near the entrance hole of the rodent's burrow. Attracted by the smell of oil, the rodent will enter the bottle and will die. Clean the trap for a new hunt after a successful application.

- Place a thin wooden or metallic board balanced through a liver arm on the edge of a bucket so that one edge of the board leans into the bucket. Fill the bucket half way with water. Place bait like nut meal, grains, butter or cream at the edge of the board that is leaning into the bucket (see Figure). When the mouse reaches the bait, it will drop down into the bucket, overbalancing the board like a "seesaw" that

returns back to its initial position, and will drown.

- To prevent mice attacks on hay stacks, dig 60-70 cm deep ditches with a width of 60-70 cm at the bottom, and a width of 40-50 cm at the top. Lay poisoned baits at the bottom of the ditch to kill trapped mice. Inspect the ditches every 1-2 days and kill any trapped, living mice.

For other rodents:

- There are various mechanical traps available on the market. Fix the traps near the holes or natural course of travel of rodents. Place or secure a small piece of bait (fish meal, nutmeat, chocolate or dry fruit) to the trigger.
- Pour cold or hot water into the holes of rodents to eliminate them

Biological control of rodents

Predators of rodents, such as foxes and weasels or birds of prey such as eagle, kite, harrier, kestrel, buzzard, red-footed falcon, and owl should be protected. They help reduce the rodent population, keeping it in a good balance.

Chemical control of rodents

Rodenticides like 'Brodifakum' and 'Bromadiolone' are available in the form of pellets or granular baits. Important organic rodenticides include the derivatives of Coumarin and Indandione.

Brodifakum and Bromadiolone are effective against all types of voles, mice, mole-voles and rats. A single dose of the bait at the rate of 5-7% of the rodents' daily food ration proves lethal. Within 3-7 days the toxic effects lead to death.

- For the control of gophers, deposit 20-50 grams Brodifakum in each separately located hole, or in a group of 2-3 closely situated holes. Apply 2-3 kg per hectare.
- For the control of rodents deposit 10-20 grams Brodifakum or Bromadiolone in each separate colony. Apply 2 to 3 kg per hectare as a maximum when the population densities of 'rodents are high (i.e. more than 100 colonies per hectare). In all other regular cases use a maxium of 1.5-2 kg per hectare.

Alternative: Baits containing 5-10% of Coumarin and Indandione compounds are placed near holes of rodents in bait boxes to control all types of rodents.

- Bait filling material: To control ground squirrels, voles and mice under field conditions, cereal grains (oat, wheat, rye and maize) can be used as bait filling material. Baits filled with grains can be used only during winter or early spring e.g. the cold period for killing voles. During the warm season, baits filled with green alfalfa or clover can be used.

- Start applying rodenticides in early spring at the end of the hibernation period and end before the young ones come out of the holes.

Precaution: Comply with all requirements of health, sanitary and ecological safety provided by the instructions printed on the rodenticide boxes or bottles.

Disposal of dead rodents
Dead rodents should be disposed off vigilantly to prevent the spread of disease and / or chemicals. Rodents killed with chemicals should be buried deep in the soil to contribute to organic matter and avoid danger to rodent predators.

B 4.4 Fertilization

To increase pasture production, it is important to use fertilizers in combination with some weed control measures. Fertilizers:

- Increase biomass production and thus fodder plant yield
- Increase legumes and reduce weeds
- Extend the vegetation period on high altitude / remote pastures by 10 to 15 days in autumn and in spring, extending the pasture season.
- Enhance the nutritional quality of pasture forages when applied in a continued manner; this is especially true for nitrogen and phosphorus.

In remote, cold and dry pastures, the effect of fertilizers becomes evident only in the second year after their application.

How to apply fertilizers
In order to achieve best results on mountain pastures we recommend first applying Nitrogen, then Phosphorus and finally, Potassium fertilizers.
The standard rate of application per hectare is 60 kg of Nitrogen, 60 kg of Phosphorus and 30 kg of Potassium.

- Apply fertilization after 4 years to maintain enhanced pasture productivity
- In zones with sufficient moisture (lowlands or middle altitudes), apply fertilizers preferably in spring before re-growth of grasses starts.
- In zones with insufficient moisture (remote pastures, foothills), apply fertilizers preferably in autumn at the end of the growing season.

B 4.5 Seeding

Collect mature seeds from good fodder species on your own pastures during seed dispersal season (regularly in August and in September). Then broadcast the seed before the onset of the winter. Alternatively you may buy seeds or a mixture of grass-legume seeds that are available on the market.

How to plant / seed

When seeding, you need to consider the erosion potential of each pasture. Check which procedure is more appropriate in specific areas.

- With tilling: This method is best applied in valley bottoms and in plain areas. It includes plowing, disking and harrowing. Take care not to destroy the soil structure by overworking the seedbed. This method also allows you to incorporate lime and fertilizers into the soil and provides a smooth surface for seeding and the occasional harvesting.
- Without tilling: Seeding or planting without tilling performs best on sandy or silt loam soils. Planting in both directions in a grid can increase the density. A specialized planter is required to assure good seed to soil application.
- Frost seeding: This method can usually be used from February to late March. The alternate thawing and freezing of the soil with rain helps to incorporate the seeds into the soil. Red clover works well but grasses are generally not suitable for frost seeding.

Seeding rate and timing

The seeding rate per hectare depends on the chosen fodder plant species, the method of application and the timing. Check the available 'Recommended Pasture and Hay Species and Planting / Seeding Rates' factsheet for specific regions, provided by specialists in pasture departments. These include detailed recommendations for grasses and legumes. Localized advice should also be available from agricultural extension workers. Here are some general recommendations:

- Late winter to early spring (before mid March) is the best time to seed legumes into an existing stand of grass.
- Late summer or early fall is the best time to seed both legumes and grasses to eliminate existing undesired species.
- Plan seeding / planting when the necessary soil moisture is available.

Management of the root system

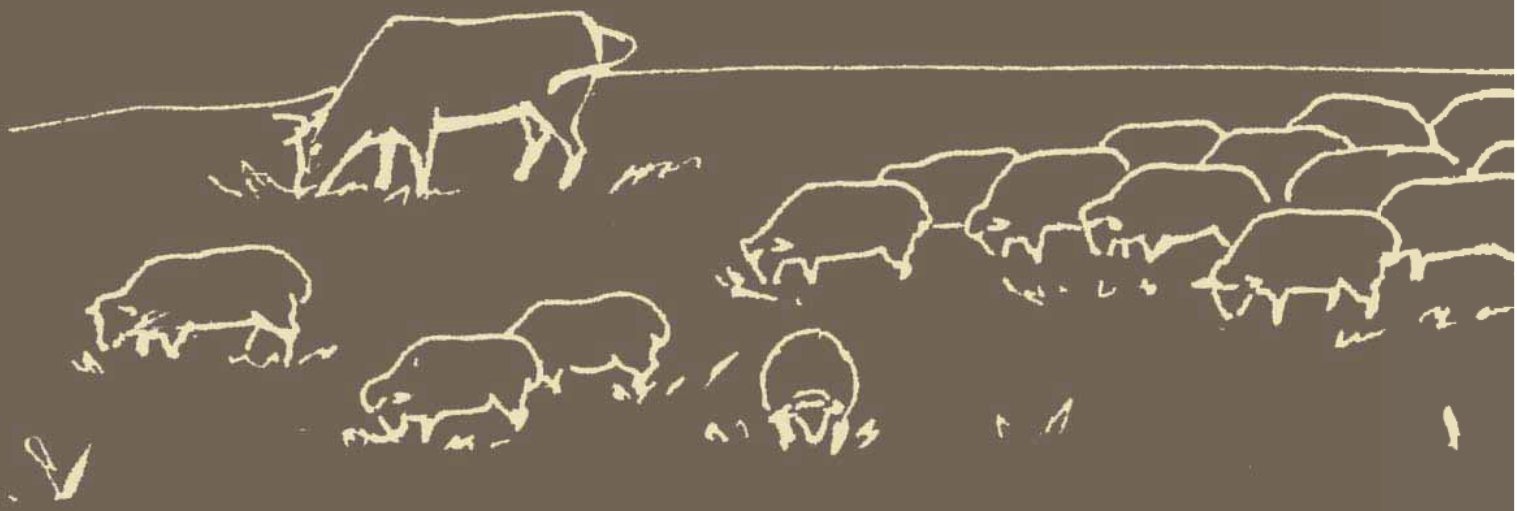
- A strong root system must be established prior to grazing to allow for a sustainable effect. Animals should be allowed to graze only on well-established plants. Never let new stands be grazed during wet periods, especially on tilled seedbeds - this will destroy the young root system.
- Test for root development by grasping a handful of desired plant material and tugging on it. If it is easily uprooted, then the root system is not yet sufficiently established and another cycle of mowing and re-growth needs to be allowed.
- Do not allow grazing of plants lower than 8 centimeters and only allow grazing when the soil surface is firm and dry.
- Implement rotational or intensive grazing management practices for more ef-

ficient use of pastures.
- After grazing, pastures need a resting period of 24 to 30 days.
- Control weeds in newly seeded pastures to maximize pasture (re-) establishment.
- Apply broad spectrum herbicides prior to no-till seeding.
- Rotational grazing and mowing or cliping of pastures may be needed to remove seed heads and un-grazed excessive growth. Never let weeds go to seed!
- Mowing is a good weed management practice because it helps develop strong root systems. It suppresses weeds, promotes uniform grazing and removes pasture plants of low palatability.
- Take care not to mow too early. If done too early, only the tops of the weeds will be eradicated, leaving the active buds which will produce new growth.

