CRP1.1 Characteristics of the site “Aral Sea” SRT2-AS1

Introduction

The international research centers of the Consultative Group on International Agricultural Research (CGIAR) have launched the CGIAR Research Programs (CRP). ICARDA as the lead Center jointly with the other partners Centers, research and development organizations in more than 40 countries, regional fora, international development agencies and other relevant international organizations initiated the CGIAR Research Program (CRP1.1) - "Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas".

The Program aims to pursue new technology, institutional and policy options for enhancing productivity and managing risks through diversification, sustainable intensification and integrated agro-ecosystem approaches in dry, which ultimately will contribute to the improvement of living standards in the target regions.

During the global preparatory meeting in Nairobi, in July 2011, five sites (3 action and 2 satellite sites) have been selected together with national partners for Central Asia and the Caucasus Region. Conducting research and introduction of innovative approaches and technologies will be implemented in two key areas:

I. Reducing vulnerability in agro-ecosystems affected by degradation of natural resources.
   Actions Sites:
   1. Aral Sea Region, including the Dashauz province (Turkmenistan), Khorezm province and the Republic of Karakalpakstan (Uzbekistan), Kyzylorda province (Kazakhstan);
   2. Rasht Valley (Tajikistan and Kyrgyzstan).

II. The intensification of agricultural production in areas with potential for improving food security and improvement of living standards in the short to medium term.
   Action site:
   1. Fergana Valley, which includes Batken, Jalal-Abad and Osh provinces regions (Kyrgyzstan), Sogd province (Tajikistan), Andijan, Namangan and Fergana provinces (Uzbekistan).

   Satellite sites. Sites that complement Action Sites to sample the diversity of Target Areas, and will also help evaluate and assess innovations developed at the Action Sites for their suitability and user acceptance.
   2. Kura-Arax plain in Azerbaijan.
   3. Kashkadarya province in Uzbekistan.

In addition, 123 descriptors characterizing the climate, topography, soils, water resources, land use, land degradation, demography, agricultural systems, institutional systems and opportunities for agricultural research were identified.

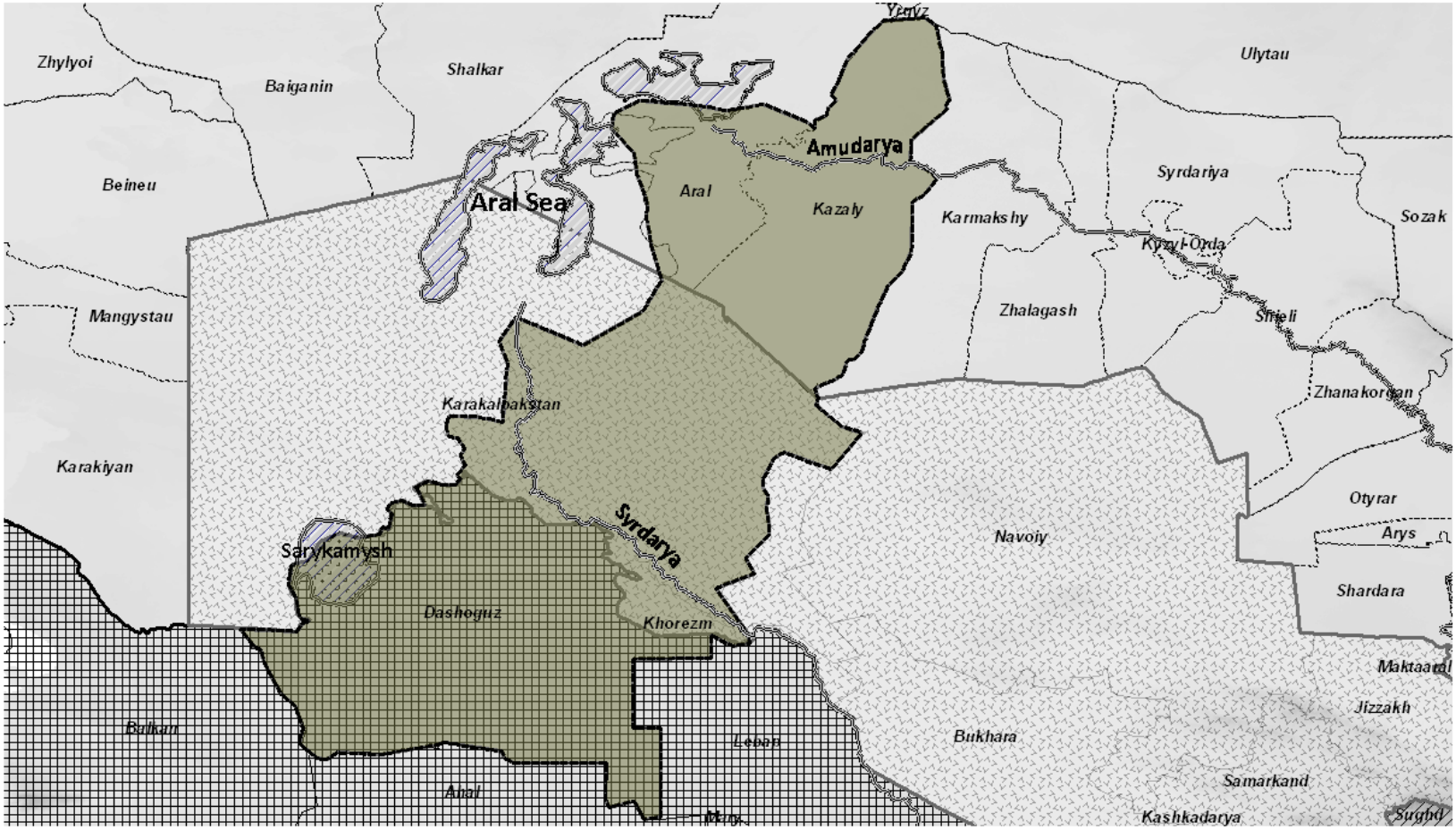
To collect the primary data, thirteen focal points from the Action Sites were involved. Data processing and compilation of the data was carried out by the interim Interdisciplinary Research Team (iIRT), coordinated by ICARDA.

A preliminary version of the characteristics of the Action Sites had been discussed during the preparatory meeting in Tashkent, May 15-17, 2012.

These characteristics of sites are not final. It is assumed that interested parties can contribute to the adjustment and the addition of data.

This material is collected and synthesized within the CGIAR Research Program (CRP1.1) - Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas", coordinated by the International Center for Agricultural Research in Dry Areas (ICARDA) in the Region of Central Asia and the Caucasus. The data, any inaccuracies or interpretations of the data presented herein are not the responsibility of the CGIAR and ICARDA. The final characteristics of the Site will be posted on the website of the CGIAR Regional Program (www.icarda.cgiar.org/cac).

SRT2. Action site 1: Aral Sea region



CRP1.1 Characteristics of the site “Aral Sea” SRT2-AS1

<table>
<tr><td colspan="2">1. Climate (according to Uzgidromet, Kazhydromet, Turkmenhydromet)</td></tr>
<tr><td colspan="2">1.1 Precipitation</td></tr>
<tr><td colspan="2">Precipitation patterns</td></tr>
<tr><td>1.1.1 Range of long-term average annual totals (mm) across the site</td><td>Fluctuations in annual amount of precipitations within the entire site:
90-150 mm</td></tr>
<tr><td>1.1.2 Number of rainy seasons</td><td>(autumn and spring).
During the vegetation season:
1. spring
2. autumn</td></tr>
<tr><td>1.1.3 For each rainy season: start and end month(s).</td><td>Amount of precipitations for the season:
Spring: 40-55 mm
Autumn: 15-25 mm

75-85% of the annual amount of precipitations is during the period from October to May.

