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YAGNOB VALLEY – NATURE, HISTORY, AND CHANCES OF A MOUNTAIN COMMUNITY DEVELOPMENT IN TAJIKISTAN

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The Yagnob Valley represents in its upper part an example of an isolated peripheral area very typical for the highlands of Asia and especially for Tajikistan, where each mountain valley has its own unique ethnic and cultural style of life and land use structure, highly adapted to natural conditions. The natural isolation of the Yagnob Valley was conducive to the preservation in its upper part of an unique ethnic group – the Yagnobis whose language is very similar to the Ancient Sogdian language attributed to the East-Iranian language group. A strict dependence of land use type on natural conditions and natural processes, as well as the peripheral positions and low accessibility, limited the development and application of new economic methods. The study is undertaken with respect to the model of the existential space of the Yagnobi community affecting land use, risks, and possibilities for survival. Within the limits of the existing structure of the natural resources and the use thereof, there are four very important types of risks that threaten to destroy the existing relationship between the natural environment and the local economy: agroclimatic risk, risk of slope processes, anthropogenic degradation, the social and political risk.
Figures 32. Tables 7. Photos 15.
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А.Гуня. Долина р. Ягноб – природа, история и возможности развития горной общины в Таджикистане. – KMK, Москва. 2002.

Долина р. Ягноб в своей верхней части представляет собой пример изолированного периферийного района, типичного для высокогорных районов Азии и в особенности Таджикистана, где почти каждая высокогорная долина имеет свой неповторимый этно-культурный уклад и формы ресурсопользования с высокой степенью адаптации к природным условиям. Объективная природная изолированность Ягнобской долины способствовала сохранению в ее верховьях уникального народа – ягнобцев, язык которых близок к древне-согдийскому языку, относящемуся к восточно-иранского языковой группе. Жесткая зависимость характера природопользования от природных условий и процессов, а также удаленность и низкая доступность ограничили развитие и применение новых методов хозяйствования. В работе делается акцент на исследование пространства существования (экзистенциального пространства) ягнобцев, модель которого описывает характер использования земель, сопровождаемые при этом риски и возможные пути к их преодолению. В пределах нынешнего характера природопользования имеются четыре наиболее важных типа риска, угрожающих разрушению сложившихся природно-хозяйственных связей: агроклиматический риск, риск склоновых процессов, антропогенная деградация ландшафтов, социально-политический риск.
32 рисунка, 7 таблиц и 15 фотографий.

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1. Introduction

1.1. General features

The valley of the Yagnob River is an important subject for the investigation of the "nature – man" interaction and study of the «delicate» structure of their interrelations and links. High mountains as well as deserted areas impregnated by ancient oases and polar Arctic areas represent the examples of geographical types of territories with the extreme forms of use of natural resources by their degree of adaptation to natural conditions. The valley of the Yagnob River situated in the middle part of the Central Asia, at the border of mountains and deserted plains (Fig. **1**), felt for all time the influence of great historical events, wars and invasions, on the one hand, and has managed, due to its objective isolated status and poor availability, to keep original features of traditional methods of the use of natural resources, style of life, culture with the Yagnobi language close to the ancient Sogdian language as one of its elements, on the other hand. The Yagnob valley enclosed in all parts by high spurs of Hissar and Zeravshan Ranges represents in its upper part an example of an isolated peripheral area – refugium of the ethnos and its environment, of ancient cultural landscapes.

Fig. 1. Location map

This presents a good example for studying the influence of natural factors on the features of use of natural resources. There it becomes quite clear that the application of the concept of sustainable development, extremely popular lately, can be very relative. In the conditions of isolation and peripheral position, strictly limited possibilities of use of resources the absence of any development is also possible. It is substituted by a sustainable equilibrium of natural and social-economic components of geosystems and a self-regulation of the population number, number of live-stock, arable lands, etc.

The analysis of the Yagnob valley presents a special interest first of all:

- As a curious phenomenon for the ethnographers, linguists, geographers;
- The Yagnob valley that represents a whole integrity together with the unique Yagnobi ethnos gives unique possibilities to build up methodological concepts and to develop models of “nature – man” interrelations, to define stable and mutable natural and social structural interrelationships of the existential space important in history, its internal and external boundaries, structure, capacity, etc.;
- At last, the valley of the Yagnob River reflects clearly a totality of problems of sustainable development typical for mountain areas. The traditional ecological experience of Yagnobis is important to elaborate the concept of development of mountain areas. The significance of a

relict experience of use of natural resources for the actual situation consists in the fact that all its components are naturally conditioned (Danilova, 2000) including the social organization. The natural basis was apparently a factor of maintenance that contributed to the survival of the ethnos.

Proceeding from the priority of these directions of research, the book consists of three main parts (with the exception of introduction and conclusion). The first part presents the description of nature, population and economy of the Yagnob Valley, the manner of description of an individual area being traditional for geography. The second part presents the Yagnobi materials basing on the concept of the space of existence (existential space) that makes it possible in full measure, to our mind, to illustrate the basic peculiarities of development of the Yagnob Valley and to find explanations of many problems, for instance, what the resource and material fundamentals of development of the Yagnobi ethnos are, risks of development, etc. The latter concept of the existential space emerged just in the middle of the field expedition research carried out with the participation of researchers and post-graduate students of the Institute of Geography Russian Academy of Sciences, students of the Department of Geography of the Moscow State University, and student-geographers from Germany and Holland. A great number of discussions «around a fire» bore ideas that combined the academic knowledge and a uniquely live reality represented by the Yagnob Valley. Later these ideas were conceptually designed in a number of publications (Badenkov, Gunja, Lindner, 1994; Gunja, 1996; Gunya, 2000), but they are not completely devised yet. At the present stage of study the existential space represents an aggregate living space of a socially identified group (in the case in question, an ethnic group – Yagnobis) made up of different subspaces – spiritual and cultural, social, subspace of material resources. Due to the natural isolation of the valley of the Yagnob River, the subspace of material resources and, partly, other subspaces have precise boundaries following the outline of high-mountain ranges and rivers (see the section concerned with the existential space below). In accordance with the suggested concept a functional zonation and proposals concerning the development of the valley, preservation of its cultural landscapes as a living environment of Yagnobis have been elaborated (last part).

1.2. Geographical position

The Yagnob River appertains to the basin of the Zeravshan River. For the distance of about 120 km the Yagnob runs from the East to the West, then it turns sharply to the North, its confluence with the Iskander-Darya River forms the Fan-Darya River flowing into the Zeravshan River. The study area comprises the upper part of the valley (a little more than 2/3 of its total length), situated between the southern slope of the Zeravshan Range and the northern slope of the Hissar Range. The maximum absolute altitude comes to 5145 m in the Zeravshan Range in the upper reaches of the Yagnob. The

river-bed of the Yagnob is situated at the altitudes of 2200–2800 m, the bottom of the valley being practically not discernible. The relative altitudes of watersheds above the bottom of the valley make up from 1500 to 2000 m (in places up to 2500 m).

The uniqueness of the Yagnob Valley is determined in many respects by its objective natural isolation (Fig. 2, 3, Table 1). The relations with the outer world are considerably impoverished. The nearest locality supplied by electricity and having a dirt road accessible to vehicles is the kishlak Marghib. Up the valley next to this kishlak there is a narrow canyon-looking gorge that practically divides the «Sogdian» (hereinafter the term is conditional) Yagnob and the outer world. The map (Fig. 3) shows that the main roads linking the Yagnob to the outer world are mountain paths open only during the summer period. In the winter period paths are covered with snow; furthermore, they are situated in a zone of permanent snow avalanche activity. Yagnobis stay completely isolated from the whole world during about eight months of the year. Several times the valley's inhabitants advanced to the authorities official requests concerning the road construction to the valley, but these attempts resulted in nothing. In the 1960's geologists made a road to the Yagnob from the South, from the Romit gorge (accessible only to cross-country vehicles). It was exploited during a certain time, but afterwards slope processes resulted in its destruction. There are some fragments of that road left on north-oriented slopes.

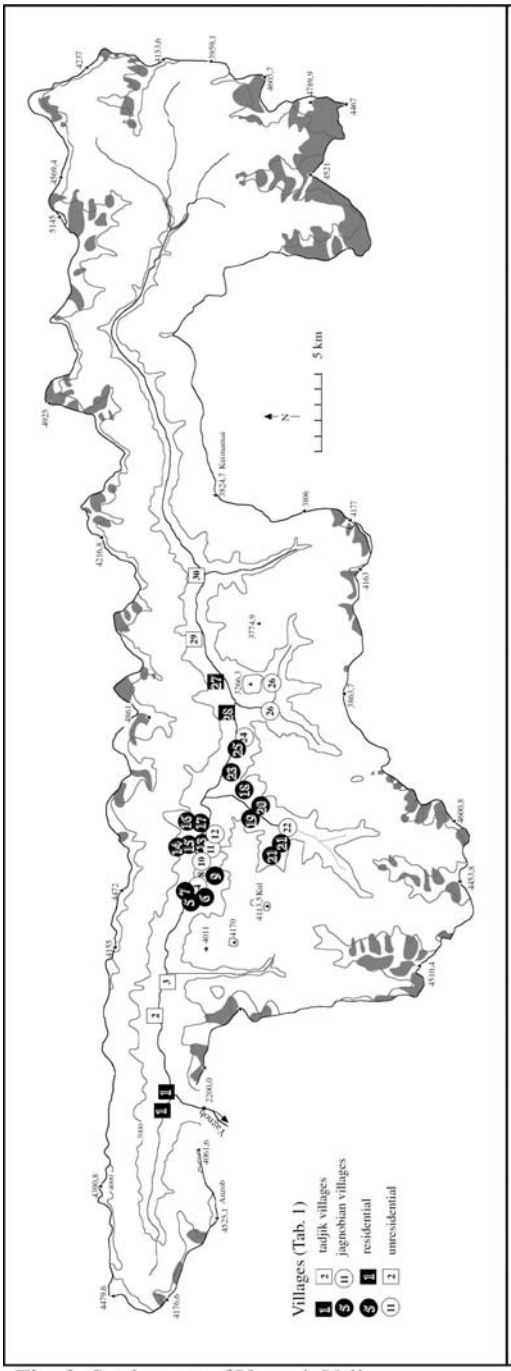


Fig. 2. Settlement of Yagnob Valley

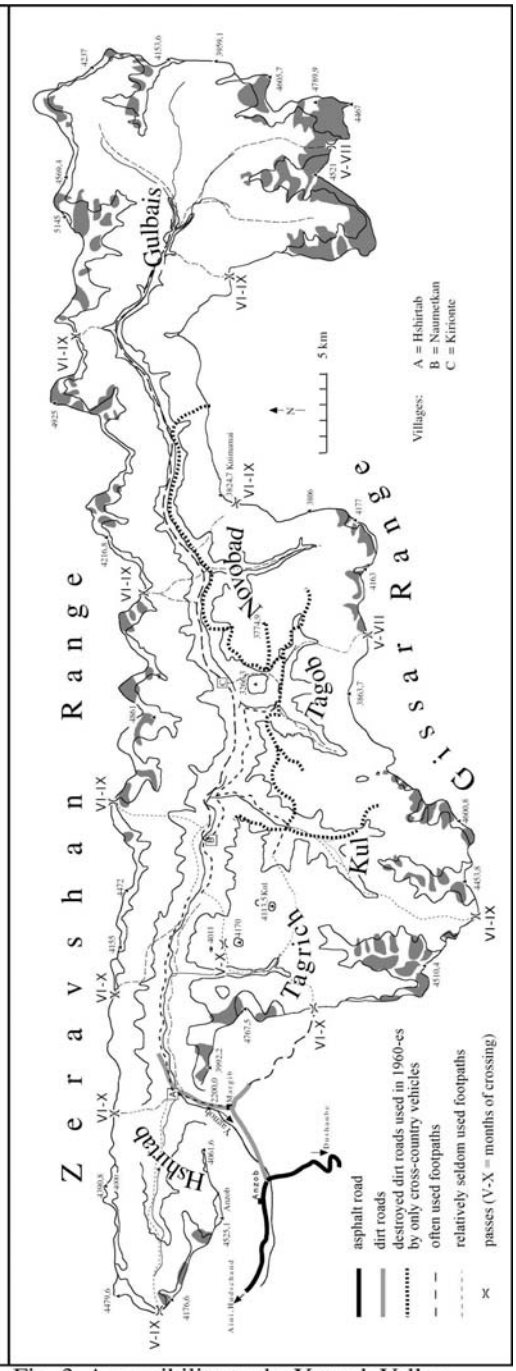


Fig. 3. Accessibility to the Yagnob Valley

number on the map (Fig. **2**)	name	altitude m	exposition	slope [°], in the overage	number of the home-stead						
					1870	1887	1904	1927	1941	1969	1995
1	Hshirtob	2320	S	15	200	35	48	40	80	170	5
2	Farkau	2400	S	10	0	5	4	3	0	0	0
3	Warsaut	2380	N	20	30	12	8	7	20	20	0
4	Mushtif	2400	NE	15	0	0	9	4	0	12	0
5	Mahtamain	2480	NE	15	20	8	?	5	13	9	1
6	Vaginzoi	2580	NE	15	30	8	?	4	14	16	1
7	Bedef	2580	SW	25	15	7	10	7	12	20	2
8	Shahsara	2500	N	10	50	10	11	2	6	10	0
9	Showita	2520	N	10	25	13	13	6	18	28	2
10	Dumzoi	2480	N	20	40	10	10	6	10	12	0
11	Sokidara	2500	N	20	25	12	14	6	17	20	0
12	Chukat	2520	NE	15	28	6	6	5	8	12	0
13	Naumetkan	2500	N	15	30	13	14	10	27	7	4
14	Pul'raut	2750	S	25	11	7	8	12	16	15	2
15	Kashi	2600	SSW	25	11	8	8	8	16	20	3
16	Tagichinor	2600	SW	25	27	12	13	13	17	14	6
17	Petif	2620	S	20	30	17	17	12	29	40	2
18	Garmen	2700	SW	20	0	0	0	15	22	48	6
19	Simich	2620	SE	25	0	0	0	10	8	3	0
20	Sokan	2700	E	20	0	27	4	?	19	13	0
21	Kul'	2760	S	15	?	22	26	25	40	?	9
22	Dagana	2620	SE	10	0	0	0	6	9	5	0
23	Pskan	2560	NE	15	35	36	38	30	29	40	7
24	Naumetkan	2530	NE	15	20	0	0	0	6	?	0
25	Dehbalyan	2600	N	20	50	14	15	25	37	32	4
26	Tagob	2640	S	20	0	13	13	15	30	?	0
27	Kyansi	2600	S	20	22	13	26	40	60	100	4
28	Kyrionte	2620	SSE	20	18	37	40	40	82	90	12
29	Dehikalon	2680	S	15	40	22	25	20	47	?	0
30	Novobad	2700	S	20	4	5	7	8	48	?	0

Table. 1. Villages of the Yagnob Valley, location and number of home-stead
(Sources: Aminov 1873; Andreev 1970; Bushkov 1988; Sobolev 1874; Virskij 1890, 1906; topographic maps and date collected by the author)

Nevertheless, the road construction is in progress now proportionally to the sponsors' money influx and the activity of the inhabitants themselves. In 1997 it was already in several kilometers to the East of the Yagnobian core, in 2001 it was built up to Bedef village. It should be mentioned that the importance of the road is belittled by its negative ecological effects on the landscapes of the Yagnob. The last section of the road from the village Khshirtob up to Bedef is characterized by a relatively steep-sloped relief. In view of a lack of resources needed to maintain the road in an appropriate condition, slope processes began to destroy this section of the road; the ecological state of neighboring landscapes is being aggravated too.

Administratively the study area pertains to Aini district of Sogdian Region (former Leninabad Region).

1.3. Research history

First precise data about the Yagnob Valley date from the 19th century and especially from its latter half; in this period first military-topographical investigations were organized in the course of the process of adhesion of the mountain areas of Central Asia to Russia. The results of the research carried out by Meiendorf in 1820 (Meiendorf, 1975), by the naturalist Leman and mining engineer Bogoslovsky, participants in the Bukhara expedition organized in 1841 and headed by the mining engineer Butelev (Brezhitsky, 1911) are mentioned in publications. Later statistical data about Yagnobis and their economy have been collected in military-topographical and scientific expeditions: G.A. Aminov (1873 – expedition of the general Abramov in 1870), M.M. Virsky (1890; 1906), L.N. Sobolev (1874), A.L. Kun (1881), N.G. Mallitsky (1924), H.F.L. Junker (1930), and others. In that period the first topographical maps of the Yagnob Valley were also created. In 1883 a well-known German journal «Petermanns Geographische Mitteilungen» published a paper of G. Capus «The Yagnob Valley and its Inhabitants» (Capus, 1883), the author emphasizing the originality of the Yagnob Valley, the uniqueness of the language of its inhabitants and the essential necessity of its detailed investigation.
In the period after the 1917 revolution a huge contribution to learning the life of Yagnobis was made by M.S. Andreev (his journals were published in their entirety only in 1970), A.N. Kandaurov (1940), M.N. Bogoliubov (1956), A.L. Khromov (1969) and others. During World War II and in the post-war period a gap between ethnographic and pure physico-geographical study intensified. Topographical maps of a scale 1/100,000 and first maps of natural resources, first of all geological maps were created.

During the last 10 to 15 years Yagnob has been an object of a special attention on the part of the public. Some publications of a sensational character appeared in the media relative to the so-called «puzzle of Yagnob». It is of no small importance that such attention has political underlying causes related, to

a certain extent, to the desire of throwing light on the negative aspects of the epoch of the «commanding economy» at which time, under the pretext of moving out of a dangerous geodynamic zone, the Yagnobi people in 1970 were within a little completely evicted to the vicinity of Dushanbe and to the cotton-growing districts of Golodnaya Steppe (the Starving Steppe). The detailed bibliography of Yagnob (115 references) contains mainly ethnographo-linguistic descriptions and notes (compiler O. Panfilov). In 1993 Yagnob became an object of research organized by the laboratory of mountain geosystems of the Institute of Geography Russian Academy of Sciences with the author's direct participation. In 1994–1996 a multidisciplinary research was organized in Yagnob with the author's leadership; a large-scale landscape map and later maps of land-use, population framework, etc. have been created.

2. Nature, population and economy of the Yagnob Valley

2.1. Ethnic groups of Tajikistan and special features of Yagnob people: The Sodges

The presence of refugiums of the ethnos and its environment is not exceptional for high-mountain areas of Asia and especially for Tajikistan, almost each valley in high mountains having there its unique ethno-cultural structure and forms of use of natural resources, highly adapted to natural conditions (Oshanin, 1959; Kisliakov, 1959; Gafurov, 1989; and others). Yagnob is however a very specific example, in that approximately three thousand people inhabiting a very restricted area, native speakers of the ancient Sogdian language and bearers of the ancient culture have managed to avoid assimilation during many centuries right up to 1970 (in 1970 the Yagnobis were forcibly evicted from the valley – Fig. **4**).

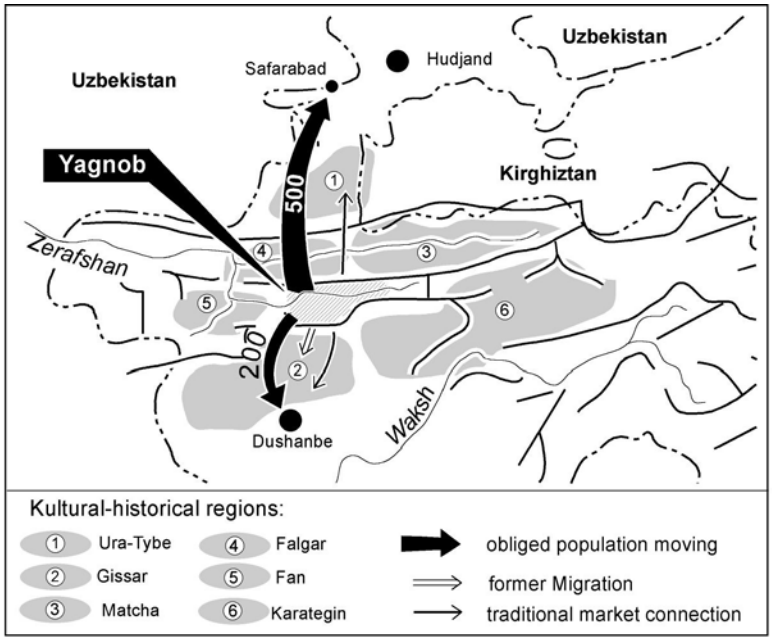


Fig. 4. Varios centres of Yagnobi population and traditional links to the outside

Yagnob occupies its special position among historic-cultural provinces of Tajikistan (Fig. **5**) being situated close to regions considerably more important by their surface and population number, such as Hissar, Karategin. In different historical periods Yagnobi mountain pastures were in the center of conflicts between powerful neighbors. Separated from ethnic groups of the

Western Pamirs speaking cognitive languages, Yagnob represented an enclave surrounded by Tajik cultural-ethnic groups; it underwent a certain influence and apparently the core of the Yagnobi ethnos truncated constantly. The actual pattern of population framework is an example of this fact, Yagnobis-Sogdians being contracted from downstream and upstream by settlements inhabited by Tajik-speaking population (Fig. **2**).

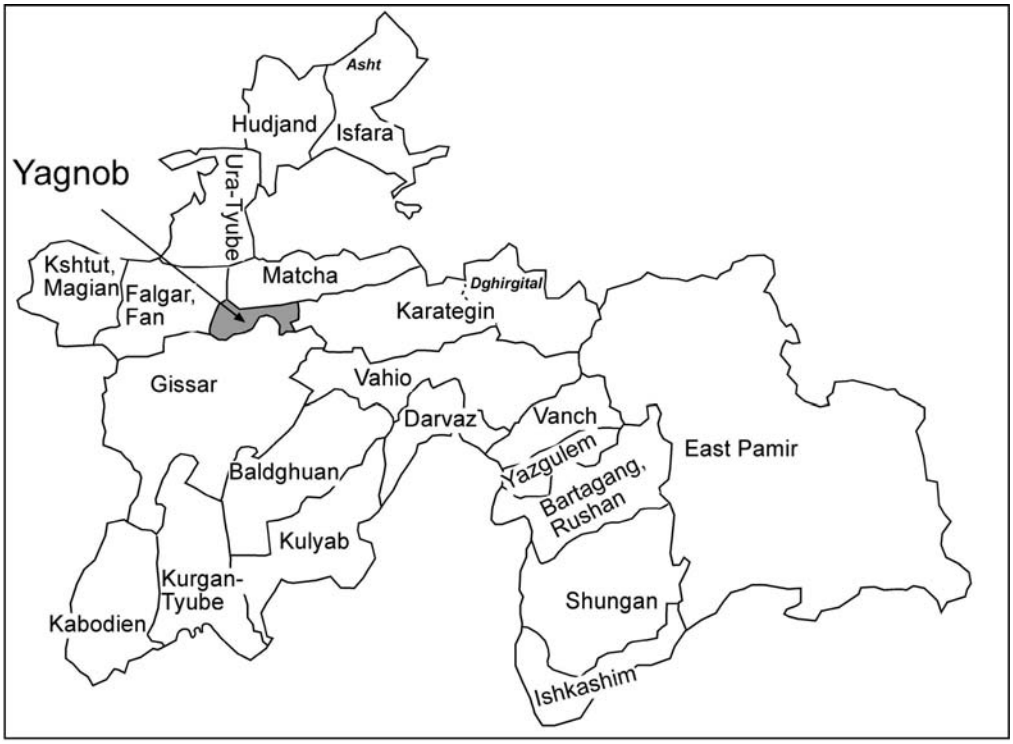


Fig. 5. Main cultaral and historical regions of Tajikistan

The history of the people inhabiting Yagnob has common roots with well-known and formerly powerful Sogdiana – an ancient state of Central Asia (7^{th}–6^{th} centuries BC to the 7^{th} century AD), first of all because of the closeness of the ancient Sogdian and Yagnobi languages (Bartold, 1926). The natural isolation of the Yagnob Valley was conducive to the possibility that ancient Sogdians could stay (or take cover?) there. They appertain to the Eastern-Iranian language branch; in the course of historical processes they were assimilated step by step by peoples appertaining to the Western-Iranian language group (Tajiks of our days belong to that group too), and after that by the Turkic-speaking peoples (Poliakov, 1983). Arabian invaders propagating Islam have basically wiped out literary texts and cultural monuments of Zoroastrian Sogdians (Gafurov, 1989).

2.2. History of the opening up

Actual forms of use of natural resources, patterns of the population framework and cultural landscapes reflect the features of at least five periods of development of Yagnob: ancient (pre-Russian), Russian (integration to imperial Russia), Soviet (before the eviction in 1970), period of eviction of 1970s – 1990s (the valley was just about not populated), modern (since the end of the 1980s the homecoming of Yagnobis taking in that time legal character). It is a paradox, but the early periods are more thoroughly described in publications; in contrast the characteristics of later periods in publications are one-sided (detailed linguistic studies, researching vegetation as such, geological structure, etc.). The first two periods are crucial for the formation of the most principal and general peculiarities of the space of existence of Yagnobis – population framework, traditional land-use, etc., whereas the subsequent periods explain many features of actual development trends of the Yagnob Valley (they will be considered in detail jointly with characteristics of the population framework and the economy).

2.2.1. Formation of population and economic assimilation of Yagnob and upper Zeravshan (ancient period)

The earliest mention of Sogdiana dates from the end of the 6th to the beginning of the 5th century BC. Sogdiana, equally with Baktria and Horesm, was the most ancient state formation in the territory of Central Asia. The slave-holding society arose very early there; it was formed of castes of priests, warriors, tillers, and slaves. At the same time patriarchal-patrimonial relations were of great importance; they have been kept just until our days as one of the major social institutes – avlod (by Bushkov, 1991). The village community also played an important part from time immemorial; it came to us in a form of Yagnobi «sada», for example. Zoroastrism was widely practiced by the side of primitive cults.

In the 4th century BC Sogdiana was invaded by the army of Alexander the Great. The legends about the expedition of Alexander the Great to the upper reaches of Zeravshan are mentioned in published works. Up to the Arabian conquest of the 8th century AD Sogd formed part of different empires: Greek-Baktrian (3rd century BC), Kushan (1st century BC), etc. First specimens of the Sogdian script date from the end of the 1st century BC to the 2nd century AD. The Arabian conquest resulted in its obliteration.

The use of historical, ethnographic and archeological materials gives a pattern of settling and assimilation of Yagnob as a part of the historical process of formation of the population of the Upper Zeravshan (Khromov, 1972; Bushkov, 1988; and others).

The final Bronze Age is considered as a period of arrival of new Indo-Iranian tribes to Central Asia and spreading of Indo-Iranian languages in this connection. In the final 1st millenary BC to the first centuries AD the population of Sogd, Tashkent oasis and Western Fergana as a whole consisted of a settled agricultural group and a stock-raising group. The stock-raising group is represented by burial monuments of burial-mounds (plains tribes) and kurums (mountain tribes). The single historical-cultural complex of burial-mounds and kurums was developed at first on the basis of closely related tribal groups, but later the representatives of each group chose, in the course of their development, different modes of economic activities. For the representatives of the kurums culture it was a way of seasonal vertical migrations developed in the process of opening up of the altitudinal belts of the mountains.

The upper reaches of the Zeravshan, as a result of a set of reasons, were found to be on the road of migration of large masses of the stock-raising population from the North to the South; some part of that people has settled the basins of large rivers of the upper Zeravshan. This process intensified in 4th – 5th centuries AD; cattle-breeding groups settled agricultural lands mingling in the local population and the patrimonial stock-raising aristocracy has emerged.

The documents discovered on the Mug Mountain (Livshitz, 1962), reports of Arab geographers and archeological works show that in the 7th century there was already a framework of settlements that has been kept in its main features until now.

In the upper reaches and partly in the middle part of the Zeravshan the memory of the people Galcha was left. The ruins of the castle settled, according to the legend, by two brother-kings Kashel and Mashel Galcha who owned the valleys of the mountain Zeravshan and Yagnob are known there.

The first Arabian campaigns to Central Asia began in the 7th century, and many monuments of the Zoroastrism were destroyed in the end of the first quarter of the 8th century. The population framework also underwent changes; many villages were destroyed. Periods of great conquests resulted in the activation of migration processes, the plains population moving up to the mountains, but after the political and economic stabilization had been installed, migrants returned to the plains. The ethnic composition of the population was relatively homogeneous in this period and the Sogdian dialects predominated.

The appearance of the Tajik language in Central Asia dates from the end of the 1st millenary AD (Western-Iranian language branch). Peoples of the upper Zeravshan continued to use Eastern-Iranian Sogdian dialects for a long time (up till the 19th century), but afterwards all of them except Yagnobis assimilated and adopted the Tajik language gradually.

During the 1220s Chinghiz-khan conquered Fergana and the territories along the Syr-Darya and the Zeravshan; one of his detachments reached Pendjikent. Inaccessible depths of the upper Zeravshan not reached by the Mongolian army served as a refuge for new groups of people come from the North as well as from the South.

In the 13th – beginning of 14th centuries the state of Chinghizides and Timurides governed by local dynasties was formed. The Turkic ethnic component gains importance.

The Mongolian invasion had disastrous effects on the social-economic and cultural development of Central Asia. The arrival of Turkis caused intensive migration processes. The population was partly exterminated, partly captured, and some part of the population ran away from conquerors to remote isolated areas. For many centuries the system of graduated state centralization able to provide support to the irrigated agricultural economy in the conditions of the Central Asian oases was replaced by an appanage organization of the state oriented to the nomadic stock-raising economy and objectively condemning entire peoples to stagnation (the state of Shaybonides) (Gafurov, 1989).