Mow pastures at a height of at least 8-10 cm.

Part C

Livestock management



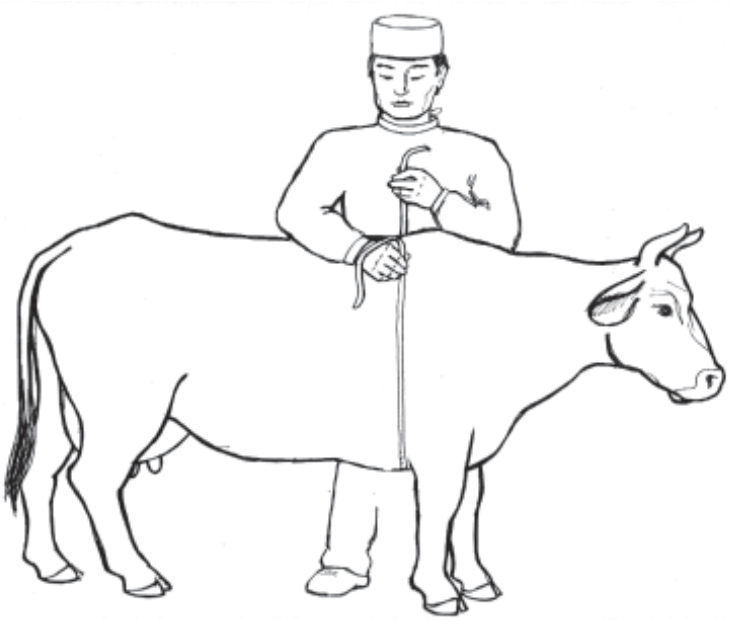
C 1 Estimation of livestock weight

Measure the weight of cattle, sheep and goat through the following formula

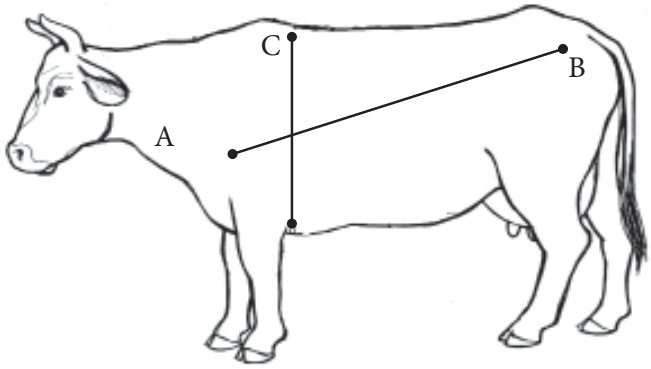
a) Measure the circumference (heart girth) in centimeter from a point slightly behind the shoulder blade as shown in the figure (C)

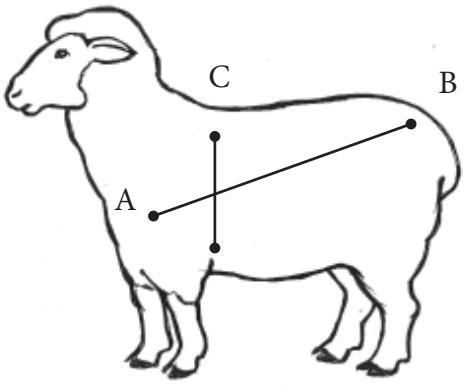
b) Measure the length of the body in centimeter, from the point of shoulder to the point of the rump (A-B)

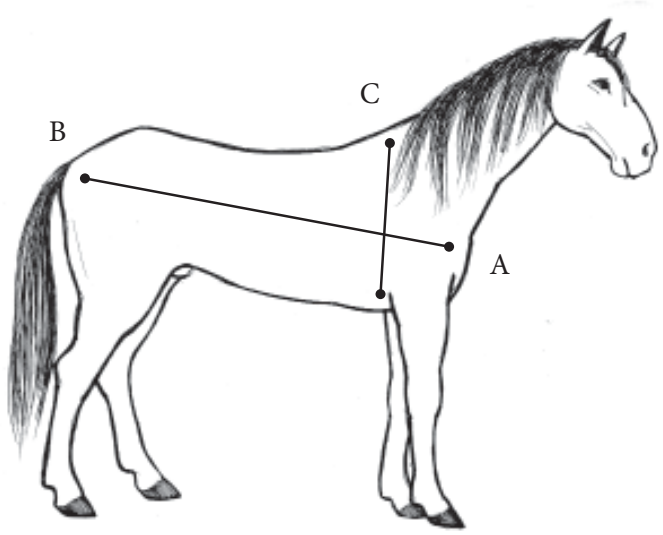
c) Take the values obtained in step (a) and step (b) and apply the following formula to calculate body weight :



Heart girth X Heart girth X Body length/10844 = Weight in kg







Measure the weight of horses, mules and donkey through the following formula

a) Measure the circumference (heart girth) in centimeter from a point slightly behind the shoulder blade as shown in the figure (C)
b) Measure the length of the body in centimeter, from the point of shoulder to the point of the croup (A-B)
c) Take the values obtained in step (a) and step (b) and apply the following formula to calculate body weight:

Heart girth X Heart girth X Body length / 10844)+23 = Weight in kg

C 1.1 Herd composition and biomass requirements

In order to calculate the required feeding biomass it is necessary to estimate the body weight of all the grazing animals. This is done by calculating the average weight of different categories of animals in a herd. The figure is then multiplied with the total number of animals in that category to estimate the Total Gross Weight (TGW) of different species in the herd. The data can be entered into the Form 3 'Herd composition and animal weight' given below.

Serial number of form: _____ Date of data collection:
Name of the Ayl-Okmotu: _____ Name of the village: _____
Name of pasture unit: _____ Name of pasture block: _____
Name of herders occupying the unit:_____
Name of data collectors:_____

Form 3: 'Herd composition and animal weight'

Species	Type	Unit weight (kg)[1]	Number in herd				Total Weight (kg)
			H1	H2	H3	T	
Yak	Young						
	Sub-adult						
	Adult male						
	Adult female						
Cattle	Young						
	Sub-adult						
	Adult male						
	Adult female						
Horses	Young						
	Sub-adult						
	Adult male						
	Adult female						
Sheep	Young						
	Sub-adult						
	Adult male						
	Adult female						
Goat	Young						
	Sub-adult						
	Adult male						
	Adult female						
Mules	Young						
	Sub-adult						
	Adult male						
	Adult female						
Donkeys	Young						
	Sub-adult						
	Adult male						
	Adult female						
Total Weight of all the animals in all herds							
Total Fresh Biomass Requirement (kg) per day[2]							

Sample form filled at annex 3

[1] Based on the weight estimation techniques, a chart of average unit weights can be displayed at Ayl-Okmotü or an individual herder may decide to carry out the estimations for his own herd.
[2] Divide total weight by 10 to obtain 10% fresh biomass requirment.

C 2 Feeding management

C 2.1 Regular fodder types

In Western Pamirs 'sainfoin' and 'medicago' – two legumes - are the main fodder crops cultivated, followed by barley and buckwheat used partly as a staple and partly as fodder. Sainfoin, referred to locally as 'esperset', is generally considered the best hay. Other regular winter feed resources include:

- Natural hay harvested from swamps and grassland areas surrounding the villages or from fallow land ('asperkan') as well as special hay making fields (mostly rainfed, rarely irrigated);
- Wheat harvested at pre-bloom when the probability of maturation is small and the decision is made to use it as fodder crop for livestock;
- The land left fallow contains a large proportion of wheat due to falling seeds during wheat harvesting; these areas are used for hay.

IIn addition, feeds also include residues of wheat and barley straw.

The majority of the households store different types of hay in different portions of the store. Separate portions include hay from Sainfoin, Medicago, swamp, grassland, and for feeding in different proportions to different classes of livestock according to the level of their production.