Number of days with precipitations (of 0.1 mm or more):
<table><tr><td>Winter</td><td>13-23</td></tr><tr><td>Spring</td><td>13-16</td></tr><tr><td>Summer</td><td>3-14</td></tr><tr><td>Autumn</td><td>6-12</td></tr></table></td></tr>
<tr><td>1.1.4 Number of years of daily rainfall records</td><td>Meteorological stations: Nukus since 1936.(76), Muynak since 1928. (84), Chimbay since 1927.(85), Takhtakupir since 1986.(26), Urgench since 1881.(130), Khiva since 1928.(84), Tuyamuyun since 1980.(32)

The data are stored in the hydro -meteorological data fund of UZGIDROMET (in hard copy). The electronic version of the daily data is available starting from 1971.</td></tr>
<tr><td colspan="2">Precipitation variability</td></tr>
<tr><td>1.1.5 Inter-annual precipitation variability</td><td>The coefficient of variation (CV) of annual precipitation in the region (n=70) 35-37%</td></tr>
<tr><td>1.1.6 Severity and type of drought risk (e.g. delayed onset of the rainy season, lengthy gaps between the</td><td>The number of days per year with temperatures above 40 ° C:
Maximum 12-17;
Average 5,1-7,5.</td></tr>
</table>

rains, early end to the rains))	The number of days per year with an atmospheric drought (daytime humidity deficit≥ 50 hPa): Maximum 26-55; Average 10-19. Irrigated agriculture zone: basic risk – water shortages in dry years.
1.2 Temperature	
Temperature means	
1.2.1 Range of annual mean temperature (°C) across the site	*Average annual temperatures in the site* range from 8,4 °C in the north to 14,5°C in the south.
1.2.2 Range of mean max. temperature of the hottest month (°C) across the site	*Average maximum temperatures* in July from 32°C in the north to 36°C in the south. The absolute maximum in the site-46,3°C.
1.2.3 Range of annual mean min. temperature of the coldest month (°C) across the site	*Average minimum of the temperatures in the coldest month* in the site from --15°C in the north to -3,5°C in the south. The absolute minimum --39°C
1.2.4 Number of years of daily temperature records	Meteorological stations: Nukus since 1936.(76), Muynak since 1928. (84), Chimbay since 1927.(85), Takhtakupir since 1986.(26), Urgench since 1881.(130), Khiva since 1928.(84), Tuyamuyun since 1980.(32) The data are stored in the hydro -meteorological data fund of UZGIDROMET in hard copy. The electronic version of the daily data are available starting from 1971.
Temperature variations	
1.2.5 Intra-annual range of monthly temperature means (C)	*Intra-annual variations of average temperature per month* from --11 to +27°C in the north, from –1,5 to +29, 5°C in the south. Inter-annual variability of average temperatures per month during the summer 1,0-2,3°C, in winter it can increase 7°C.
1.2.6 Diurnal temperature ranges throughout the year (C)	*Fluctuations in average daily temperatures within the year during some years:* from --28 to +35°C in the north, from --21 to +37°C in the south. *Mean daily amplitude:* January 4.5-8,0°C; April 8,4-14,8°C; July 8,6-15,2°C; October 6,0-14,8°C

<table>
<tr><td>1.2.7 Frost risk (severity and months of occurrence)</td><td>The risk of frost:

<table>
<tr><td></td><td colspan="3">Dates of extreme air frost</td><td colspan="3">Dates of extreme soil frost</td></tr>
<tr><td></td><td>The earliest</td><td>Average</td><td>The latest</td><td>The earliest</td><td>Average</td><td>The latest</td></tr>
<tr><td>Risk of spring frost</td><td>5.03-22.03</td><td>23.03-10.04</td><td>22.04-09.05</td><td>7.03-29.03</td><td>29.03-20.04</td><td>26.04-24.05</td></tr>
<tr><td>Risk of autumn frost</td><td>10.09-22.09</td><td>10.10-25.10</td><td>1.11-25.11</td><td>3.09-24.09</td><td>5.10-22.10</td><td>1.11-15.11</td></tr>
</table>

Maximum intensity of the frost during spring period is not less than -5◦C. The frequency of frost with intensity of -3,1 - -4◦C does not exceed 10%.

The absolute minimum air temperature in April: from –11°C to --2°C. In September from-6,6°C to -2°C

The average number of days per year with minimum temperature:
below (--10 °C) from 44 days in the north to 15-20 days in the south with maximum 87-90
below (--20°C) from 19 in the north to 1-2 in the south.</td></tr>
<tr><td colspan="2">1.3 Indices</td></tr>
<tr><td>1.3.1 Range of annual growing degree days, base temperature 5°C (C, heat units) across the site</td><td>Total of efficient temperatures 3100-3600 °C along the site</td></tr>
<tr><td>1.3.2 Ranges of mean length (days) of temperature and moisture-limited growing period(s) across the site for predominant agricultural soils</td><td>The average duration of the period with an average daily temperature:
<table>
<tr><td></td><td>Number of days</td><td>Crops</td></tr>
<tr><td>Higher than 5°C</td><td>230-280</td><td>Cereals, alfalfa, horticultural crops</td></tr>
<tr><td>Higher than 10°C</td><td>200-250</td><td>Cotton, maize</td></tr>
<tr><td>Higher than 12°C</td><td>180-210</td><td></td></tr>
<tr><td>Higher than 15°C</td><td>160-190</td><td>vegetables, melons</td></tr>
</table></td></tr>
<tr><td>1.3.3 Range of Aridity Index across the site</td><td>0,065-0,18</td></tr>
<tr><td>1.4 Climate change projections</td><td>According to the Second National Statement of Uzbekistan on Climate Change (2008)</td></tr>
<tr><td colspan="2">Scenario B2</td></tr>
</table>

<table>
<tr><td>1.4.1 Range of annual mean temperature change (C) across the site for time slices (periods) 2016-2045, 2036-2065, 2066-2095 in comparison to 1961-1990.</td><td>
<table>
<tr><td>2016-2045 (2030)</td><td>2046-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>1,3°C</td><td>2,0°C</td><td>3,2°C</td></tr>
</table>
</td></tr>
<tr><td>1.4.2 Range of relative annual precipitation change (%) across the site for time slices (periods) 2016-2045, 2036-2065, 2066-2095 in comparison to 1961-1990</td><td>
<table>
<tr><td>2016-2045 (2030)</td><td>2046-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>104%</td><td>105%</td><td>101%</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Scenario A2</td></tr>
<tr><td>1.4.3 Range of annual mean temperature change (C) across the site for time slices (periods) 2016-2045, 2036-2065, 2066-2095 in comparison to 1961-1990.</td><td>
<table>
<tr><td>2016-2045 (2030)</td><td>2046-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>1,1°C</td><td>2,0°C</td><td>3,7°C</td></tr>
</table>
</td></tr>
<tr><td>1.4.4 Range of relative annual precipitation change (%) across the site for time slices (periods) 2016-2045, 2036-2065, 2066-2095 in comparison to 1961-1990.</td><td>
<table>
<tr><td>2016-2045 (2030)</td><td>2046-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>115%</td><td>116%</td><td>108%</td></tr>
</table>
According to http://seakc.meteoinfo.ru

Similar tendencies are expected for Kazakhstan and Turkmenistan
</td></tr>
<tr><td colspan="2">2. Topography</td></tr>
<tr><td>2.1 Landforms (e.g. plains, hills, mountains) across the site (%)</td><td>The territory relief in Lower reaches Amudarya as a whole represents plain nature, the slope of area is very insignificant and is directed from the southeast on the northwest. On the arrangement the relief is characterized by a combination of plain spaces and low heights, such as Krantau, Porlitau, Beltau, Kushkanatau, Kiziljar with small high elevations from 53,0 to 200 above sea level.

Dashaguz region is located in the north of Turkmenistan in a left-bank part of downstream Amudarya. Northern part - slightly wavy week convex plain which has been cut up by multi-branch irrigational network.

Plain formation is genetically related to activity of the ancient water currents following from Amudarya in the Sarykamyshsky hollow. According to a direction of the basic ancient and modern water currents, the surface of</td></tr>
</table>

plain of the hollow falls in the west to the Sarykamyshsky hollow (about 0,2 m on 1 km). Absolute elevation of plain close to Amudarya - 80 m, at east slopes of the Sarykamyshsky hollow - 50 m.

The occupied space basically represents river quarterly deposits of the alluvial origin, and radical bed of which being tertiary cretaceous and Paleozoic rocks. On the western part there is a plateau Ustyurt, the height of which makes 200,0 - 300,0 m.

According to design institute Uzgiprozem, the plain part of territory makes 1,571 thousand km^2 (97,3 %), of which hills make 33,9 th. km^2 (2,1 %), and mountains make 9,7 thousand km^2 (0,6 %, (a southern part).

Name	Khoresmcкая region	Republic Karakalpakstan,	Kizilorda region	Dashaguz region
Latitude	41°35'05.46"N	42°20'02.98"N	44°51'00.12"N	41°50'05.30"N
Longitude	60°40'02.19"E	59°35'20.59"E	65°30'59.64"E	59°57'25.42"E
Altitude above the sea level	97 (Urgench city)	76 (Nukus city)	128 (Kizilorda city)	89 (Dashaguz city)

Source: Farming system of Dashaguzskiy region G.Dyujev and other sources,

2.2 Elevation range across the site (m)

Land surface	Khoresm region,	Republic Karakalpakstan,	Kizilorda region	Dashaguz region
Plain part	77 - 100 m.	53-110	47-123	50-106
Hills	100-132 m	111-140	124-150	107-156
Mountains		141-300	151-270	

2.3 Prevalent slope ranges (%) of different land forms of the site

Land surface	Khoresm region	Republic Karakalpakstan, %	Kizilorda region	Dashaguz region
Plain	0.0003-0.0005 (100%)	0,0001 – 0,00025 (97,3 %)	0.0002 – 0,0006 (100%)	0,0002 – 0,0004 (100%)
Hills		0,0003 – 0,01(2,1 %)		
Mountains		0,08 – 0,1 (0,6 %)		

<table>
<tr><td></td><td>Source: Institute «Turkmenulumtaslama» and other sources</td></tr>
<tr><td colspan="2">3. Soils</td></tr>
<tr><td>3.1 Soil types</td><td>Soil: Soils of the area are characterized as old-irrigated meadow-alluvial, sand-desert, sandy, grey-brown soils and in some places are covered by saline soils, soils are of takyr type and strongly saline, with a special dark covering, alkali soil.