During the latter Middle Ages the political situation in the state of Shaybonides with an appanage structure, permanent internecine strives of the second half of the 16th century and of subsequent centuries was objectively conducive to the preservation of the natural economy. Remote isolated areas of the upper reaches of the Zeravshan (Matcha, Falgar, Yagnob, Fan, and others) represented a system of settlements forming a uniform economic organism with very poor relations with the outer world. The conditions of isolation dictated the keeping of a complex economy – stock-raising combined with grain culture.

In the latter half of the 18th century – beginning of 19th century important migrations of all mountain-dwellers are registered. At the same time as Matcha people an important group of Yagnobis advanced across the Turkestan Ridge and organized settlements on the north-oriented slope of the Turkestan Ridge. These mass resettlements were caused not only by free lands available, but also by the over-population rise in the upper reaches of the Zeravshan. Yagnobis founded the village Pushtiokhtona and others; they settled in Ura-Tiube and in its suburbs.

Migrations of Iranian-speaking agricultural groups (16th – beginning of 19th centuries) occurred together with oncoming streams of Turkic-speaking stock-raising groups that gradually filled the vicinities of Pendjikent, first settling lands along large main sais (shallow streams) and then also along small streams and in other places in which water was available. In that period at least 60 % of villages that existed before the integration of this region to Russia, were founded (Bushkov, 1988).

In the whole of the ancient period of development, Yagnob reveals itself in full measure in social and cultural population features, which have remained until our days: the social forms of organization – family, clan (avlod), village community (sada) – have an ecological character; they are engendered by the necessity of adapting to environmental conditions. The natural isolation of Yagnob is often advanced in publications as a major factor that has determined the conservation of the Yagnobi ethnos. It is hardly worth interpreting in so simplified a manner the mechanism of formation of specific features of the Yagnob phenomenon. The concept of «isolation» itself is very relative in time. Some 200 years ago Yagnob was no more apparently isolated than, for example, Matcha or other mountain areas. In many neighboring mountain areas, similar mountain paths closed for a long time in the winter served as main transport arteries. In Yagnob we run across contrasts of the historical development, the «time shift», a territory as though being more ancient in comparison with its neighbors. It would seem logic to put a question: what is the exact age of this relic, what time its isolation dates from and to what spheres of man's activity was it initially related? At first the factors of isolation of Yagnob did not play a decisive part; they became more prominent and amplified only on a background of historical development of political, economic, religious and other conditions of the environment. This fact emphasizes a certain process of «socialization» of the natural environment itself just at the most ancient stage of development of Yagnob.

2.2.2. Development of Yagnob during the period after the association to Russia and until the revolution of 1917

Prior to the association of Kokand khanate to Russia Yagnob and the adjacent areas were marked by political instability due to permanent wars between Bukhara emir and Kokand khan as well as between small becks of mountain principalities of Matcha, Falgar, Yagnob, Kshtut, Magiano-Farob and others (generally for water, arable lands and pastures). Many mountain dwellers moved to territories that were integrated already to Russia. After the official association of Yagnob to Russia in 1870 the entire system of land-ownership underwent major changes. The lands were declared property of Russian State and were left in temporary use to the persons that had owned them. Afterwards three forms of land-ownership remained: state-owned, vakuf (church)-owned and privately-owned lands. The amliak (village communities) lands and a part of vakuf lands were transmitted to peasants without repayment that led to a slight improvement of the land-owners state and was conducive to a certain increase of agricultural production. One land-holding of Iskander Volost (Yagnob formed one of its parts) had 1.3 dessiatines on the average (Materials…, 1961).

During the first years the imperial government restricted itself to collecting the same taxes as earlier: kheradj (irrigated lands tax), tanab (non-irrigated lands) tax and zakot (livestock tax). Those taxes were collected in money and partially in kind. In 1887 a house tax as well as a land tax were established; the latter was increased later at the expense of non-irrigated arable lands taxation and pastures tax and exceeded the potential solvency of poor and average-means parts of the peasant population. The non-irrigated agriculture depended greatly on the climatic conditions of the year; as a result it could not always ensure sufficient grain supply to poor sections of the population. Vegetables were grown in Yagnob only in its lower part up to the kishlak Khshirtob.

Poor harvests as well as unreasonable high taxes have resulted in migrations of large masses of the population. A sharp population outgo was noticed during the first 20 years after the association of the region to Russia. In 1895 the imperial government liberated the population of mountain volosts of land taxes. As a result the population number stabilized, and in the latter half of the 90s an abrupt population growth up to 7–10 % per year was detected. At the same time the population of adjacent areas, particularly from behind the Hissar Range and from Matcha was assembled there (Bushkov, 1988).

The release of the land tax and the increase of population number resulted in the extension of arable surface in mountain areas by several times. The newly materialised overpopulation provoked new waves of migration out from the valley.

A period from 1909 until 1920 (famine and the civil war) was marked by an abrupt outflow of the population (7 % of inhabitants abandoned Yagnob) (Bushkov, 1990). As a whole, in the beginning of the 20th century the production forces of Yagnob remained at the lowest level as those of hundreds of years ago, and the population dragged out a semi-starving existence. The implements were confined to wooden omach, ketmen and sickle. The imperial administration input major resources in easier accessible adjacent Pendjikent, Aftobruin and Magiano-Farab Volosts that initiated the use of ploughs, iron harrows, cultivators, binders, scythes, separators and bullock-carts there. Yagnob possessed only one handicraft of processing agricultural raw materials, the mills. They were small constructions situated along mountain streams with a productivity of up to 10 poods of meal per day. The population excess as well as rigid natural conditions restrained the application of new technologies.

2.3. Natural environment and resources

2.3.1. General physico-geographical peculiarities

In the system of physico-geographical zoning the Yagnob Valley is treated as a part of Pamiro-Alai mountain country. The valley of the Yagnob River is one of typical semiarid-semihumid mountain areas of Pamiro-Alai. In its

morphological structure it is singled out among other cultivated high mountain valleys of Middle and Central Asia first of all for the fact that the bottom of the valley is not discernible (complexes of terraces and flood-meadows are fragmentary; Photos **1**, **2**). The valley is enlarged only in the middle part of its flanks composed of crystalline schist and partially of calcareous rocks (Fig. **6**). This enlargement is expressed more distinctly on north-oriented slopes. Ample altitudinal overfalls, meridional orientation of the valley and complex geologo-tectonic processes have determined general properties of landscapes differentiation: 1) altitudinal-climatic and exposure zonality of landscapes, including cultural ones as a result of man's activity; 2) division of the valley depending on tectonico-geological conditions – alternation of gentle, structural-denudation and steep slopes on different flanks of the valley resulting in the variation of boundaries of the altitudinal zones. A very remarkable pattern of the landscape structure in comparison with adjacent areas is a very sharp elevation of the upper boundary of mountain meadow-steppe landscapes that have been used for a long time for terraced agriculture. That fact can be partly explained by the lithological composition of mother rocks conducive to the formation of fine soil particles and partly by a relatively more humid climate in the valley, its absolute altitude being generally higher than that of adjacent mountain valleys. The traces of terraces are observed up to the altitude of 3200 m a.s.l. Long-time economic activity (grazing) combined with a very dry climate on the south-oriented slopes (about 500 mm of precipitation per year at the altitude of 3000 m) have determined the disappearance of the sub-alpine meadows belt there. The dynamics of precipitation increase with altitude is very interesting: up to the altitude of 3000–3500 m the precipitation increases slowly and higher, in the high mountains a sharp leap is observed (at the altitude of about 4000 m).

2.3.2. Geological structure and tectonics

Geological structure, tectonics and seismicity of Yagnob are related to the history of development of Hissaro-Alai, a Hercynian plicative formation that underwent principally in the Mesozoic a stage of plat-form development replaced then by newer orogenesis. The Yagnob Valley pertains to the Zeravshano-Hissar structural-formation zone by the composition of stratigrapho-lithological complexes of rocks (Fedorenko et al., 1981).

Photo 1. Bottom part of Yagnob Valley near Bedef village (right)

Photo 2. Bedef village

Photo 3a,b. Yagnobian villages

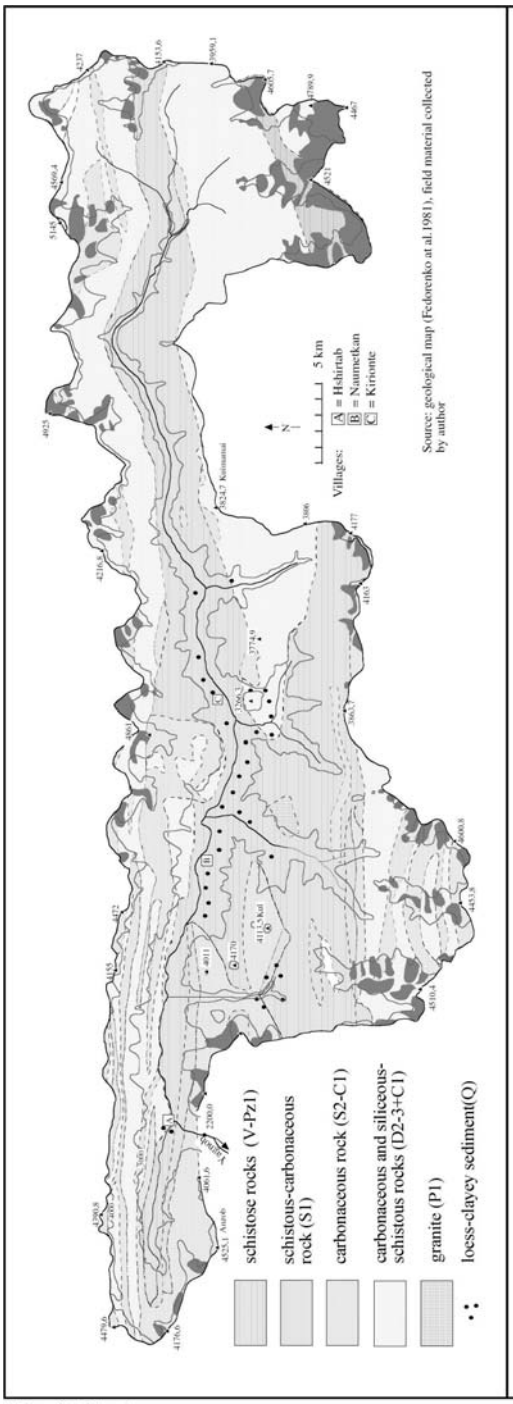


Fig. 6. Geology

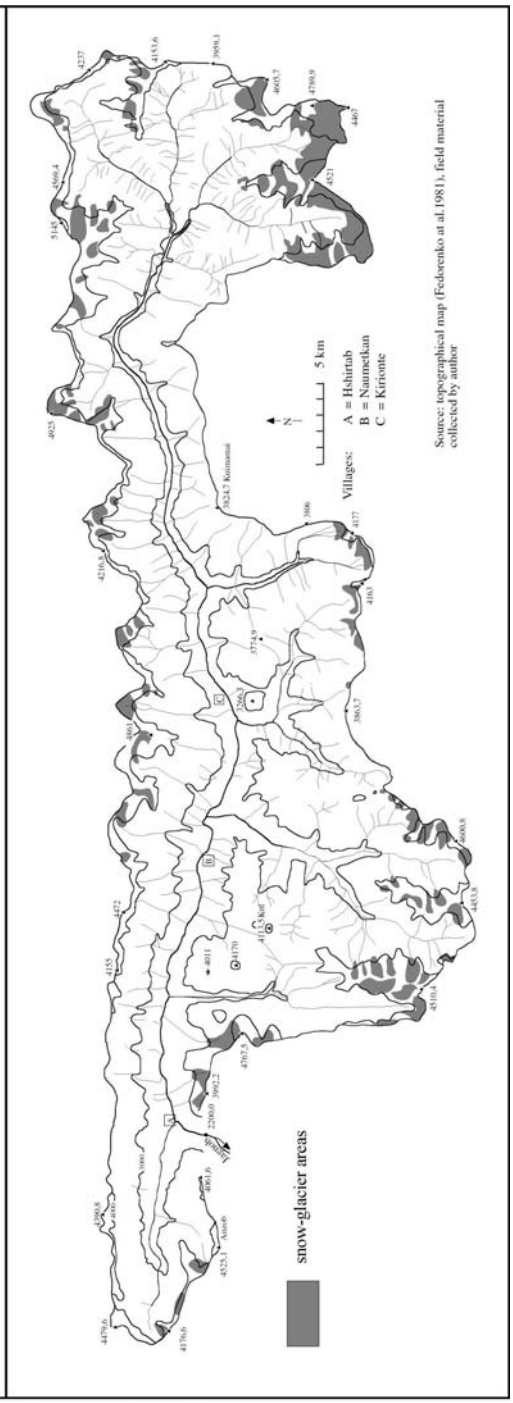


Fig. 7. Gydrography

The most ancient rocks of the Inferior Paleozoic are dominant among other rock complexes, they are represented by the Yagnob schist series characterized by corrugated and tiled formations, high degree of metamorphism, purely schistous composition with rare streaks of siliceous rocks and limestone. They compose the Yagnob Valley in its axial part and thin out in the upper reaches and on slopes close to watersheds (Fig. **6**). Strongly altered schistose rocks determine the formation of surfaces of slopes having smaller angles of incidence than in high mountains resulting in formation of a cover of mellow deposits and presenting favorable places for agriculture and settling.

The schistous-carbonaceous rock complexes of the Silurian are present in the study area fragmentary, in a form of lenses and have no major landscape importance. The carbonaceous and siliceous-schistous rocks of the Silurian, the Cretaceous and the Carbonaceous compose high mountain areas, they are represented by limestone, dolomitic limestone, dolomite as well as streaks of quartzite and blocks of limestone. A low degree of metamorphism and the features of the lithological composition determine a steep-sloped aspect of the relief. In the central part of the Yagnob Valley the calcareous rocks are observed in the middle and even in the lower part of slopes of the right flank of the valley determining a rocky aspect of landscapes, their relative aridity, pointed differentiation of the population framework, ploughed terraces being practically absent.

Yagnob, by the actual degree of intensity of neotectonic phenomena, appertains to a zone of earthquakes force 9 with recurrence of 1000–2000 years. Earthquakes force 4 to 5 are considered rather frequent calamities, in the upper part of slopes their force increases up to 5–6. The seismic dislocations are very widely spread: grandiose seismogenic landslips and crumblings, seismogenic fissures, fosses, «dams», a system of fractures (Fedorenko et al., 1981). Weak earthquakes (force 4 to 5) already have an influence on the development of active and potentially unstable landslips, sometimes provoking their catastrophic sliding. The «undercut» of the slopes by the Yagnob River is also conducive to the formation of landslips.

Geological factors had a special effect on the formation of the natural resources environment of Yagnobis. The predominance of stone-made buildings (Photo **3a,b**) arrests attention as against loess-clayey («earthen») ones in the major part of adjacent areas (Karategin, Hissar, Zeravshan Valley and others). Apparently, it is related to cultural traditions of house building adapted at a maximum degree to the conditions of the natural environment. The loess-clayey material is found less often (on landslip slopes), it contains all but overall a large number of stones and rubble and can be put to use only as cementing material. In the house building flat splits of crystalline schist are

predominant. Houses are stocky, as a rule, a natural surface (rocky bench, fold in the slope) serving very often as one of walls.

2.3.3. Hydro-geological conditions and surface waters

The Yagnob River has its source in a small glacier on a slope of Hissar Range; it appertains to Zeravshano-Hissar hydro-geological region characterized by the predominance of carbonaceous formations, widespread development of young fractures and seismic dislocations; the dominance of north-oriented slopes that determines early snowfalls and late snow melting is very extended in time and has an important effect on the supply and habits of subterranean waters. The complexes of carbonaceous and schistous-carbonaceous Paleozoic rocks on the left flank of the Yagnob Valley are aquifers due to the presence of lithogenetic, tectonic and exogenous fissuration. The streams network is much more ramified there than on the right flank of the valley (south-oriented slope) (Fig. 7). In dry years some shallow streams on the south-oriented slope dry up due to quick melting of mountain snows, the part of runoff formed by the melting of glaciers being not so important. Furthermore, a more «carbonaceous» composition of rocks that compose south-oriented slopes is often conducive to the fact that mountain streams cannot reach the main artery infiltrating through the rocks (the section of the valley from Khshirtob up to Bedef). The most important part in the alimentation of the river is played by the water from melted snow, the part of glacier in the runoff making up only 2.8 %. The Yagnob River, due to good humidity conditions of high mountain slopes appertaining to its water basin, is marked by a high specific water output. The water output reaches its maximum values in June, it makes up 26.5 l/s. The period of peak of water output is favorably synchronized with the period of fields irrigation. Within a little Yagnobis do not make use of the main water artery (it represents rather an obstacle as, for example, for transport connections). All mills are situated on the Yagnob's lateral tributaries and irrigation channels are drained out of numerous shallow streams. The conditions of relief allow the building of relatively small channels that can satisfy the needs in water, as a rule, of one, or in rare, exceptional cases two villages situated close one to another. Nowadays the major part of the irrigation channels is abandoned.

2.3.4. Relief and Quaternary deposits

In the region of mountain ranges surrounding the valley of the Yagnob River there are three stages of relief adequate to the main phases of geomorphological development and correlating to appropriate Quaternary deposits (Geomorphological Zoning of the USSR, 1980; Kiselvater, Raskatov, Ryzhova, 1981).

The upper (Oligocene – Inferior Miocene) and middle (Miocene – Inferior Quaternary) stages of relief did not hold out within a little since they were subject to intensive processing by subsequent erosion and glacial exaration. The remains of ancient planing surfaces are found out mainly on flattened

surfaces of mountain ranges; they occupy small areas and have no major landscape and resource significance (shepherds' summer camps are often attached to them).

Accumulation and denudation forms of relief are different in the Zeravshan and Hissar ranges, and also in a mountain-mass in the upper reaches of the Yagnob River. The source and the upper reaches of the Yagnob River lay in deep trough valleys with deep moraine deposits – in that area relief forms of glacial accumulation are predominant, they are represented by ridges and knolls of terminal and lateral moraines (Gulbais locality). The moraine deposits represent deep clod-boulder-detritus formations containing compact loam and sandy loam cementing this débris.

The alpine relief of the Zeravshan Range is represented by kar forms and exaration relief forms created by beetling glaciers: kars and glacial circuses. The Zeravshan Range, narrow, with steep slopes on a major part of its stretch, does not present any favorable orographic conditions for the formation of large circuses that could accumulate considerable masses of glacier snow, therefore the glaciation is of no importance at all in that area. It is generally reduced to small spots of glacier snow situated in steeply inclined kars under the saddle-points.

The glaciation of the Hissar Range, more puissant, has also formed valley glaciers in some valleys of lateral tributaries of the Yagnob (for example, Tagrich and others). A part of them is situated in deep trough valleys and represent a product of junctions of some smaller glaciers. The glaciation of the Hissar Range is much more important since it has north-oriented slopes and relatively more gentle inclines.

The lower stage of relief (middle Pleistocene – Holocene) represents forms of steep-sloped deep-cut valleys and gorges. The main process transforming tectonic forms, is the erosion of rivers processing the forms of ancient glaciation and ancient planing surfaces. The erosion and denudation forms of relief are predominant there; their formation is related to the neotectonic activity, exaration activity of glaciers and action of water streams, especially in the period of latter Pleistocene being the most humid period in that region. The partitioning of slopes composed of schistose rocks is more intensive than that of slopes with underlying carbonaceous rocks. In the locations of limestone prevalence, the streams and river valleys form narrow, canyon-looking gorges. All but all exogenous slopes that make up the lower stage of relief were formed in the post-glacial period and were subject to secondary transformation by different natural processes. The deluvial and landslip slopes are predominant among them. The deluvial deposits recovering the pre-Quaternary deposits lay on watersheds and on slopes adjacent to them.

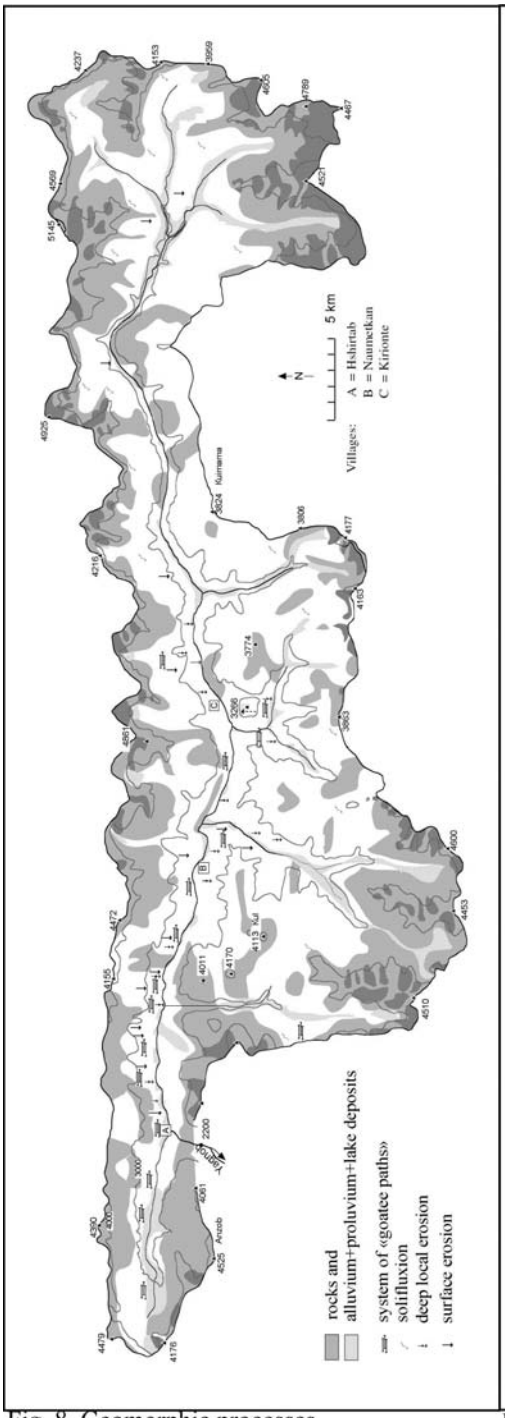


Fig. 8. Geomorphic processes

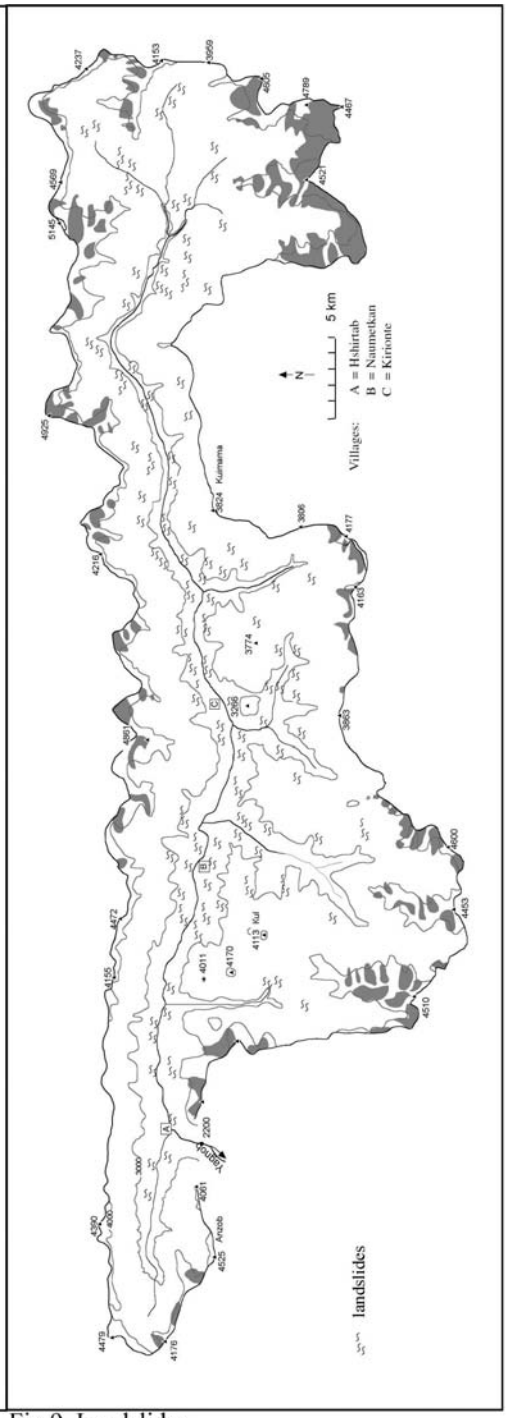


Fig.9. Landslides

Landslip deposits are the most important for the formation of modern landscape among all Quaternary deposits (Fig. **9**). The development of landslips and crumblings indicates an ample activity of denudation processes. Landslips dated by the latter Pleistocene have a compact loam and sandy loam aggregate, landslips of the Holocene consist of blocks, packets, clods and detritus with gravelly-loamy aggregate that designate their higher mobility and instability in the actual period. Slopes formed on the alteration crust of Paleozoic schist are predominant among landslip slopes.

Scree and crumbling-scree slopes are attached to Paleozoic mountain-masses. In high mountains scree deposits are combined with products of accumulation of trough avalanches; scree-avalanche cones and stub lines are widespread there. The accumulation of material (alluvium, proluvium and lake deposits) and terrace formation is rarely observed in Yagnob and is related principally to local manifestations of blockages and barrages that barrier temporarily a river-bed. In general, accumulation forms of relief play a minor part (Fig. **8**). Erosion processes are rather highly developed due to unlimited grazing on south-oriented slopes, the system of «goatee paths» is also observed frequently. Solifluxion processes are more active on north-oriented slopes above 2800–3000 m and represent generally forms of solifluxion terraces that are often broken down as a result of stock grazing.

As a whole the following geomorphological factors were leading for the formation of the traits of the natural-resource environment of the Yagnob Valley:

1) Flattened landslip slopes in the middle part of the valley with loess-looking and loamy deposits give favorable conditions for agriculture and settling framework formation. Rather gentle slopes and a complex of terraces and deluvial stub lines in Gulbais locality lay just at the boundary of climatic optimum for agriculture. According to the information that M.S. Andreev (1970) wrote by narrative of old residents, about 200 years ago up to 300 families inhabited the uppermost section of the valley, Gulbais locality, but later they left for Karategin because of permanent avalanches.

2) Distribution and intensity of hazardous slope processes, first of all, avalanches and landslips. The development of mudflows in Yagnob has a fragmentary mode. The more and more important influence upon the resource environment is exerted by slope processes stimulated by man's activity, first of all, erosion in lower and middle parts of slopes being the subject of pasture digression, and also along an old geological road and a new one being constructed starting at Khshirtob.

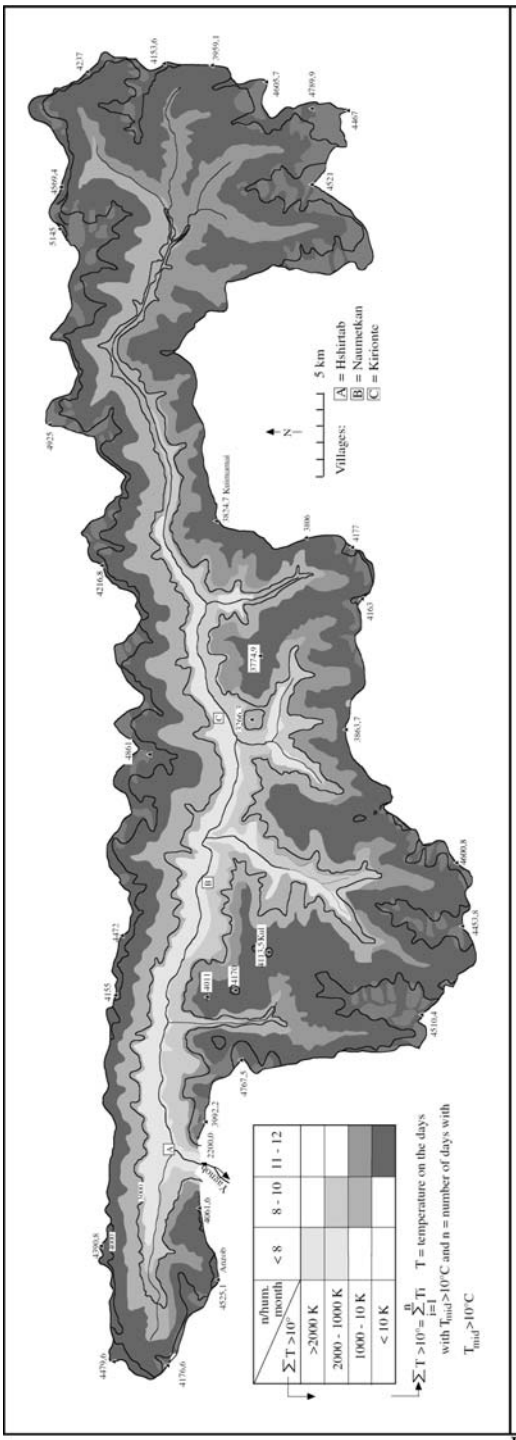


Fig. 10. Hygrothermal differentiation

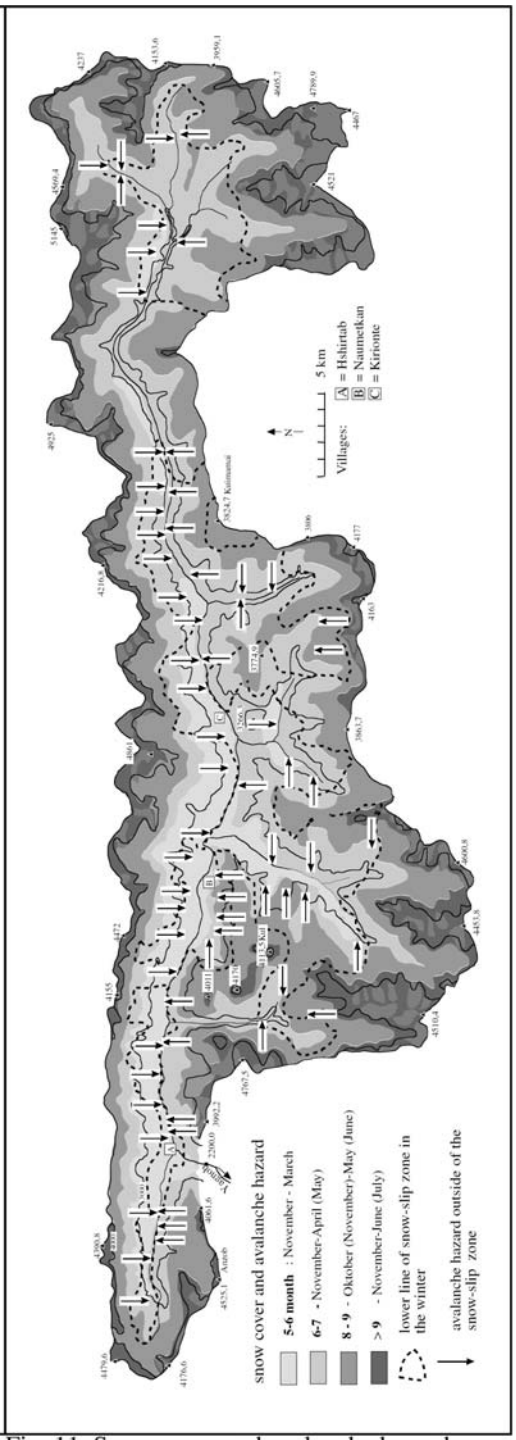


Fig. 11. Snow cover and avalanche hazard

2.3.5. Climate

The climate of the region is extreme continental, this fact being related to its position nearly in the middle of the Asian continent, in the zone of subtropical deserts. The indices of total solar radiation and radiation balance make 150 and 50 kcal/sq.cm per year respectively. The vicinity of Kazakhstan and Siberia in the North that are intensely freezing in the winter and dry hot countries in the South and South-West strengthens temperature contrasts. The sublatitudinal orientation of mountain ranges is favorable to the atmospheric fronts from the West to penetrate into the valley of Zeravshan River. Therefore relatively cold air masses come up there bringing abrupt changes of weather: cold snaps, strong winds and precipitation. The intrusions from the South are barriered off by the Hissar Range.