C 2.2 Common feeding practices during winter

Herders often provide fodder to their livestock on the basis of the availability and less according to the animals' requirements. This means that:

- At the beginning of the winter season when stubble is the main feed, low quality hay from swamp and grassland is often provided.
- When the more severe winter season starts, herders shift to high quality hay such as sainfoin, medicago and 'asperkan'.
- Wheat bran, wheat flour, corn flour, buck wheat, barley, potato peelings, sugar beets, and carrots are only provided to milking and pregnant cows.

C 2.3 Daily feed requirement

Every animal regularly consumes 2.5-3.5% of its body weight as dry matter (DM) such as hay, straw, stalks or alternatively 10-15% of its body weight as fresh matter (FM) such as grass, green forage, silage or beets per day. Hence if an animal weighs 100 kg it will consume on average 2.5-3.5 kg of dry fodder or 10-15 kg of fresh fodder a day. Silage and beets contain only 30% and 20% of dry matter, respectively. Hence, one needs to consider 10 kg silage equivalent to 3 kg dry matter and 10 kg of beets equivalent to 2 kg of dry matter.

If in late autumn the animals graze on stubble fields or graze during day time, they may receive only half of the above daily ration at the manger i.e. 1-2% of DM or about 5-7% of FM in the evening time.
In order to provide intensive winter feeding to different livestock, the following proportions of ingredients need to be respected:

Species	Type	Ration ingredients (%)					
		Hay	Straw	Silage	Beet	Concentrate	Remarks
Cattle	Milking	20	20	15	20	25	
	Dry	20	35	20	15	10	
	Bull	15	15	15	25	30	
	Young	25	10	25	25	15	
Sheep	Adult	40	0	30	20	10	
	Young	50	0	10	25	15	
Goat	Adult	80	0	0	0	20	
	Young	90	0	0	0	10	
Horse	Saddle	6 kg	0	0	0	5 kg barley	
	Harness	12 kg	0	0	0	3 kg barley	In addition to grazing

C 2.4 Improving winter feeding

For a winter period of 4-5 months the requirements of feed for one cow are commonly: 1.5-2 tons of hay; 1-1.5 tons of haylage; 1-1.5 tons of silage and 450-500 kg of concentrated fodder.
To estimate the need of other types of domestic animals use the following transformation: one cow is equal to 5 sheep or goats and 1.2 cows are equal to one horse.

General tips

1. Substitute if needed 3 kg of corn silage for 1 kg of alfalfa-grass hay and substitute 3 kg of alfalfa-grass hay for 1 kg of grain.
2. Provide warm drinking water so that energy from the animal's body is not consumed through cold water.

Tips for silage

1. Use thick stemmed corn and sorghum crops for silage making. Harvest these crops just after bloom, chop the material and ensile it after proper pressing. However, once a silage ball is opened it needs to be continuously provided otherwise it will spoil.
2. The herders with small number of livestock can now store the silage in small plastic bags with less chances of spoilage through the following procedure

a. Fill strong plastic bags (with no holes) from 5-20 kg capacity with chopped fodder during summer.
b. Gently but firmly squeeze the bag by hand to expel air.
c. Twist the neck of the bag while compressed, turn it over and tie it tightly with a string.
d. Invert the plastic bag, filled with silage into a second empty bag, close and tie it as above. Stack the bags carefully into a room protected against rodents.
e. Feed it during winter to animal as desired

Filling and squeezing of bag

Stacking of filled bags

Advantages of silage

1. Silage can be kept for many years and can serve as an efficient fodder bank during years of droughts or a prolonged winter.
2. Storage of fodder as silage face little hindrance from unfavorable weather condition
3. Silage provide more flexibility in choice of feed ingredient
4. Silage making reduce field losses and nutrient losses due to leaching and bleaching

Tips for hay

1. Use thin stemmed grasses and legumes for hay making. Harvest the fodder for hay storage at early bloom stage, when 40% of the plants are flowering to ensure the availability of all necessary nutrients. The fodder harvested for hay at pre-bloom or post maturity stage is less nutritious
2. Cut grass selectively, first at the southern slopes, then on valleys and at last, on the northern slopes to enable early blooming stage harvest in all areas.
3. It normally takes 2-4 days to reduce the water content of the harvested forage to 15-18%.
4. A simple technique is to twist and squeeze the stem of the forage tightly and if no water comes out, it is suitable for baling. Conversely if stem is broken by twisting, the hay is over-dried. Over drying result in significant loss of leaves that contain the major proportion of the nutrient and energy
5. Do not store hay loose and in open exposing it to the effect of leaching and bleaching. Both remove a large proportion of important nutrients from the hay. Leaching

and bleaching can be avoided simply by covering the hay piles with black non-transparent plastic sheet.

6. Proper stacking of hay also prevents spoilage and allows for a longer period of storage

Tips for concentrates and minerals

1. Cultivate more sugar beets for fodder as necessary to have ready available concentrate during winter. Sugar beets can be grown in most of the cultivable areas of the country.
2. Among minerals, Iodine remains deficient in highlands. The negative consequences can be avoided by offering iodized salt to the animals. Magnesium remains deficient particularly during the spring season when the vegetation is sprouting. This can be avoided by providing wheat or barley straw in the evening or by feeding Magnesium salt (Magnesium sulfate or Magnesium oxide 2-15 grams). Copper remains deficient mainly in marshy / swampy area and can be supplemented by adding minute quantities (0.1-0.5 grams) of copper sulfate to the daily ration.
3. Phosphorus is deficient in most of the grazed systems. The deficit can be avoided by fertilizing the fodder crops with Di-Ammonium Phosphate (DAP). Supplementing Di-Calcium Phosphate (DCP 10-100 grams daily) along with common salt also improves the performance of the animals even with a modest nutrition plan.
4. Vitamin A is often needed if animals graze mostly dormant, dry vegetation. The intramuscular injection is effective in providing sufficient amounts of vitamin A. Two times injection in autumn and winter each at three months interval generally provides sufficient vitamin A during the winter scarcity season particularly to milking and pregnant animals. Occasional provision of Butter Oil to pregnant or milking animals (100-200 ml once a week) may help to avoid acute deficiency of both Vitamin A and D.

C 3 Breeding management

Currently only a few herders with large herds keep own bulls for breeding. They also provide breeding services to small herders on different terms. However, using bulls to provide breeding services to more than the desired number of females reduces the conception rate. Furthermore the bulls don't remain productive for a sufficient period of time.

The following table shows the general reproductive characteristics for the main domestic animals.

Species	Heat duration	Heat cycle (days)	Gestation period (days)	Desirable female / male ratio
Horse	6–7 days	22	340-342	15-30
Cattle	12–18 hrs	19.5	283-285	25 average
Sheep	29–36 hrs	17	144-151	25-40
Goats	24–26 hrs	20–22	145-155	25-40

C 3.1 Breeding Calendar

It is recommended to control the breeding in such a way, that calving starts 60 to 90 days before the grass greens. This will allow calves to take full advantage of increased milk production, while the cows will be in a good condition to breed back.

The most acceptable time for cattle mating are the summer months as by this time the organism of an animal will have had time to compensate for nutrient and energy losses during winter and early-spring periods. Animals become physiologically fully prepared for fruitful copulation and subsequently for calving which will be at the beginning of the subseqent spring when the weather becomes warm and the period for spring / summer pastures starts.

For sheep and goats the most favorable mating and lambing periods are autumn and spring.

Many livestock producers leave males and females together throughout the year. However, this results in lower calving and lambing rates and in greater difficulties to cull slow breeders. Re-breeding should start within 85 days after calving. A follow-up bull is generally used with each 100 cows in order to breed those that fail to conceive after one or two services.

C 3.2 Selective Breeding

One has to avoid inbreeding by repeatedly using the same breeding bull over many years. Hence the regular exchange of breeding bulls among herders is important to keep the desirable traits and characters intact.Do not select the male only on the basis on the pedigree record of milk output nor inseminate indiscriminately with less adapted imported breeds. For a successful selective breeding the following qualities should be considered as important:

- Disposition
- Fertility
- Weight
- Rate of weight gain
- Conformation of the body
- Environmental adaptability
- Milk production capability.

C 4 Housing management

Proper housing is an important health and production factor. Providing livestock with adequate shelter during night or rainy and cold weather is beneficial to the animals' health and livestock's (re-) production. Barns should provide access to fresh water and be kept clean. They should allow for keeping different types of animals separated if required (e.g. ewes with their young after having given birth).

Some tips

1. Always allow for proper space in housing livestock. Space requirements for cattle e.g. include the following dimensions:

- Platform width 1.1 meters, platform length 1.6 meters.
- Manger width 0.5 meters and manger height 0.5-0.6 meters, according to the age of the animal. The base of the manger should be raised 0.1-0.2 meters above the platform.
- Platform slope may be from 2-4%.
- Manure gutter depth 0.2 meters and manure gutter width 0.4 meters.