Results of a chemical compound of soil for 2007-2009 have shown following properties of salinity on depth: 0-30 cm - low salinity - of 25 % from a total area; average salinity - 35 %, high salinity - 20 %, very salted - 20 % from a total area. On these areas the soil is very hard for reclamation for agriculture purpose.</td></tr>
<tr><td>3.1.1 Major or agriculturally important soil types and soil associations across the site (classification units, %)</td><td>On climatic indicators the territory of downstream of Amudarya is characterized by high dryness, low snow (dry and severe) in the winter. Thanks to nature of a climate and moisture of territories, original soil types and groups were formed here, which are divided on different types of soil (tab. 3.1. and 3.2). Total area of Aral Sea Basin makes approximately - 42,233,9 thousand hectares, out of which irrigated area makes 1,288,1 thousand hectares. (tables 3.1, 3.2, 3,3 и 3.4.).

Table 3.1. Soil groups of land fund of Republic Karakalpakstan (1984)
<table>
<tr><th>№</th><th>Soil</th><th>Total area, th.ha</th><th>%</th><th>Irrigated arable land, th.ha</th><th>%</th></tr>
<tr><td>1.</td><td>Grey-brown</td><td>6924,7</td><td>43</td><td>1,6</td><td>0,52</td></tr>
<tr><td>2.</td><td>Takyr</td><td>980,0</td><td>6,1</td><td>24,9</td><td>8,10</td></tr>
<tr><td>3.</td><td>Meadow-takyr and meadow-desert</td><td>285,0</td><td>1,8</td><td>56,1</td><td>18,3</td></tr>
<tr><td>4.</td><td>Meadow-alluvial</td><td>1041,4</td><td>6,4</td><td>211,8</td><td>68,9</td></tr>
<tr><td>5.</td><td>Swamp-meadow</td><td>13,6</td><td>0,08</td><td>12,9</td><td>4,2</td></tr>
<tr><td>6.</td><td>Flood-palin-Meadow, alluvial</td><td>594,0</td><td>3,68</td><td>-</td><td></td></tr>
<tr><td>7.</td><td>Alkiline lands</td><td>658,0</td><td>4,08</td><td>-</td><td></td></tr>
<tr><td>8.</td><td>Desert, sandy</td><td>1960,5</td><td>12,1</td><td>-</td><td></td></tr>
<tr><td>9.</td><td>Water surface</td><td>3687,8</td><td>22,8</td><td>-</td><td></td></tr>
<tr><td colspan="2">Total</td><td>16144,9</td><td>100</td><td>307,3</td><td>100</td></tr>
</table>
In the territory of the irrigated land there are basically concentrations of Meadow-takyr and Meadow-desert (18,3 %) and Meadow-alluvial (68,9 %) lands

During the last years on the one hand in connection with reduction of receipt of Amudarya water, and on the other due to fall of level of subsoil waters in downstream of river Amudarya, considerable changes took place which</td></tr>
</table>

characterize transition from meadow to desert soil type, that is aridization of territories. As a result of drying huge territories of deltoid lakes and a sea-bottom, there is a process of formation of unsuitable for use sand-saline soils, that is another prominent feature of the site.

Table 3.2. Soil group of land fund of Dashaguzskiy region, (needs to be clarified)

№	Soil	Total area, th.ha	%	Irrigated arable land, th.ha	%
1.	Sand-desert	401,1		X	
2.	Desert-meadow	244,7		X	
3.	Desert-takyr	104,3		X	
4.	Takyr	84,2		X	
5.	Solonchak-meadow	92,3		X	
6.	Remaining-meadow	30,1			
7.	Meadow-takyr	9,6			
8.	Meadow	25,7		X	
9.	Meadow-marsh	40,1			
10.	Meadow-alluvial	26,1			
11.	Meadow-flood-plain (swamp)	40,1			
12.	Sand mobile and poorly fixed	601,7			
Total		1700	100	437	100

X- no data

Table 3.3. Land fund of Kizilorda region

№	Name of crops	Total area, th.ha	%	Irrigated arable land, th.ha	%
1.	Arable land	166	0,66	166	56,6
2.	Perennial plantings	2,8	0,01	2,8	1,0
3.	Deposit	99,8	0,40	99,8	3,1
4.	Haymaking	116,5	0,46		
5.	Pastures	12538,4	50,36		
	Including: watering	9193			
	Household gardens	24,4	0,10	24,4	8,3
	In total agricultural land	12947,9		293	100
6.	Forestry	5011,2	20,13	-	
7.	Forest-shrub plantings	88,5	0,36		
8.	Swamps	12,7	0,05	-	
9.	Under water	2357,8	9,47	-	
10.	Other land	4481,5	18,00	-	
	Total	24899,6	100	293	100

Table 3.4. Soil groups of land fund of Khoresm region

№	Soil	Общая площадь, th. га	%	Орошаемая пашня, th. га	%
1.	Gray-brown	5.882	1		
2.	Takyr	8.475	2		
3.	Meadow-takyr and meadow-deserted	8.774	2		
4.	Meadow-alluvial	333.753	74		
5.	Swamp-meadow	15.740	4		
6.	Meadow-inundated, alluvial	2.277	1		
7.	Saline soils	6.533	1		
8.	Deserted, sandy and sand	41.993	9		
9.	Water table	25.699	6		
Total		16144,9	449.1	276.6	100

3.2 Soil characterizations for each of the major soil types

The main factors in the soil-forming process (for hydromorphic soils) are sludging due to irrigation, flooding and close (deep) shallow water table.

- Gray-brown soils are characterized by insignificant capacity of loose of loose pit-run fines, a layer 0,5-2,0 m, the low humus content (0,4-0,6 %), high carbon and salinity.
- Takyr soils have high distribution on modern and ancient alluvial deposits. They are basically concentrated on the territory of northern and northeast and northwest part of the region. Crust presence on a surface is characteristic for this type of soil. The humus content fluctuates from 0,4 to 0,8 %.
- Meadow-alluvial soils of a desert zone are developed on alluvial deposits of a river origin. Irrigated meadow soils are the most widespread soils, they make about 2/3 areas of an irrigated arable land. Depending on structure of soils, the humus content fluctuates from 0,5 to 1,8 %.
- Swamp-meadow soils are developed basically on the lower elements of a relief with low level of subsoil water. Usually these soils are characterized by the high content of salts. The humus content fluctuates from 0,8 to 1,5 % with smaller value of phosphorus. For maximum use of these soils, it is necessary to carry out agro-ameliorative actions.
- Meadow-swamp soils in flood-plains of river Amudarya and in a zone of modern delta, periodically flooded at the big floods, with depth 0,5-1,0 m.
- Meadow and swamp-meadow, flood-plain-alluvial soils in a young part of modern delta of the river, occupy extensive inter-current falls. These soils continue the development with receipt of the necessary water and their surface is constantly renewed. The humus content is considerably higher in comparison with other types and this type is the best reserve for irrigation.

	• Newly irrigated grey-brown, grey-brown low-power, newly irrigated meadow and a complex of hily sand. (Basically they are extended on ancient remains of a plateau, for example - the Tashsakinsky plateau • Takyr soils (the area of 300-350 thousand hectares) are extended in the western part of an oasis and make the basic land fund subject to development. Soil salinity is average, chloride-sulphate. • Sandy deserted soils are formed on grown oases sand and in Zaunguzsky Karakums. In some places they are used for irrigation. Takyrs are extended in southwest part of Dashaguzskiy region. Alkaline lands refer to the lowered sites and to places of outlet of irrigating water. • Desert-meadow soils. Development of these soils has begun 15-20 years ago, though it was not always conducted systematically, without observance of norms and rules of agricultural practices, that has led to a sharp rising of level of subsoil waters, which at the moment of inspection corresponded to 2-3 meters. Soils on depth of 6-10 cm have turfy horizon, deeper they are crusty, decorated by humus. On the depth of 50 cm there appears rusty - ferriferous coloring. • Desert takyr. They are formed on proluvial - alluvial loamy-clay deposits on flat and gently wavy surfaces. Subsoil waters are opened on depth of 20-30 meters and do not influence on processes of a water-salt mode of soil thickness. The deserted nature of takyr soils is shown in crust formation (porous, leaf, sometimes reminding a crust of takyr), in absence of considerable moving of carbonates, in low humus and small capacity of absorption. • Alkali-meadow. These soils develop in the conditions of close strong-mineralized subsoil waters (Ground water level 1-3). The vegetation is also strongly rare and presented by ephimers and a cane. In investigated territory alkaline - meadow lands are presented by light loamy soils, sometimes with pro-layers of heavy loamy mechanical composition. • Meadow. They are extended on the lowered elements of a relief in hydromorphic conditions with depth of subsoil waters within 1-2 m. The Mineralization of subsoil waters as a result of analyses fluctuates within 4-15 gram/liter. Influence of subsoil waters (rehumidifying) is shown in a view of exposure and oxidations in thickness 80-150 cm. Capillary border is closed with a surface of soils that promotes rising of salts in top of root horizons. Any change of a water mode will lead to change of a salt mode, taking into account features of mechanical structure. • Meadow - takyr soils occupy the raised sites of area. Morphology of meadow-takyr soils combines lines of meadow and takyr, water-soluble salts containing its considerable quantity. At irrigation of meadow-takyr soil due to rising of subsoil waters they turn in takyr-meadow, where meadow soil formation processes prevail. At long irrigation without a drainage network, they turn to meadow and swampy. • Meadow soils move with irrigated masses, saline soils, takyr soils and sand. All irrigated meadow soils are salted in various degrees. Due to high content of carbonates, they are most perspective for agriculture. As a result of irrigation, they refer to a class of highly cultured soils of oases at performance of following

conditions: creation of not salted irrigational horizon, increase in soil of humus content, nitrogen and other nutrients for plants, introduction Cotton-Lucerne crop rotations.