The average annual air temperature varies from 6.4ºC at the altitude of 2200 m up to –6.9ºC at the altitude of 4200 m. The annual course of temperature shows its maximum values in July – August and minimum ones in January. The average temperature of January is –6.1ºC at the altitude of 2200 m and –17.1ºC at the altitude of 4200 m. Average temperatures of July at the same altitudes are 18.0ºC and 3.6ºC respectively. The average monthly temperature at the altitude of 3600 m never rises above 10ºC.

The total annual precipitation varies over a wide range from 306 mm at the altitude of 2200 m up to 841 mm at the altitude of 3600 m. The distribution of precipitation within a year is uneven. The precipitation reaches its maximum values from the end of March – beginning of May (50 % of the annual total), the second peak falls in the autumn: beginning from middle October until the beginning of December. The major part of precipitation falls in a solid form. The depth of the snow cover comes to 25–30 cm at the altitude of 2500–2800 m. At the altitude of 2800–3600 m the snow depth is 150 cm (maximum 275 cm). On south-oriented slopes there is practically no snow up to the altitude of 2600–2800 m, the north-oriented slope being completely covered with snow and the snow-melting period is exceedingly stretched in time there. The summer period is the driest, the average monthly precipitation at almost all altitudes up to subnival landscapes (at the altitude of 3700 m) does not exceed 15 mm.

Basing on estimates of data of the meteorological stations Anzob (3583 m), Shakhristan saddle-point (3143 m), Dekhauz (2584 m) and Iskander-Kul (2204 m) (Reference-book on the Climate of the USSR, 1965) and also on personal microclimate research in July and August, 1995, maps of hydrothermic differentiation and duration of snow-covering period (Figs. **10**, **11**, **12**) have been produced. The map of hydrothermic differentiation has been designed taking into account both the number of humid months and the total of temperatures exceeding +10ºC. Basing on the matrix correlation of heat and humidity factors six potential zones of heat and humidity transaction were settled; they were plotted on the map taking into consideration

corrections of aspect, steepness and closeness of slopes. The zone that is the hottest and driest in the summer period includes territories situated below 2300–2400 m. One kishlak only, Khshirtob, is located in that zone. Arid conditions of that area were conducive to the development of cultural landscape that does not differ very much of those of adjacent areas (stony steppes, pyramidal poplars along irrigation channels, etc.).

Areas being moderately hot in the summer period are situated above 2300–2400 m and the major part of settlements of Yagnobis-Sogdians are attached to them. The interrelationship of heat and humidity makes it possible to keep not only irrigated fields there, but also dry-farming lands. In general, the settled hydrothermic zones have a reliable correlation with the zonality of vegetation, landscapes and, consequently, with the character of land-use, especially with the seasonal cattle migration.

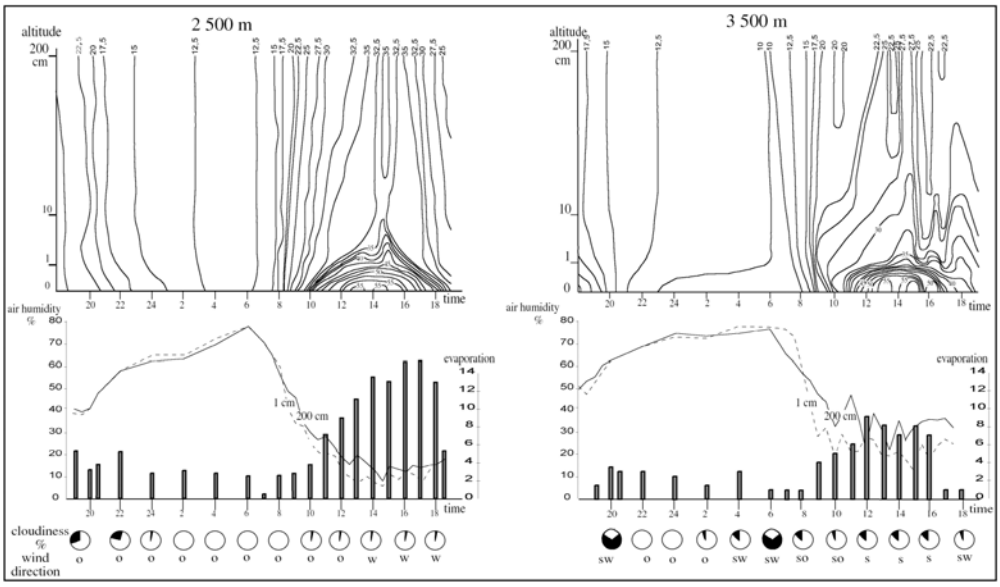


Fig. 12. Temperature stratification, daily course of air humidity (determined with AMR thermohydrosensors) and potential evaporation (Piche evaporimeter, filter paper 30 mm) at July 18 to 20, at two altitudes in the central Yagnob Valley, on the south-oriented slope at comparable weather situation (radiation days).

The map of duration of snow-covering period and that of snow avalanches distribution is analyzed in the chapter relative to the hazards characteristics. The hydrothermic conditions represent one of grounds, by the side of relief features (steepness and aspect of slopes), that conditions the duration of snow-covering period and, as a result, the beginning of the vegetative season in mountain meadows and steppes very important for stock-raising. Fig. 11 shows that Yagnob is in snow captivity during more than 8 months. All attempts to escape and to go along the known paths are quite dangerous because of the risk of permanent avalanche descents. Only in the case of the

last resort dare Yagnobis leave the valley going along the frozen bed of the Yagnob River.

Kishlaks situated on south-oriented slopes are in a better situation, the intensity of solar radiation furthering snow evaporation in the zones of arable lands. At the same time it is however a negative factor for cultivation of winter crops. The farm-holders of kishlaks situated on north-oriented slopes are obliged to sprinkle their fields with dirt in the springtime in order to accelerate snow melting (Andreev, 1970).

Climate fluctuations from year to year are very important for the subsistence of agriculture. Yagnobis score in memory very well two types of extreme years: years with dry summers and years with snowy winters. During the summer expedition of 1993, a relatively wet year, some particularly big mountain snows of avalanche origin bordered upon the Yagnob's river-bed up to middle August; a luxuriance of grass flowering was observed in mountain meadows. In 1995, a relatively dry year, wormwood was predominant within a little in mountain meadows and steppes, all other herbs and grasses were depressed owing to the lack of moisture. Just in such years Yagnobis drive their livestock high to the mountains, next to the boundary of the nival-glacial zone, they also use grass-plots of landscape niches – among the rocks, on steep slopes of difficult access.

The chart (Fig. **12**) displays, first of all, ample thermal gradients within a day that are much higher than the variance related to the difference in altitudes above sea level. A very considerable dryness of the layers juxtaposed to the ground (humidity values in afternoon time vary around 10–20 %), as well as an intense heating of soil lead to an abrupt lowering of moisture reserves in the soil. The fields require regular irrigation. Planting of forest-shrubbery belts furthering the formation of softer microclimate could be one of successful melioration measures, first of all on south-oriented slopes.

2.3.6. Vegetation

The vegetation cover of Yagnob is extremely varied and non-uniform. A large number of vegetation associations and variegation of their distribution is a result of diversity of external conditions (orographic, climatic, soil conditions, etc.). Furthermore, the flora composition itself is not homogeneous, the flora being composed of several groups of species different in ecologo-geographical and genetic aspects. A complex history of the flora formation is typical for Central Asia as a whole resulting in co-existence of genetically inhomogeneous groups of plants (Ovchinnikov, Sidorenko, Kaletkina, 1973). Ecological conditions of living environment of a certain species are often very wide, which makes it possible to observe that species in quite different conditions. An equal abundance of different species within a single association complicating the definition of a predominant species can be mentioned as a typical characteristic (Sidorenko, Strizhova, Choukavina,

1964). Seasonal distribution of precipitation that is concentrated in a cold season, only an insignificant part of the annual total fall in the summer, determines the development of vegetation at the expense of spring moisture accumulated in the soil (Kaletkina, 1974). After the exhausting of those reserves and coming at the same time as a summer dry period, the development of vegetation is gradually halted. The summer drought reduces even more a short vegetative season. Many plants wither away with the coming of drought; only plants attached to very wet habitats or, on the contrary, mountain xerophytes have longer vegetative season (up till the approach of first frosts). Dry climate and low temperatures of the vegetative season are in the origin of a small number of species and low abundance of trees and shrubs, grassy and dwarf-shrub forms of vegetation being predominant. The rarefaction of the vegetation of Yagnob is its important characteristic (projective covering is about 0.6).

Basing on edificators of the vegetation cover some particular floristic groups can be designated (Grigoriev, 1941; Flora of the Tajik Soviet Socialist Republic, 1957).

1. Extremely xeromorphic, usually thorny herbaceous perennials and shrubs – representatives of the mountain xerophytic vegetation. Herbaceous perennials are represented mostly by species of *Cousinia*: *Cousinia Francheti C.W.*, *C. splendida C.W.*, *C. hissarica C.W.* and others playing an important part in the landscape. However, combined polydominant associations are prevalent, mountain xerophytes sharing the dominant status with representatives of other groups, first of all with steppe grasses (associations of one or other species of *Cousinia* and steppe grasses are the most common) or wormwoods; pure mountain xerophytic vegetation (mainly the association of *Cousinia Franchetti*) has no great importance.

2. Xerophytic and xeromorphic compact-bunch grasses – representatives of steppes. They are: fescue – *Festuca sulcata*; feather-grass – *Stipa kirdhirosum*, *S. Capillata*; steppe bluegrass – *Poa relaxa*; June grass – *Koeleria gracilis* and meadow oat grass – *Helictotrichon hissaricum*. Some of these species are widespread all over the vertical profile of the terrain, but commonly they are all related to the high mountain area. Their importance in the landscape is very significant. They form not only associations of purely steppe aspect occupying large surfaces, but they also take part in polydominant associations, combining with mountain xerophytes, wormwood deserts or meadow mesophytes.

3. Mesophytic herbaceous perennials – representatives of meadow vegetation. This floristic group comprises: *Alopecurus seravschanicus*, brown bent – *Adrostis canina L.*, orchard grass – *Dactylis glomerata L.*, red fescue – *Festuca rubra L.* and some other relatively rare species. Side by side with meadow grasses vegetation there are also in Yagnob combined associations of grasses and forbs (ace. *Varioherbetum*, *Alopecurus seravschanicus*, ace.

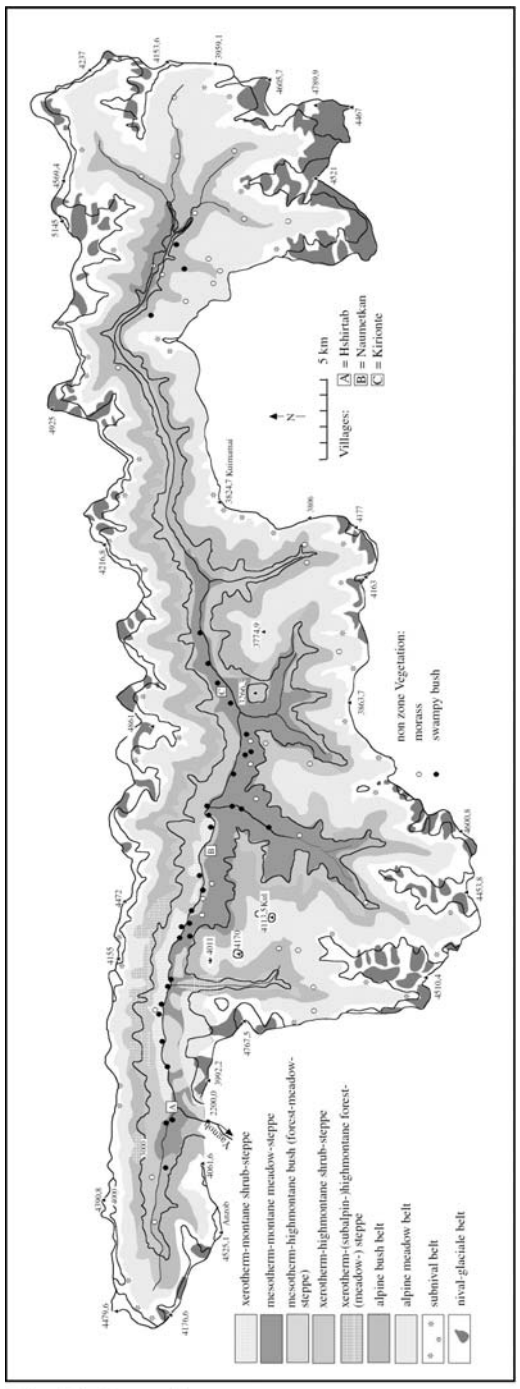


Fig. 13. Vegetation

Nepeta podostaschys, *Alopecurus seravschanicus*, etc.). The meadow-steppe type of vegetation is also well discernible (especially on the north-oriented slope of the Hissar Range) – forbs and steppe grasses are predominant (ace. *Varioherbetum*, *Poa relaxa*, *Festuca sulcata*).

4. Dwarf psychrophytous herbs and dwarf shrubs are dominants of alpine carpet heathlands specific for Pamiro-Alai. They are: dwarf shrub oxytrope – *Oxytropis savellanica*, herbaceous cinquefoil – *Potentilla flabellata* and *Atropis subspicata* recalling by their aspect common compact-bunch grasses. All these species are fairly widespread in Yagnob, but exclusively in the alpine area, where they form carpet heathlands playing the leading part in the vegetation cover. Just in this type of heathlands all three species reach their maximum degree of abundance and development.

5. Compact-bunch sedges (*Kobresia*) psychrophytes, representatives of the Asian heathland vegetation. This group is constituted by three species of Kobresia: *Kobresia pamiroalaica*, *K. persica*, *K. capilliformus*. These plants are observed exclusively in the alpine area within a little, they are related to very wet habitats. Kobresia heathlands are fairly widespread, but they are usually to be found in a form of small spots in connection with dryness of climate and other unfavorable conditions (for example, orographic ones).

6. Mesohydrophytic sedges – representatives of high mountain

helobious vegetation. This group comprises species of rhizomatous sedges – *Carex pseudofoetida*, *C. orbicularis*, *C. melanantha*, etc. They are widespread in conditions of permanently excessive humidification forming dense herbaceous associations.

7. Tall-herbs ephemeroids – umbrelliferous, representatives of the ephemeroid vegetation. This group comprises two species of herbaceous perennials: kamol – *Ferula jaeschkeana* and yougan – *Prangos pabularia*. They are fairly widespread in Yagnob (principally in its lower belt and to a smaller extent in high mountain area). Nevertheless, the vegetation with these species' predominance is developed only within the bounds of a limited territory of the north-oriented slope of the Hissar Range – in basins of the rivers Kul and Tagob.

The leading role of heat and humidity interrelationship in the distribution of vegetation is confirmed by the comparison of maps that have been produced: map of hydrothermic differentiation and that of modern vegetation (Figs. **10**, **13**). The map of vegetation has been created based on materials of field investigations and results of remote sensing data processing.

Shrubbery steppes degraded up to semideserts (with wormwood, juniper and partly yougan) are attached to the driest and hottest lower parts of south-oriented slopes (below 2400 m). North-oriented slopes at the same altitude and slopes of different aspects up to the altitude of 2600–2700 m are covered with **stepped meadows and meadow-steppes** that represent the main base of hayfields for Yagnobis. Tall-standing kamol alternating with dogrose (several species), less frequently with currant often gives to these associations the aspect of savannoids.

The **shrubbery belt** with hawthorn, mountain ash, dogrose, currant is attached to the altitudes of 2500–2400 m and lower on steep north-oriented slopes. The positioning of this belt is fragmentary and it depends to a large extent on the closeness of range to which sheep flocks approach. So, in 1993, a relatively wet year, this belt was well discernible, the second stratum with currant and other shrubs began to develop there. In 1995 some flocks of sheep were grazed on that slope and they exterminated shrubbery tracts within a little. Taking into account the absence of forest cover in Yagnob as well as a high importance of the shrubbery belt as living space for many animals, plants and birds, it is necessary to organize a natural reserve in this location in the course of further planning.

The stepped savannoid meadows being attached mainly to flattened surfaces, shrubbery wormwood steppes occupy relatively steeper north-oriented slopes. Proportionally to gathering altitude zeravshani juniper arises in this belt. Small tracts of juniper form a very torn belt in the West of the Yagnob Valley (2800–3200 m). Apparently, this belt was formerly extended right up to the modern core of settling (in the middle of kishlaks some rare separate trees are

to be found, all mazors – cemeteries – are overgrown with shrubbery and trees, as a rule, mainly with poplar), but later it was completely exterminated (for fuel needs during a long winter period, and also trampled down by livestock). In the place of this former forest belt **wormwood-grassy steppes** transferring to **alpine stepped meadows** have been formed. Above 3900-4000 m rocky-snowy slopes with rare **subnival** grass-plots are located. The set of vegetation species there is similar to alpine subnival complexes in other mountain lands.

The vegetation resources of Yagnob are well known beyond its limits. Yagnob's mountain meadows and steppes compensated formerly, and compensate now, the lack of summer pastures that was always felt in more arid adjacent areas. The increase of local livestock number was always limited by a lack of fodder during the long winter period. Now many pastures are highly degraded as a result of unlimited grazing; large areas are beaten down to a large extent and are weed-grown with rather badly eaten and poisonous herbaceous species (for example, wormwood – *Artemisia hissarica*, etc.).

More than thirty plant species are used as medicinal plants in food preparation. According to published sources, the currant grown formerly in Yagnob was rated highly in markets of Tashkent and was even sold to Russia.

2.3.7. Soils

Soil distribution by altitudinal zones in the valley of the Yagnob River is similar to the Zeravshan type of vertical zonality (Koutiminsky, Leontieva, 1966). The types of soils correspond thus to the types of landscapes (or to landscape zones).

In the zone of mountain meadows with low-grassy grass-plots, carpet heathlands, mountain xerophytic and stepped vegetation primitive detritus soils, **mountain meadow soils** (with relatively high humus contents) and **mountain steppe soils** are formed.

On south-oriented slopes and in flattened tracts having northern aspect **mountain meadow-steppe soils** develop above 2600 m, very similar by their characteristics to **light brown soils**. At the same time on carbonaceous rocks (especially the south-oriented slope close to the kishlak Tagrich, to the East of the kishlak Kashi, etc.) **light brown carbonaceous soils** are formed.

The depth and detritus contents of the soil cover vary to a large extent depending on relief conditions and on the degree of cultivation as well. So, on landslip terraced surfaces at the altitudes of 2400–2600 m (kishlaks Naumetkan, Shakhsara, etc.) deep (up to 1 m) soil profiles with high detritus contents in upper horizons were formed as a result of long-time soil cultivation for agricultural crop-growing (Photo **4**).

Altitude m	location	slope [°]	Exposition	soil level	nitrogen [%]	CN-	humus - [%]	land use
2450	river terrace	3	N	0-10cm	0,16	**23,94**	7,67	potatoes
2500	arable terrace on the slope	12	S	0-5cm	0,13	17,15	4,46	meadow
				10-15cm	0,15	**14,00**	**4,21**	
2500	arable terrace on the slope	12	S	0-10cm	0,17	18,82	6,41	wheat
2500	an old arable terrace on the slope	15	N	0-5cm	0,22	17,18	7,57	pasture
				10-15cm	0,14	18,57	5,19	
2600	arable terrace on the slope	8	N	0-10cm	0,15	18,53	5,57	wheat
2850	an old arable terrace on the slope	10	S	0-5cm	0,19	19,11	7,26	pasture
				10-15cm	0,13	19,62	5,11	
2800	slope	10	S	0-5cm	0,16	18,75	5,99	pasture
				10-15cm	0,13	21,08	5,48	
2800	an old terrace on the slope	18	N	0-5cm	0,17	19,41	6,61	pasture
				10-15cm	0,12	22,25	5,34	
3000	an old terrace on the slope	20	S	0-5cm	0,13	19,23	5,01	pasture
				10-15cm	**0,11**	20,00	4,39	
3100	slope	20	S	0-5cm	0,16	19,06	6,11	pasture
				10-15cm	**0,11**	21,27	4,68	
3100	slope	15	N	0-5cm	0,15	19,53	5,86	pasture
				10-15cm	0,14	20,79	5,83	
3400	slope	25	S	0-5cm	0,14	21,43	6,01	pasture
				10-15cm	0,12	**24,42**	5,86	
3450	slope	20	N	0-5cm	**0,36**	16,28	**11,72**	pasture
				10-15cm	**0,34**	17,03	**11,58**	

Table 2. Diagnostic values of selected soils in central Yagnob Valley

In 1995–1996 some samples were collected in the course of field investigations; later they were treated in the soil-geochemical laboratory of the Erlangen University (Germany) in order to analyze geochemical characteristics of soils being cultivated already (Table **2**). The highest humus content is observed, as expected, in soils of relatively gentle slopes covered with meadow vegetation communities (11.7 %) as well as in cultivated soils with potato culture (regular manuring) (7.7 %). In soils of dry-farming lands with wheat culture the humus contents is lower than in soils with pasturing use; this fact, apparently, can be explained by an objective removal of nutritious substances along with the harvest (absolute altitude as well as other environmental factors of examined sites – aspect, angle of incidence, etc. – are the same). The lowest nitrogen contents in the soil are observed in a zone of maximum grazing intensity. Furthermore, the altitude of 3000–3100 meters

is transit for livestock driving from high mountains down to villages; pastures are used up to the largest extent there, and the soils are consolidated. The best ratio of nitrogen and carbon is characteristic for cultivated soils with potato culture (about 24). It is characteristic that this ratio is minimum for adjacent fields with cereals (14), this fact testifying to an important influence of long-time activity on the geochemical habits of soils.

Photo 4. The old arable terrace on the landslide slope in the central Yagnob Valley

2.3.8. Landscape structure

The landscape map has been originated attracting topographical maps of a scale 1/100,000, technical-geological map of the same scale, aerial photographs as well as a color spectrozonal satellite photograph enlarged up to the scale 1/100,000, published materials and, the main thing, materials of field investigations of the complex Yagnob expedition of the laboratory of mountain geosystems of the Institute of Geography of the Russian Academy of Sciences, physico-geographical descriptions realized using the method of landscape profiling. The mapped natural and natural-anthropogenous geosystems are associated by typical indices according to principles of landscape classification by N.A. Gvozdetsky (1961). In view of a large size of the map that has been generated we present here below only one of its

fragments showing the uppermost stages of the landscape differentiation: types and subtypes of landscapes (Fig. **14**) as well as the complete legend of the landscape map giving an idea of groups of landscapes observed in Yagnob.

High mountain landscapes are prevalent in Yagnob, they are represented by nival-glacial, mountain meadow, mountain meadow-steppe and steppe types.
Glacial-nival landscapes occupy the uppermost hypsometric levels and are limited by a snow line extended above 4000 m on the southern slope and above 3800 m on the northern one. The major factor having formed the relief and organizing the structure of ***rocky-glacial*** and ***rocky-snowy landscapes*** is the modern and ancient glaciation. The center of glaciation of Yagnob is a mountain site Takali («horseshoe-looking»), the Zeravshan Range breaking up there into two ranges: Zeravshan and Hissar, separated by the flow of the Yagnob River.

Rocky-scree steep slopes adjacent to summits with outcrops of base rocks – siliceous schist with streaks of limestone, dolomitic limestone and dolomites, in places intrusions of granites – serve as habitats to the scanty petrophytic vegetation.

Mountain meadow landscapes are prevalent in the Yagnob Valley; they are represented by subnival, alpine and sub-alpine subtypes.

Subnival landscapes (from 3600–3800 up to 3800–4000 m) occupy slopes undergoing a direct influence of seasonal rhythms of nival-glacial and cryogenic processes. The excessive humidification combined with a minimum duration of the vegetative season conditions the development of low-herbs carpet grass-plots on primitive detritus soils.

Alpine landscapes (from 3200–3300 m up to 3600–3800 m) and ***sub-alpine landscapes*** on the northern slope (from 2900–3000 up to 3200–3300 m) are of major interest as pastures.

The source and the upper reaches of the Yagnob River in the Gulbasy locality, the site of junction of the streams Takali, Yagnob and Barzengi, form a wide intramontane depression (up to 1 km in width) with relatively gentle slopes covered with abundant alpine vegetation used in the summer period as pastures for sheep and goats.

But in general alpine landscapes are formed on relatively steep slopes complicated by outcrops of base rocks and superposed by eluvial and moraine deposits. The vegetation cover is represented by carpet heathlands, mountain xerophytic vegetation and rare spots of bogs attached to local outcrops of aquifer base rocks.

The variety of aspects and the morphometry of slopes determines the

formation of different landscape groups. On alpine south-oriented slopes xerophytic associations are of a major importance along with carpet heathlands; on north-oriented slopes alpine heathlands with spots of meadows and bogs are predominant. The soil cover differentiation depends to a large extent on the variety of aspects of slopes too.

Climatic and orographic conditions forming sub-alpine landscapes favor the development of sub-alpine vegetation only on relatively gentler north-oriented slope of the Hissar Range and in the upper reaches of the Yagnob. At the same time on south-oriented slopes the gradients of humidification change so fast within the interval of altitudes from 3000 up to 3500 m that they can not form any distinct bioclimatic belt for the formation of the sub-alpine vegetation. Therefore sub-alpine landscapes do not make up any continuous zone of their disposition there. Slope surfaces occupied by sub-alpine landscapes are superimposed by eluvial and moraine deposits; they are represented by stepped sub-alpine meadows with grasses, mountain xerophytic and meadow forbs vegetation, less frequently by tall-herb ephemeroids. The location of mountain meadow landscapes in the upper part of slopes, an area of active development of snow avalanches, landslips, screes, crumblings, water erosion, not only make their dynamics and functioning more complex, but also determine a large variety of intrazonal geosystems (avalanche troughs, scree slopes and slopes partitioned by water erosion) complicating to a considerable extent the structure of mountain meadow landscapes. These elements of landscape serve as objective boundaries for pastures of different kishlaks as well as for pasturing sites of different flocks of sheep brought in by different farm-holdings.

Mountain meadow-steppe landscapes are spread up to the altitude of about 2800–3000 m; they come down by the north-oriented slope just to the Yagnob's river-bed. This type of landscape represents an anthropogenous modification of the forest-meadow-steppe type gradually transformed with the extermination of forest tracts in the major part of this altitudinal landscape belt into the meadow-steppe type subdivided on subtypes: mountain meadow-steppe, juniper-open woodland subtype and underwood-shrubbery subtype. The most transformed natural-anthropogenous geosystems are located there; they are used as settlement lands, arable lands, hayfields and much less frequently as pastures. The living activities last there during practically all three seasons: spring, summer and autumn.

The slopes with mountain meadow-steppe landscapes are composed of schist of the Yagnob series, this fact conditioning relatively gentle forms of relief and a widely developed network of streams of the second and third order, prevalence of landslip and water erosion processes.

Mountain meadow-steppe landscapes with tall-herbage meadow-steppes on typical light brown soils on the northern slope and carbonaceous light brown soils on the southern slope are the most widespread and various. Landscapes

of meadow-steppes are characterized by a high variety of vegetation that is however moderately used up and is weed-grown with such species as wormwood.

Juniper-open woodland landscapes are to be found fragmentary in the western part of the valley at the altitude of 2800–3200 m and consist of zeravshani and turkestani juniper. The use of these sites for pasturing led to a considerable degradation of the soil cover and to depressed condition of the undergrowth. To the East and to the West of the main zone of this type of landscape only some single juniper trees are observed.

Underwood-shrubbery landscapes have remained on steep slopes of the left flank of the Yagnob between the localities Marghib and Makhtamain, i.e. in the area of minimum economic activity, the existing path being much worse and therefore less exploited than the main path on the opposite slope. The thinning out of aquifer schistous-carbonaceous rocks in the upper part of the slope and a high fissuration of schistous rocks of the major part of the slope were conducive to the development of shrubbery in that area with currant, dogrose and barberry in association with hawthorn and mountain ash.