2. Provide adjustable ventilation that can be covered with warm cloth during severe cold. Manage the ventilation to allow entry of fresh air and light, and avoid accumulation of humidity and extreme exposure to cold.
3. Bedding provides warmth, insulation, and comfort to housed animals. A thick layer of the mix of bedding and manure provide good insulation, if kept dry. Various materials can be used for insulation such as straw, hay, dried corn stalks, saw dust, wood shavings, wood chips, pine shavings, and leaves.
4. Livestock require water at the rate of 8-10 liter / 100 kg body weight daily. Hence, a calf may require up to 10 liters and an adult cow up to 35 liters of water daily.
5. During winter provide warm drinking water so that energy from the animal's body is not needed to warm up the water.

C 5 Calving management

Herders are always required to handle their animals during calving. Proper handling of animals during calving and lambing is necessary for the future productivity of both child and mother.

Tips to remember

- Do not abruptly change ration of the cow within 3 days after parturition. Any desired ration adjustment should be made at least 2-3 days before the initiation of parturition

- Always feed full colostrums to the calves. It contain antibodies against diseases that are necessary for the tolerance of calf to different diseases and ailments
- Always put the born calf in front of the mother cow. Licking of the born calf on one hand improve the blood circulation of the new born calf and help the mother cow to timely expel the fetal membrane
- Always clean the udder before allowing the calf to suckle. The cause of Calf Scour disease is not because of consumption of excessive colostrums but caused by allowing calf to suckle unclean udder
- Always tie the navel cord tightly after birth with clean hands. Never attempt to cut the naval cord as it may lead to formation of naval abscesses and other complications

Visible signs of calving

1. Stage 1

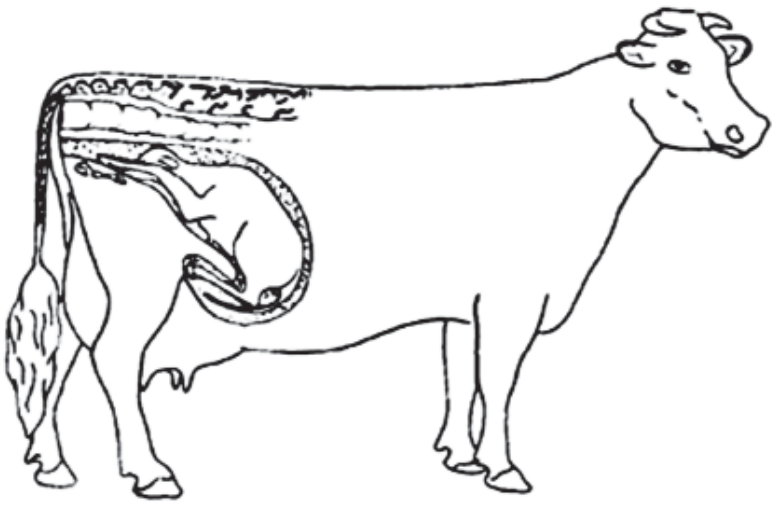
a. Relaxation and enlargement of the vulva,
b. Enlargement of udder, tenseness and filling of the teats,
c. Increase in quantity and viscosity of vaginal secretions

2. Stage 2

a. Restlessness and a tendency to lie down and get up frequently
b. The contracting uterus first expels the water sacs that is followed by visibility of fetal parts coming out of the vagina
c. The animal presses its abdomen to expel the fetus
d. This period normally lost for up to 2 hours with expulsion of fetus

3. Stage 3

a. Expulsion of fetal membrane within 8-12 hours of calving

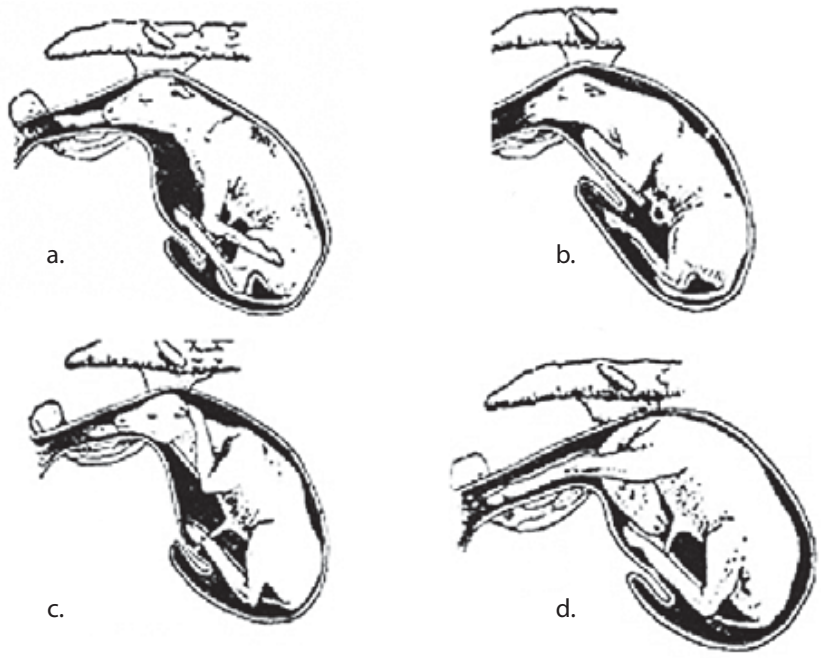


The most common reason for calf losses is calving difficulty. It also affects future productive and reproductive performance of the cow.

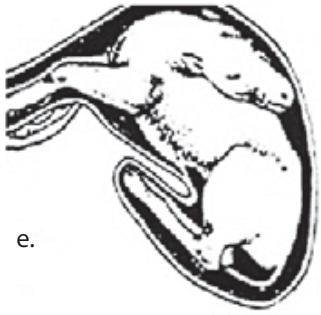
Normal calving occurs when the fetus has normal presentation, position and posture

as shown in the sketch. Presentation refers to whether the calf is coming frontward, backward, or transverse. Position refers to whether the calf is right side up or upside-down with only right side up being considered normal. Posture refers to the relationship of the calf's legs and head to its own body.

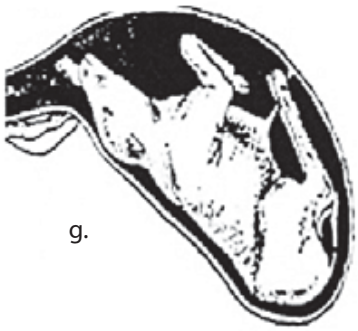
The most frequent calf delivery is a frontward presentation, right side up position, and a normal posture of both front legs and head extended into the birth canal.
Sometimes a backward presentation may occur and may be deliverable if we have right side up position and the posturing being with both hind limbs in the birth canal. Nevertheless, a backward presentation should be considered a high-risk delivery and provides grounds for external intervention.
All other presentations are considered abnormal. Some common abnormal presentations that need external assistance are shown in the following sketches



A: One leg back B: Two leg back C: Leg over head D: Poll first

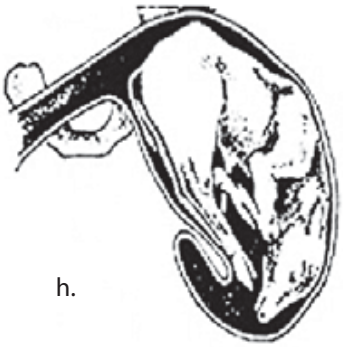


e.



g.

g.



h.

E: Head back F: Upside down G: All feet at once H: True breech

In the above sketches of abnormal presentations the first four (A, B, C and D) can manually be corrected through the help of experienced village expert without need of special instruments. The last four abnormal presentations (E, F, G and H) always need special instruments and assistance of specialist veterinarian. Other conditions that need specialist veterinarian assistance are removal of dead fetus, removal of delayed fetal membrane and removal of torsion of the uterus. **Remember that delay in seeking specialist assistance means increased risk to the life of both mother and offspring**

Appropriate time to take external assistance:

Observe cows close to calving - early intervention can help prevent some of the more difficult calving and calf deaths

1. If you suspect the cow has been in stage 1 of labor for over 8 hours, intervention is indicated
2. If the water sac is visible for 2 hours and the cow is not trying.
3. If the cow has been trying for over 30 minutes and making no progress.
4. If the cow has quit trying for over a 15-20 minute period of time after a period of progress.