- Alkaline lands. Half of irrigated land of Dashoguz region is subject to secondary salinization. Alkaline lands are extended everywhere within irrigated zone. Meadow and swampy Alkaline lands have the least distribution. Their characteristic morphological sign is a land-salt fragile crust and chubby powder type dust sub crustal horizon with a significant amount of salts. In saline soils there is no turf horizon.
- Alkaline lands - the land of ameliorative fund, as without building of a collector-drainage network it is impossible to develop them.

3.2.1 Rooting depth, cm

The depth of the root zone, cm

Cotton	Wheat	Rice	Alfalfa	Tomato
60-80	40	40	110-180	30

3.2.2. Water holding capacity (defined by measures of field capacity and wilting point)

Water-retaining capacity of soil – ability of the soil to retain a certain amount of water due to the influence of sorption and capillary forces

Information about the MFM и SWM in irrigated area depending on mechanical structure
Typical soils, located in irrigation zone:

#	Name of soil	MFM*	MSW**
1.	Meadow-takyr и Meadow-desert	22-23	4-7
2.	Meadow-alluvial	20-22	3-6
3.	Newly irrigated Meadow-alluvial	19-24	3-5
4.	Grey-brown	20-21	4-5
5.	Grey brown-meadow	19-21	3-4
6.	Swamp-meadow	23-24	5-6
7.	Takyr non-saline	22-24	4-5
8.	Takyr solonchak soils	21-23	3-4
9.	Takyr alkaline-solonchak	22-23	4-5
10.	Alluvial-meadow (тугайные)	20-21	3-4
11.	Desert-meadow	13,9-21,8	2-3
12.	Sand-desert	12,5-20,3	2-3

	13.	Desert takyr	16,9-25,6	3-4
	14.	Takyr	16,17-26,8	3-4
	15.	Alkiline lands meadow	19-21	3-4
	16.	Meadow	20-22	3-4

* Maximum field moisture
** Moisture of stable wilting

3.2.3 Measure of soil fertility – OC%

Transformation of organic matter into humus takes place in the soil with the participation of microorganisms. The remains of various species and other organisms after contact with a soil are decomposed by the microorganisms and used by them as a source of feed and power.

Not humus substances include:
a) substances of plant or animal origin (carbohydrates, proteins, tannins, lignins, fats, etc.)
b) the substance of secondary forms of microbial synthesis (proteins, carbohydrates, fats).).

Analysis of data on sampling in experimentation sites and at Aral Sea reveals an extremely low content of humus in the soils. Below given 16 types of soils which are the most widespread within the irrigated lands:

№	Type of soil	Humus content
1.	Meadow-takyr и Meadow-desert	0,4-0,81%
2.	Meadow-alluvial	0,4-1,3%
3.	Newly irrigated Meadow-alluvial	0,6-1,1%
4.	Grey-brown	0,2-0,4%,
5.	Grey-brown-meadow	0,4-0,8%
6.	Swamp-meadow	0,6-1,4%
7.	Takyr non-saline	до 1,5%.
8.	Takyr solonchak	2-3%,
9.	Takyr alkaline-solonchak	1%
10.	Alluvial-meadow (tugay)	1-2%
11.	Desert-meadow	0,32-0,45 %
12.	Sand-desert	0,28-0,43 %
13.	Desert takyr	0,34-0,47 %
14.	Takyr	0,36-0,51%
15.	Alkiline lands meadow	0,25-0,36 %
16.	Meadow	0,37-0,69 %

<table>
<tr><td></td><td>Carbon forming facts are the stubbles of a vegetative and animal origin, and make the lowest size, the principal cause of which being:
burning or removal outside the residuals of a vegetative cover (straw, the residuals of a stalk of a cotton, etc.) in the conditions of Republic Karakalpakstan, Khoresmski and Dashaguzskiy regions; mulching of soils is almost not conducted;
legumes and a lucern are cultivated in extremely limited areas;
low or lack of the stubbles (manure) of animals.</td></tr>
<tr><td>3.2.4 Soil pH</td><td>Physic-chemical and absorption capacity of soils explains the nature of soil acidity and alkalinity, which play an important role in agronomic practices.

(Acidity of soils is caused by hydrogen ions. Thus pH=7 characterises neutral reaction, pH <7 - acid, pH> 7 alkiline)

Usually in the soils pH ranges from 4 to 8. pH < 7 occurs in swamp soils – excess moisture, Alkaline lands pH >8 and higher, Swamp-meadow - pH = 6.

The ratio of crops to the PH<table><tr><th>Crop</th><th>Optimum PH</th><th>Grows in the PH range of</th></tr><tr><td>Cotton</td><td>7,0-7,5</td><td>6-8</td></tr><tr><td>Maize</td><td>6,0-7,0</td><td>-</td></tr><tr><td>Alfalfa</td><td>7,0-8,0</td><td>6,8</td></tr><tr><td>Wheat</td><td>6,0-7,0</td><td>5-8</td></tr><tr><td>Potato</td><td>5,0</td><td>4-8</td></tr><tr><td>Rice</td><td>5,0-6,9</td><td>5-7</td></tr></table></td></tr>
<tr><td>3.3 Soil problems posing serious management challenges</td><td>A complex combination of natural conditions and the existence of salt rocks, management operations, etc. cause widespread reclamation of disadvantaged lands - saline, alkaline, eroded, rocky, marshy, which determines the complex, often dysfunctional, land-reclamation status.</td></tr>
</table>

3.3.1 Salinity (severity, soil types and % of area affected)

Within the territory of the irrigated lands (there are all kinds and types of soils, but in the selection of samples for salinity, they are not considered separately) there is a dense network of sampling and there is detailed information on their salinity degree. The results are shown in the below table.

Average magnitude on salinity degree of soil in downstream of Amudarya for the period 1997 – 2010

Years	Total irrigated area	Area covered by monitoring	Salinity degree of soil (layer 0-100 cm)							
			Non saline.		Week saline.		Medium saline		Strongly saline	
	th.. ha	th.. ha	th..ha	%	th..ha	%	th..ha	%	th..ha	%
1997	1452,4	1422,8	147,8	10,4	411,4	28,9	644,3	45,3	219,3	15,4
1998	1450,6	1421	139,1	9,8	407,2	28,7	651,2	45,8	223,5	15,7
1999	1445,9	1416,2	164,1	11,6	398,1	28,1	640,2	45,2	213,8	15,1
2000	1449	1419,3	156,6	11,1	390,9	27,5	651,2	45,9	220,6	15,5
2001	1449	1419,4	157	11,1	362,5	25,5	664,9	46,8	235	16,6
2002	1441,9	1412,3	172,9	12,3	322,6	22,8	679,6	48,1	237,2	16,8
2003	1441,8	1412,2	178,4	12,6	331,7	23,5	670,2	47,5	231,9	16,4
2004	1452,8	1423,2	213,3	15,0	352,8	24,8	631,3	44,3	225,8	15,9
2005	1486,8	1457,2	206,2	14,1	349,5	24,0	667,3	45,8	234,2	16,1
2006	1489,8	1460,2	212,3	14,5	337,8	23,1	671,4	46,0	238,7	16,4
2007	1488,6	1459	207,22	14,2	349,55	24,0	664,48	45,5	237,75	16,3
2008	1486,16	1456,56	205,51	14,1	338,44	23,2	673,72	46,3	238,89	16,4
2009	1501,8	1472,2	220,1	15,0	342,9	23,2	669,64	45,5	239,56	16,3
2010	1550	1490,1	224,1	15,0	366,1	24,6	680,74	45,7	219,16	14,7

There is a need to clarify perennial information on salinity in Dashaguzskiy region of R.Turkmenistan, Kizilorda region of R.Kazahstan and Khoresmski region of R.Uzbekistan.