Mountain steppe landscapes are attached to the lower parts of slopes of the southern macro-aspect; they are used as irrigated agricultural lands, settlement lands and pastures, most often early in the spring and late in the autumn period. The pasture lands are thus the most degraded. Xerophytic and extremely xeromorphic dwarf semishrubs are developed there – representatives of the plain desert zone (astragalus, sage, etc.), as well as wormwood semideserts beaten down to a large extent on mountain carbonaceous light brown soils. Small depth of the snow cover and a long duration of the dry period result in the necessity of irrigation of agricultural lands. Positioning in the lower part of the slope and the development of scree and landslip processes have determined high detritus contents in the soil. The use of these landscapes as transit live-stock tracks strengthens their degradation and desertification.

List of types, subtypes and groups (indicated by numbers) of natural-anthropogenous landscapes observed in Yagnob[1].

NIVAL-GLACIAL LANDSCAPES (above 3800–4000 m)

Rocky-glacial landscapes

1. Kars, troughs, slopes adjacent to summits with glaciers and mountain snows composed with siliceous schist with streaks of carbonaceous rocks, in places granites.

[1] The legend of the map of groups of landscapes was compiled with the participation of graduate student of the Department of Geography of the Moscow State University O.E. Samovarshchikova

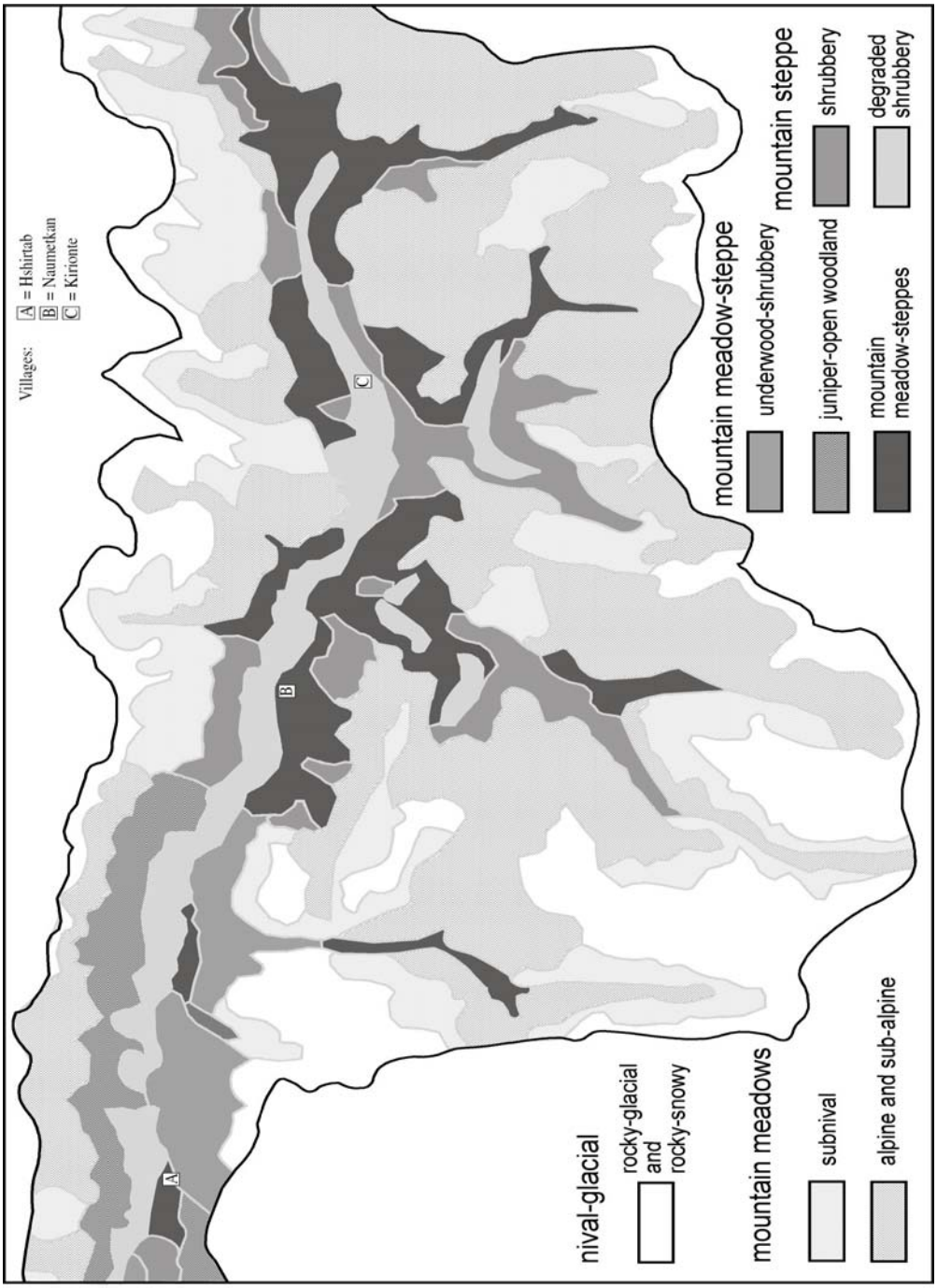


Fig. 14. Landscapes

Rocky-snowy landscapes

2. Pectinate summits, in places kars with mountain snows, rocky-scree slopes adjacent to summits composed with siliceous schist with streaks of carbonaceous rocks superposed by moraine deposits in kars, nivation niches and valleys of the small rivers, with petrophytic-lichens groups of vegetation.

MOUNTAIN MEADOWS, pasture lands

Subnival landscapes (3600–3800 – 3800–4000 m)

3. Steep slopes composed with siliceous schist with streaks of carbonaceous rocks superposed by moraine deposits, complicated by the system of kars, nivation niches and moraine-fluvioglacial forms of relief, outcrops of base rocks with low-herbs carpet grass-plots (*Potentilla flabelta*, etc.) on primitive detritus soils; out of use.

Alpine landscapes (3200–3300 – 3600–3800 m)

Slopes composed with siliceous schist with streaks of carbonaceous rocks and crystalline schist superposed by eluvial and moraine deposits, less frequently complicated by outcrops of base rocks with carpet heathlands, mountain xerophytic vegetation and spots of bogs on mountain steppe alpine soils on the southern slope and mountain meadow-steppe alpine soils on the northern slope; used from July to September as pastures for sheep and goats.

4. Steep north-oriented slopes complicated by rocks, avalanche and scree troughs with carpet heathlands and Cousinia (ace. *Festuca alaica*, *Oxytropis savellanica*, *Cousinia Franchetti*) with spots of slightly used up meadows on mountain meadow-steppe alpine soils with high detritus contents and primitive detritus soils.

5. Relatively gentle north-oriented slopes superposed by eluvial-deluvial, less frequently by moraine deposits with carpet heathlands (acc. *Potentilla flabellata*, *Oxytropis savellanica*, *Atropis subspicata*), spots of sedge bogs (*Carex rseudofoetida Kiikenth.*, *C. orbicularis Boott.*, *C. melanantha*, *C. parva Nees.*) and Kobresia heathlands (ace. *Kobresia pamiroalaica*) on mountain meadow-steppe alpine detritus soils.

6. North-oriented slopes of different steepness partitioned to a large extent, superposed by eluvial-deluvial, moraine and landslip deposits, complicated by outcrops of base rocks and ground waters with grasses meadows (*Agrostis canina L.*, *Festuca rubra L.*) and carpet heathlands (acc. *Potentilla flabellata*, *Oxytropis savellanica*, *Atropis subspicata*) used up to a medium and large extent on mountain meadow-steppe alpine soils with different detritus contents.

7. Mostly steep south-oriented slopes superposed by fragmentary moraine and crumbling-scree deposits, partitioned by water erosion with carpet Cousinia

heathlands (ace. *Festuca alaica*, *Oxytropis savellanica*, *Cousinia Franchetti*) and mountain xerophytic vegetation (*Onobrychis echidna Lipski*, *Astragalus lasiosemius Boiss.*, *A. nigrocalyx A. Slob.*, *A. Bornmullerianus B. Fedtsch.*, species of *Acantholimon*, etc.) on mountain steppe alpine soils with moderate and high detritus contents.

8. Relatively gentle south-oriented slopes superposed by scree deposits, complicated by terraces and scree stub lines with stepped vegetation modified by intensive grazing, represented by wormwoods (especially *Artemisia Dracunculus L.*), less frequently by Cousinia heathlands (*Alopecurus seravschanicus Ovcz.*, *Oxytropis savellanica*, *Cousinia Franchetti*) intensely used up, on mountain steppe alpine detritus soils.

9. Steep and rocky south-oriented slopes complicated by scree troughs with tussock grasses steppes (*Festuca sulcata*, *F. alaica*, *Leucopoa Olgae*) and with rare thickets of dogrose (*Rosa Ecae Aitsch.*) on primitive detritus soils.

Sub-alpine landscapes (2900–3000 – 3200–3300 m)

Slopes composed with schistous and carbonaceous rocks superposed by eluvial and moraine deposits with stepped sub-alpine meadows on mountain meadow-steppe sub-alpine and mountain meadow soils; used from June to September – October as pastures for sheep and goats, less frequently as hayfields.

10. Mostly steep (lower parts) north-oriented slopes superposed by moraine, landslip, less frequently by scree deposits, complicated by landslips with steppe grasses and mountain xerophytic communities (*Artemisia Lehmanniana Bge.*, ace. *Cousinia*, *Festuca sulcata*, *Stipa kirhisorum*), moderately used up, on mountain steppe sub-alpine detritus soils.

11. North-oriented slopes of different steepness superposed by landslip deposits, complicated by avalanche troughs, partitioned by water erosion with tall-herbage ephemeroids (*Ferula Jaeschkeana Vatke* and *Prangos pabularia Lindl.*) on mountain meadow-steppe sub-alpine detritus soils on crests and meadow vegetation (*Nepeta podostachys*, *Alopecurus seravschanicus*, *Agrostis canina*, ace. *Vicia* and np. *Varioherbetum*) on mountain meadow sub-alpine soils with low detritus contents in ravines.

12. Gentle slopes of different aspects superposed by deep landslip deposits with stepped meadows (*Ligularia Thomsonii*, *Poa bucharica*, *Euphorbia seravschanica*, *Geranium saxatile*, *Poligonum coriarium*, *Delphinium oreophilum*) beaten down by intense grazing, on mountain meadow-steppe sub-alpine soils with low detritus contents.

13. Terraces, deluvial stub lines and dejection cones superposed by moraine and alluvial deposits with meadows (*Alopecurus seravschanicus*, *Agrostis*

canina L., *Festuca rubra L.*) used up to a large extent by grazing and spots of bogs (*Carex pseudofoetida*) on mountain meadow sub-alpine soils.

14. Steep south-oriented slopes partially superposed by landslip deposits, partitioned by water erosion, with meadows stepped to a large extent (*Ligularia Thomsonii*, *Poa bucharica*, *Euphorbia seravschanica*, *Artemisia Lehmanniana*) extremely used up and rose thickets (*Rosa Ecae Aitsch.*) on mountain steppe sub-alpine soils.

MOUNTAIN MEADOW-STEPPE LANDSCAPES (up to 3000–3200 m), pasture, settlement and arable lands

Mountain meadow-steppes

Slopes composed mostly with schist, less frequently with schistous-carbonaceous rocks superposed by deep landslip deposits with tall-herbage meadow-steppes on light brown carbonaceous soils on the south-oriented slope and typical light brown soils on the south-oriented slope.

15. Gentle north-oriented slopes complicated by landslip terraces, with outcrops of subsoil waters, with tall-herbage meadow-steppes (ace. *Varioherbetum*, *Poa relaxa Ovcz.*, *Festuca sulcata*), frequently with *Ferula Jaeschkeana Vatke* and rose thickets (*Rosa Ecae Aitsch.*) on typical light brown soils with low detritus contents; used as arable lands, hayfields and settlement lands.

16. Gentle south-oriented slopes and north-oriented slopes of different aspects complicated by outcrops of base rocks, terraced, partitioned to a small extent, with rose meadow-steppes (*Artemisia Dracunculus L.*, ace. *Varioherbetum*, *Poa relaxa Ovcz.*, *Festuca sulcata*, *Rosa Ecae Aitsch.*) used up and beaten down to a large extent, on light brown carbonaceous soils with low detritus contents; used as pasture lands for cattle, sheep and goats (May – October).

17. Steep north-oriented slopes complicated by crests of monoclinally arranged crystalline schist with forbs steppes (*Lindelofia Olgae*, *Piptatherum alpestre*, *Astragalus alatavions*, *Nepeta podostachys*) moderately used up, frequently with rose and currant thickets (*Rosa Ecae Aitsch.*, *Ribes*), on typical light brown soils with high detritus contents; used as pasture lands for cattle, sheep and goats (May – September).

18. Mostly steep south-oriented slopes partially superposed by landslip deposits, complicated by outcrops of base rocks, frequently stepped, partitioned by water erosion, with rose meadow-steppes (*Rosa Ecae Aitsch.*, *Artemisia Dracunculus L.*, *Festuca sulcata*), frequently with *Ferula Jaeschkeana Vatke*, beaten down, on light brown carbonaceous soils with high detritus contents; used as pasture lands for cattle, sheep and goats, less frequently as arable lands.

19. Steep slopes of different aspects complicated by outcrops of base rocks with spots of rose thickets (*Rosa Ecae Aitsch.*) and wormwood (*Artemisia tenuisecta Nevski*, *A. Lehmanniana*) on gross detritus soils.

20. Terraces and dejection cones superposed by moraine and landslip deposits with forbs meadow-steppes (ace. *Varioherbetum*, *Dactilis glomerata L.*, *Prangos pabularia Lindl.*) used up to a large extent on irrigated light brown soils with low detritus contents; used as arable lands and hayfields.

Juniper-open woodland landscapes

South-oriented slopes composed with siliceous schist with streaks of carbonaceous rocks, superposed by eluvial-deluvial deposits, partitioned by water erosion, with very sparse juniper open woodland and steppe vegetation on mountain light brown soils; used as pasture lands for cattle, sheep and goats.

21. Rather gentle slopes partitioned by water erosion with very sparse juniper open woodland (*Juniperus zeravschanica Kom.*) and grasses-woodland steppes (*Artemisia Dracunculus L.*, *A. hissarica, Stipa kirghisorum*), beaten down, with rose thickets (*Rosa Ecae Aitsch.*) on light brown soils with low detritus contents.

22. Steep rocky-scree slopes partitioned by water erosion with juniper grasses-wormwood steppes (*Artemisia Dracunculus L.*, *A. hissarica*, *Stipa kirghisorum*) beaten down to a large extent with *Prangos pabularia Lindl.* on flattened crests on light brown soils with high detritus contents.

Underwood-shrubbery landscapes

North-oriented slopes composed mostly by schist, schistous-carbonaceous and carbonaceous rocks partially superposed by landslip deposits, complicated by avalanche and scree troughs with mountain shrub xerophytes and birch thickets on mountain typical light brown soils; used fragmentary as pastures for sheep and goats, brushwood stockpiling.

23. Rather gentle slopes partially superposed by landslip deposits with shrubbery (*Rosa Ecae Aitsch.*, *Ribes*) and fragments of meadow-steppes on mountain typical light brown soils with low detritus contents.

24. Steep slopes complicated by outcrops of base rocks, stepped, with shrubbery (*Ribes*, *Berberis heteropoda Schenk., Rosa Ecae Aitsch.*), less frequently with birch groves (*Betula*) on mountain typical light brown soils with high detritus contents.

MOUNTAIN STEPPE LANDSCAPES, settlement-arable lands and pastures

Shrubbery

South-oriented slopes composed with schist superposed by landslip deposits, complicated by outcrops of base rocks, with shrubbery steppes, mountain xerophytes and semidesert vegetation on mountain light brown carbonaceous soils.

25. Gentle slopes, less frequently deluvial stub lines, dejection cones and low terraces superposed by deep landslip deposits, partitioned by water erosion, with wormwood semideserts (*Artemisia hissarica*, *Stipa caucasica*, *Festuca sulcata*) and rose steppes (*Rosa Ecae Aitsch.*, *Poa relaxa*, *Stipa kirghisorum*, *Festuca sulcata*), beaten down, on mountain light brown carbonaceous soils with low detritus contents; used as irrigated arable lands, settlement lands and pastures for cattle, sheep and goats (April – November).

26. Steep slopes partitioned by water erosion, frequently rocky-scree, with steppe and semidesert vegetation (*Festuca sulcata*, *Stipa kirghisorum*, *Cousinia splendida*, *C. Francheti*) on mountain light brown carbonaceous soils with high detritus contents and primitive detritus soils; fragmentary used as pastures for sheep and goats.

2.4. Economy

2.4.1. Traditional natural economy[2]

The traditional natural economy constitutes a basis of Yagnobis' livelihood up to now. An age-old land-use experience accumulated over time the traditional natural economy has been practiced in Yagnob, in conditions of a restricted natural resource potential and a relatively high population density has developed into the formation of an economy with a very pronounced adaptive function. Four main historical types of use of natural resources that form eight space modifications of use of landscapes are designated:

Pasturable type. The presence of very productive alpine and sub-alpine pastures gives large possibilities for livestock grazing and housing, mostly sheep and goats, less frequently cows, calves, horses. The function of stock-raising, unless subordinate, was the peer with agriculture, first of all because the stock-raising provided fertilizers for fields. The livestock distribution in families was non-uniform, but almost each family had a donkey, a cow and calves, the number of sheep and goats in families varying within the range of several times. Every kishlak had its own pasture with a rigged night-lodge for shepherds and a stone-made enclosure for young animals. Earlier the function of shepherds of cattle joined also with sheep was discharged by the women of

[2]*This section is written basing on materials of interrogations performed during field expeditions as well as on publications, first of all, the work of M.S. Andreev (1970). Several work technologies described below are not to be found any more in actual conditions.*

each particular kishlak. The local (Yagnobi) livestock occupied a rather small part of pastures in the valley even in the period when the valley was the most populated. The major part of pastures was exploited by sheep flocks driven from adjacent regions (Karategin, Matcha, Hissar, etc.). For a long time the complexity of high mountain relief restrained the execution of control of pasture use. So, there are references in publications that the upper reaches of the Yagnob (in that time associated to Russia already) were sometimes used for grazing sheep flocks of neighboring beckates tributaries of Bukhara khanate. The Bukhara officials even managed to collect taxes there (Brzezicky, 1911). Strictly speaking, more than 2/3 of pastures and, therefore, cultural pasturable landscapes do not bear any imprint of relict use of natural resources related to the life activities of Yagnobis themselves.

landscape	type of using			
	pasturable	**hayfield-pasturable**	**arable farming**	**settlement – arable farming**
mountain meadow				
mountain meadow-steppe				
mountain steppe				

Table 3. Use of landscapes in Yagnob before 1970.

Hayfield-pasturable type of land-use characterizes a pure «Yagnobi» cultural landscape. The local livestock number is limited by the availability of fodder during the long winter period. Particularly for this reason the attempts to organize big dairy farms undertaken in Yagnob in 1950s-1960s period was a very expensive measure in itself and required, in conditions of a severe Yagnobi winter, a considerable volume of heat-insulating material supplied from a distance. It is no accident that livestock housing «under the same roof» with masters is widespread among many mountain peoples. This fact is related to the necessity of permanently looking after livestock. The walls of dwelling houses and sheds are frequently common in order to save heat in severe winter conditions.

Photo 5. Yugan (Prangos pabularia) in the mountain meadow-steppe of Yagnob Valley

Photo 6. Hay harvesting in the arid Zeravshan Valley

Haymaking is carried out manually. The altitude of extension of hayfields is limited by the possibility of hay transporting by donkeys. In species composition of winter fodder the species are generally yougan, bramble vetch, sage-leaf mullein, etc.

Hayfield plots are used after haymaking as after-grass pastures only for local livestock kept for the winter in Yagnob. Yougan and wormwood are mowed last (in August – September) by which time they lose their poisonous properties. In the main, the best hayfields are attached to the mountain meadow-steppe zone, but in dry years the hay is made all around, including hard-to-reach rocky terrains.

Arable farming type in Yagnob is subdivided into two classes by the composition of cultivated crops: grain, legumes cultivation and potato-growing; it is also subdivided by the necessity of irrigation into dry farming and irrigated farming.

Varieties of agricultural crops

Species diversity of agricultural crops in Yagnob is very scanty. Grain legumes are represented by barley (90 % of the area under crops), peas and wheat. All crops are summer ones without exception. Winter crops are not cultivated since they either rot on north-oriented slopes or freeze out on south-oriented slopes by reason of snow blowing off or evaporation. Summer wheat belongs to the only variety that Yagnobis call «sourkha» – reddish. Two varieties of barley are sown – common one, in a hull, with a seed coat and a hull-less one (so-called Himalayan corn).

Grain legumes

Structure of the lands under crops

The proportion of sown areas under wheat and barley varies from one kishlak to another, the volume of sown grain also varies to a large extent depending on fields' location; (in general, the fields are attached to the location of kishlak). This fact can be explained by different possibilities of cereal cultivation in different landscapes. The structure of the areas under wheat is highly influenced by the slope aspect. Wheat is usually not sown on north-oriented (shady) slopes with not many exceptions. Barley is sown by each farm-holding (family) in the volume of about 300 kg. In the upper reaches of the Yagnob; wheat frequently can not ripen and barley cultivation is predominant. In the lower part of Yagnob (Khshirtob) fields are sown approximately half barley and half wheat. Peas are sown in volumes from 30 up to 130 kg per farm-holding.

Productivity

According to the opinion of local inhabitants, the highest yields of wheat are obtained from the fields that have the southern micro-aspect and are situated in mountain meadow-steppe and mountain steppe landscapes of a northern macro-aspect (kishlak Garmen and others, see Table 1). However, steadily high yields of wheat are attached to irrigated fields on slopes of southern macro-aspect (Kiansi, Bedef).

The productivity of grain legumes depends to a large extent on the position of fields on irrigated («obi») or dry-farming («lami») lands. Irrigated lands produce much higher yields than dry-farming ones in the case of fertilizer use, and they are of a major importance in the life of Yagnobis. But, according to local inhabitants, if these fields were only irrigated but deprived of fertilizing, the yields obtained from them would be lower than those of dry-farming areas, the soil being very exhausted there.

Rotation of crops

The cereals are sown on both irrigated and dry-farming lands, in the same fields every year. The rotation of crops of barley or wheat with peas allows to enrich the soil by nitrogen and to increase the productivity of main agricultural crops. In effect there is no rotation of crops in the fields used under potatoes. This fact is related to some extent to an acute shortage of soils suitable for potato-growing.

Potatoes

Potato-growing was introduced in Yagnob only in post-war (World War II) years, but it has already become widespread due to its high productivity. Potato-growing requires the field surface to be relatively gentle and all stones to be removed from the soil. In the case of good maintenance potato productivity can be very high and during interrogations Yagnobis uprate very much yields they have obtained. Potato fields are generally situated near or close to villages and even within their limits (they constitute, as a matter of fact, a new land-use element of Yagnobis playing the part of kitchen gardens). Small plots of fields and kitchen gardens do not exceed 0.5–1 ares, except for some fields situated on terrace-looking benches (village Vaginzoy). The fields reach the size of 6–7 acres there.

Irrigated lands

The irrigation system of Yagnobis is not very complex, watering regulation being carried out by changing the volume of water thrown on the field. All channels are made in the ground without the use of any building materials or concrete. There is not one irrigation channel originating in the Yagnob River. A large number of streams and small rivers, particularly on a «shady» slope, provides regular irrigation. In most Yagnobi villages there are no fixed turns for water and everyone can take water for irrigation depending on individual needs.

Thus, watering of fields situated on steeper slopes varies from 10 to 6 times per season. Different crop varieties do not require identical watering either, wheat being watered 5–6 times per season (only on south-oriented slopes), barley 10 times and peas 15 times (Andreev, 1970). It should be mentioned that watering frequency could vary by 2–3 times depending on the humidity of a particular year and on the aspect of the field.

Size of fields

The fields apportionment into small plots is related not only to relief characteristics, but also to the diversity of climatic conditions: from place to place, in different years (by humidity and heat conditions) now one, now another site in different localities appeared more or less favorable for arable farming. Therefore, a specific space diversification of fields on slopes of different aspects is necessary in order to provide steady yields. The field is considered a normal-size one («zoy») if 35 to 50 kg of grain can be sown in that field. Fields reaching up to 80 kg of grain to be sown are to be found very seldom. The largest field we observed is situated in the kishlak Naumetkan, 300 kg of grain is sown there.

Fields are considered small-size ones («lakka») if 20 kg of grain can be sown there. They are usually located among rocky slopes, in any locality that can be supplied with water. In the period when the population of Yagnob was growing, practically each parcel of land was put in use. Altitudinal limits of the extent of cultivated lands can be fixed at a hypsometric mark of 3000 m on the north-oriented slope and 3200 m on south-oriented one. After the eviction the most elevated fields remained abandoned, but the traces of terracing that had been performed still keep their former smooth-stepped aspect.

Work cycle of agricultural activities

The schedule of agricultural works filling in practically all the active year of Yagnobis has so high an adaptation degree to local seasonal natural rhythms that it is even shifted a little with regard to the traditional Muslim calendar. The ancient traditions of Iranian nations have been preserved and reveal themselves now particularly in agriculture; original reverential honoring of agriculture especially lighted by the aureole of divine provenance is notably perceived. The most critical disparities in rhythms of agricultural activities in different kishlaks are caused by the position on the northern or southern macro-aspect. The delay of the terms of agricultural works on the «shady» slope makes about two weeks.

The official coming of spring associated to the vernal equinox day – Tajik New Year («Soli Nau») does not originate any special change in the agricultural life of a Yagnobi. Only one month later, between April 20 and 30, people in Yagnob begin to execute a specific grounding – scattering of ground

over the snow in order to stimulate the snow melting. In this period Yagnobis take care mostly of dry-farming fields situated high in the mountains, since it is necessary to ensure to those lands a vegetative period sufficient for ripening. The snow is scattered with ground 4–5 times on north-oriented slopes and 2–3 times on south-oriented slopes.

At the same time a labour-intensive process of inputting manure accumulated during the winter is carried out in irrigated fields. A field manured with sheep and goat dung can be used for sowing for three years running. Cattle dung is judged as considerably worse, since a field fertilized with it can produce a good yield for only one year. Ashes are thrown in the fields under barley and peas.

The prosperity level of farm-holdings can be estimated by the volume of the stored fertilizer since it is determined by the livestock number. According to the data of M.S. Andreev (1970) the volume of fertilizer of the poorest families does not exceed 20–30 baskets, the fertilizer volume of rich ones reaching 100 baskets and even more.

The beginning of ploughing on the south-oriented slope falls on the beginning of May, ploughing lasts about 0.5–1 months; for the reasons of ritual character the first day of ploughing is celebrated with great solemnity and is timed to the appropriate day of the week – Wednesday.

First of all dry-farming lands are worked up. The furrow in the ploughed field is always laid horizontally and ploughing is executed beginning from the lower extremity of the field in the direction of the upper one. Sowing in dry-farming lands is executed just before ploughing by seed- scattering over a non-ploughed field. At the same time irrigated lands are ploughed twice and sowing is executed after the first ploughing. After ploughing the field is ploughed up with a harrow consisting of an armful of wild shrubs.

Fuel resources being extremely restricted, fuel gathering is also executed during ploughing – plants roots that can be extracted from the ground are gathered. Although pressed dung represents the principal fuel, roots of weeds are also a considerable help in the economy of a Yagnobi.

After the end of ploughing a period of relative lull in agricultural works comes and at the beginning of June, i.e. in one month after ploughing, weeding is executed in dry-farming fields; its duration is from a few days up to 2 weeks. Weed plants are not pulled out but cut off in order that the soil would not be destroyed. The vegetative period is so short that new sprouts of weeds can do no harm to crops any more. After weeding dry-farming crops practically are not worked on, the watering of irrigated lands taking a lot of time. Only in the most productive years for dry-farming crops (abundant rains fall regularly during the vegetative period) can their yields be compared to irrigated ones, all the fertilizer being expended exclusively on irrigated crops.

Photo 7. Threshing in the village Kirionte (upper Yagnob)

Harvesting is also an example of the forced rationality of the economy of a mountain dweller. Wheat and barley are not reaped, but pulled out of the ground together with roots, exclusively in order that roots and bases of stalks would not be lost. Sheaves are stacked on the ground and grain legumes «ripen» this way from a few days up to a month. Then they are threshed either in mills situated on main inflows of the Yagnob River or manually and with use of cattle. At the present time the majority of mills are out of use and people have to execute threshing in the old way (Photo **7**).

Settlement – arable farming type of land-use

Photo 8a. Village Pskan (middle Yagnob) on the northern exposition

Photo 8b. Villages: Kashi and Pul'raut on the southern exposition slope

A very close connection to everyday life and economic structure, with the problem of land cultivation and maintenance, determines the main patterns of the population framework in Yagnob (Photo **8a,b**). The population framework depends on the positioning of irrigated fields that require regular maintenance, maturing, etc. This fact can explain to some extent the stretching of a singular kishlak to 2 or 3 separate groups of houses, and the absence of large villages. At the same time the increase of population numbers in each particular kishlak is limited by a lack of suitable arable lands not far from the dwellings. Kishlaks that are relatively big by population size are situated generally at low altitudes. These are mostly kishlaks peopled by Tajiks, while Yagnobi-Sogdian kishlaks consist of 8–20 farm-holdings (70 % of all kishlaks) and fewer. Low number of families is typical for Yagnobi kishlaks situated mainly on the south-oriented slope at which place a lack of land resources is observed. Maximum altitude of settlements makes up 2760 m (slope of northern macro-aspect but southern micro-aspect – kishlak Kul). On proper north-oriented slopes the maximum altitude of settlements was observed in a relatively flattened site (2580 m). High dependency of the population framework on climatic conditions is also traced through such aspects as, for example, layout of dwelling houses, stocky, with a minimum of «bare» walls in order to save heat in the period of severe winter cold. In general the majority of kishlaks is attached to relatively dry and warm mountain steppe landscapes (70 %).