5. If the cow or calf is showing signs of excessive fatigue and stress—like swollen tongue of the calf or severe bleeding from the rectum of the cow.
6. If the cow has not passed fetal membranes within 12 hours of calving

Prevention of difficulty in calving

The other causes of difficult calving may be either breeding or feeding related and their occurrence can be reduced by proper management

1. Breeding / Genetics - The sire, as well as the dam, contributes to the size of the calf. Some difficult calving are caused by too large of a calf in a small cow or especially in a heifer. Always be sure to breed your heifers to sires that are proven not to produce high birth weight calves. However, you may not want to go to the other extreme and select sires that produce very low birth weight calves either; small calves tend to grow into small heifers.
2. Nutrition - The cows / heifers should be supplied with enough calories to maintain body condition and fetal growth. The cows should not be under-nourished (too slim) or over-nourished (too fat) during pregnancy. Over-nourishment may lead to calving disorders and metabolic problems, whereas under-nourishment can lead to decreased production and reproductive performance.

C 6 Health management and disease control

C 6.1 Most important livestock diseases

- The following table provides basic information on the 28 most important and frequently occurring livestock diseases and prevention and treatment options. The information should be used as a reference point for understanding and responding to symptoms. However, always remember, only a qualified veterinarian can make a precise diagnosis of disease.
- Use antibiotics only after qualified veterinarian advice.
- Antibiotics and other drugs can distort the results of subsequent diagnostic investigations. It is therefore important to take samples (blood, serum, excrements) before administrating drugs.
- Always follow manufacturer's or veterinarian's directions for drug and vaccine administration.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
1.	Anthrax	Warm-blooded animals	1. Feces, urine and saliva of sick animals. 2. Spores of bacteria in the soil. 3. Sick and dead animals and their graves. 4. Consumption of meat and meat products, and milk and milk products of sick animals.	Incubation period: 3-7 days. **Septicemia form:** high temperature, muscular tremors, rapid pulse and breathing; abortion in pregnant animals; sudden death in surviving animals; when dying, dark foamy blood oozes from all natural orifices. • **Localized forms:** Skin (ulcers) • Intestinal (diarrhea with blood,) • Lungs (pneumonia) and • Tonsils (swelling of neck and lymph glands - only in pigs)	All seasons; particularly early spring	1. Urgent treatment of suspect animals with Gamma globulin, anthrax serum, antibiotics (Penicillin or tetracycline) and local anti-inflammatory therapy. 2. On outer skin form, apply 3-5% carbolic acid around the ulcers. 3. Do not open or operate on the swollen part of the affected animal.	1. Burn and deeply bury dead animals. 2. Vaccinate all animals in spring and autumn. 3. Get veterinarians permission before slaughtering infected animals to avoid transmission of disease
2.	Black leg	Cattle and (rarely) sheep and goats; more common at 3 month to -4 years of age.	1. Sick animals. 2. Spores of bacteria in pastures.	Incubation period: 1-5 days Fever, difficulty in breathing, irregular pulse, painful and warm swelling of thigh muscles with lameness, and crepitating sound on touching the affected part; death often follows within a few hours	Spring and early autumn	1. Treatment is effective only in the initial stages of illness. 2. At the site of inflammatory edema inject a solution of hydrogen peroxide (3-5%) or potassium permanganate (0.1%).	Inject penicillin to prevent new cases; vaccination and re-vaccinate after 1 year and then annually till 5 years of age; vaccinate no later than 2

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
3.	Brucellosis	Cattle, sheep, goats, swine, dogs, horses, AND human beings.	1. Sick animals and their products. 2. Aborted fetuses and placentas of sick animals.	Incubation period: 2-3 weeks **In females:** the main symptom is an abortion in the second part of pregnancy, with retention of placenta and discharge of brown liquid from uterus after delivery; chronic inflammation in the uterus usually follows without visible symptoms. **In males:** inflammation of the genital organs. Infected people become carriers and may suffer from loss of fertility.	All seasons; disease rapidly spreads especially during lambing and copulation period, and during confinement of many animals in the same locality	Diagnostic investigations can help identify infected animals but there is no treatment.	1. Vaccinate sheep and goats 2. Serum test of cattle twice a year and Killing/deep burial of the infected cattle 3. Observe and do not use purchased animals for up to 30 days in disease prone areas. 4. Boil milk and other animal products before use
4.	Salmonellosis	Cattle, sheep swine, horses, poultry, dogs, cats, wild mammals and birds. Human beings are susceptible to elementary form of infection.	1, Sick animals. 2. Spores in the soil. 3. Infected manure may cause infection within 9 months. 4. Contaminated drinking water can cause infection within 4 months. 5. Contaminated room dust can cause infections within 18 months after removing the source.	Incubation period: 1 to 7 days Increase in body temperature and increased thirst **In animals:** Persistent diarrhea, retarded development, arthritis, neck and abdomen; 70% of infected animals die. **In birds:** Decrease of appetite, drowsiness, diarrhea, eye inflammation and sudden convulsion; head bends back and swings before death.	All seasons; especially spring	1. Inject antibiotic especially oxy-tetracycline, penicillin or Biomycinum. 2. Inject broad spectrum antibiotics to treat septicemia 3. Provide yeast, multivitamins and sulfonamides to affected animals.	1. Clean and disinfect livestock premises regularly. 2. Maintain personal hygiene in human beings. 3. Vaccinate regularly.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
5.	Lamb dysentery / Enterotoxemia	Young livestock: calves, lambs and piglets.	1. Sick and recovered animals. 2. Spores survive in soil for up to 4 years.	Incubation period: several hours to 2-3 days. **Acute form:** Lambs die within few hours without distinct clinical features after birth; sometimes, before death, they discharge bloody feces. **Sub acute form:** Diarrhea, initially liquid yellow-green, then with a mixture of blood, mucus and gas bubbles; initially high fever and then a sharp decline in body temperature. Dysentery begins during the early spring in lambing period; initially, isolated cases are encountered, after a few days over 20% of the young may be infected.	Spring	1. Treatment is only effective in the early stage of disease: Inject hyper immune serum subcutaneously at multiple sites in doses of 200-400 iu twice daily. 2. Provide antibiotics: Synthomycin orally from 0,1 to 0,2 g 2-3 times daily or Norsulfazolum orally at a rate of 0,04-0,06 g added to 1 kg of feed and provided 2-3 times daily for 3 days. 3. Inject Bicillin-5 and Biomycinum at the rate of 20-30 thousand IU per kg of body weight intramuscularly.	1. Take early preventive measures 2. Ensure young receive complete feeding of colostrum to maximize natural immunity. 3. Provide antitoxic serum within 1-2 hours after birth
6.	Necrobacillosis (Calf diphtheria	All animals and birds.	1. Affected and recovered animals act as carrier. 2. Spores in the soil may cause disease for several years. 3. Scab and discharge from affected body part.	Incubation period: 1-3 days. Inflammatory symptoms around the mouth, larynx and gums (in young animals) with mucous discharge from the visible lesions; inflammation of the lung, liver and other internal organs. **Cattle:** Dense film on tongue and gums. **Sheep:** Lameness; affected limb is warm. **Pigs:** Necrotic inflammation of the jaw, high fever, affected limb hot and painful. **Rabbits:** Necrotic inflammation of the skin, mouth and nasal passage.	Spring and autumn	Treatment should be comprehensive: 1. Sulfonamide and broad spectrum antibiotics injection. 2. Visible affected parts are treated with solutions of potassium permanganate, hydrogen peroxide and iodine-glycerin, 3. Use antibiotic and sulfanilamide ointments. 4. Inject poly-vitamins and keep affected animals on a dry area.	1. Cleaning hooves of animals, disinfect barns and keep them dry during infection season 2. Burn bedding and corpse of affected animals 3. Clean and disinfect feeding and drinking areas

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
7.	Bradsot / Braxy (Cl. septicum and Cl. oedematiens) Malignant edema	Sheep, goats and their young.	1. Contaminated soil. 2. Contaminated pastures with intestinal content of affected animals. 3. Wounds caused by accident, castration, docking. 4. Unsanitary vaccination. 5. Unsanitary parturition.	Disease proceeds quickly; sheep often perish at night and sometimes in pastures; surviving animals have convulsions, tympany and discharge foam from the mouth. Involuntary movements, teeth-grinding, difficulty breathing, bloody fluid from mouth, and swelling of neck. When dying the animal throws back the head, and stretches extremities Discharge of foamy dark blood that does not coagulate from orifices. Lungs, liver, kidney and spleen are filled with foamy blood after death.	Spring, summer and fall when animals are in high pastures; annual outbreaks are common	In acute outbreaks treatment is seldom effective; treatment with high doses of penicillin or broad-spectrum antibiotics (Bioimycin, Synthomycin, Terramycin) is indicated early in the disease; the injection of penicillin directly into the periphery of the lesion may minimize spread of the lesion.	1. Vaccinate annually in early spring 20-45 days before grazing pastures 2. Burn dead animals and bury deep the ashes 3. Don't use milk from affected animals 4. Don't slaughter affected animals for meat, skin or wool
8.	Pasteurellosis / hemorrhagic septicemia	Cattle, sheep, goat, camel, yaks and birds.	1. Sick animals are carriers. 2. Polluted environment. 3. In manure and cold water pathogens remain alive for 2-3 weeks; in dead bodies up to 4 months; and under freezing up to one year.	Incubation period: several hours to 3 days. **Enteric form:** diarrhea, sometimes with blood, excessive thirst; enteric form is often found in offspring, accompanied by diarrhea, increased body temperature. **Pulmonary form:** Thick and sticky discharge from nose – sometimes with blood, dry cough at first followed by moist cough with plenty of sputum **Chronic form:** rapid deterioration of general body condition followed by lameness. **Hydropic form:** edema of the neck, larynx, abdomen and extremities; heavy breathing, stringy salivation and heart failure.	All seasons; mainly in spring	Diseased animals should be placed in the warm and dry room, and treated with hyperimmune serum; inject a combination of broad spectrum antibiotics and sulfanamides	1. Vaccinate all animals and birds with antibody-binding formulated vaccine 2. burn dead animals and the bedding material of affected animals