Thus salinity types could be seen as follows:

<table>
<tr><td></td><td>
<table>
<tr><td>Salinity degree</td><td>Type of salinity</td></tr>
<tr><td>Non saline soils</td><td>Sulphate–chloride</td></tr>
<tr><td>Week saline</td><td>Sulphate – chloride</td></tr>
<tr><td>Medium saline</td><td>Chloride – sulphate</td></tr>
<tr><td>Strongly saline</td><td>Chloride – sulphate</td></tr>
</table>

According to Institute of Soil Science (2003)in Khoresm region of R.Uzbekistan (on experimental data):

newly irrigated Grey-brown, Grey-brown poor, newly irrigated meadow and a complex of hilly sand. On a layer 0-30 cm the dense residual makes - 0,23-0,38 %, on layers 50-100cm - 0,1-0,2 %, chlorine: 0,033-0,035 %, sulphate of 0,1-0,19 %. Type of salinity: Chloride-sulphate.
old irrigated Meadow - alluvial, newly irrigated Meadow - alluvial, newly developed Meadow - alluvial and Swamp - meadow and alluvial soils in a layer 0-30 cm - 0,35-1,4 % (residual area), 50-150 cm - 0,64-1,1 % (residual area), chlorine of 0,07-0,091 %, sulphate of 0,07-0,15 %. Type of salinity: Chloride-sulphate.
modern newly irrigated Meadow - alluvial, newly developed Meadow-alluvial, meadow and Swamp-meadow soils with a layer 0-30 cm 0,30-0,98 % (residual area), bottom 50-1500 cm - 0,14-1,2 % (residual area), chlorine: 0,025-0,038 %, sulphate: 0,085-0,14 %. Type of salinity: Chloride-sulphate.

The following conclusion, on degree of salinity of soil has been drawn:
- High (from 1.4 to 2.1 % - the dense residual of salts);
- Average (from 0,7 to 1,4 % - the dense residual of salts);
- Low (from 0,35 to 0,7 % - the dense residual of salts).
</td></tr>
<tr><td>3.3.2 Sodicity (severity, soil types and % of area affected)</td><td>According to Institute of Soil Science (2003)in Khoresm region of R.Uzbekistan, and based on data of newly developed alluvial soils, alkalinity makes around 2,2-3,8%.</td></tr>
<tr><td>3.3.3 Al-toxicity (severity, soil types and % of area affected)</td><td>On all types of soils, 20-23% of total composition is made of silt fractions in ploughed and sub-ploughed horizons (According to Institute of Soil Science of R.Uzbekistan).</td></tr>
</table>

3.3.4 Low chemical fertility (organic carbon, CEC, etc.) (description, severity, soil types and % of area affected)

In all soils of Aral Sea, there is a low content of elements such as silicium, aluminum, sulfur, calcium and magnesium.

For the normal growth and development of plants, it is essential to have nitrogen, potassium and phosphor in the soil.

Selective quantification of these elements in the soils of Aral Sea is shown in the following Table:

№	Type of soil	Content		
		Phosphor	Potassium	Nitrogen
1.	Meadow-takyr и Meadow-desert	low	low	average
2.	Meadow-alluvial	low	Too low	average
3.	Newly irrigated Meadow-alluvial	low	low	average
4.	Grey-brown	low	low	average
5.	Grey-brown-meadow	low	low	average
6.	Swamp-meadow	low	low	average
7.	Takyr non-saline	low	low	low
8.	Takyr solonchak	low	low	low
9.	Takyr alkaline-solonchak	Very low	low	Very low
10.	Alluvial-meadow (tugay)	low	low	low
11.	Desert-meadow	low	low	low
12.	Sand-desert	low	low	low
13.	Desert takyr	Very low	Very low	Very low
14.	Takyr	Very low	Very low	Very low
15.	Alkiline lands meadow	low	low	low
16.	Meadow	Very low	Very low	Very low

According to Institute of Soil Science (2003)in Khoresm region of R.Uzbekistan (on experimental data):

- Newly irrigated Grey-brown, Grey-brown poor, newly irrigated meadow and a complex of hilly sand. On a layer of 0,28-0,30 % of 0-30 cm -the general carbon; Percent of the general nitrogen - 0,035-0,039 %; C:N - 7,9-8,2 %; Humic acid - 16,34-20,63 %; Fulvic acid - 36,72-37,06 %.
- Old irrigated Meadow-alluvial, newly irrigated Meadow-alluvial, newly developed Meadow-alluvial and Swamp-meadow and alluvial soils in a layer 0-30 cm. General carbon-0,46-0,55 %. Percent of the general nitrogen - 0,045-0,053 %; C:N - 10,3-10,5 %. Humic acid - 15,45-19,20 %. Fulvic acid - 20,09-23,55 %.
- Modern newly irrigated Meadow-alluvial, newly developed Meadow-alluvial, meadow and Swamp-meadow soils with a layer 0-30 cm. General carbon-0,39-0,50 %. Percent of the general nitrogen - 0,03-0,052 %. C:N - 9,6-13,1 %. Humic acid - 11,20-14,64 %. Fulvic acid – 19,68-20,50 %.

3.3.5 Phosphorus fixation (severity, soil types and % of area affected)

On the given section there is very little information on big territories on all types of soils (such data is absent in general).

Therefore we cite data which have been resulted from a pilot site (FAO) in territory of Meadow-alluvial types of soils (agro-chemical laboratory during last years does not take analyses on phosphorus). Below in the table there is data on 10 points on depth of 40 cm (R. Karakalpakstan).

The content of the mobile form of phosphorus on a pilot site of FAO 2006-2008 A.Aybergenov(mg/kg)

Depth	№ of field										
	1	2	3	4	5	6	7	8	9	10	norm
0 - 10	26	22	28	28	22	30	29	26	25	16	100-200
10 – 20	28	26	30	29	27	38	33	28	23	26	(average)
20 – 30	35	30	33	34	31	36	42	34	41	38	
30 – 40	32	34	42	37	40	40	43	38	45	41	

According to Institute of Soil Science (2003)in Khoresm region of R.Uzbekistan, on experimental data,

- newly irrigated Grey-brown, Grey-brown, low-power, newly irrigated meadow and a complex of hilly sand. On a layer 0-30 cm. The general phosphorus - 0,09-0,14 % and gross phosphorus - 14-24 mg/kg.
- old irrigated meadow alluvial, newly irrigated meadow alluvial, newly developed meadow alluvial and swampy meadow alluvial soils in a layer 0-3 0 cm. The general phosphorus - 0,09-0,14 % and gross phosphorus - 12-19,4 mg/kg.
- modern newly irrigated meadow alluvial, newly developed meadow alluvial, meadow and swampy meadow soils a layer 0-30 cm. The total phosphorus - 0,10-0,19 % and gross phosphorus - 8,5-14 mg/kg.

Fixation of phosphorus in irrigated land of Dashaguzskiy region

№	**Name of crop**	**Level of supply of mobile phosphorus (per 1 kg in mg)**					**Supply of potash (per 1 kg in mg)**			
		Up to 15 Very low	*16-30 low*	*31-45 average*	*16-60 high*	*C 60 high and very high*	*Up to 150 Very low*	*151-250 low*	*251-400 average*	*From 400 very high*

1.	Co□ton	1:1	1:0,8	1:0,6	1:0,3	-	1:0,5	1:0,3	1:0,2	-
2.	Corn	1:1	1:0,7	1:0,6	1:0,3	-	1:0,6	1:0,4	1:0,2	-
3.	Rice	1:09	1:0,7	1:0,5	1:0,3	-	-	-	-	-
4.	Cabbage	1:08	1:0,6	1:0,5	1:0,3	1:0,2	1:0,5	1:0,3	1:0,2	-
5.	Tomato	1:1,3	1:1	1:0,7	1:0,5	1:0,3	1:0,5	1:0,3	1:0,1	-
6.	Onions and garlic	1:1,3	1:1	1:0,8	1:0,5	1:0,3	1:0,7	1:0,5	1:0,3	-
7.	Cucumber	1:1	1:0,7	1:0,5	1:0,3	-	1:0,6	1:0,4	1:0,2	-
8.	Vegetable crops	1:0,9	1:0,7	1:0,5	1:0,3	-	-	-	-	-
9.	Beet	1:1,2	1:1	1:0,7	1:0,5	1:0,3	1:0,7	1:0,5	1:0,3	-
10.	Grapes	1:0,9	1:0,7	1:0,6	1:0,4	1:0,2	1:0,6	1:0,4	1:0,2	-
11.	Orchard	1:1,2	1:0,5	1:0,4	1:0,2	-	1:0,6	1:0,4	1:0,2	-
12.	Grain crops	1:1,2	1:1	1:0,8	1:0,6	1:0,2	1:1	1:0,5	1:0,2	-
13.	Potato	1:1,2	1:1	1:0,9	1:0,7	1:0,3	1:1	1:0,8	1:0,5	1:0,3
14.	Old lucerne	180 kg/ga	150	112	75	-	65	60	35	-

In dehkan association «Medeniyat» inspections have been made of 650 ha irrigated land.
On the basis of research it has been found out, that on the irrigated land there are 52,3 % mobile phosphorus (low) and 44,2 %, which is very low. Exchange potassium 18.5 % - average, 26,1 %- low and 48,5 % -very low. On the basis of the agrochemical analysis of soil, for reception 25 centner/ha of raw cotton it is necessary to apply in soils pure 200 kg of nitrogen, 200 kg phosphorus and 72 kg potassium.