Side by side with the dependency on the altitude and slope aspects, the dependency of the population framework on the distribution of hazardous slope processes and, first of all, snow avalanches is apparently appreciable. In this connection houses are built on folds of slopes and in the parts of slopes adjacent to crests, and also rather high above the bottom of the valley, at which place landslips are frequent and furthermore it is wet. Sometimes the layout of a kishlak appears as a crest of rocks outcrop cutting the slope as if it were a break-avalanche.

The wealth of Yagnobis is related to a steady productivity of crops, therefore not the quantity but the quality of the land is of prime importance. Strictly speaking, the stability rate of the farm-holdings of Yagnobis can be expressed through the proportion of irrigated and dry-farming arable lands. By our reckoning the area of potential arable fields of superior category (sites of slopes located near at hand and not too steep) per family could vary within the limits of up to 60 times in the years differing by population number and in different kishlaks (see Table **4**).

number on the map (Fig. **2**)	name	altitude m	exposition	Slope [°], in the overage	Area of potential arable land (ha)	
					Category A	Category B
1	Hshirtob	2320	S	15	625	1250
2	Farkau	2400	S	10	40	1700
3	Warsaut	2380	N	20	125	1200
4	Mushtif	2400	NE	15	200	0
5	Mahtamain	2480	NE	15	110	175
6	Vaginzoi	2580	NE	15		
7	Bedef	2580	SW	25	275	410
8	Shahsara	2500	N	10	125	175
9	Showita	2520	N	10	240	50
10	Dumzoi	2480	N	20		
11	Sokidara	2500	N	20	225	0
12	Chukat	2520	NE	15	275	250
13	Naumetkan	2500	N	15		
14	Pul'raut	2750	S	25	70	170
15	Kashi	2600	SSW	25		
16	Tagichinor	2600	SW	25	160	0
17	Petif	2620	S	20	225	0
18	Garmen	2700	SW	20	175	50
19	Simich	2620	SE	25	325	0
20	Sokan	2700	E	20	150	50
21	Kul'	2760	S	15	175	150
22	Dagana	2620	SE	10	200	900
23	Pskan	2560	NE	15	300	0
24	Naumetkan	2530	NE	15	250	275
25	Dehbalyan	2600	N	20		
26	Tagob	2640	S	20	775	875
27	Kyansi	2600	S	20	200	575
28	Kyrionte	2620	SSE	20	475	450
29	Dehikalon	2680	S	15	375	200
30	Novobad	2700	S	20	500	2050

Table **4**. Potential agroclimatic areas suitable for the arable farming: distribution among the Yagnobian villages
A – high category (not far from villages, on the gentle slopes, suitable as a rule for irrigation), with 20-50% of real using;
B – low category (relatively far from the villages, suitable as a rule for dry-farming), with 4-10% of real using.

For Yagnobi-Sogdians (the Yagnobi core) in the case of average minimum there is 2–5 ha of such arable lands per 1 family. In general, a very risky agriculture depending in many respects on climatic fluctuations forced the population to migrate to more propitious areas or to leave to look for some work for one year and more. According to the data of M.S. Andreev (1970), in 1860–1870-es the full waves of spontaneous resettlements took place (up to 60 farm-holders moved to another slope of the Hissar Range).

2.4.2. Actual use of landscapes

Based on large-scale field profiling, as well as remote sensing data processing and archive materials six main historical types of the use of landscapes and their space modifications have been analyzed and mapped: **pasturable** mountain meadow, mountain meadow-steppe and mountain steppe; **hayfield-pasturable** mountain meadow-steppe; **settlement – arable farming** mountain meadow-steppe and mountain steppe (Table **5**). The abandonment of dry-farming lands located far from villages caused withering away of a pure arable farming type of land-use.

landscape	type of using		
	pasturable	**hayfield-pasturable**	**settlement – arable farming**
mountain meadow			
mountain meadow-steppe			
mountain steppe			

Table 5. Use of landscapes in Yagnob after 1970.

The priority in the present-day economy of Yagnobis has moved towards stock-raising. Many food products including meal can be bought now in other regions. The map (Fig. **15**) shows that the major part of ploughed terraces distant from kishlaks is now out of use. Many of them are subject to water erosion and can hardly be restored as elements of the cultural landscape. Many villages that are also are relatively distant from the main Yagnobi core are uninhabited, and kishlaks that have remained consist of only a few families each.

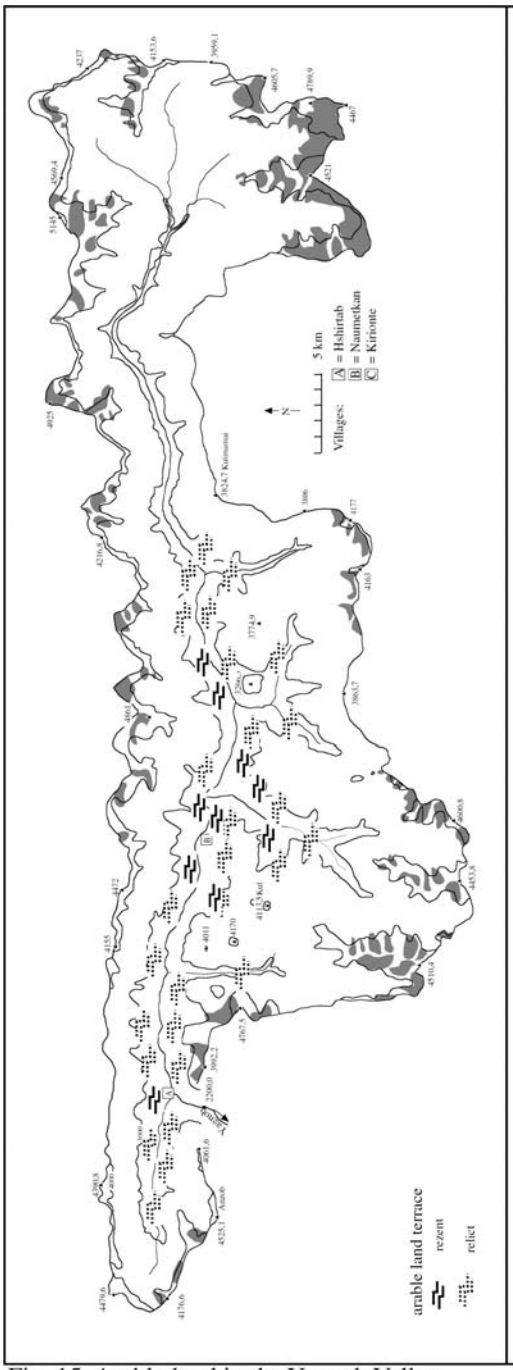


Fig. 15. Arable land in the Yagnob Valley

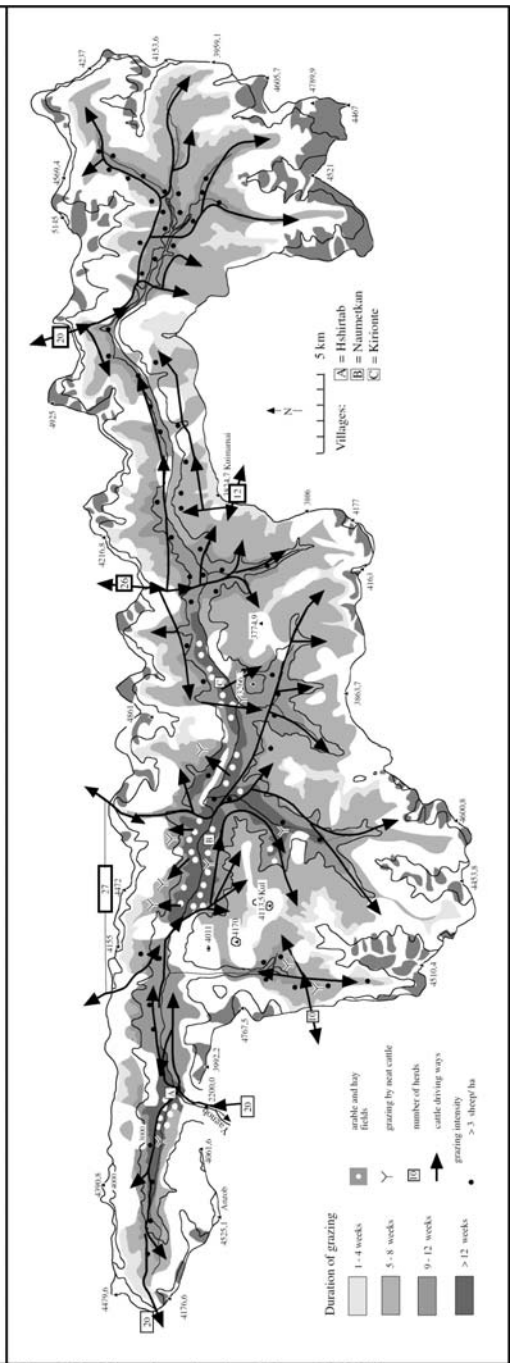


Fig. 16. Grazing in the Yagnob Valley (Situation: 1995)

Photo 9. Disordering of the sub-alpine landscapes near the shepherds' camp (kosh)

The richest pastures are situated in sub-alpine and meadow-steppe landscapes of north-oriented slopes. Disordering of these landscapes, generally focal, is attached mostly to the sites of permanent summer shepherds' camps – koshes (Photo **9**). Pastures of the south-oriented slope, at which location the duration of snow-covering period is shorter than in landscapes of the north-oriented slopes by 2–3 months, are beaten down to a large extent mostly now, with a sparse soil and vegetation cover, development of water erosion. These landscapes were used for early unregulated spring or late-in-the-autumn grazing of private livestock. Only in June was the livestock assembled and driven to summer pastures, where it was grazed up to October.

Now sheep flocks are driven from other regions in May (Fig. **16**). There are two types of livestock migration in the valley of the Yagnob River: sheep flocks of Yagnobis that live in Zafarobad and sheep from Fergana and adjacent Matcha. Yagnobis drive their livestock just along the main road Khudjand – Dushanbe. In June sheep flocks exhaust the mountain steppe and mountain meadow-steppe landscapes and in July – mountain meadows, returning to the mountain steppes in September in order to migrate from there for winter outside the Yagnob Valley, to the foothills.

In 1996, by our evaluation, up to 110 sheep flocks per season are grazed on Yagnob pastures (approximately 1000 sheep each flock), only a quarter of them owned by Yagnobis and their descendants living in other regions (Fig. **17**). According to data of 1995, 6 different groups are designated:

1) 26–30 flocks from Proletarsky and Naus districts (grazed in Gulbais locality);

2) about 10 herds of sheep as well as horses, cows and yaks from Anzob, grazed in Tagrich locality;

3) about 20 sheep flocks from Matcha (grazed in the neighborhood of Novobad locality);

4) 12 sheep flocks from Hissar (grazed between Novobad and Gulbais);

5) 28 sheep flocks from Aini (grazed in Kul and Tagob);

6) 20 sheep flocks of Yagnobis in the neighborhood of their core of settling and uphill (since 1975). Yagnobi shepherds accept also sheep of local Yagnobis in their flocks earning in repayment some food products.

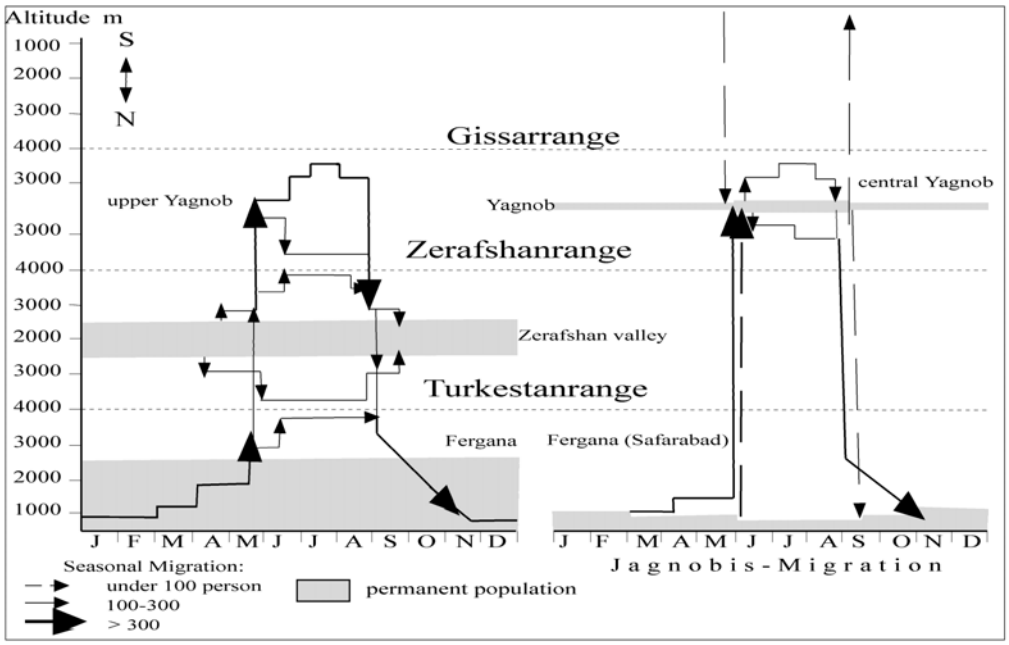


Fig. 17. Seasonale migration in the Yagnob and the upper Zerafshan valleys

Only in the latter case the livestock being grazed is private, in other cases it is mainly state-farm livestock joined with a certain part (it is always very hard to reveal the total number of this part) of private one.

Hayfields are attached mostly to flattened sites of the mountain meadow-steppe zone. Haymaking lasts from mid-June until August. But it is mostly in non-irrigated hayfields distributed in small plots in the areas not occupied by ploughed fields. At the present time, due to a small population, many areas that were formerly ploughed are occupied by irrigated hayfields, very fertile and favorable to local stock-raising (Photos **10**).

Photo 10. Arable land with barley (right), potatoes (center) and hayfield (left)

Among cultivated crops summer wheat, summer barley and peas are prevalent now. On the average the dates of sowing are the following (written down during interrogation): barley: beginning of May – August; wheat: May 20 – August 10; peas: May – August. Recently people in Yagnob have got down to active planting of potatoes and less frequently other vegetables. According to the words of Yagnobis, it is possible, in certain fields, to obtain a yield of up to one thousand quintals of potatoes per hectare. In adjacent Zeravshan potatoes have become a profitable product in recent years; mountain dwellers put them on sale in cities.

2.4.3. Anthropogenous transformation of landscapes

Maximum infringements of Yagnobi landscapes are related to the disordering of the soil and vegetation cover in mountain steppe landscapes of

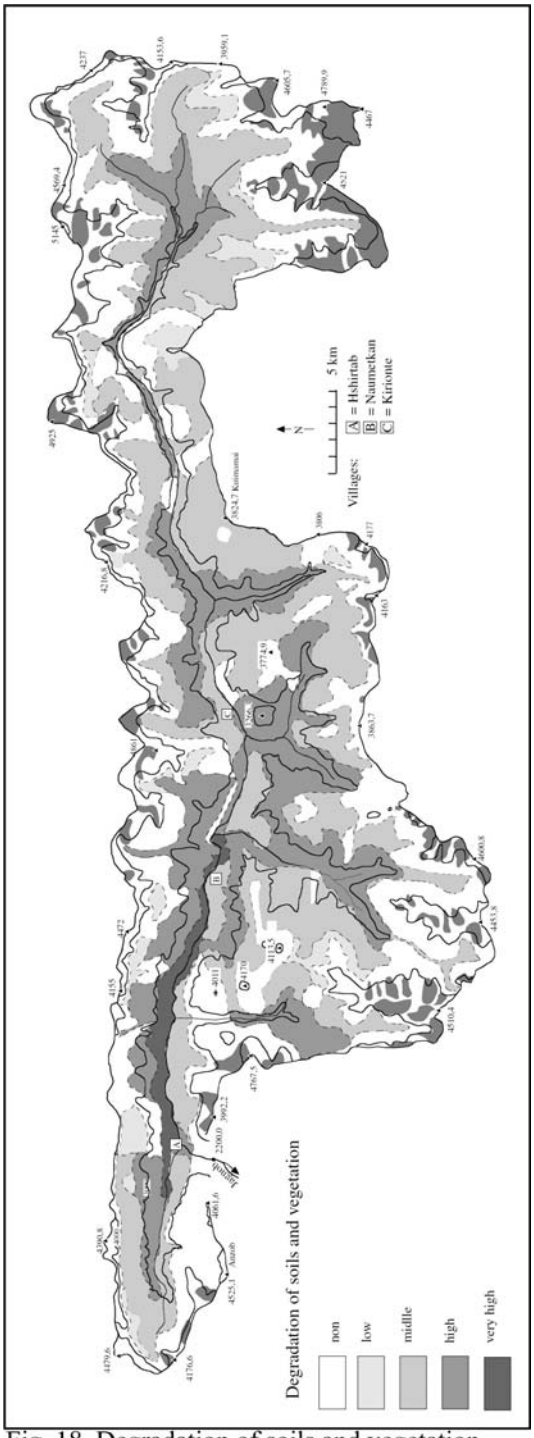


Fig. 18. Degradation of soils and vegetation

the southern aspect, degraded up to semideserts (Fig. **18**). Grazing is carried on for the longest time in those landscapes; furthermore they are frequently used for driving transit sheep flocks. Therefore a continuous network of «goatee paths» has been formed; projective covering of vegetation is less than 30 % which gives rise to the development of erosion processes.

Heavy infringements are also related to unlimited grazing on south-oriented slopes in mountain steppe and mountain meadow-steppe landscapes as well as in mountain meadow landscapes on relatively steep north-oriented slopes. The network of «goatee paths» is fragmentary there, and wormwood predominates in the herbage almost everywhere. Heavy infringements are related to some extent to landslip processes on terraced north-oriented slopes (former dry-farming lands).

Moderate infringements of soil and vegetation cover are typical for mountain meadow-steppe landscapes on flattened surfaces. There the regulation of grazing as well as of any other economic activity is under a strict control of local inhabitants. It can be stated, for instance, that landscapes of landslip slopes adjacent to river-bed under the meadow-steppe vegetation with irrigated hayfields, arable lands and settlements represent an example of a cultural landscape in the classical meaning of a mountain cultural landscape. Moderate disordering is also typical for mountain-meadow landscapes. Grazing reduces

projective covering there to 60 %, decreases the productivity by a half and promotes xerophytization of mountain meadows.

Small infringements are typical for distant and hard-to-reach sites of mountain meadows and steppes. Irregular grazing leads to selective eating of grass, consequently the species composition becomes scantier regarding the increase of the part of bunch grasses in the herbage.

2.5. Population and cultural integration

Photo 11. Peasant from the Margib village

As Fig. **2** and Table **1** show, the population of Yagnobi kishlaks has become rather different in course of time. Kishlaks of the Yagnobi core were relatively stable, especially kishlaks situated on the south-oriented slope (Pulraut, Kashi, Tagichinor), the population number being regulated there by the availability of irrigated arable lands. Fluctuations of population number in kishlaks situated far from the main core were much greater. As in many other mountain regions of Tajikistan, the cult of forefathers and honoring the elders is a priority in cultural and spiritual values. Each settlement represents, as a matter of fact, 1–2 (in some cases 3) clans – avlods extending their genealogy to a certain well-known ancestor – founder of the clan. In former times a rather important element of organization of Yagnobis were the so-called «sada» similar to Tajik «makhalla», i.e. associations on the basis of neighborhood but differing of them by the fact that «sada» associate one or several kishlaks situated side by side into a certain community. Within the framework of «sada» many important economic problems were solved, preparing and organization of festivities, construction and maintenance of bridges, etc.

Photo 12. The girl from the village in the central Yagnob Valley

Only first explorers of Yagnob, geographers and geologists, took note of the European appearance of Yagnobis. In Yagnob it is not done for women to cover themselves by shawls, as it is accepted in Muslim countries; however no women speak Russian in effect. Men are disposed to come into contact; they like to talk politics over a cup of tea, to joke, and are very hospitable as a whole.

Dwelling houses are very tidy, but low, practically without windows, with a high doorsill, with a minimum of decorations and extras. On the whole an original modesty and moderation in the everyday life, clothing, house furnishing, food, etc. represent a distinguishing feature of Yagnobis. Jugs manufactured formerly by women were characterized by a minimum ornament too. Yagnobis do not use alcoholic drinks in effect; they do not smoke; various herbs growing in Yagnob are widely used in food. According to the words of Yagnobis, they fall ill very seldom.

Almost each big kishlak has its own primary school; the teacher is usually the most literate man, very often without any special education. In the beginning

of the 20th century, according to M.S. Andreev (1970), women were more literate since they earned money by rewriting religious books. It is possible to continue the education in a boarding school in adjacent regions; in particular there was a boarding school in Marghib in the beginning of 1990s.

Ancient, pre-Muslim beliefs in holy rocks have remained up to now; there is a column having cult significance in the kishlak Sokan. As well as in many other mountain regions some superstitions have been kept: it is not acceptable to blow a fire, to shake water off after washing hands, etc. Muslim customs are often observed rather mildly, as was noted by some researchers still earlier. In effect there are no common hotel-mosques as in the case of adjacent regions. Frequently drawing-rooms of Yagnobis serve at the same time as premises for performing religious rites.

2.5.1. Integration features before 1970

Photo 13. The plough as a sign of the collective farm period in the Yagnob Valley

A spur to the development of industries related to the Russian influence gave origin to leaving outside for seasonal work and as a result also to greater contacts of Yagnobis. In particular, Yagnobis began to learn Tajik on a larger

scale in this period. Their earnings made it possible to hold out even in bad harvest years. The scheme of interrelations with the outer world was characterized by the intensification of one-sided centripetal links by remaining relatively close, with a minimum influence from outside. This period characterized in the most faithful manner the social portrait of Sogdians in their interrelations with nature, Yagnob apparently being left to its own resources. In the Soviet time three periods of integration are designated: 1920–1930; 1930–1950; 1950–1970.

In the first period Yagnob appertained to Iskander Volost of Samarkand Region. There were 8 so-called village committees that represented organs of the new government. In the Yagnobi core they coincided in many respects with the local forms of organization – «sada». This «soft» form of government lasted up to the organization of collective farms and village soviets in respect of performing different administrative functions, particularly taxation, etc. The revolution and consequent wars felled the economy of Yagnobis. So, before the revolution there were 300 horses in Yagnob, but only 4 of them remained (Andreev, 1970).

In the 30s, by the time of the establishment of the Tajik republic (before it was only Tajik autonomy within the limits of Uzbekistan), three traditional Soviet branches of power are traced in Yagnob: communist party, soviet (kishlak Naumetkan was the center), and collective-farm as well. In the lower part of the valley the Engels collective farm was situated and in the upper part – the Ordzhonikidze collective farm. Change of power affected first of all the treatment of land-ownership. Inadequacy of information about this period does not allow to make any specific conclusions in this respect. However it is known from available sources that collective farms were extremely poor and disadvantageous for the inhabitants. This fact was also related to objective natural preconditions: absence of areas large enough for collective work, absence of roads and no possibilities of mechanisms application.

A positive role of education is well-known – some primary schools were opened, but on the other hand we can only suspect negative sides of the cultural policy, for instance, in the domain of religion.

In post-war years the policy of subsidizing poor collective farms aimed at amplification of the stock-raising specialization, founding of cattle-breeding farms and a sharp increase of livestock numbers was quite evident. Up to the end of the 1960s many pastures were heavily degraded, as it is noted in certain works (for instance, Materials…1961). Frequently the investments in the economy of collective farms were unwarrantably raised too high. The policy of subsidizing resulted in the abandonment of many dry-farming lands on slopes (since it was easier to buy grain). This period is also characterized by an amplified integration of Yagnobis with Tajiks and Russians (every man ought to serve in the Army, and there he had to learn Russian inevitably).

The absence of roads side by side with a wide development of communications in adjacent territories (electricity, surfaced road from Leninabad to Dushanbe, etc.) pushed the inhabitants into official requests to authorities concerning the road construction in Yagnob. The complexity of connections with the center made troubles for the party and Soviet control as well. All these circumstances as well as the economic unprofitability of Yagnobi collective farms were probably conducive to the decision of the organs of government concerning the total eviction of Yagnobis out of the valley, alongside with other formal and informal reasons.

2.5.2 Actual tendencies of development

In the former Soviet Union forced resettlements were present both at global level (certain nations) and at regional (for instance, resettlement to cotton-growing regions from Karategin neighboring on Yagnob) and local levels (amalgamation of collective farms and settlements). Different reasons have been retrieved for the purposes of resettlement: formal (necessity of infrastructure development, eviction outside of hazardous geodynamic zones) as well as real ones (amplification of administrative control, reluctance to take charge of the infrastructure development, acquisition of manpower for cotton-growing, etc.). The main formal motivation for the eviction of Yagnobis was the resettlement outside of a hazardous geodynamic zone (decision of the Aini district executive committee of 27.02.1970). But the real reasons, to our mind, were: liquidation of the problem of an uncontrolled territory, reluctance to take charge of the infrastructure and the acquisition of manpower for the new-established cotton-growing districts.

Approximately 3 thousand people were evicted, 500 families being moved to Golodnaya Steppe (the Starving Steppe) (Zafarobad district) and about 200 to the vicinities of Dushanbe (see Fig. **3**). Thereupon the Yagnobi population network has been suddenly spread out threatened with the assimilation of the people and its total extermination. This course of events was impeded to some extent by democratic changes in the republic at the end of 1980s – beginning of the 1990s. Great attention was paid to Yagnobis. Schools with teaching in Yagnobi language were opened; a large number of publications about Yagnobis appeared; appropriate scientific disciplines were established at universities, etc. A very popular belief in respect appertaining to the northern Tajiks to Sogdians has played a very important part as well. It should be mentioned that even the use of the words «Sogd», «Sogdian» became more popular and replaced the word «Yagnobi». Everybody considered it as his duty to extend his genealogy to ancient Sogdians. Furthermore, the political situation evolved in Tajikistan in the 1990s played a certain part; it was characterized by a rivalry of regions - a step-by-step displacement of northern

Tajiks from leading posts in the republic. Restoring of the prestige of the Northern Tajikistan proceeded also through the search of proper regional features in its history. It is no accident that a region, on the whole loyal to communists, was soon renamed: instead of Leninabad Region it was named Sogdian Region.

However the spreading out of the area of Yagnobis occurred with a brusque collapse of its core. Approximately up to the beginning of the 1980s some families living in Yagnob managed somehow to avoid eviction. They played an important role keeping up with cemeteries (mazors) and receiving visitors – pilgrims to tombs of forefathers.

Abandoned lands were shared anew among free and long-term state land reserve (Tajikistan and Ordzhonikidze collective farms as well as summer pastures of Gancha and Naus districts of Leninabad Region). At the same time dwellers of neighboring Matcha have increased the number of their sheep driven to summer pastures in Yagnob.

As from the middle – the end of the 1980s the people have begun to return progressively to their native land. For a long time their status was formally illegal there since they were registered in effect in other places. After repeated publications in the media concerning the unique Yagnobi people and a subsequent official resolution of the Leninabad Region executive committee of 30.01.1990, homecoming to the Yagnob Valley became more appreciable. In particular, this resolution points to the administrative subordination of 286 people living already in Yagnob to the kishlak soviet Anzob. The delivery of foodstuff and manufactured goods by helicopter has been organized, 5 primary schools have been opened, teaching 52 pupils. It was programmed to reallocate the lands and to assign them to a new-organized collective farm. At the same time it was planned to set up a farm for sheep and 4 plant-growing work-teams, to allocate bulldozers, motor vehicles, diesel stations for lighting and building materials for the road construction to Yagnob.

With regard to the revival of the Yagnobi culture it is programmed to open university departments of the Yagnobi language, to organize a folklore band, etc.

However 20 years did not pass over for nothing for Yagnobis – new people grown up outside Yagnob have appeared. Semi-official directions concerning the propagation of the Sogdian origin and Yagnobis' auto-perception as Sogdians furthered to some extent the adaptation of Yagnobis in the conditions of Zafarobad district, quite new for them. Resettled Yagnobis did not strive to come back and make their home forever in their native land; they were content with summer visiting as shepherds, visitors or simple pilgrims. Yagnobis-Sogdians living in Yagnob permanently were hardly in a privileged situation. On the contrary, they encountered serious difficulties in the main (especially with the suspension of the state assistance in the period of the

collapse of the USSR). The process of homecoming for permanent residence was even slowed down. By and large the new resolution concerning the reanimation of Yagnob began to play a conservative role over and again, since it was more convenient for local inhabitants to spend the winter in relatively comfortable conditions (not far from Dushanbe or in Zafarobad district), and to come for the summer to their native land.

In mid 1990s a stable economic structure of the Yagnobi ethnos was formed in the valley: people living in Yagnob permanently (about 300 persons), people coming for the summer with shepherds (about 100 persons at once and about 500 per season with 23 flocks of sheep out of possession of 700 families of Zafarobad district), about 300 persons as constant and non-constant visitors, about one third among them having their own fixed private lands and the others helping to work the lands of their relatives living in the valley permanently that expect coming visitors to assist them.

Despite large areas of unoccupied lands, a control is effected until now of the ancient lands and sites, in which native houses and fields were located earlier. For people living in Yagnob permanently the potential of land resources exceeds very much the possibilities of working the lands. Therefore only the most suitable lands – gently sloping, situated near at hand, consisting of rather large plots are generally worked up.