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
9.	Rabies	All warm-blooded animals AND and human beings.	1. Rats act as carriers or infectors. 2. Bite or saliva of infected domesticated, stray or wild animals (dogs, cats, cattle, sheep, wolves, foxes, jackals).	Incubation period: 3-6 weeks, depending on depth of the wound and its proximity to the nervous system. **Furious (violent) form:** In pigs, sheep, goats, dogs and cats the disease proceeds in furious form with initial excitement followed by paralysis and death; in dogs and cats furious form is accompanied by changes in behavior, anxiety, non-recognition of owner, aggressiveness, then paralysis and death; death may follow after initial symptoms within 10 days after initial signs Dumb (quiet) form: In cattle, the dumb form dominates, with paralysis and death within 2 weeks time	All seasons; mainly autumn	No treatment possible; avoid contact and dispose carefully of infected animals; inform veterinarian or authorities.	1. Isolate and kill sick animals immediately. 2. Vaccinate all pets annually. 3. Vaccinate all animals in proximity to affected animals.
10.	Foot and mouth disease	Domestic and wild cloven-hoofed animals.	1. Sick animals. 2. Polluted streams and air.	Incubation period: 12 hours-7 days and rarely up to 21 days. The disease spreads very rapidly. Typical symptoms in adult cattle: stringy salivation, decreased appetite, reduced yield of milk in cows, high fever, Initially 2-3 primary blisters are formed (often in the mucous membrane of oral cavity, or on the udder or skin of hoof) extending to surrounding areas; pregnant animals usually abort; death is rarer in adult than young	All seasons	Treatment requires confirmations of major serotypes in the laboratory; sick animals are isolated and treated with immunolactone, lactoglobulin serum; mouth cavity is washed with aseptic preparations with hand; affected parts of extremities and udder are treated with a combination of antibiotic, soothing ointments and anesthetics. If necessary, heart stimulating drugs, glucose and calcium chloride are injected intravenously.	1. Isolate infected animals. 2. Vaccinate within a radius of 30 km from the epicenter of the infection.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
11.	Sheep and Goat Pox	Sheep and goats.	1. Sick and recovered animals act as carriers. 2. Environment polluted with virus, specially bedding of sick animals.	Incubation period: 2-20 days. Increase of body temperature, typical lesion on skin and mucous membranes particularly visible around the udder, eyes and muzzle and nasal cavity; formation of tiny abscesses filled with pus, papules, vesicles and rash; the disease may occur in acute, sub-acute, and occasionally chronic form; mortality reaches 60-100%.	All seasons	No specific treatment; antibiotics are injected to prevent complications; softening ointments and oils painted over affected skin; ulcers may be cauterized; nasal cavity is washed with 2-3% boric acid.	Vaccinate sheep and goats regularly in outbreak prone areas.
12.	Leucosis / leukemia	All farm and domestic animals AND human beings.	RNA, containing oncogenic virus; precise mechanism of transmission are not identified, but theories suggest that ionizing radiation, impact of climate change or genetic disorder predispose the animals to disease.	Incubation period: 60 days up 2 to 6 years Deterioration of general condition in the affected animals, reduced milk yield and swollen lymph nodes **In young animals:** the disease may occur in three forms: • Multi-centric: swellings at multiple lymph nodes sites • Thymic: tumor-like accretion at the bottom of the neck • Skin leucosis: infiltrating skin accretions.	All seasons	No treatment for livestock.	1. Secure a timely diagnosis. 2. Slaughter suspected animals to avoid possibility of further spreading. 3. Use milk from affected animals only after pasteurization, and meat only after thorough boiling.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
13.	Equine influenza	Horses.	Sick animals act as carriers of the disease; there is close antigenic relationship between influenza viruses of horses, ducks, AND humans.	Incubation period: 1-6 days Increased body temperature (400C), rapid pulse, loss of appetite, cough, inflammation of the eyes and nasal passage; the disease commonly proceeds unnoticed, followed by recovery within 3-4 days. Sometimes there is diarrhea, and edema of the chest, hind limbs and abdominal wall, and inflammation of mucous membrane of vagina. Complications with other viral or bacterial infection may lead to pneumonia and inflammation of the intestines.	All seasons	1. Isolate infected animals 2. Allow infected animals to rest. 3. Provide easily digestible feed. 4. Inject broad-spectrum antibiotics and or sulfanilamide according to instructions.	1. Keep affected animals separately for 30 days. 2. Vaccinate remaining healthy animals. 3. Disinfect and keep premises clean.
14.	Foot rot	Sheep and goats.	1. Sick animals are carriers. 2. Polluted pastures. 3. Wet climate predispose animals to the disease.	Incubation period: 4-14 days. A chronic disease with loss of hairs from parts of skin around hoof slit, Inflammation of the slit, its maceration, decay of the shoe (with smell like putrid cheese) and rapid loss of conditions; Rise in body temperature up to 400C, necrosis of tendons and ligaments in the proximity to the affected region, Sores in the regions of corona and hobble; morbidity reaches 40-90%; sick animals often die from starvation or sepsis	In spring and autumn, during wet weather when herbage is abundant.	Treatment begins with cleaning and surgical treatment of affected hooves; ablution with warm water and soap, followed by application of antiseptic solutions; after cleaning and ablution the affected limb is immersed into 10% formalin or 1% copper sulfate solution for 2 minutes; the animal is then kept on dry areas and a thin layer of lime is spread in the barn; in severe cases inject broad spectrum antibiotics.	No preventive treatments possible. Arrange a dry place for grazing to prone animals.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
15.	Contagious ecthyma	Sheep, goats and their young.	1. Sick animals act as carriers. 2. Polluted environment.	Incubation period: 3-10 days Disease occurs in acute, sub-acute, and chronic forms; In ewes, skin of nipples and udder is particularly affected; at the beginning there is reddening which is followed by formation of vesicle, pustules and scabs that disappear in 2-3 days; the affection of coronet and slit causes lameness; the disease is often complicated by necrobacteriosis that delays the recovery from the disease for up to 40 days.	Late summer and fall	Affected areas of the mucous membrane of mouth cavity are daily treated with glycerol or 5% solution of iodine; on other parts apply Synthomycin emulsion; if the disease gets complicated with necrobacteriosis, then provide supportive treatment by injecting tetracycline.	1. Vaccinate all ewes 3 months before lambing. 2. Disinfect premises.
16.	Newcastle disease / pseudo-plague / Asian plague of birds	Fowl.	1. Sick birds. 2. Polluted environment.	Incubation period: 3-18 days. **Per-acute form:** experienced by unvaccinated birds. No visible symptoms but sudden death. **Acute form:** is the typical form; increase in body temperature, asthma, diarrhea, discharge of stringy mucus from the mouth and sneezing; bird usually lies, hiding its beak, and has nervous disorders, twisting of neck, paralysis of legs and wings and sudden death. **Sub-acute form:** is the atypical form that may occur during stress of immunization and antibiotic use and some of the bird may recover after stress is relieved with supported therapy.	All seasons	No treatment possible	Kill and burn sick birds and birds in close contactwith them. Vaccinate healthy birds in surrounding areas with "La Sota" and "H."