There is no information on fixing phosphorus in Kizilorda region.

3.3.6 Poor profile development (soil types and % of area affected)	Information is not available
3.3.7 Rockiness, stoniness (severity, soil types and % of area affected)	There are no rocky and stony areas in the irrigation zones.
3.3.8 Very compact subsoils (soil types and % of area affected)	According to Institute of Soil Science (2003) in Khoresm region of R.Uzbekistan (on experimental data): • newly irrigated Grey-brown, Grey-brown □□ow-power, newly irrigated meadow and a complex of hilly sand. On a layer 0-30 см. Volume weight of soil - 1,39-1,48 g/cm^3 and 50-100 cm-1,43-1,53/ cm3

	Relative density of soil 0-30 cm - 2,75 g/cm^3 and on a layer of 50-100 cm - 2,67-2,81/cm3/ Total porosity: 43,9-49 %. • old irrigated Meadow-alluvial, newly irrigated Meadow-alluvial, newly developed Meadow-alluvial and Swamp-meadow alluvial soils in a layer 0-30 cm. Volume weight of soil - 1,38 1,49 g/cm^3 and 50-100 cm-1,35-1,63/ cm3. Relative weight of soil of 0-30 cm - 2,67-2,71 g/vm^3 and 50-100 cm - 2,63-2,75/cm3. General porosity: 40,7-50,4 %. • modern newly irrigated Meadow-alluvial, newly developed Meadow-alluvial, meadow and Swamp-meadow soils in a layer 0-30 cm, volume weight of soil - 1,31-1,49 g/cm^3 and 50-100 cm-1,20-1,52/cm3 Relative density of soil of 0-30 cm - 2,64-2,69 g/cm^3 and 50-100 cm - 2,64-2,69/cm3. General porosity 38,3-52,7 %. According to project WUFMAS selective measurements with use penetrometer, carried out in 1996-1999 in several farms on meadow and Swamp-meadow and alluvial soils have shown, that in 40 % of cases the indication penetrometer in a layer of 0-70 cm exceeded 1500 кН/m^2 that corresponds to the raised density. (35 % for Karakalpakstan). The percent of fields with sub-plough layer has made 30 % (10 % for Karakalpakstana).
3.3.9 Poor drainage, waterlogging (severity, soil types and % of area affected)	The irrigated land occupied with an agricultural production is basically concentrated on takyr meadow-takyr Meadow-desert, Meadow-alluvial and Meadow-swamp types of soils. In territory of the meadow-swamp land, located on lowered areas there are problems (in irrigated zones), bad working capacity or absence of drainage systems. The areas of these lands are made roughly by 40-50 % from the general arable land of 6,4 th. ha (Republic Karakalpakstan) in a zone of meadow-swamp soils, as a whole drainage systems are in satisfactory conditions. On the given information of Soil Institute (2003) R. Uzbekistan for Khoresm region, the following conclusion can be drawn: • satisfactory water penetration - (100-200 mm for 10 hours) soils make 19,5 % of the total territory; • unsatisfactory water penetration - (50-100 mm for 10 hours) soils make 17,6 % of the total territory; • very unsatisfactory water penetration - (to 50 mm for 10 hours) soils make 5,2 % of the total territory According to research (Katz, 1976), in Khoresm region lateral streams of underground water do not exceed 19-26 cm/year, thus, only vertical movements prevail. As a whole drainage density 30-44 m/ha, depth reaches 1,5-2,0 m and the basic collectors of 2,5-3,0 m (Ibrakhimov, etc. 2011). In Dashaguzskiy region there are open drainages, the length of which makes 9120 km (21,7 m/ha). Including length of inter-farm open drainages of 3313 km (7,9 m/ha) and length of on-farm open drainage systems it is equal to 5806 km (13,8 m/ha). Security of the irrigated land in open drainages makes only 54,2 %. All drainage

waters are dumped on the Sarykamyshsky water basin. Length of the Sarykamyshsky water basin is equal to 668 km. In a year on the average it collects 5500 million m^3. Operation of open drainage systems does not meet demand.

Ниже приведена информация площадь заболоченных земель Dashaguz region P.Turkmenistan.

Area of water-logged land Dashaguz region, th.ha

Name	Г О Д Ы			
	1986	1990	1995	1999
Area waterlogged	1,6	0,6	19,3	6,1

Также были приведены информация о Characteristics межхозяйственной и внутрихозяйственной оросительной и RLC Dashaguz region R.Turkmenistan.

Characteristics of inter-farm and on-farm network in Dashaguz region

Irrigated area, th.ha	Inter-farm canals			On-farm network					Specific weight of length in farm network, running meters/ha
	Total, km	including		Total, km	including				
		Earth bottom	concrete.		Earth bottom	concrete	canalets	pipes.	
407,3	3185,4	3159,7	25,7	9698,3	9655,9	42,4	0	0	24

Characteristics of collector-drainage network in Dashaguz region

Irrigated area th. ha	Vertical drainage wells			The length of collector-drainage network, km				
				Main and interfarm.		onfarm		
	Number, pieces	ha/well.	including operating	Total	specific. m / ha	Total	including. close	specific. m / ha
407,3	0	0	0	3313,5	8,14	5806,15	1049,64	14,26

3.3.10 Excessive drainage (soil types and % of area affected)	There is no over drainage, as they were built in accordance with the project According to Institute of Soil Science (2003)in Khoresm region of R.Uzbekistan, very high-water-permeable - (400 mm. for 10 hours) soils make 13,7 % of the total territory. Highly-permeability - (300-400 mm. for 10 hours) soils make 18,1 % of the total territory. Good water penetration - (200-300 mm. for 10 hours) soils make 15,4 % of the total territory. After construction of lake "Altin-asyr" in Dashaguzskiy region, drainage water will flow to lake better. Level of depth of underground water as a result decreases. The condition of the irrigated land improves. High accumulations of water were formed as a result of the main drainage water diversions of Turkmen lake «Altin-asyr» and draining of drainage systems from areas in different eco-system zones of desert Karakum: Ulshor (26 km^2), Rahmonkol (12 km^2), Eraji (55 km^2), Zennibaba (25 km^2), Uzinshor (16 km^2), Atabayshor (6 km^2), Hangui (25 km^2), Airakli (40 km^2). On a zone of flow of the main drainage systems of Turkmen lake «Altin-asyr», calculations have been made on a separation of underground waters. By calculations on distance of 1000 m from the main drainage systems on durations of 100 days of filtration, speed of a separation of underground water is equal to 0,024 m/day and after 500 days its speed magnitude will decrease to 0,0052 m/day.
3.3.11 Flooding (severity, soil types and % of area affected)	The flooding does not almost occur in the irrigated area of all types of soil; on the contrary, there is a process of aridization or drainage of soils. Where rice is grown, it is possible to see, that there is a flooding. A rice area under crops is not the considerable.
3.3.12. Other management problems (description, soil types and % of area affected)	In Republic Uzbekistan (Khoresm region and R.Karakalpakstan), due to distribution of land between farms, the quantity of powerful tractors (on balance of farmers) has considerably decreased and many farms have passed to processing (ploughing) by tractors of type T-28, MTZ, etc. Therefore ploughing of soils is made in the majority of farmers on depth of 0-20 cm that has led to formation compact plough layer below this layer that is the basic constraining factor of growth and development of root system of plants. Also there are facts of untimely and in incomplete volume inter-furrow processing of soils. The capital leveling of irrigated fields is almost not conducted, the crop rotation, harrowing, clearing irrigating and collector-drainage systems, etc. is not observed. Farms are rather young in R. Uzbekistan, as they were created during last 20 years, therefore among farmers which have no operational experience in agriculture and among those who were not engaged in agriculture earlier, there is a requirement for training of the scientifically-proved best practices of conducting agriculture. In view of untimely shortage of equipment and resources, some field works are carried out in deadlines that are reflected in quality of the conducted works. Among problems on agricultural practices it is necessary to pay

attention on water saving activities (such as a laser leveling, leaving the vegetative residuals), system of conducting sustainable agriculture including soil preserving agriculture.

Techniques and technologies of irrigation are not observed on irrigated land of Dashaguz region. As a result of it salinity of soils occurs, which in its turn leads to poor harvest of agricultural crops.
It is required to introduce water saving techniques and technologies on irrigation of agricultural crops. It is necessary to use everywhere water metering irrigation pipes and siphons.

4. Water resources

4.1 Irrigation water availability

The main sources of water in the territory of downstream of Amu-Darya:

- river Amudarya;
- river Syrdarya;
- underground waters;
- returnable collector waters;
- lake Sarykamysh etc.;
- the small rivers of snow-spring supply Besarik (annual volume of a runoff of 170 million m^3), Shelgay, Asarshik, Teles, Jideli, Akuyuk, Kaynar, Shunkiroy, Sholak, Sassik, Tamdi, etc. These rivers do not reach Syr-Darya , being lost in pebble cones of carrying out at an exit from mountains;
- Turkmendarya;
- Gurzhak-Vozeiv;
- Gilichbay.