Some 1–2 families on the average live in each Yagnobi kishlak that execute unofficial functions of control and reception of visitors. Relatively big Tajik kishlaks situated in the extreme East of the valley (Kirionte, Kiansi) are the exception. Each family works up 2 ha of fields on the average. The average productivity being about 10 quintals of grain per hectare, it is not sufficient, and about one third of the meal is bought additionally in adjacent regions (the situation in the mid-1990s).

The «Sogdian» policy giving the incentive to homecoming to Yagnob was supported for a certain length of time (in the beginning of the1990s) by subsidies for house-building and repairs. For a certain time helicopter flights were resumed, and there was even a shop in which it was possible to buy some foodstuff and to deliver sheepskins and wool. But this process was stopped all at once with the collapse of the USSR. Money just collected by local inhabitants for the road construction from the kishlak Marghib to Yagnob lost its value very fast. The road had been built only to the distance of 2.5 km from Marghib by that time. Local land owning collective farms involved Yagnobis only de jure and put in use only pasture resources, often using them excessively.

As a whole the aggregate space of existence for the Yagnobi ethnos and for many Yagnobis has been greatly spread out. At the same time the ancient core in the Yagnob Valley per se has been notably narrowed down at the time-space range, the intensification of grazing of sheep flocks driven from

adjoining regions on the ancient Yagnobi lands being not the minor reason. Seasonal disparities in the life of people have amplified abruptly. Only the necessity to look after livestock restrained many Yagnobis from leaving Yagnob for the winter. Altitudinal boundaries of arable farming and its intensity have been lowered, the population framework scattered, stationary pastures moved down closely neighboring on arable lands and settlements. The pasturable influence on nature grows. In the present period stock-raising is more profitable for those Yagnobis who bring private livestock every year from Zafarobad district for the summer and drive them to winter pastures in that district for the winter. This way of life is more profitable for Yagnobis as a whole and they would hardly strive to settle in Yagnob even if the road were built. Most likely, strengthening of pressure on the part of settlements populated by the Tajiks is to be expected. A more intensive growth of population numbers is observed just now in those villages.

The preservation of cultural arable farming traditions, architectural and other historical-cultural features of Yagnobis requires urgent measures to be undertaken. Now it is hard to say which one of the existing well-founded forms of preservation of the geographical environment would be the most acceptable for Yagnob. One thing only is clear, to wit the Yagnob phenomenon is to be the subject of further detailed studies within the framework of different programs, international ones as well, of preservation of unique nations, ethnic groups and their living environment.

Severe natural conditions of the Yagnob Valley in the course of many centuries, rigid influence of the Soviet «command» economy could not destroy the phenomenon of the Yagnob Valley. Where the origin of that stability is, what the framework and limiting bounds of existence of the Yagnobi ethnos is allowed to survive in the modern world, what the strategies of reaction to existing risks are, we try to outline answers to all these and other questions in the next part of the book.

3. Structure of the existential space of Yagnobis

3.1. About the concept of the existential space

3.1.1. Ethnographic sources

A complex methodological problem of time-space typology of development of the economy and culture of mankind in global and regional aspects has been solved by ethnographers in the very general outline. Within the framework of the world diversity of human communities and economical-cultural phenomena two particular types of cultural (ethnographic) communities are designated equally with social structures and peoples (ethnoses) – economical-cultural territories (ECT) and historical-cultural areas (HCA) (Levin, Cheboksarov, 1955).

ECT are complexes of peculiarities of the economy and culture formed in the course of historical development, typical for peoples living in particular natural-geographical conditions at a particular level of their socio-economic development (Levin, Cheboksarov, 1955). ECT is a unit of economical-cultural differentiation of the mankind; it can be used as an important socio-cultural unit in the course of a solution to specific problems of historical interaction of society and nature at the widest planetary level. A study of the ECT has shown that they are closely linked to the environment in their development, and this dependence can be traced very apparently through the allocation of different forms of agricultural activities. The ECT bring about the transformation of natural geosystems into their natural-anthropogenous modifications through a system of complex balance correlation links. The dependence of the ECT on the ecological conditions, in its turn, was always and everywhere mediated by the mode of production and the level of socio economic development of each people (Andrianov, Cheboksarov, 1972).

The ECT allows to generalize particular historical and areal forms of interaction of society and nature in connection with the development of production forces, economic specialization and cultural specifics. Principles of designation and classification of ECT are based on historical-genetic typology. At first groups of ECT are designated by greater or smaller productivity of labour (by the value of surplus product), then ethnographic parameters of the way of life are attributed (settled, semi-settled, nomadic), modes of production (irrigated, non-irrigated, stick-hoed) and at the lowest classification level ECT are attached to geographical zones using the schemes of agroclimatic zoning of the world (Andrianov, Doskach, 1983).

According to the scheme of ECT, at the turn of 19^{th} – 20^{th} centuries Yagnob appertained to developed ECT of settled arable farmers of the arid zone with irrigation. It is characteristic for this area that the advance of economical-cultural skills in the extreme natural conditions has reached up a certain

limiting level, very hard to be overcome further (especially in connection with the conditions of historical and geographical isolation). When all the possibilities of this type were exhausted, the economic and cultural stagnation began. High specialization and ecological adapting turned gradually from a positive factor into a brake for the progress of the economy.

Just at the beginning of the scientific and technological revolution the significance of ECT as specific socio-cultural systems of interaction of society and nature underwent quick transformations. At the present stage of globalization of the economy and technologies the economical-cultural types do not give adequate representation of processes that are taking place, although they have retained their basis for all that. Yagnobis of today as a single ethnos can hardly be referred to any one ECT.

Peculiarities of traditional-domestic culture are taken into account by ethnographers in the course of historical-ethnographic **zoning**, designating on the map of the world **historical-cultural areas** that represent territories in which many common features of material as well as spiritual culture of the population have been shaped in the process of long-time interaction and mutual influence (Andrianov, Doskach, 1983). Present-day ethnoses of mixed origin have been formed in the course of socio-economic, political, linguistic and cultural interaction of ethnoses within the limits of an area restricted geographically and historically (as in the case of mountain countries, and Yagnob as well) or wide socio-political associations – states. In each large historical epoch there was a specific system of provinces and regions of the Upper Zeravshan proper to that epoch. Opening up of new territories, transition to productive forms of the economy, coming-to-be of the class society and statehood, changing of relations to feudal ones, beginning of colonial conquests of 19^{th} – 20^{th} centuries can be specified as its key events. Before the appearance of class societies and states the boundary-lines of HCA were drawn mostly by natural geographical boundaries, but henceforth the role of political factors in the zoning of HCA has increased. Yagnob was characterized by a step-by-step contraction of the boundaries of the HCA to its actual position – location in the middle and upper reaches of the Yagnob River.

The ECT and HCA concept has been critically rethought from a position of the system theory by V.P. Alekseev (Alekseev et al., 1984) rightly pointing out the inexplicitness of many problems of structured ness, hierarchy, functional organization of ethnic entities and their environment on the basis of the concept of economical-cultural types. For a system model representing structural links in the «nature – man» system the concept of anthropogeocenosis is propounded. An important part in the development of anthropogeocenoses is played by mechanisms of adapting not only to the natural environment, but to the social one as well (so-called «social adaptability»).

A resolute step towards geography, taking into account factors of the geographical environment and landscape differentiation is represented in the concept of holding (vmeshchayushchij – *Russ.*) landscape (Kul'pin, 2000). The development of this concept seems to be very effective at a local level. At passing from local to regional level the sense of the concept «holding landscape» turns limited for explaining all the diversity of relationship of nature and man. Nowadays landscapes serving as living environment to large ethnoses, as in examples given by L. Gumilev, are hardly conceivable.

3.1.2. Geographical sources

Doctrine of the geographical environment

The human society in process of accommodating different landscapes has not only adapted its economy to nature, but also adapted and transformed that nature and created the essential cultural environment conforming to the trends of economic activity and the way of life. In the course of historical development these two components, nature and society, interrelated and interdependent from the very outset, have created a new objective and existing in reality differentiation of spatially localized systems. At the present moment the concept of the geographical environment performs mostly methodological and scientific-cognitive function. The attempts of further development of this concept, classification of geographical environments, unfortunately, have not found wide response among geographers. This concept, in application to building up models and conceptions of interaction of man and nature, can be compared with such a capacious term as territory.

Notions of cultural and natural-anthropogenous landscapes

L.S. Berg has formulated the definition of landscape as follows: «Geographical landscape is a definite aggregate or grouping of objects and phenomena in which the peculiarities of relief, climate, waters, soils, vegetation cover and fauna, as well as man's activity merge into an entire harmonic whole reiterating typically all over a certain zone of the Earth». (Berg, 1915, P. 8). In the above-cited quotation the idea of L.S. Berg of a harmonic landscape entirety not only of natural complexes, but also of the man's activity should be especially emphasized.

Unfortunately, for a long time (up to the 70s) the predisposition to exclude man and his activity from the sphere of direct study was prevalent in the Russian classical landscape science. Only after the appearance of the works of F.N. Milkov concerning anthropogenous landscapes (1973) and the substantiation of the concept of a geotechnical system (Nature, Engineering, Geotechnical Systems, 1978) interest in studying cultural (or natural-anthropogenous) landscapes increased greatly. At the same time the problem «man – landscapes» was always paramount for German and French schools of

landscape science. In modern German literature the concept of landscape is considered just as cultural landscape. In last discussions initiated, in particular, within the framework of the workshop of the Moscow State University «Cultural landscape», the natural landscape is pointedly opposed to the cultural one. The natural landscape carrying the resource significance, risk of life activities (destructive natural processes), the cultural landscape is answerable for spiritual and cultural-aesthetic aspects of life.

Natural-anthropogenous landscape is interpreted as a landscape transformed in either event by the economic activity that represents a resource-reproducing geosystem and man's living environment. In the up-to-date definition of natural-anthropogenous landscape the notions of history and genesis of landscape, its morphology, dynamics and functioning, anthropogenous transformations, etc. are used.

In spite of sound methodological grounds and practical developments the concept of natural-anthropogenous landscape does not embrace all the diversity of geographical types of territories, in which the priority factors of development and maintenance of stability are the elements of landscape institualized by the socium.

Living space

German-speaking scientists approached the most closely to the explanation of natural-social relationship in their entirety in the concept of living space – "*Lebensraum"*. However the works begun as long ago as in the 19th century were subject later to geopolitical development by the ideologists of Hitlerite Germany that discredited this area of study. The development of these ideas at the present time takes place in Switzerland. The optimistic model of P. Messerli (Messerli, 1989) mirrors a certain consensus of the mountain community with nature basing on the experience of assimilating the living space (*Lebensraumerfahrung*).

Conception of sustainable development

Among the models of sustainable development of the mountain areas the models oriented to the isolation of social, natural (ecological) and economic constituents of the sustainable development stand apart (for instance, Baetzing, 1994) (Fig. **19**). Such models reflect the inadequacy of development of the economic progress in Alpine European countries to the level of application of modern technologies of the use of natural resources and to the perspectives of the social forms of organization of mountain communities. But in Yagnob economic, ecological and social components are very firmly linked with each other representing an indissoluble entirety. This fact comprises both a positive moment (a certain harmony of existence of nature and man) and a negative one (low degree of sustainability in the case of impact from outside).

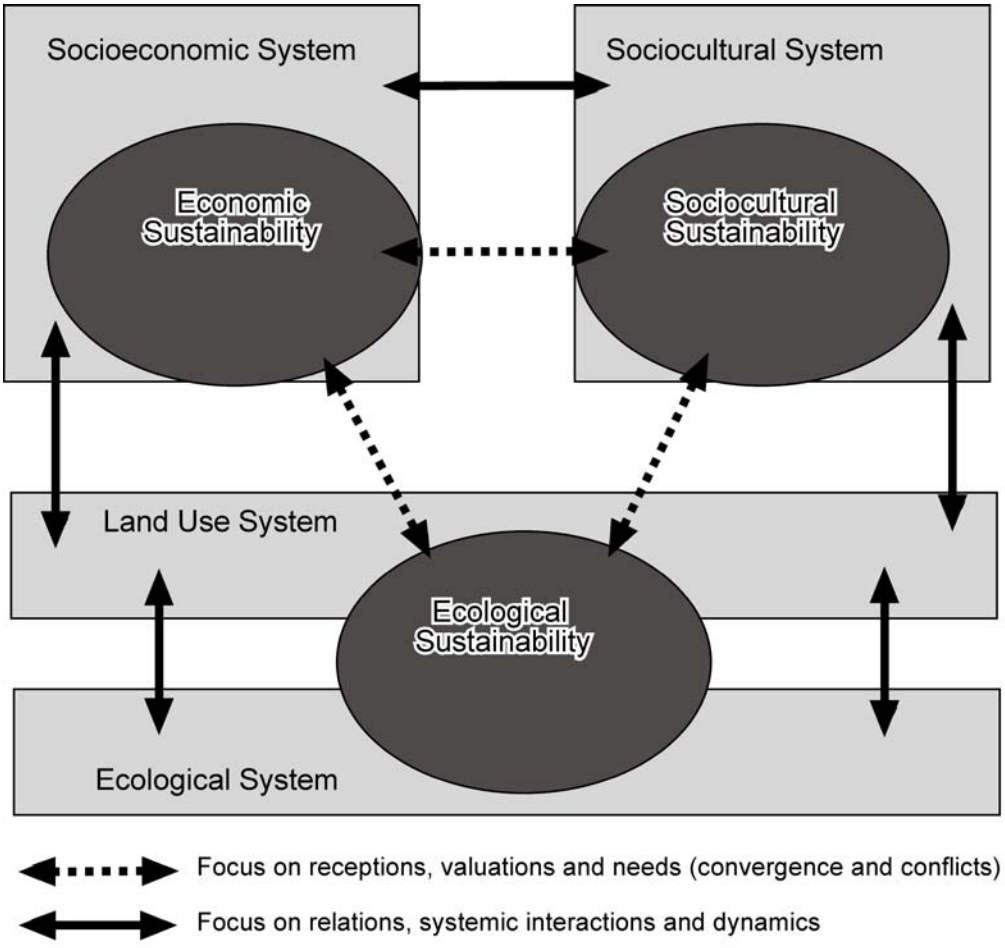


Fig. 19: Assessment and impact in the "magic triangle" of sustainable development (Wissman, 1993)

3.1.3. Sociological sources

Precipitated development of sociology, especially in the second half of the 20th century, forwarded a new notion of space and environment as a purely social phenomenon (for instance, Giddens, 1999), the size, the form and other characteristics of the space-environment being determined by the behavior of people. The behavior of people, in its turn, as a complex mechanism, is characterized by different share of involvement of socio-public, spiritual-religious and other norms, rules and stereotypes of behavior. In the extreme natural conditions these norms and rules are mediated to a large extent by natural structures and processes. The natural condition gives a theatre stage

bounded and structured in full measure – space of existence or existential space (ES). Taking into account the hierarchy of social organization ES of a particular individual, family, social-kindred group, clan (for instance, avlod), neighborhood (for instance, makhalla, sada), ethnic group, ethnos, nation, etc. can be allocated. The study of the Tajik avlod is presented, for instance, in the works of V.I. Bushkov (1991), the research on the ES of a family taken separately is a very popular area of study among modern western sociologists. As to the ES of an individual (so-called behavioral space), this problem is so complex that there has been no general theory of individual behavior till now, and the solution of this problem is a matter of joint interests of philosophy, psychology and other disciplines.

Thus, the existential space is an aggregate space of life activities of a social element of a particular rank (individual, family, settlements or ethnos), in which all kinds of possible acts of behavior and activity aimed at self-preservation and self-development of the concerned individual or community are realized. The existential space consists of a set of different subspaces that can be conventionally assembled in three groups:

- resource-material space;
- social space;
- spiritual-cultural space.

An important part in trajectories of behavior is played by ritualized stereotypes of behavior expressed in so-called institutes. The institutes represent a social level of people's self-organization not legalized on paper yet; there are no strict rules and laws attributed to it. The institutes rank higher than stereotypes of behavior that can arise from time to time, but can not be transmitted from generation to generation. According to P. Lindner (Lindner, 1999) institutes have the following characteristics: everybody knows about them, they are accepted legitimately (in part involuntary), education passes simultaneously with their existence, they are stable during a certain relatively long period of time. In Yagnob the following examples of institutes can be referred to: the institute of land-use (distribution of fields, hayfields, system of grazing, watering), organization of local communities «sada» that are informal and were existing even in the period when there were rather many branches of power in Yagnob (party, collective farm, soviet, etc.).

Institutes consist of representatives-actors themselves (in our case Yagnobis), socio-public norms (inherited norms, traditions, religious influence, etc.), leading idea (in the case of «sada» it is the optimum social organization allowing to mitigate severe natural conditions) and the nearest environment of material valuables. In the conditions of a close relationship of nature and socium, as it is the case of high mountains, it is often hard to define which motives of behavior are mediated by the social environment and which of them are related to a rigid necessity to survive. In the conditions of high mountains such mediation is a result of a two-way process of determination – adaptation in the «nature – man» system.

3.2. Existential space of Yagnobis

The explication of many processes and characteristics of the ES occupied by the ethnic group of Yagnobis-Sogdians is impossible without thorough studying of geographical processes, such as relief, climate, vegetation and soil cover; complex notion of landscapes and the territory as a whole.

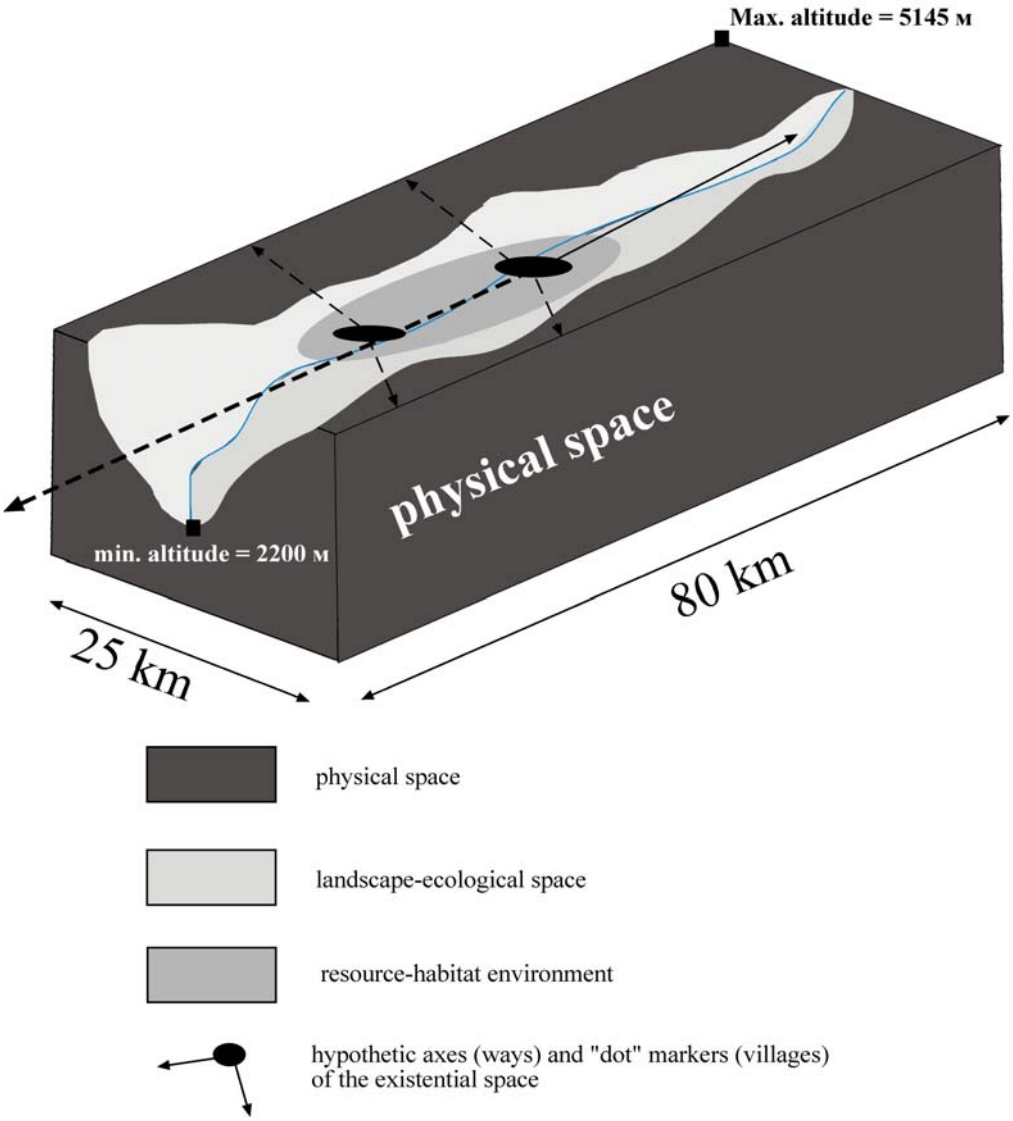


Fig. 20. Existential space of Yagnob Valley

As Fig. **20** shows, the ES enters into landscape and physical spaces, the resource-material part of the EP totally forming part of landscape and physical spaces. As a result of our research it was detected that the resource-material space is characterized mostly by areal projections and properties, as long as social and spiritual-cultural spaces that have a more complex multiplex nature are projected to the geographical space through axes and nodes. Thus, the geographical projection of the ES is delineated both by areas and by lines and points-nodes that represent axes and markers, in which resource-material, social and spiritual-cultural spaces converge and intersect. The geographical framework of the ES can be characterized through the following structural blocks and their properties:

Areal elements: boundaries (external and internal), structure and time-space size, anisotropic characteristics (for instance, seasonal anisotropy), hierarchy of space, capacity characteristics, etc.;

Linear elements: space characteristics of axes of the ES (orientation, links with areas and «dot» markers);

Dot elements: space characteristics of nodes and other «dot» markers of the ES (position, links with areas and axes of the ES).

The characteristics of dynamism of stability of the structural blocks of the EP as well as risks of development represent its important properties.

Structural blocks and characteristics can be both of natural origin (involved, borrowed in nature) and of social one (worked out in course of self-development of the socium or borrowed in other social systems, including also supersystems).

External boundaries

The ES of the Yagnob Valley has relatively well-defined boundaries that coincide with the watershed of the Yagnob River and pass in lower reaches by a narrow canyon separating Yagnob from the rest of the world. The natural boundaries, on the one hand, protect Yagnobis against assimilation, and on the other hand hinder from a normal intercommunication with the outer world. Low accessibility of Yagnob has conditioned a high degree of autonomy of its ES, allowing to evolve such mechanisms of self-sustaining development that have preserved the originality of Yagnob. The events of the beginning of the 1990s presented a vivid example of the positive effect of the isolated position of Yagnob. The collapse of the USSR has led to an acute aggravation of well-being of people all over Tajikistan. In many regions wars and even famine took place. Impoverishment affected first of all mountain valleys of low productivity situated generally not too far that had been oriented in the Soviet time to subsidies and assistance of centers. But in Yagnob social cataclysms were relatively less painful, the share of natural

economy attaining almost 100 % (Fig. **21**). It was just in the beginning of the 1990s that young families of Yagnobis that were out of work in cities began to move to Yagnob.

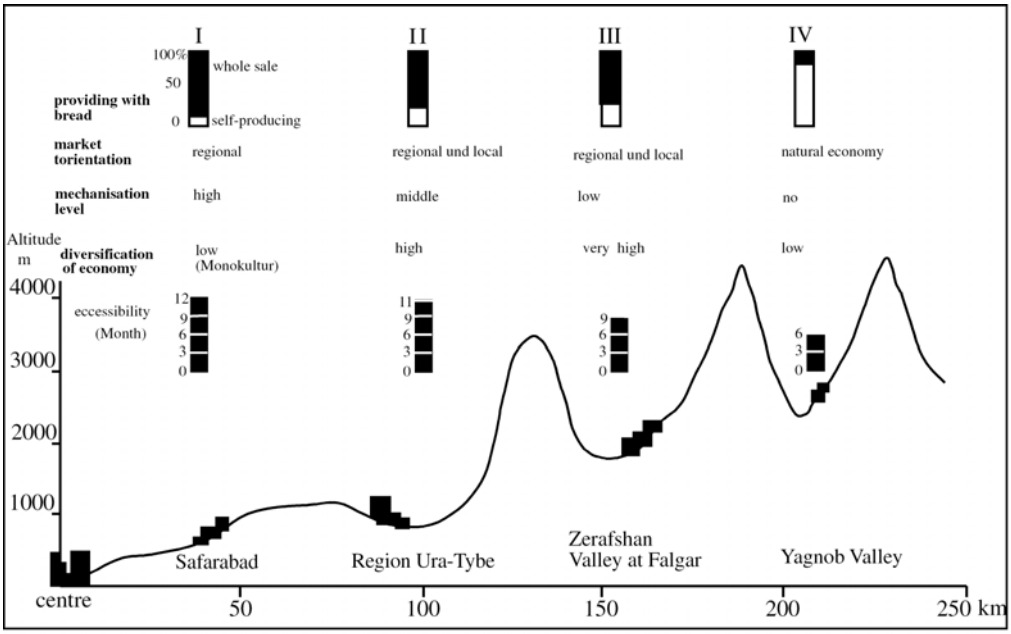


Fig. 21. Centre-periphery relationships in the 1990s

Time-space size and seasonal anisotropy of the ES

Yagnobis spend the most part of their time in the arable farming core during a warm season. If the altitudinal-seasonal use of natural resources were pictured as an arena of activity of Yagnobis, less than a quarter of that arena only would be involved in substantial life, the most favorite site making less than 2–3 % of the whole «arena». About 6 % fall to minor episodes and some 15–18 % – to rare ones (Fig. **22**). The rest of the territory is as a matter of fact a silent witness to the life of Yagnobis, the interior not involved in the material production. After the eviction of Yagnobis in 1970 their ES underwent considerable changes. The game space has restricted, and more attention was paid to minor episodes (in the concerned case to stock-raising improper to Yagnobis being traditionally arable farmers) was given up.

Hierarchy of the existential space

Based on the analysis of maps that had been created: hydrothermic differentiation, slope processes, duration of snow-covering period, snow avalanches hazard, vegetation, landscapes and land-use, the map of different potential of usage has been produced (for the arable farming – stock-raising type of economy) that defines real zones of determination in the ES of Yagnobis (Fig. **23**).

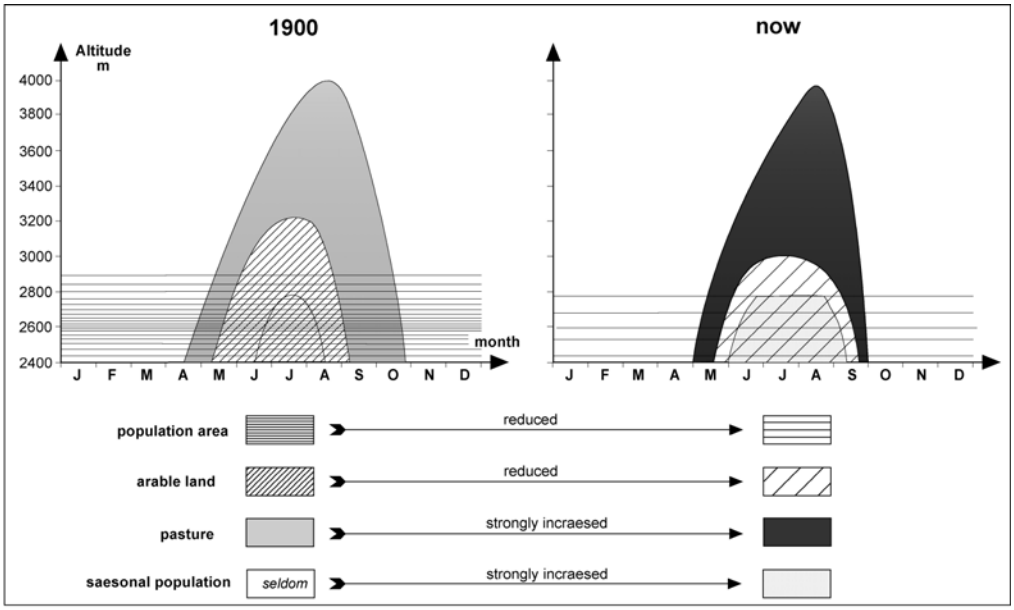


Fig. 22. Land use change in the Yagnob Valley

The zone in which permanent life activity is possible all the year round consists of 7 broken areas. Maximum absolute altitude of this zone is of about 2800 m. Nowadays only 4 of these areas are habitable. The second zone is represented by the areas in which seasonal very risky arable farming and stock-raising are possible (up to 3000 m). This zone does not exceed very much the first one by the area, enlarging gradually in its lower part proportionally to lowering of the absolute altitude.

The third zone is free only for seasonal pasturable stock-raising in the summer time and is bounded from above by the fourth zone, in which life activities and the use of natural resources are not possible (unless the potential possibilities of this zone for mountain climbing were taken into account, of course). The upper boundary of the third zone coincides with the boundary of mountain snows and glaciers, hard-to-reach steep and crumbling-scree slopes lacking in vegetation cover.

Landscape-morphological conditionality of the ES structure

As it was shown in the book part relating to the use of landscapes, at a level of types and subtypes of landscapes a rather appreciable correlation of the main types of use of natural resources has been noticed. The most «strong» boundaries are: the boundary between nival-glacial and mountain meadow landscapes that represents as a matter of fact the upper boundary of pasturable stock-raising; the boundary between mountain steppe deserted landscapes and the mountain forest-shrubbery belt that passes by the bottom of the valley and

Fig. 23. Zones of different land use potential

reflects the aspects contrast. Other boundaries are rather fuzzy and have usually transition zones from 100 up to 300 m in width.

As to the types of land-use, they also interchange with altitude gradually. More distinct correlation of types of land-use with landscapes is observed at a rank of 26 groups of landscapes that have been designated (see section 2.3.8.). Besides, the principal role in the distribution of types of land-use, areas of arable fields and hayfields within an altitudinal landscape zone is assigned to the presence of aleurite. Loess-looking loam of landslip slopes of the mountain meadow-steppe zone is of a special importance for the landscape-formation, the main areas of arable lands and hayfields as well as settlements of Yagnobis being attached to those sites.