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
17.	Hypoder-miasis	Cattle horses, sheep, goats and yaks.	Infested pastures and environment.	Affected animal is dull and depressed, bumps on the skin, from which larva falls leaving behind holes in the skin, the animal becomes nervous and loses weight; the larvae fall into manure, to transform in to pupae; after 20-60 days mature warble flies are formed and are ready for another attack; The larvae that emerge from the eggs laid by the warble fly over the body of the animal penetrate the skin and either migrate below the skin or inside muscles during the subsequent 5-6 months; in some cases, the animal is paralyzed, when the larvae reach the spinal cord. The full cycle of development of insects comes to an end within a year.	Spring and summer.	Treat with Hypodectin-H after warble flies leave; dosage is 10 ml for animals up to 150 kg and 15 ml for animals over 150 kg weight; alternative: Ivermectine (Ivomec, Baymec) 200 mg/ kg live weight.	Spray skin of animals with Neguvon solution at the beginning of autumn.
18.	Cysticercosis of cattle and pigs / measles	Cattle, yaks, pigs AND human be-ings.	1. Affected animals and humans. 2. Contaminated meat.	In cattle and pigs the larvae localizes in all muscles and more commonly in mastication muscle, tongue and heart; diarrhea, reduced appetite, and general weakness.	All seasons, but more common during pasturing season	Praziquantel (e.g. Dronsit, Drontal, Azinocs): 1 tablet per 10kg body weight.	Check farm laborers regularly for cysticerco-sis (measles). Regularly provide specific preventive de-wormers in disease prone areas.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
19.	Dictyocaulesis	Cattle, sheep, goats and their young; sometimes horses, donkeys and camels.	1. Sick animals acting as carrier. 2. Polluted pastures, soil and water with parasites larva.	Cough, difficult respiration, discharge of fluid from nose, followed by pneumonia and death.	All seasons, but more common during pasturing season	Albendazol (3-8mg/kg body weight); Ivermectine (Ivomec, Baymec) 200mkg/kg body weight.	Provide regular preventive de-wormer in disease prone areas.
20.	Dicrocoeliosis	Sheep, goats, cattle and camels.	Intermediate hosts are snails and ants.	Parasites localize in bile ducts and liver of animals. Depression, diarrhoea, and reduced productivity in affected animals	Spring and autumn	Rolinol: 1 ml/10 kg weight; Albit: 80 mg/kg weight mixed in feed. Phascoside: 1 granule/10 kg body weight or 1 tablet/50kg body weight.	De-worm animals during winter and summer.
21	Parascaridosis	Horse, donkey and mule of all ages, but mostly young animals are affected	Infected animals and pastures, water soil polluted with eggs and larvae of parasites	The parasite occupy the intestines. However, the migrating larvae can also affect the lungs. It can thus cause pneumonia, bronchial hemorrhage, colic, and intestinal disturbances like diarrhea. These symptoms can lead to sluggishness in affected animal. These roundworms may also cause intestinal perforation or obstruction. The affected animal loses weight and appetite. There is a marked increase in sweating	Winter and summer	Piperazine: At a dose rate of 10 mg/kg body weight to animals with 6-12 month of age and 20-25 mg/kg body weight to animals having 1-2 years age. The drug is mixed with feed and provided after a 7-10 hours preliminary starvation. Phenbendazole (Panacur): At a dose rate of 15mg/kg body weight to animals of 6 month -4 years age and 10mg/kg body weight to animals above 4 years of age. The drug can be given mixed with feed. Inject subcutaneously Phebantal 6 mg/kg body weight or Ecvalane 0.2 mg/kg body weight according to given instructions	De-worming should be done twice a year. First before moving to pasture and then before wintering

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
22.	Monieziasis	Young cattle, sheep, and goats (1.5 - 8 months of age); adult ruminants are rarely sick but act as carriers.	1. Infected animals. 2. Contaminated pastures and reservoirs where eggs are swallowed by mites acting as intermediate hosts for larval stage. The deposited larvae are swallowed by young animals during grazing.	Infestation may occur in April-May and symptoms may appear in May and June, Anemia, depression,, parasites can be seen in feces, sometimes spasms and shaky gait; death occurs from blocked intestines or gastroenteritis.	Spring and autumn	Tetramisole hydrochloride-batch method 0,05-0,06g/kg with feed; Albendozole (Alben, Albit) according to instructions.	Separate young and adult animals; plough pasture and household territory; start de-worming at 25-30 days of age with Albendozole, 3 times a year.
23.	Mange	All farm animals, especially cattle, sheep and horses.	1. Sick animals. 2. Contaminated tools and contaminated pastures. 3. Close contact with sick animals. 4. The environment and animal housing may serve as a reservoir.	The disease may proceeds acutely and chronically; In the affected areas, wool easily falls out, itching, and skin is inflamed and crusty; the symptoms rapidly spread to the adjoining parts of the body.	Autumn and winter, but if not treated, all seasons	Neocidol 60: solution for bathing 100 ml/240 liter water; renewal with 100 ml/80 liter water Ivermectine (Baymec, Aversect, Ivermec according to directions (dose rate and route of administration); e.g Ivomec: cattle 1ml/50kg weight; Cidectin is used in the form of injections in doses of 0.01mg/kg live weight.	Disinfect with "Butocs 50" at 0,005% aqueous solution; use injection of Ivomec or Aversect in winter.
24.	Fascioliasis liver fluke infection	Cattle, sheep and goats.	The eggs of parasite are excreted in dung, and enter the snail acting as intermediary host. The larvae are deposited on grasses near marshy areas acting as a source of infestation.	**Acute form:** Rise in body temperature, lack of appetite and rapid loss of body condition. **Chronic form:** sub-normal body temperature, weakness despite good appetite, foul smell from the usually loose faeces, digestive disturbance, rapid pulse, short breathing, anaemia and death may also occur in untreated animals.	Summer, autumn and winter	Rolinol: 1 ml/10 kg weight. Albit: 80 mg/kg weight added to feed. Phascoside: 1 granule/10 kg or 1 tablet/50kg live weight.	De-worm in December, January and March.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
25.	Trichophytosis	Farm and domestic animals; calves from 2 months to 1 year of age are more susceptible And human beings.	1. Sick animals. 2. Contaminated environment.	Incubation period: 2-4 weeks Baldness of affected areas By 2-3 months, thick, round, raised, gray-white, crusting plagues are seen around the eyes, nose, neck, tail, back and perineum, which transfer into white dry spots; the spots grow in size and may form abscesses.	All seasons	1. Remove thick crusts with a brush and mild soap. 2. Apply solution of Iodine mono chloride 3-5% for three days and then apply 10% solution after removing scabs to the affected area. 4. A traditional method for treatment of the skin lesions is the application of hot motor oil to the affected area.	1. Spontaneous recovery is common. Topical therapy is to prevent progression and spread of disease. 2. Vaccinate calves with LTF-130 vaccine from one month of age.

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
26.	Echinococcosis / tapeworm	All farm and wild animals.	The adult tape worm occupies the intestine of dogs and cats and lay eggs which are excreted into the environment. Ruminants are infected with larval emerged from these eggs during grazing and the penetrated larva form hydrated cysts inside different body organs. Dogs, cats get the disease by consuming hydrated cyst .affected body parts of the dead animals.	Weakness, loss of appetite, jaundice, digestive disturbance, ; when cysts are located in the lungs, breathing becomes difficult, and animal usually cough.	Summer and autumn for sheep, goats and cattle; all seasons for dogs and cats	No effective treatment; effective preventive measures are important.	De-worm dogs and cats with Praziquantel (1 tablet/10 kg of weight); kill infected dogs and cats and burn corpses and bury them deeply.
27.	Theileriases	Cattle	1. Sick and recovered cattle. 2. Mites act as carrier of the parasite	Incubation period: 9-19 days. There are acute and sub acute forms; Sharp increase in size, and pain in external lymph nodes; increase of temperature (up to 41-420C), for 9-10 days, general depression, lack of appetite, no chewing; the visible mucous membranes are yellow, rapid pulse; abortion in pregnant cows, rapid weakness and high death rate.	May to September with maximum infection in June and July	Symptomatic treatment with a combination of antibiotics like Azidine, Terramicine, Biomycinum, Neozidine etc. and supportive treatment with vitamin B12, parvaquone, buparvaquone and halofuginone according to the advice of a qualified Veterinarian.	Prevent tick infestation; use vaccination 2-3 month before grazing ; in the event of an outbreak, do not graze livestock on the ticks infested pastures

	Name of disease	Affected animals	Source of infection	Symptoms	Seasonality	Possible treatment	Preventive measures
28.	Tympany	Cattle, sheep and goats.	1. Consumption of alfalfa, vetch, tops of cabbage, especially when wet with rain or dew. 2. Consumption of spoiled fodder. 3.Consumption of poisonous substances.	**Acute tympany:** increased abdominal protrusion, accumulation of gases in rumen, initially increase and then decrease or cessation of motion of the scar, anxiety, shortness of breath, palpitations, foaming from mouth. **Chronic tympany:** periodic swelling of the rumen, especially after feeding, but the swelling is less severe, than in acute tympanic form, gradual loss of weight; lack of appetite.	Acute tympany occurs during summer when eating green forage; chronic tympany occurs during winter	Treatment has to begin immediately; provide anti-fermentative substances including - ichthyol, formalin, Lysol; for setting down off foam inject into the rumen timpanol, 200 ml mixed with vegetable oil or Vaseline 150-300 ml for the adsorption of gases; provide 2-3 liters of fresh milk and massage the rumen; in severe cases apply Trocar to the rumen to expel gases.	Add dry feed with fresh grasses.
29.	Mastitis	Cows and ewes.	1. Incorrect and unhygienic milking methods. 2. Inadequate care of the udder and milking equipment.	Redness of udder and pain during milking flakes in the milk, foul smell of the milk, obstruction of the teat canal, swelling of the udder; disease may spread rapidly from one quarter of the udder to the other quarters; it may render the milking animal completely unusable.	All seasons	1. Treatment should be comprehensive, early and continuous, to improve the resistance of the body; reduce the inflow of blood to the affected udder by, -reducing water intake, reduce provision of concentrate feeds, and temporary exclude of green fodder 2. Carry out frequent milking, massage udder, and apply, water-alcohol bandage 3. Use Novocainum block, antibiotic therapy. Early counseling with a veterinarian and early diagnosis can save the animal.	Regularly clean udder and wash hands before milking; keep bedding dry.