Amudarya, as it has been told above, refers to the basic components of water resources for R. Karakalpakstan, Dashaguzskiy and Khoresmski regions. In hydro-alignment Tuyamuyun water resources during 1997-2010 fluctuated from 12030 to 53607 million m^3. Dynamics of an annual runoff during 1997-2010 is resulted below.

The change in volume of annual runoff of river Amudarya for the period 1997-2010 (along Tuyamuyun range,upper irrigated zone of Republic Karakalpakstan, Khoresmski Dashaguzskiy regions).

Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Runoff volume, mln. m^3	26601	58907	35218	20709	17590	32771	41943	33491	50333	32178	26462	19662,1	30217	48174

No data on Kizilorda region.

Apparently from the above-given table one can see that water resources of river Amudarya in downstream are decreasing in the period 2005 for 2008. Only for the last 2-years in the period from 2008 to 2010 the volume of a water runoff is increasing.
On Dashoguzsky region in average the farmers get water from irrigation sources approximately about 6000 mln. m3, in shallow years it decreases to 4000 million m3 (this sum is an average index of last 15 years, includes volume on leaching).

By 01.01.2001 for 15 sites reserves have been approved, which make 265.4 th.m^3/day, forecast reserves in Dashaguz region - 376.4 th.m^3/day. Practically all reserves are located near centers of etraps and the region.

Averaged data on water demand for the past 20 years:

irrigation	4,0 - 8,0 km^3	10,0-24,0%;
Internal lakes	Up to 0,2 km^3	Up to 0,61%
Pasture-haymaking lands	Up to 0,3 km^3	Up to 0,92%
drinking water supply	0,16-0,18 km^3	0,49-0,55%
The industries	0,02-0,025 km^3	0,06-0,07%
Aral sea	Up to 0,20 km^3	Up to 61,2%
River deltas	Up to 4,0 km^3	Up to 12,2%

The basic part of water to 95-97 % (in shallow years) is used for irrigation. In high water years the sanitary-ecological outlet is carried out for delta and Aral sea.

4.2 Quality issues (e.g. waste water reuse)

Long-term supervision on change of a mineralization of river water shows their increase within the last 3 decades. If 30-35 years ago the water mineralization in an alignment "Nukus" made 0,7-0,9 g/l on the compact residual, for last year’s their value has reached to 1,6-2,0 g/l. The Principal cause of it is on the one hand this general decrease water content of the rivers, and from other side outlet of a considerable quantity of drainage water in a channel of the river from medium and bottom runoff (to 10 km^3 in a year). Data on water salinity of river runoff for the characterized years is given below.

Mean monthly data on water salinity in the range Samanbay (R.Karakalpakstan).

Months	Years						
	1960-63	1985	1995	2000	2002	2008	2011
January	0,67	1,07	0,99	1,35	1,76	1,60	1,18
February	0,67	0,92	1,12	1,11	1,51	1,48	1,35
March	0,71	1,07	1,37	1,28	1,47	1,25	1,05
April	0,68	1,01	1,53	1,8	1,10	1,15	1,09
May	0,56	1,07	1,26	1,45	0,82	0,92	1,10

June	0,43	0,95	0,9	0,93	1,10	0,9	0,98
July	0,34	1,13	0,72	0,70	0,72	0,78	0,79
August	0,33	0,64	0,58	0,75	1,28	0,93	0,86
September	0,36	0,50	0,78	0,98	1,02	0,95	1,20
October	0,46	0,42	0,79	0,97	1,25	0,97	1,25
November	0,54	0,50	0,97	1,35	1,6	1,25	1,32
December	0,6	0,62	1,29	1,02	1,45	1,40	1,44
Average	0,53	0,83	1,02	1,14	1,26	1,13	1,13

Quality of surface water in territory Republic Karakalpakstan worsens from year to year. Earlier river water during an annual cycle was referred to hydro carbonate type, the most optimum for the drinking purposes, and for the last years the parity of ions began to vary and now sulphate-chloride type of water prevails even more often, which is harmful to drink.

The information on size of a drainage flow and diveriosn of salts, and also diversion of drainage flows in Dashaguz region is resulted below. Diversion of drainage flows makes approximately 47,5 - 52 % from water supply.

Size of a drainage flow and diversion of salts in Dashaguz region

№	Indicators	2000	2005	2010
1.	The area, th.ha	411	456	503
2.	Water supply, million m^3	4813	4036,2	4206,9
3.	Drainage flow, million m^3	2283,8	1959,8	2188,7
4.	% diverted water from drainages	47,5	48,6	52,0
5.	diversion of salts, . т	7908,0	7997,7	8841,6
6.	%% efficiency from water supply	47	49	52

Diversion of drainage flows in Dashaguz region, mln.m^3

№	Indicators	2000	2010	2025
1.	Total efficiency	2284	2189	2209
2.	Volume of reused collector-drainage water and outlet in rivers	100	200	350
3.	Volume of efficiency outlet to desert depletions	2184	1989	1859

The dynamics of water quality within Republic Karakalpakstan

Indicators	Standard	2000	2002	2008	2010
dry residues, mg/l	1000	865-1860	692-1413	795-1480	785-1290
chlorides, mg/l	350	194-531	9□-375	145-586	180-626
sulfates, mg/l	500	364-640	170-491	195-497	264-462
total hardness, mg (milliequivalents per liter concentration)	7,0	7-12	5-13	7-14	6-11

Such bad quality of water for the last years leads to increase in disease among inhabitants of this region, especially women and children (disease on 1000 th. person occurs in 4740 to 50460 persons, and infantile death rate on 1000 born live 21-23 persons).

From irrigated territories of Republic Karakalpakstan annually returnable-collector waters are formed in 600-2500 million volume m3 (in connection with absence of sewage, their insignificant volume is utilized on local falls). These collector waters have the high content of salts (4000-6000 mg/l) and they are polluted by various pesticides, and other biologically active connections. In connection with insignificant size of capacity of underground waters, with low filtration properties and bad quality, they are practically not used.

Khoresm region (Source. *Ibragimov, etc. 2011.* The mineralization of irrigating water 1 ds/m. the Average mineralization of ground water 1,88 g/l (April), 1,83 g/l (July) and 1,68 g/l (October) (2.35, 2.29 and 2.10 ds/m), each of which has an average level of a deviation 0,98-1.08 gr/l (1 ds/m), and can be classified as moderate on classification of FAO (Rhoades, etc., 1992). Locally, though in small territories, there are high values till 14-15 g/l. In some places it is possible to observe week mineralized ground water 1.3 g/l. This information can be used for water resources management support. On sites with low level of a mineralization, the reuse can be considered as a perspective variant for saving of water. Sites with a high mineralization can help to reveal regions, demanding the further activity on management of water or can promote defining marginal sites. Use of mineralized water on irrigation during the periods of strong accumulation of salts in the top layers of land, in the absence of leaching effect, can be especially harmful. In 2008 potential allocation for a reuse of water from a

collector-drainage network was in volume 275 million m^3. The quantity of water for a reuse has been established for the period from 2nd decade of May till September, 2008.

5. Land use/land cover

5.1 Types of agricultural/non-agricultural land

(data need to be clarified)

Types of agricultural / non agricultural lands

№	name	Khoresm region	Republic Karakalpakstan	Kizilorda region	Dashaguz region	Total
1.	Total area	734,3	16144,9	24899,6	1700	43478,8
2.	Farmlands	411,2	307,3	293	□37	1448,5
3.	Arable land		450	166		616
4.	Perennial plantings		500,2	2,8	18,5	521,5
5.	Pastures	39,8	8937,4		611,4	9588,6
6.	Under the rivers and artificial reservoirs, canals	123,3	3687,8	6852	152,5	10815,6
7.	Roads		60,5	400	50	510,5
8.	Under the buildings and settlements		658	386		1044
9.	Unused lands	160	1543,7	16799,8	430,6	18934,1

Distribution of land resources between agricultural and livestock farms in R..Karakalpakstan, th.. ha.

№	Groups of farms on character of land tenure	The total area	Farmlands	Out of which arable land and perennial plantings
1.	Agricultural	884,4	532,3	293,1
2.	Cattle-breeding, based on field feed production	526,6	275,7	22,7
3.	Cattle-breeding, based on natural pastures	5251,9	3753,2	8,9

During the last years in connection with reduction of water resources there are considerable changes in distributions of land resources. Basically there are groups of land users (arable land).
In Dashaguz region livestock is mainly based on natural rangelands 6114,4 ha.

There is no information on other areas.

5.1.1 Extent of rainfed cropland across site (ha, %)

There are no rainfed cultivated lands

5.1.2 Main rainfed crops or varieties grown (ha)

There are no rainfed crops

5.1.3 Extent of irrigated cropland across site (ha, %)

The area if irrigated arable land in Aral Sea Basin (Area of irrigated cultivated land in Aral Sea Basin)

years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
t□.ha	1129	1129	1146,9	1017,8	1030,6	1071,4	1080,2	1084,3	1097,5	1126,8	1134,5	1127,3	1134,6	1129,2	1389

There is no information on Kizilorda regions.