In general at a level of the whole Yagnob Valley some directions or axes of landscape-geographical selectivity stipulated by the landscape structure are explicitly exhibited, such as: the altitudinal-zonal axis (intensity of use of natural resources decreases with increase of absolute altitude), substratum (preference is given to landscapes with a cover of loose deposits), etc. At a local level a micro-zonal allocation of dwelling houses and fields can also be stated. So, it is to be noted, citing the kishlak Kashi as an example (Fig. **24),** that all irrigated lands are situated lower than dwelling areas, this fact facilitating regulation of water supply, use of pure water for drinking. The extension of the

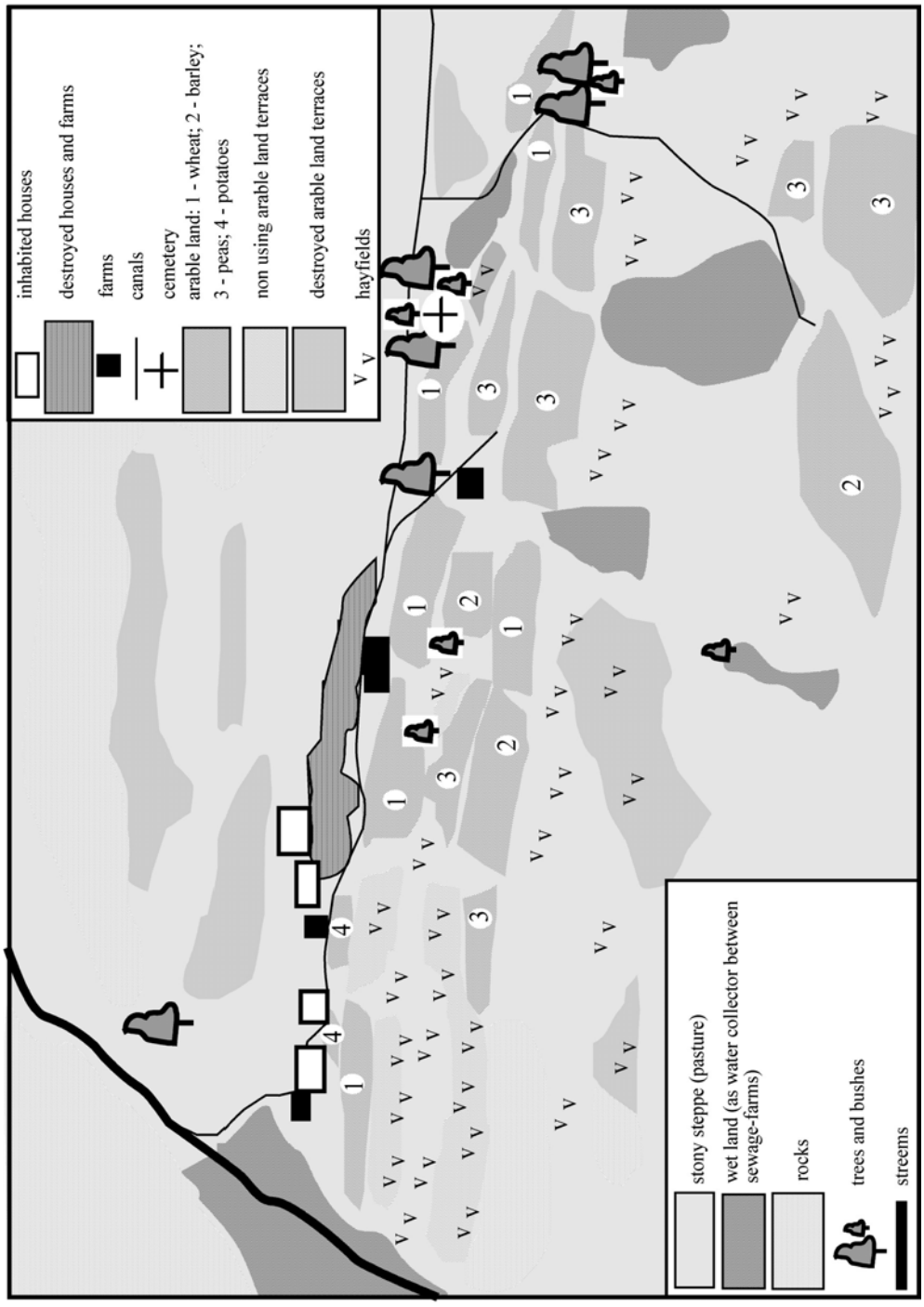


Fig. 24. Kashi village: surroundings and land use (1995)

kishlak up the slope is restrained by outcrop of rocks under which the kishlak is located, and its extension down the slope – by the presence of lands valuable for the purposes of agriculture.

Landscape-ecological conditionality of the ES structure

From the point of view of landscape ecology the landscapes of Yagnob can be conventionally subdivided into protective, protective-productive, and productive landscapes, so-called niches (Fig. **25**). A landscape-ecological ES structure can be considered as an optimum one when protective landscapes are put out of use or under protection, the use of protective-productive landscapes is regulated; productive landscapes are involved in the economic use to a maximum possible extent (the structure of cultural landscapes is maintained this way) and the niches are to be used only in exceptional cases (in dry and other unfavorable years). But in fact the landscape-ecological ES structure is not taken into account in the existing system of land management of Yagnobis. It is observed:

- uncontrolled use of protective-productive landscapes (for instance, mountain meadows, pasturable);

- under-using of productive landscapes (mountain meadow-steppes) leading to the destruction of cultural landscapes;

- abusing use of the landscapes of «niches» (grazing in forest-shrubbery landscapes);

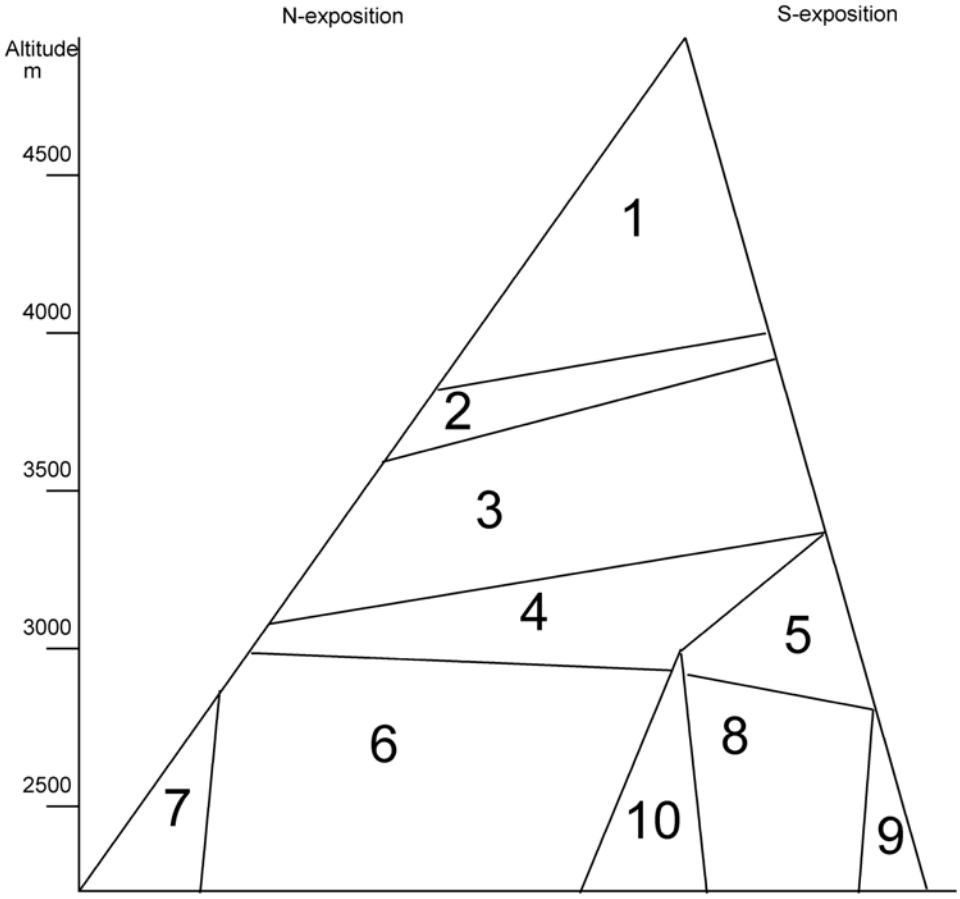
- a specific type of landscapes has appeared – shrubbery steppes degraded up to semideserts.

Introduction of measures prohibiting the use of these or those landscapes will be hardly effective in actual conditions, when Yagnobis are on the verge of survival. The elaboration and inculcation of measures of rational use of the landscape-ecological ES structure can be more fitting.

ES capacity

The value of capacity helps to answer a question of how many inhabitants can the Yagnob Valley support at the existing level of application of the technologies of use of natural resources. The main limiting factor of Yagnobis' livelihood is the quantity of agricultural lands – arable lands and hayfields (the quantity of pastures exceeds the needs of Yagnobis). Therefore data concerning the pressure on agricultural lands of Yagnob correlated to the number of inhabitants have served as initial material for the analysis of the ES capacity. For these purposes statistical data on the population number dynamics in Yagnob since 1870 have been used (Aminov, 1873; Sobolev, 1874; Virsky, 1890, 1906), as well as values of the area of lands potentially fit

for agriculture calculated as a result of conjugate landscape-ecological analysis and cartometric measurements.



Protective landscapes:
1 -nival-glaciale

Productive landscapes:
10 -mesotherm-montane meadow-steppe
on the slope terraces (arable and village area)

Protective-productive landscapes:
3- alpine meadow zone
4 - alpine bush zone
6-mesotherm-montane meadow-steppe
8 - xerotherm-highmontane shrub-steppe

"Nisha":
2 - subnivale zone
5 - xerotherm-(subalpine) highmontane forest-steppe
7- mesotherm-highmontane bush

Degrade landscapes:
9-xerotherm-montane shrub-steppe

Fig. 25. Hypothetic landscape-ecological structure of Yagnob Valley

As a result of correlation of these two values the index of specific pressure on agricultural lands for a hundred years (1870 – 1970) has been calculated. The technique of calculation included two stages. At the first stage the quantity of lands potentially fit for use in arable farming was determined a in cartometric way for each kishlak taken separately (steepness of slopes, aspects, altitude above sea level, presence of aleurite, water supply, suitability for cultivation and input of fertilizers, etc. have been taken into account). The most complex thing was to delineate boundaries between agricultural lands of different kishlaks. We used for this purpose both the information obtained from local inhabitants and landscape-ecological assessment (delimitation by natural elements of landscape – rivers, rocks). In many cases boundaries of agricultural lands of different kishlaks coincided with natural boundaries. In the case of a nearby location of two and more kishlaks the total area of lands was calculated and it was then divided conventionally into equal parts between kishlaks. At the second stage the share of the area of agricultural lands per one family of the concerned kishlak was calculated.

These calculations have shown that, in spite of dispersion of values, the lower threshold characteristic for the whole of the valley is distinctly designated – about 5 ha per family.

It is an interesting fact that in the statistical analysis of distribution based on its density, the following threshold values are 4-, 10- and 20-fold values of the minimum, i.e. 20, 50 and 100 ha per farm-holding respectively. Those values characterize different kishlaks situated in different parts of the valley. Furthermore, the farther from the main core of settling (minimum quantity of lands potentially fit for arable farming), the more land (as a rule, of worse quality) per an average family is available and the larger are the dynamics of the population number fluctuations for the studied period.
These conclusions gave an impulse to new cartometric calculations based on the hypothesis that not the quantity but the quality of lands is a key question of stability. More detailed cartometric measurements in the core of settling of Yagnobis allowed to subdivide lands that can be potentially used for arable farming into two categories (see Table **4**). A diagram of distribution of the potential arable lands of the first (higher) category has been charted allowing to define more precisely threshold values of availability of arable lands being in fact the most accessible in an average kishlak (Fig. **26**). Large-scale mapping (in particular, in the territory of the kishlak Kashi, see the next book part) has shown that kishlaks with the share of irrigated lands fit for arable farming taking up not less than 20 % (up to 50 %) of the area of lands surrounding the kishlak are in the best situation. Other lands are either useless for arable farming or positioned too far (second category). In this case not less than 2 ha of arable lands per average family is required. Such kishlaks are represented only by a small group on the south-oriented slope (Tagichinor, Kashi, Bedef, Petif, Pulraut). So then, a 20–50-percent provision of kishlaks with lands of the best quality is characteristic for the steady core of Yagnobis.

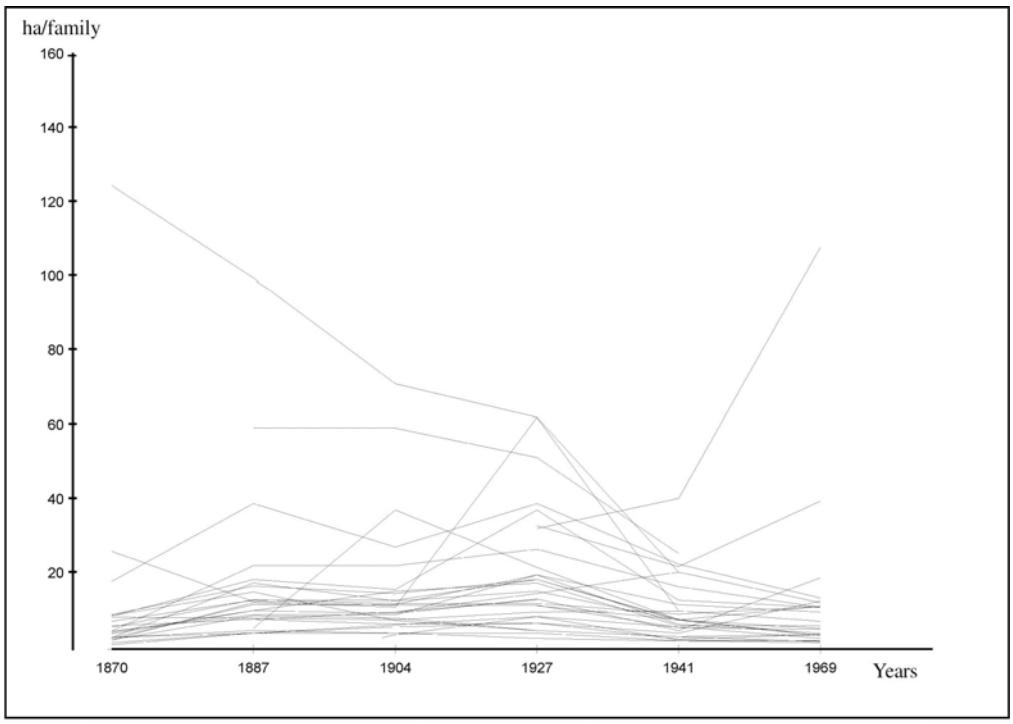


Fig. 26 . Distribution of potential agroclimatic area (category "A" - Table 4) suitable for the arable land among the Yagnobian villages

In the case of being provided by less than 20 % (i.e. additional area of arable fields is recovered at the expense of outlying, generally dry-farming lands) the risk of agriculture increases sharply and more appreciable surges of population shifts take place. The second zone of capacity is characterized by fluctuations of the share of arable fields within the framework of surrounding lands within the range from 20 % to 5 %. Cases of being provided with arable fields by less than 5 % at the expense of lands located near at hand are observed very seldom, they are inherent only in fragmentarily arising and disappearing kishlaks outside of the main zone of Yagnobis and populated mostly by Tajiks (for instance, Novobad).

Optimum of the ES

The above-cited characteristics of the ES, in particular its capacity and hierarchy result in the concept of an optimum of the ES as a space providing the self-preservation of the Yagnobi community and its cultural landscapes. The optimum of the ES is expressed the most distinctly in its resource-material subspace, to be exact in the zone of 20–50 % provision of kishlaks with lands ensuring relatively steady yields from year to year a crop. Only in this case the existence of the Yagnobi ethnos is insured, secured to some extent, natural-landscape factors remaining as though invariant, put «out of

brackets», and the sustainable existence depends on the ethnos itself, its conservatism in the application of technologies of the use of natural resources.

Space axes and markers-nodes characterizing the spiritual-cultural and social subspaces of the aggregate ES

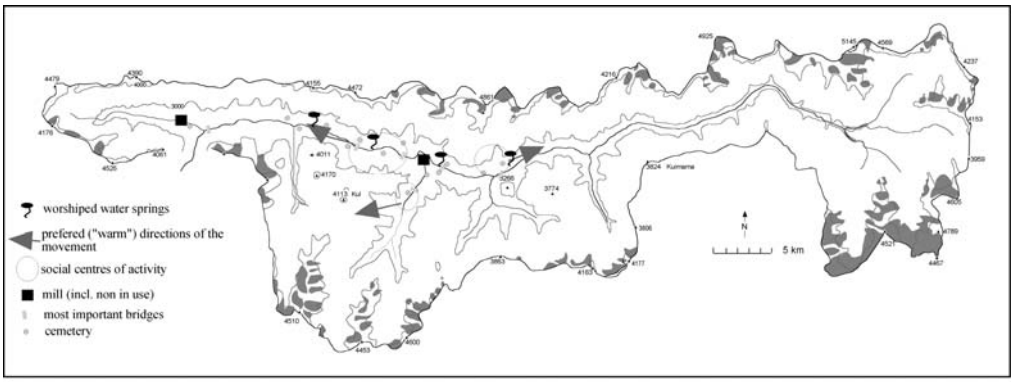


Fig.27. Social and spiritual elements of existential space of Yagnob Valley (examples)

First of all, the axes of social and spiritual-cultural space are to be the roads linking Yagnob to the other world. Pilgrims pass by roads too, preferring particular paths and saddle-points. Based on the interrogations of the population we have also specified «warm» traffic directions that are especially favored by the population (Fig. **27**). The main marker-nodes of social and spiritual-cultural space are:

- mazors in which founders of the clans (avlods) are buried; those sites are unofficially guarded, wooded vegetation is growing there, since all trees in the neighborhood were destroyed a long time ago as a result of grazing and firewood stockpiling;

- water springs; there are among them especially venerated ones;

- notable rocks and summits;

- bridges;

- mills;

- resting sites for travelers.

The Fig. **24** reveals a sharp differentiation: kishlak – mazor. There are practically no fields of the kishlak Kashi dwellers to the rear of the mazor. For people that spent all their life in Yagnob each scrub and stone is specifically loved, labeling the ES as marker in a specific manner.

3.3 Dynamics and stability of the ES: limiting factors and hazards

Within the limits of existing socio-historical type of use of natural resources there are five most important types of hazards and risks threatening to destroy the structure of the ES that has been shaped up:

1) Hazard of earthquakes. A huge number of landslips (Fig. 9) testify to rather active earthquakes. In spite of the significance of this type of hazard its analysis is the matter of the present work.

2) Agroclimatic risk. Early sowing and heating of the soil is seriously hindered by strong snowfalls in March – April (almost 50 % of total annual precipitation), extending the duration of snow-covering period. As it was already specified, Yagnobis scattered the snow with earth in order to stimulate the process of snow melting. On the other hand, insignificant values of precipitation from June to September (10–15 %), being moreover unevenly distributed both within these months and from year to year (every 4–5 years a strong drought takes place) (Fig. **28**), augments the risk of dry-farming. The area of irrigated arable fields with relatively stable yields can satisfy the needs of grain only by fifty percent. Very poor harvests of grain (8–10 quintals per hectare) on dry-farming lands in the situation of frequent droughts aggravate the risk of famine. Furthermore, the productivity of stock-raising capable of providing supplementary means if needed for buying additionally some bread goes down in dry years too. If such a situation were repeated within several years, spontaneous migrations arise. Too large areas of dry-farming lands frequently play a fatal role for the kishlaks situated in the upper part of the valley. At the same time a constant, even if restricted, balance of irrigated and dry-farming arable lands (the central part of the valley) reduces the risk.

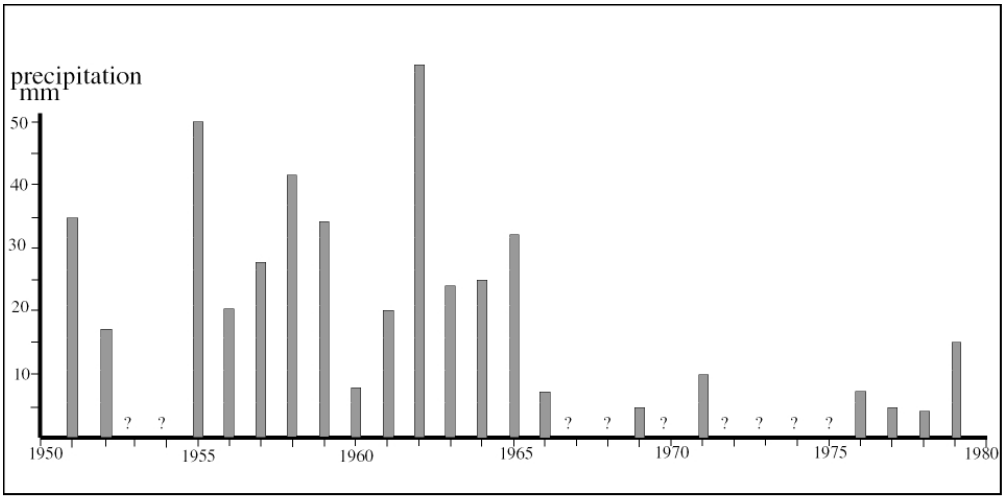


Fig. 28. Precipitation in June and July, weather station Iskander-Kul, 2,204 m a. s. l.

3) Hazard of slope processes. Snow falling in March – April furthers the snow avalanches descending. Avalanche mountain snows hold out in the lower sections of slopes right up to August (in 1993, for instance). Landslips are the second factor of frequency and catastrophic character; they are activated from time to time by frequent earthquakes. The development of the water erosion processes is originated apart from anything else by the economic activities causing the degradation of the vegetation cover, compactness of the upper strata of the soil due to overgrazing. Therefore the hazard of slope processes is interlaced with another kind of hazard, to wit **anthropogenous degradation**. Special attention should be given to the degradation of the soil and vegetation cover related to overgrazing. Nowadays, by our estimates, up to 100 sheep flocks are grazed in Yagnob pastures every season, only a quarter of them being owned by Yagnobis and their descendants living in other regions. Grazing of more than three heads of cattle per hectare causes the depletion of species composition (for instance, spreading of wormwood in all parts of the alpine zone), development of slope processes. The vegetation is degraded to a particularly large extent along cattle tracks (lower part of the valley from Bedef to Khshirtob). Earlier (in the pre-Soviet period) the livestock number in farm-holdings of Yagnobis was regulated by the availability of fodder for the winter, which was determined in its turn by the quantity of hayfields.

4) Risk of overpopulation. At the present time this risk can hardly threaten Yagnob, since the homecoming to Yagnob of the inhabitants from Zafarobad district has decreased notably. Arable lands are available in plenty, there is not enough manpower. It can not be completely scorned however,

since the homecoming Yagnobis now have just other, heightened requirements and are not familiar with the skills of traditional agriculture.

5) Socio-political risk is related both to directive decisions of central authorities (the eviction of 1970 can be cited as an example) and to gradual «degrading» of ethno-cultural traditions of use of natural resources on account of contacts (of young Yagnobis, for instance) and acquiring other methods, forgetting thus the experience of forefathers. The destruction of the resource-material subspace of the aggregate ES of Yagnobis in 1970 did not exterminate them as an individual ethnic group, first of all owing to firm links with the spiritual-cultural and social subspaces remaining intact. On the whole the eviction of Yagnobis created a precedent allowing to find an answer to the immemorial question, what is more important – material or spiritual. In our case the spiritual-cultural constituent of the ES appeared more important than the resource-material one. Now it is hardly possible to restore the resource-material space of Yagnobis in its initial state (and it is hardly worth it); it has changed into just a part of the more extensive space of existence of the present-day Yagnobis. The approach to the problem of optimization and developing of measures of sustainable development should be based just on this feature of the ES of Yagnobis.

4. Opportunities and problems of sustainable development

4.1. Initial items and probable scenarios of the development of the existential space

Rigid dependence of the type of use of natural resources on natural conditions and processes as well as outlying and hard-to-reach position have set bounds to the development and application of new methods of economic activities (mechanization and diversification of the economy, development of infrastructure, etc.). The analysis of available information relative to the history of development of population and economy in the Yagnob Valley has shown, that Yagnob represents an example of typical peripheral and isolated development, mirroring the evolution-dynamic state of natural-economic interrelationship at initial stages of its development (Table **6**):

1) The Yagnobi arable farming ranks in the dynamic series of *application of production implements* between hoe and plough land cultivation. The application of draught power is limited by fields apportionment into small plots, steepness of slopes. The application of large-sized mechanisms in the years of extensive subsidizing of Yagnobi collective farms did not bring success in view of complex natural conditions.

2) The *commodity economy* is missing. The natural economy constituting the core of the whole natural-economic system is prevalent. Arrangements of small-scale cattle breeding on the basis of organization of commodity dairy farms in Yagnob in 1960-es did not bring any success either. They were substantially hindered by a long winter and extended period of keeping cattle stalled requiring considerable reserves of forage.

3) Yagnob represents a unique phenomenon by *backwardness of infrastructure*. In Yagnob there is no electricity, roads, telephone and telegraph till now. People are forced to get to shops and hospitals on foot or riding donkeys through mountain paths in the same way as thousands years ago, and that only in the period from May to October. During more than half a year Yagnob is isolated from the outer world; any attempts to go out-in in the winter period are rather dangerous because of the risk of avalanches descending. In the Soviet period foodstuff was sometimes delivered by helicopter. During a short time a dirt road built by geologists and accessible only to cross-country vehicles going from the Romit Valley through saddle-points served as summer road to the central part of Yagnob. That route subsisted only a few years however and fell into degradation very soon. The dream of each new generation of Yagnobis is the construction of a road that could connect them with the outer world.

4) Low *diversification* of the economy. The same cultivated crops are predominant as it was a case of many centuries ago (barley up to 90 %, peas,

wheat). Gardening is missing, vegetable-growing, wild-honey farming are next to missing, etc. In 1970-es only (first attempts came to pass quite earlier, still in 1930-es) Yagnobis began to grow potatoes at large. The stock-raising played an important part satisfying the needs both for meat and milk and in fertilizers, but it was restricted by a lack of winter fodder.

5) The *social-property stratification* in the valley is developed rather poorly in comparison with surrounding areas. The concept of a «rich» family was traditionally identified with the quality of arable lands (the quantity of lands was of second priority). In general high-quality lands comprised relatively extensive gently sloping sites situated close to settlements, water channels being built to them. In conditions of rigid general deficiency of land resources mutual aid and kinship-neighborhood relations played an important part. The social-property disparities between families were substantially concealed by family-kinship ties (avlod) and partly by neighborhood relations (sada).

6) The extreme *degree of peripheral standing* (Fig. 21), allowing to benefit a certain autonomy and independence on unpredictable social cataclysms in surrounding areas. So, in the beginning of 1990-es, when the volume of foodstuff come on the market decreased sharply and the consumption of bread grew up, shortage of bread taking place, Yagnobis did not feel those changes, since they always baked bread by themselves and they produced as a whole up to 80–90 % of all foodstuffs in their own farm-holdings. Nevertheless «cutting off» from the whole world obviously hampered the development not only of all Yagnobi economy, but also of every people lacking information, education, health service.

7) The following file is drawn up by the *degree of transformation/assimilation* of the Sogdian language: modern Yagnobi language, Yagnobi dialect of the Tajik language (for instance, in kishlaks situated to the West and to the East from the «Sogdian» center) and almost pure Tajik language as well, in the cultural-historical regions of the Zeravshan Valley – Falgar and Matcha (Fig. 2), where the Sogdian roots are traced, however, in speech and especially in toponymics.

8) The *development of the population framework* passes its first stages as well – those of small kishlaks-farms numbering 10–20 homesteads on the average (before 1970). To match: in adjacent Karategin and Zeravshan Valley the population framework is characterized but now by hierarchy and stratification of kishlaks by altitudinal levels with detachment of upper, average and lower parts of the kishlak into independent settlements (poyon, miyona, bolo). The kishlak Kul constitutes an exception, the elements of altitudinal stratification being present already.

9) Rigid natural determination of the life and use of natural resources leaves next to no place for *conscious transformation of the natural*

environment (within the limits of the existing type of natural-economic relations). The degree of adaptation of the main type of use of natural resources in the valley – arable farming – is very high. Yagnobis arrange skillfully the plots of dry-farming lands on the slopes of different aspects in order to avoid both wet and droughty years. The seasonal rhythm is characterized by a high diversity of works of different kind. Irrigated lands are carefully «inserted» in the surrounding landscape lest they could cause water erosion or landslip processes. The population framework is distinguished by the most skilful positioning in the landscape. Villages are located on avalanche-protected crests and not too close to the river, where it is too wet and the snow lies much longer. The most part of kishlaks is located on more gentle and relatively better supplied with water north-oriented slopes.

components of the mountain geosystems	evolution stages (sketchy)			
application of production implements	primitive	**hoe land cultivation**	**plough land cultivation with application of the draught power**	application of mechanisms
development of the commodity economy	**locked nature economy**	**nature economy with barter elements**	small-scale commodity economy	large-scale commodity economy
infrastructure	**footpaths**	**improved footpaths (beasts of burden using)**	ways for cross-country vehicles	dirt roads
diversification of the economy	very low	**low**	middle	high
degree of transformation/assimilation of the Sogdian language	classical Sogdian language	**modern Yagnobi language**	**Yagnobi dialect of the Tajik language**	Tajik language
development of the population framework	separate distributed houses (mostly seasonal buildings)	**small kishlaks-farms without any hierarchy**	hierarchy and stratification of kishlaks (for example by altitudinal levels with detachment of upper, average and lower parts of the kishlak into independent settlements)	hierarchy of the whole population framework (for example in the system "centre - periphery")

Table 6. The position of the Yagnob Valley community in the evolution of the different components of the mountain geosystems

Each of foregoing trends of evolution can be used to a certain extent for the assessment of development scenarios of the ES of the Yagnob Valley. At the present-day stage natural conditions play a restraining part in the development of multi-component processes. Therefore, external factors will play the main role in the formation of probable scenarios of development. In the course of historical development vectors and velocities of change in the whole region of Central Asia coincided with the processes in Yagnob itself (1st stage), did not coincide and were opposed to Yagnob to a certain extent (2nd stage), destroyed the Yagnob environment (3rd stage) (Fig. **29**). At a new stage a certain compromise of external and internal tendencies of development has been formally established. But an attentive look at the development of events makes it visible that the conservation of status quo of the valley based on the natural economy keeping and a high degree of adaptation to natural conditions is endangered. External factors transform and destroy the ES of Yagnob to a considerable extent just now by dint of a «soft» infiltration of new technologies and methods of managing, development of new mentality of young Yagnobis that do not want to live in the old fashion. Another probable scenario of destructive development – internal processes that can lead to the degradation of landscapes and, consequently, of the resource-material constituent of the ES (Fig. **30**).