C 6.2 Calendar of vaccination and de-worming

Affected animals	Name of disease	Time of occurrence	Frequency of vaccination	Instructions for vaccination
All warm blooded animals	Anthrax	Spring and autumn	Once a year	Vaccinate all animals near area 4 weeks prior to the time the disease usually appears
	Rabies	All seasons	Once a year	Vaccinate all animals near area of outbreaks; start preventive vaccination to all pets at the age of 6 months, followed by regular annual repetitions
Cattle	Black leg	Spring	Once a year	Vaccinate no later than 2 weeks before moving to pastures; start vaccination at the age of 6 months and revaccinate annually until 4 years of age
	Hypodermitis (warble fly)	Autumn	Once a year	Vaccinate no later than 2 weeks before moving to pastures; start vaccination at the age of 6 months and revaccinate annually until 4 years of age
	Trichophytosis	Any time	Once a year	Vaccinate preferably in spring; sart vaccination at the age of 1 month with LTF-130 vaccine, according to instructions
Cattle and pigs	Foot and mouse disease	Autumn	Once a year	Vaccinate all animals with trivalent vaccine; start vaccination at the age of 3-4 months
Cattle, sheep and goats	Dictyocaulus	All seasons but more common in pasturing season.	Twice a year	De-worm with Ivermectine (Ivomec, Baymec) at the rate of 1mg / 15 kg of live weight
	Moniesiosis	Spring and autumn	Thrice a year	Start preventive de-worming at the age of 25-30 days
	Dicrocoeliosis	Winter and summer	Twice a year	Preventive de-worming with a choice of 1) Rolinol (1 ml / 10 kg body weight in feed); 2) Albit (80 mg / kg body weight with feed); or 3) Phascoside (1 granule / 10 kg body weight or 1 tablet / 50kg of body weight twice a year)
	Fascioliasis	All seasons	Twice a year	Preventive de-worming with Rolinol, Albit, Phascoside as shown above

sheep and goats	Peste des Petits Ruminants (PPR)	Autumn	Once in lifetime	Vaccinate all animals with Pestevac
	Sheep and Goat Pox	Spring and autumn	Once a year	Vaccinate all animals with Kenyavac, starting at the age of 3 months
	Brucellosis	Spring and autumn	Once in lifetime	In spring, vaccinate adults and in autumn vaccinate young animals up to 3 months of age with Brucevac (conjunctival or eye drops) without blood test
	Contagious Ecthyma	Autumn and winter	Once a year	Vaccinate all ewes 3 months before each lambing
	Sarcoptic mange	Summer	Twice a year	Dip all animals and all age groups in Neocidol 60 solution, according to packet instructions; repeat treatment within 21 days Or inject all animals Ivermectine (Baymec, Aversect, Ivermec, Ivomec) at the dose rate shown above
	Bradsot	Spring	Once a year	Vaccinate animals 2 weeks before moving to pastures
Dogs and cats	Echinococcosis	All seasons	2-4 times a year	Conduct routine de-worming with Praziquantel tablets (1 tablet / 10 kg of weight
Dogs	Infectious canine hepatitis		Once a year	Start vaccinations at 2 months of age
Birds / poultry	Newcastle disease		3-4 times a year	Provide La-Sota vaccine to all birds at the age of 15 days in drinking water; start injectable vaccine at the age of 3 month with vaccine "H"

Part D

Annex material

D1 Forms

Annex#1
Sample Form: 'Fresh Biomass Assessment'

Serial number of form[1] : **1**
Date of data collection: **25-06-2010**

Name of Ayl-Okmotu: **On archa**
Name of the village: **Echki Bash**i
Name of pasture unit: **Kara Kujur**
Name of pasture block: **Chong Kara Kujur-1**
Name of herders occupying the unit: **1: Mambetov. E, 2: Alymkolov. E, 3: Imanaliev. T**
Name of data collectors **1: Salamat. E, 2: Aizada. B**
Number of hectares in the unit: **80** (for every 10 hectares use 2 reference quadrates)

Quadrate	Fresh biomass (in grams)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
HPFB	25	-	120	55	20	15	15	15	70	15	
LPFB	60	26	26	26	26	26	100	15	5	5	
WFB	100	100	30	30	80	20	20	30	45	55	
Quadrate	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	Total of all quadrates
HPFB	10	10	10	10	20	150					560
LPFB	80	120	125	100	20	10					770
WFB	5	10	25	20	35	35					640

Quadrate	Number of quadrates used	Correction Factor CF: 20 / N	FB: TxCF [kg / ha]	Number of ha in the unit	Total Fresh biomass FBxha [kg / unit]
HPFB	16	20 / 16=1.25	700	80	56'000 (28.5%)
LPFB			962.5		76'200 (38.8%)
WFB			800		64'000 (32.7%)
TFB					196'200 (100%)

Local names of plants encountered for HPFB

(1) Japaiy esparset
(2) Chai chop
(3) Betege
(4) Donguz syrty
(5)

Local names of plants encountered for LPFB

(1) Shymyr
(2) At kulak
(3) Japaiy markovnik
(4)
(5)

Local names of plants encountered for WFB

(1) Sasyk chop
(2) Jalbyrak
(3)
(4)
(5)

Annex#2

Serial number of form: **1**
Date of data collection: **25-06-2010**

Name of Ayl-Okmotu: **On Archa**
Name of pasture unit: **Kara Kujur**
Name of herders occupying the unit:
Name of data collectors
Name of EIS 1: **Betege**

Name of the village: **Echki Bashi**
Name of pasture block: **Chong Kara Kujur-1**
E. Mambetov, E. Alymkolov, T. Imanaliev
Salamat E., Aizada B.
Name of EIS 2: **Prei**

Sample Form 'Pasture Monitoring'

Relative cover												Tally value				Weighted	% Cover
EIS 1 / Quadrate	1	2	3	4	5	6	7	8	9	10	T	1	2	3	4		
10%	√					√	√	√	√	√						26	
20%			√		√			√									
30%	√								√								
40%			√	√													
EIS 2 / Quadrate	11	12	13	14	15	16	17	18	19	20	T	1	2	3	4		
10%		√		√		√										11	37*10/ 16= 23.1
20%					√	√										26+11=37	
30%																	
40%						√											
Relative frequency (%)												13*100 / 16= 81.25					

Annex#3

Example Form 'Herd composition and animal weight

Serial number of form: **1**
Date of data collection: **25-06-2010**
Name of the Ayl-Okmotu: **On Archa**
Name of pasture unit: **Kara Kujur**
Name of herders occupying the unit:
Name of data collectors

Name of the village: **Echki Bashi**
Name of pasture block: **Chong Kara Kujur-1**
1: Mambetov. E, 2: Alymkolov. E, 3: Imanaliev. T
1: Salamat. E, 2: Aizada. B

The total avaialbe biomass in HPFB in the example block is 56000 kg. This allows grazing with the 3 herds for one round in the block during 8 ½ days (56000kg / 6730kg / day= 8.3days).

Species	Type	Unit weight (kg)[1]	Number in herd				Total Weight (kg)
			H1	H2	H3	T	
Yak	Young						
	Sub-adult						
	Adult male						
	Adult female						
Cattle	Young						
	Sub-adult						
	Adult male						
	Adult female						
Horses	Young						
	Sub-adult						
	Adult male						
	Adult female						
Sheep	Young						
	Sub-adult						
	Adult male						
	Adult female						
Goat	Young						
	Sub-adult						
	Adult male						
	Adult female						
Mules	Young						
	Sub-adult						
	Adult male						
	Adult female						
Donkeys	Young						
	Sub-adult						
	Adult male						
	Adult female						
Total Weight of all the animals in all herds							
Total Fresh Biomass Requirement (kg) per day[1]							

Herders' manual for Western Pamir

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