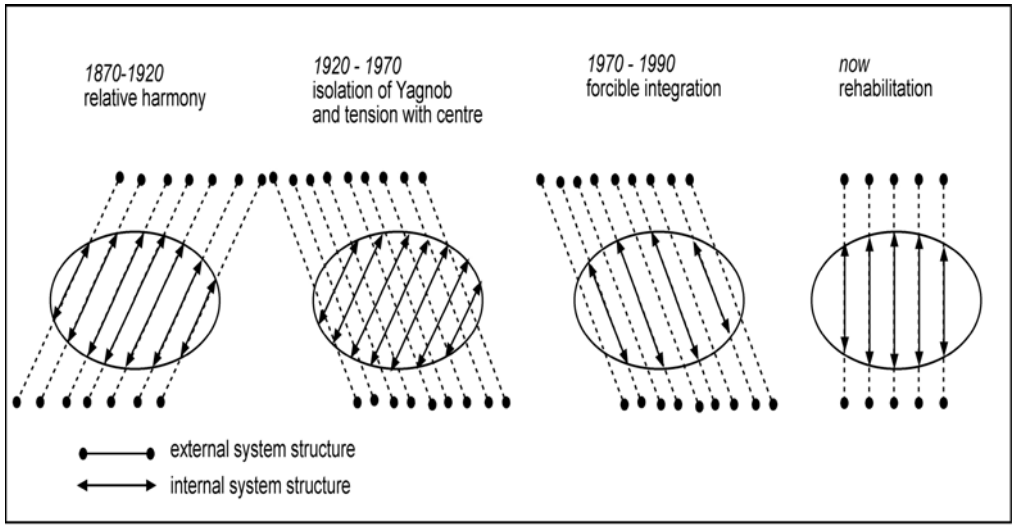


Fig. 29. Development of the Yagnob community: integration processes

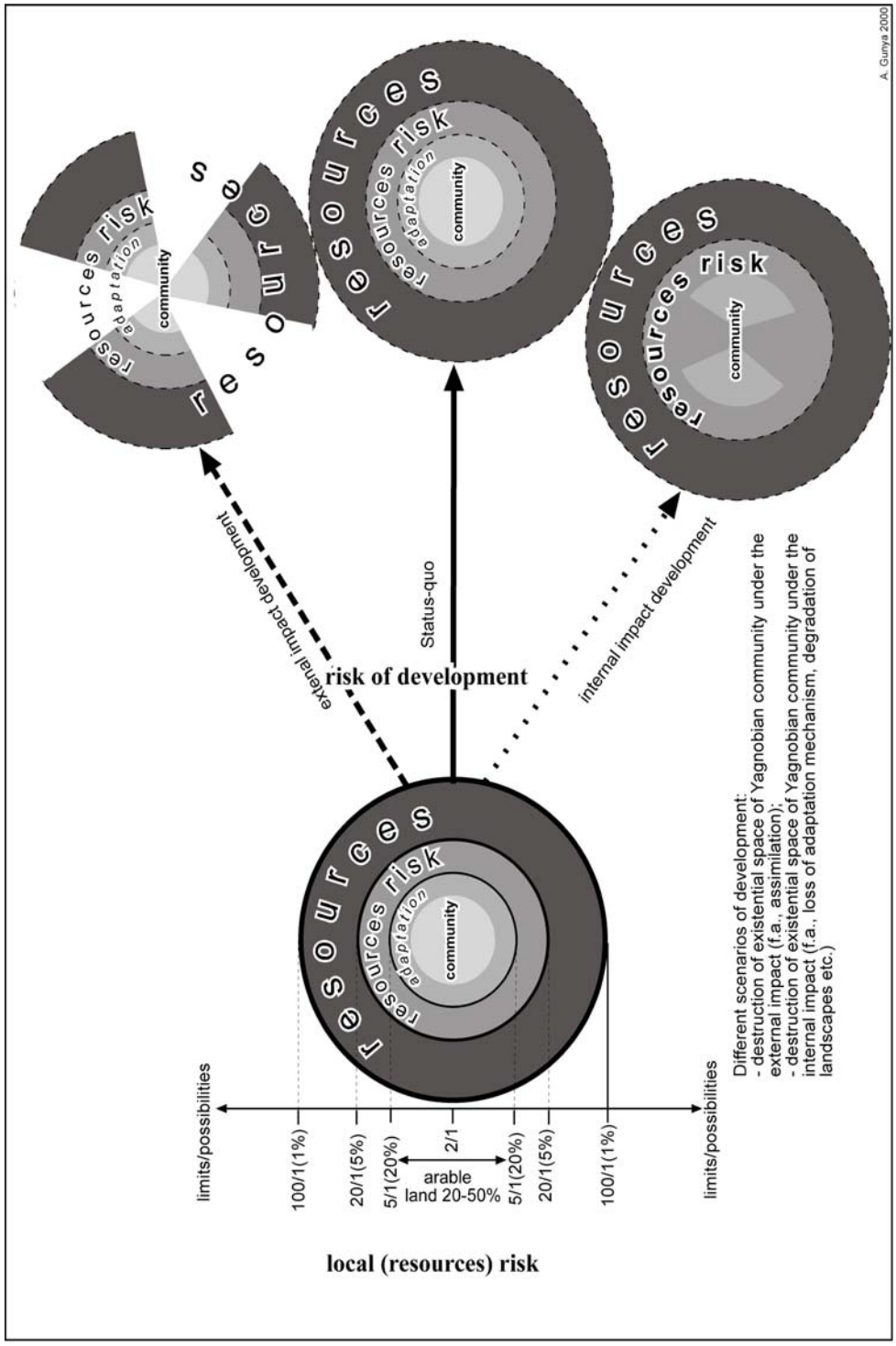


Fig. 30: Existential space and development of a mountain community

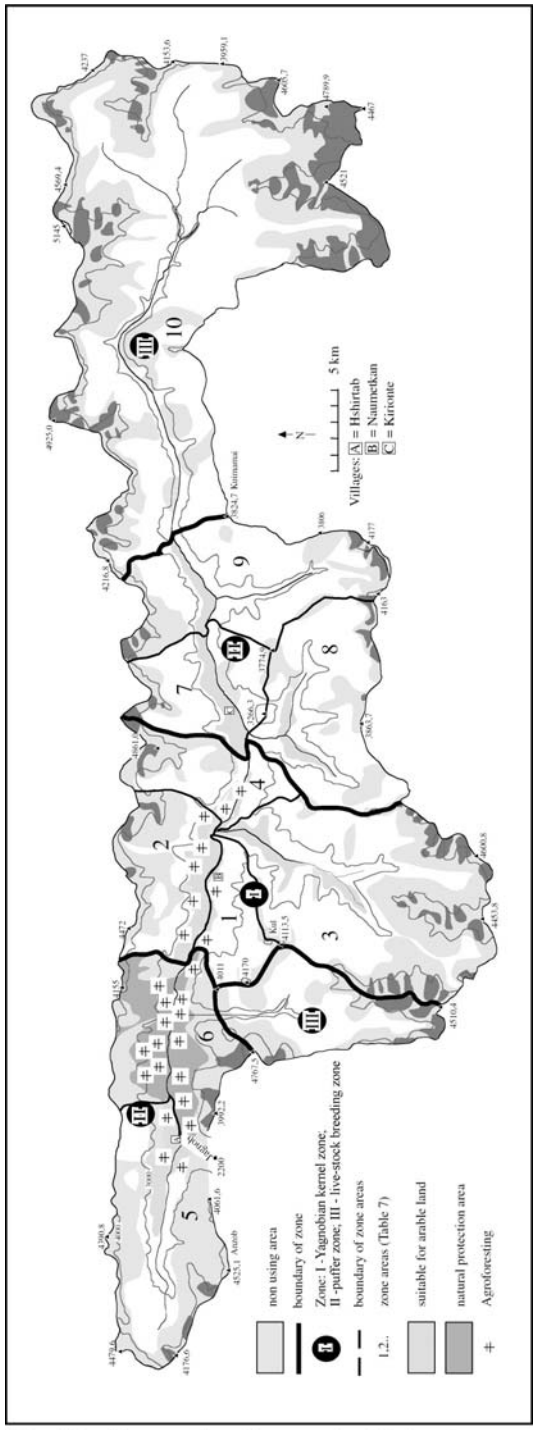


Fig. 31 . Suggestion for sustainable land use

Just the construction of a road to the valley could give a spur to the destruction of existing economic structure. In this case the following scenarios are possible:

Road → relatively cheap foodstuffs, generally meal imported from other regions → reduction of arable farming and amplification of stock-raising → shortage of winter fodder and restraining of the development of local stock-raising → predominance of summer pasturable stock-raising → loss of uniqueness and autonomy of Yagnob + pasture digression. Just now more than 70 % of the whole valley are used for grazing of «strange» livestock brought in from other regions (Matcha, Falgar, etc.).

Road → development of tourism, first of all scientific one, under the condition of preservation of the Yagnobi «core» as an ethno-cultural reserve and maintenance of a relatively high standard of living of Yagnobis (in actual conditions of extreme poverty the tourism in a large scale would be only an irritating factor).

4.2. Optimization of the ES of Yagnobis

The possibilities of sustainable development of the Yagnob valley are utterly unlike at the level of the whole valley of the Yagnob River and at the level of a kishlak taken separately. Consequently, the optimization measures at those two levels differ too. The functional zoning basing on landscape-

ecological analysis of the territory and taking into account the system of population and land-use in the valley has been chosen as the basic tool of optimization of the ES of Yagnobis.

4.2.1 Optimization measures and functional zonation of the Yagnob Valley

Taking into account cultural-historical differentiation of the Yagnob Valley, different value of its components as well as landscape-ecological conditionality of the ES structure, different ecological value of the landscapes of Yagnob, three main functional zones designating three main strategic groups of measures of preservation of the Yagnob Valley and its sustainable (maintaining) development have been allocated:

1. Old Yagnobi core of settling, with valuable cultural landscapes of settlements, arable lands, hayfields, channels etc.;

2. Buffer zone surrounding the core from the East and from the West that is populated with Tajiks now;

3. Purely agricultural zone that all the time had in principle few things in common with the existence of the Yagnobi ethnos and was used for grazing of livestock brought in from adjacent regions (Fig. 31, Table **7**).

Characteristics	zone		
	Yagnobi core zone	Buffer zone	Live-stock breeding zone
Population (%), now / 1969	70/50	30/50	0
Area (%)	24.2	35	40.8
Land use potential: Pasture (%)	5	12	14
Pasture and arable land (%)	4	6	0.5
Using by:	Yagnobis, partially by Matchis	Yagnobian, partial by Matchian and Falgarian	Ferganis and Fanis
Major risks	Climate	Soil and vegetation degradation, climate	vegetation degradation
measures	grazing regimentation, Ethnic-cultural protection, Agroforesting	grazing regimentation, organization of landscape conservation	grazing regimentation

Table. 7. Brief characterization of the zones (Fig. 31)

The Yagnobi core

The Yagnobi core is separated from the buffer zone in the West by an appreciable narrowing of the valley with steep crumbling-scree slopes hazardous of snow avalanches in the winter period. The Eastern boundary is smoother, it passes by the bound of land tenure of upper-Yagnobi kishlaks populated by Tajiks (Kiansi, Kirionte). As against Tajik kishlaks in the West and the East of the valley, the Yagnobi core exceeds them notably by the quality of land resources suitable for agricultural activity. Potentially this fact implies a conflict and danger of step-by-step assimilation of the Yagnobi core by the Tajiks. Mixed Yagnobi-Tajik settlements are noticed in the Yagnobi core just now (the valley of the Kul River). The Yagnobi core is subdivided into Soyaru (lying in the shade – 1, Fig. 31), Aftorbu (lying in the sun – 2), the Kul Valley (3), Pskan (4). Those four parts are shared out based not only on physico-geographical conditions, but also on cultural-ethnical ones. Some explorers notice even the difference in the dialects of the Yagnobi language.

Soyaru is provided with land and water best of all; mother rocks are represented by loess-looking loam and therefore the best fields for agriculture are located here. Just there unsuccessful attempts of laying large collective-farm fields were undertaken. Nowadays 4 of 9 kishlaks are habitable there, the hayfields are widespread alongside arable lands. The volume of stockpiled hay there allows the keeping of a relatively large number of livestock (in comparison with other Yagnobi settlements) and to amplify thus the stock-raising component of the economy. Besides, suitable pastures are situated at a rather short distance, above on the slopes. Those pastures are used for the grazing of livestock brought in from Zafarobad district by Yagnobis that are themselves natives of Soyaru kishlaks.

Aftorbu designate the part of the Yagnob Valley provided with heat best of all. But not everywhere is there sufficient water for irrigation. And if the kishlaks Tagrich and Kashi are provided with water to some extent, Bedef encounters a shortage of water in its turn, especially in drought years. Owing to the rocky relief of the slope there are also rather few good pastures there. In particular, the inhabitants of Aftorbu kishlaks encounter a critical deficiency of hayfields.

Pskan is situated on the north-oriented slope contiguous to the Yagnob River. The conditions there recall Soyaru on a small scale; however there are not such extensive pastures there, and besides the fields fit for arable farming are apportioned into smaller plots.

Kul is situated in the valley of the same name – left tributary of the Yagnob. The relief of the valley allows the keeping of fields on slopes of different micro-aspects within the bounds of a small space; the laying of channels for irrigation of fields being complicated constitutes a negative factor.

Just beyond the confluence of the Kul and Yagnob rivers there is a narrow gorge hugged on two sides by outcrops of base rocks. This place can be advantageous for the construction of a micro-hydroelectric power station. Besides, this locality is situated practically in the center of the Yagnobi core. Hence it is possible to supply with electricity all its kishlaks without expending many resources and, the main thing, without disturbing the landscape in the laying of electric systems from adjacent localities. There is already an experiment of setting up micro-hydroelectric power stations in the kishlak Tagichinor (used in Djabirov's farm-holding). With the object of better communication of Aftorbu and Soyaru farm-holdings the construction of one more bridge over the Yagnob River is expedient. Taking into account a large number of solar days in Yagnob the application of solar batteries for local needs is very perspective. In Soyaru it is expedient to organize a cultural and historical center. It is also recommended to found a kishlak-museum of Yagnobi culture, using for this purpose uninhabited areas of villages and abandoned fields.

The building of a motorway open for all time to the Yagnob center would be pernicious for landslip slopes. The transport problem is solvable within the framework of potential creation of Yagnob ethno-cultural park. In this case the organization of transportation by means of draught power from the terminal of the motorway (kishlak Khshirtob) could be one possibility.

The buffer zone, as it was already specified, is inhabited by Tajiks. The locality of the Western buffer zone with the kishlak Khshirtob (5) represents a convenient place for the organization of a staging post, organizing transportation in the Yagnobi core with the help of donkeys or horses, for example. It is a paradox, but the kishlak Khshirtob situated in a more advantageous proximity to «civilization» (about 5 km from the kishlak Marghib, where there are already asphalt roads, electricity, telephone) is populated very sparsely in comparison with other Yagnobi settlements (only five families, and there were about 200 formerly). Apparently, this proximity was at the same time a temptation for young families that did not want to stay in their native localities.

The locality Farkau (6) represents a part of the Yagnob Valley with relatively steep slopes. The only forest in Yagnob (juniper-open woodland on the south-oriented slope) and shrubbery (north-oriented slope) tracts are situated just here. The building of a road there towards the Yagnobi core has intensified the water erosion on the slopes. In this locality it is necessary to introduce strict limitations for the grazing and driving of livestock, to undertake forest-managing measures, to prohibit grazing in forest tracts. This locality is also the most suitable for gardening based on the growing of drupaceous trees.

The Eastern part of the buffer zone consists of three localities: Kiansi – Kirionte (7) (kishlaks of the same name), Tagob (the valley of the same name formerly populated, now uninhabited (8), Novobad (9), at which place about

50 families lived more than 50 years ago, and now there are only summer pastures. All three localities are located at the boundary of risky (because of unfavorable climatic conditions) arable farming. Only in Kiansi and Kirionte is intensification possible on account of the extension and improvement of the sites of irrigated lands. Pastures represent the main resource however. Now the major part of pastures is used for grazing of livestock brought in from Matcha and other districts. It is necessary to set up control and regulation of the grazing there, and particularly to restrict very strictly grazing in the most dry mountain meadow-steppe belt.

The agricultural zone is constituted by Gulbais and Tagrich localities that are practically autonomous in their development and usage from the other part of Yagnob. All the time Gulbais was a favorite location for the grazing of numerous sheep flocks from adjacent regions. With regard to landscapes it is quite an attractive site for mountain tourism and climbing: intramontane-depression aspect of the bottom of the valley is substituted uphill by mountain meadow and then nival-glacial landscapes with numerous glaciers and mountain snows. In Tagrich locality side by side with sheep grazing cows, horses and even yaks from Marghib and Anzob are grazed too. It is possible to get to Tagrich only through saddle-points, since the mouth of the Tagrich stream represents an impassable rocky gorge. In functional aspect Gulbais and Tagrich should «draw down» on themselves the main pasturable pressure on mountain meadows of Yagnob affording in this way more freedom to the buffer zone and the Yagnobi a core in the domain of landscapes protection.

4.2.2. Optimization measures at a local level – the kishlak Kashi

The kishlak Kashi is situated in the Yagnobi core and lies on the south-oriented slope in Aftorbu (see Figs. 2, 31; Photo **8b**). It is one of the oldest kishlaks, where the conditions being important for life are favorably combined – being provided with heat (southern aspect) and moisture (system of channels), relatively flattened sites for fields are available. Natural growth of the kishlak is restrained by the presence of sites of irrigated arable lands. Owing to the dryness of climate in the summer season, dry-farming lands yield harvests that are quite unstable from year to year.

Nowadays shortage of manpower (in 1995 there were only six persons of real workers) and lack of possibilities of mechanization of work led to over-usage of nearby sites of fields, abandonment of outlying ones, potato-growing practically without any rotation of crops, and that resulted in wash-out of the upper fertile horizons, regular watering of fields under potatoes by letting water in (by furrows) being applied. It was found out from the interrogations of local inhabitants that earlier fields were left fallow not less often than every three –

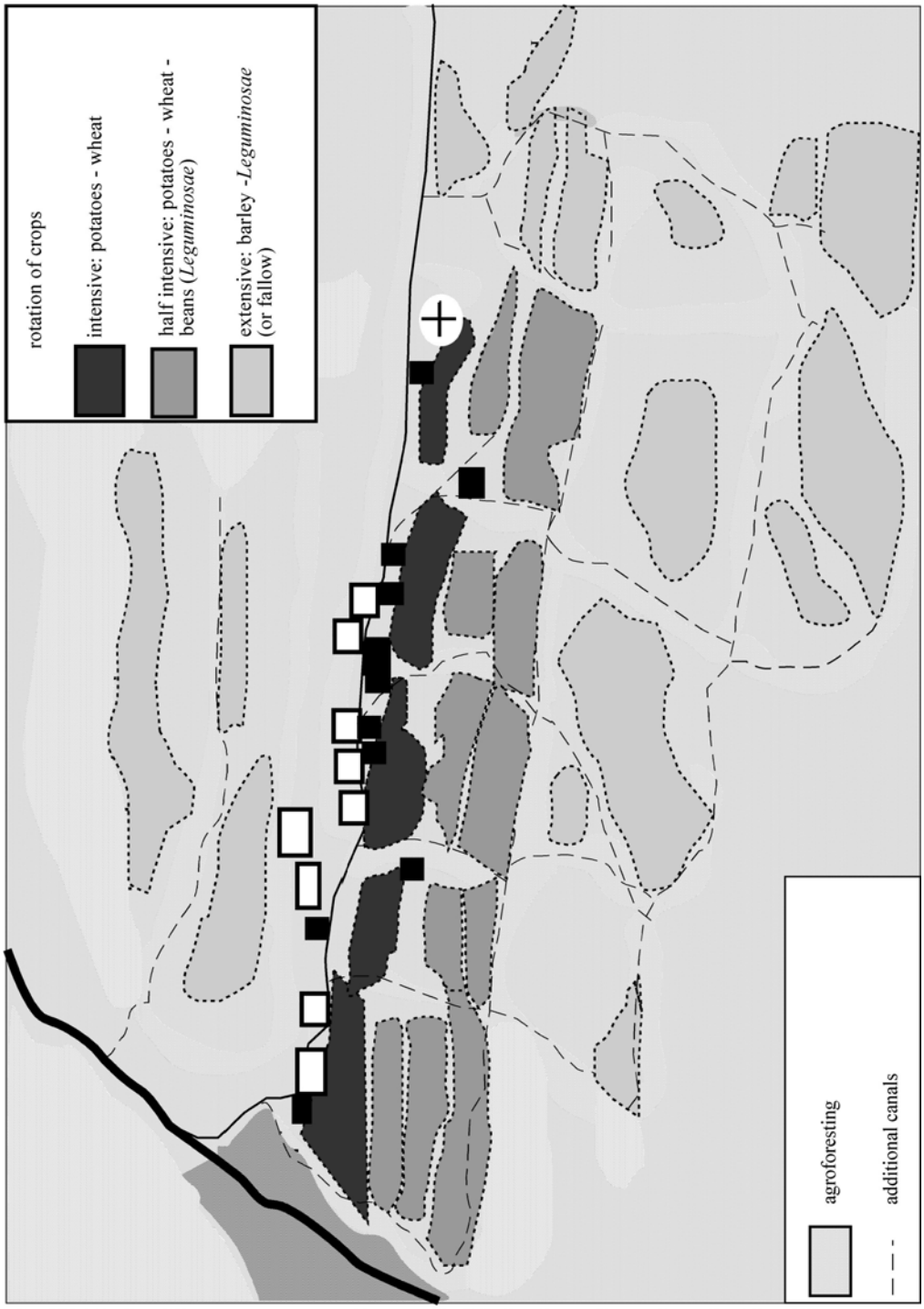


Fig. 32. Kashi village: suggestions for sustainable land use (legend on the Fig. 24)

four years. But now, in the period of the lowest number of population, nearby fields are actively fertilized, but it does not compensate deficiency of nutritious substances, however (of nitrogen, for instance). (It was established from the results of processing of a spectrozonal satellite photograph that in adjacent Zeravshan Valley, much better provided with heat and advantageous from the standpoint of transport availability of fields, and, consequently, accessible for manure input, only about 30 % of potential fields in the bottom of the valley are used under crops cultivation, the rest being used under sown herbs, fallow lands, etc. In Karategin, situated to the South, on the contrary, about 50 % of potential fields in the bottom of valleys are used under gardens, arable lands, etc.).

The scheme (Fig. **32**) shows that in existing land-use the following regularity is observed: sites closest to houses are used under potatoes, next fields under wheat succeed gravitating to the upper, relatively drier parts of the slope; barley and peas occupy peripheral fields and are combined in the rotation of crops. Taking into account landscape-geoecological factors and properties of the territory as well as limited possibilities of Yagnobis of managing the economy by themselves, the following scheme of optimization of land-use including three systems of rotation of crops and appropriate melioration measures is suggested. In order to improve the microclimate, to wit huge overfalls of temperature in the layers juxtaposed to the surface in daytime in the summer period (see book part Climate and Fig. 12), forest and shrubbery plantations are needed, that should be composed, alongside with juniper, poplar (it grows very fast and can also be used as building material) and drupaceous (wild cherry-plum, etc.), of local varieties of shrubs, such as a currant, dogrose. The best sites for forest and shrubbery plantations are located along channels, on boundary-strips between fields. Growing of drupaceous can diversify to some extent the economy of Yagnobis making a start on gardening.

Fields closest to houses should have the **intensive rotation of crops** potatoes – wheat. As earlier, locations for keeping the livestock can be positioned just amidst the fields of this type of rotation of crops (for cutting down labour expenses on input of manure).

The **semi-intensive rotation of crops: potatoes – wheat – peas (or sown herbs of Leguminosae)** is suggested to be used in the zone next by remoteness. The use of legumes in the rotation of crops for the third year after potatoes and wheat is very important thus enabling the restoration of nitrogen contents in the soil. Apart from available varieties of peas the growing of leguminous herbs is needed, for instance, esparcet (there is already an experiment of using esparcet in Soyaru).

The **extensive two-field rotation of crops: barley – leguminous herbs (or fallow lands)**. In the positioning of this type of rotation of crops labour consumption of manure input to those relatively distant fields is taken into account as well. Therefore leaving fields fallow for the third year is quite

important for maintaining natural fertility. Growing of leguminous herbs for silage is important first of all for compensation of shortage of winter fodder on this dry rocky slope. Besides, the extensive character of arable farming in this type of rotation of crops will reduce the volume of fertilizers, and consequently, it furthers the accumulation of pressed dung used as fuel, and eventually will reduce brushwood stockpiling in the region.

5. Conclusion: obstacles for an invaluation of sustainable development: aspects of marginality, political interests and tribal conflicts

In the mid 1990s in course of assessing future scenarios of development of Yagnob we elaborated two models of strategy of studying the Yagnob Valley complementing one another. They were conventionally called Yagnobi and Sogdian models. The Sogdian model is aimed at analysis of the phenomenon of the valley, its uniqueness. Accordingly, it was assumed that this uniqueness should be taken into account to a maximum possible extent in State and international concepts of development, projects of preservation of the Yagnob Valley, its landscapes, way of life, etc. up to reservation and conservation of particular elements of cultural landscapes and relic use of natural resources would be prepared and implemented. In case of the Yagnobi model it was assumed to pay maximum attention to the complex of problems intrinsic to the Yagnobi community, vividly mirroring main problems of the mountain community on the whole (isolated development, poverty, high degree of risks of subsistence, etc.).

Important changes of the socio-political environment, general aggravation of the economic situation in Tajikistan forced Yagnob, as well as other mountain communities to turn to the standards of self-preservation, having thus given a spur to the original manifestation of cultural-ethnic and geographical features. Therefore the factor of uniqueness of Yagnobis as the last representatives of ancient Sogd and native speakers of the Sogdian language was involved in politics, the existence of Yagnobis themselves, especially of those stayed in the valley, continuing to aggravate. The change of the region's name from Leninabad to Sogdian did not open optimistic perspectives for Yagnobis. Every Yagnobi family, as well as the overwhelming majority of families in the whole of Tajikistan, was forced to rely on itself, to survive using any possible ways. Therefore, reverting to natural economy, amplification of a role of the clan (avlod) were observed and are observed now all over as efficacious methods of survival in present-day society.

On the background of these processes measures of implementation of projects aimed at preservation of the Yagnobi ethnic group, such, for instance, as planning of the Yagnob cultural-ethnic park (Buzurukov, Gunya, 1998) seem to be rather delicate. Without a general improvement of elementary living conditions such actions would be hardly effective. The entire system of measures of optimization of the conditions of existence and development in the whole region is needed. Yagnob studies must occupy an adequate place in this system. We are convinced that the future of Yagnobis can hardly be stable in the case of conservation of the natural mode of the economy. The Yagnob Valley turns steadily into a reservoir of pasture resources; arable lands are abandoned or used for haymaking; the half-built road furthered the transit of livestock in the valley and also stimulated a new round of evolvement of water erosion processes in mountain steppe landscapes of south-oriented slopes. Official decisions of the authorities conducive to the

beginning of Yagnobis' homecoming to their native valley are hardly completely in keeping with the realities and wishes of Yagnobis now. The young generation of Yagnobis expresses the wish to stay in Yagnob for the winter less and less often; it is not interested accordingly in the production of provisions to be stored for a long winter. Realities of the actual situation surrounding Yagnob, education and development of the motivation of activity, first of all of young Yagnobis, forecast a step-by-step adaptation to the outer world, application of new technologies in the economy (use of micro-hydroelectric power stations, satellite communications, etc.), diversification of the economy (for example, development of tourism).

In the present work on the structure of the existential space of Yagnob the analysis has been carried out of the ES being as though only a theatre stage, its environment, size, form, etc. The analysis of the «actors» themselves, their character roles could be a very logical sequel. It means first of all the study of motivations of behavior of Yagnobis, assessment of the role of traditional stereotypes of behavior and institutes of use of natural resources and their relationships with the acquired experience and innovative technologies; analysis of the role of innovations in the traditional framework of life of Yagnobis and the assessment of possibilities of traditional social forms of organization, for instance, «sada» in modern development and management. Studying the forms of social adaptation of Yagnobis in the locations of their new residence, in particular, in foothill and desert Zafarobad district could be also one of perspective ways of research. Large-scale social investigations and study of social organization of their life in new conditions can compensate the study of different aspects of their aggregate ES that could not be included in the present work.

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