5.1.4 Main irrigated crops or varieties grown (ha)

The main crops cultivated in Aral Sea basin include: cotton, wheat, rice, corn, lucerne and other vegetable-melon crops. Leading crop is the cotton which makes 30-50 % from a total area. Its total area fluctuates from 456,6 to 560 th. ha. in this zone variety of cotton C-4727, Chimbay 3010, Tashkent-6, etc.are cultivated

For the last years, in connection with reduction water content of the rivers, the area of rice was reduced from 110,0 th. ha (1980) to 4,0 th. ha. Rice varieties UzROS-59, Uzbek-5, Dubovski-120 and Nukus-2 etc are released for this zone.
Wheat cultivation started since 1990, and for the last years its area occupies within 190,4-332,2 th. ha.
For the considered period the area of the main cultivated irrigated crops (th. ha) fluctuate:

№	Crops	Regions и Republic				Total, Aral Sea basin
		Khoresm	Karakalpakstan	Kizilorda	Dashaguz	
1.	Cotton	95,1-110,9	74,0-129,8	87,9 - 110,5	197,8-208,8	454,8 - 560
2.	Cereals	48,6-72,7	52,8-114,9	8,6 - 51,2	80,4-93,4	190,4 - 332,2
3.	Vegetables	10-12,6	4,6-8,7	0,3 - 12,6	5,2-6,3	20,1 - 40,2
4.	Melons	3,6-4,9	4,4 – 7,3	1,5 - 4,9	3,8-4,1	13,3 - 21,2

5.	Gardens and perennial plantings	9,4-11,4		6,6 - 11,5	4-15	20 - 37,9
6.	Maize for grain				1,5-2,5	1,5 - 2,5
7.	Maize for silage				4,5-8,7	4,5 - 8,7
8.	Barley				20,4-53,6	20,4 - 53,6
9.	Other crops	10-41	24,0-39,0	8,2 - 42,4	57,9-87	100,1 - 209,4
10	Rice			4,0 - 110	2,9-29,4	6,9 – 139,4

5.1.5 Extent of pastures across site (ha, %)

Area of pasture lands in Aral sea region

years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Th.. ha												11716.2	11716.2	14717	14260.1

No data for Kyzylorda region

5.1.6 Extent of rangelands across site (ha, %)

Area of lands suitable for the pastures in Karakalpakstan

years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Th..ha	8600							8650						8659	

No data for other regions

5.1.7 Extent of other major land use/land cover types across site (description, ha, %)

Other major types of land use Aral Sea basin

№	**Types of land use**	Regions			
		Khoresm	Karakalpakstan	Kizilorda	Dashauz
1.	Perennial plantations	12083	8559		18,5
2.	Household plots		34277		42,8
3.	Forestry				

Only available information has been given

5.2 Land use trends

5.2.1 Increase/decrease in irrigated cropland due to availability/decline of groundwater resources (severity,

Increase/decrease in irrigated cropland due to availability/decline of groundwater resources (this is not peculiar for the conditions of Republic Karakalpakstan).

In the conditions of Republic Karakalpakstan introduction in an agricultural production is carried out on a half- hydromorphic soil formation mode at level of subsoil waters of 1,5-1,6 m from a land surface. However, for the last years in connection with low water, the areas of the irrigated land were reduced and level of ground water (2000-2001) has decreased to 4,0-5,0 m, and also has

% of area affected)

passed to more auto-morphic a mode.

Transformation of the areas of agricultural crops in agriculture of Republic Turkmenistan for 1990-2007.

№	Crops	1990		2007 г		Transformation of the areas of agricultural crops	
		th..ha	%	th..ha	%	Increase (+)	Decrease (-)
1.	Total area under crops	1230,7	100	1588,1	100	357,4	
2.	Cotton	623,4	50,7	642,7	40,5	19,3	
3.	Grain and leguminous	187,3	15,2	865,7	54,5	678,4	
	Including: wheat	60	4,9	832,9	52,4	772,9	
	Rice	16	1,3	22,1	1,4	6,1	
4.	Vegetables	34	2,8	21,8	1,4		-12,2
5.	Melons	39,6	3,2	8,9	0,6		-30,7
6.	Potato	4,3	0,3	11,1	0,7	6,8	
7.	Sugar beet	0	0,0	15,9	1,0	15,9	
8.	Other	4	0,3	0,5	0,0		-3,5
9.	Forage crops	337,7	27,4	21,5	1,4		-316,2
	Total					720,4	-362,6
1.	Besides: Gardens	25,5		15,5			-10
2.	Vineyards	26,7		22			-4,7

5.2.2 Changes of land use/land cover types (description, % of area affected

After the independence of Uzbekistan, country faced the problem of providing the population with grain products, and therefore the area under wheat was increased and by present time the area of this type of land users for R. Karakalpakstan makes 65-70 th. ha. (see Section 5.1.4 where it is resulted the areas of cultivation grain crops in limits 52,8-114,9 th..ha).

5.2.3 Other significant changes in land use (description, % of area affected)

As a whole on Republic Karakalpakstan in connection with reduction of receipt of a river drain (water supply now has been reduced on the average to 25-30 %, and in shallow years by 50-60 %) there were following changes in land tenure:

- The areas of pasture-hay-makinging lands were sharply reduced (especially in an irrigation zone) to 50-65 % in comparison with 1965-1970;
- The areas of crops of rice were reduced in 25 times R.Karakalpakstan.

6. Land degradation	
6.1 Type and current severity of particular types of land degradation	
6.1.1 Salinization (severity, % of area affected)	Major factors of formation of the salt affected soils in Aral Sea basin include: • evaporation of surface and ground waters which more than in 10 times exceeds quantity of rainfall; • the readily soluble salts flowing with surface and ground waters from regions of formation of a surface drain; • hydraulic pressure of ground water, which creates a continuous ascending current of ground waters from depressions to a surface; • close occurrence of mineralized ground waters (strong saline soils and Alkiline lands); • vegetation (more often halophytes), raising concentration of soil solutions; • security of district CDS or natural drainage; • content of salts in irrigation water and other.
6.1.2 Water erosion (description, severity, % of area affected)	There is also water soil erosion in irrigated foothill plains . Additional research is required.
6.1.3 Wind erosion (severity, % of area affected)	Khoresm region is located in a zone of average wind activity. Winds of a northeast direction are observed in most cases in an annual cycle. Within 6 days of dusty storms (10 - calm) are noticed on the average for a year. Average speed of a wind of 3,5 km/s. Months with active wind activity - December-June. Speed of a wind during this period reaches 3,6-4,5 km/s (Kuziev R 2001. Evolution of soils of Khoresm). Wind erosion of soils in territories Dashaguzskiy regions occurs not only on eroded soil, but also in soils, where the soil moves, and where floods and ravines are formed. For the decision of water and wind erosion in the region, it is required: -The-improved system of knowledge of development of a situation concerning land degradation; -Provide economic or other stimulus for realization of measures on management of process of erosion or on maintenance of crop rotations of sowing crops on slopes with the revealed erosion; -Introduce progressive methods of irrigation on the slope land; -Provide changes at cultivation of grain crops from annual to technical long-term crops or forests in the weakest territories; -Restore the land broken by the industry, mining and other branches; -Introduce new methods and technologies of processing of the land. Below resulted deficiencies, which are the reasons of the above described problems: -Absence of sufficient means to promote monitoring at regional and national level to the budgetary purposes and planning; -Lack of the consent concerning appropriate stimulus; -Lack of experience in the regions on modern methods of an irrigation and outreach to broad masses of farmers; -Fault in maintenance of farmers with irrigating water and other necessary resources in some cases;

<table>
<tr><td></td><td>-Weak control of execution of laws to provide responsibility of oil and gas enterprises for committing damage;
-Weak advocacy and realization of methods and measures on the careful relation to water and the land;
-The-weak control on use of water, the land and inefficiency penal sanctions.</td></tr>
<tr><td>6.1.4 Loss of soil organic matter (severity, % of area affected, ha)</td><td>According to materials of State Design Institute (GosNIIP), the statistical processing of results of the humus content in irrigated soils on the various periods of researches has shown, that in 1950-1959 in a layer of 0-30 and 30-50 cm the quantity humus made within 1,13-0,998 0,77-0,684 % accordingly, depending on conditions of its formation. Thus the greatest indicators were in meadow-oazis soils in the riverbed deposits of old Amudarya, then - irrigated meadow soils of the same deposits and the least - irrigated meadow soils of modern deposits of Amudarya. These indicators in 1970-1980 on the same soils generated on the same deposits and have made accordingly 1 and 0,84-0,566 %, i.e. have considerably decreased, and in 1996-2000 made: 0,984-0,8 and 0,773-0,545 %. There is a decrease tendency (R.Kuziev 2001. Evolution of soils of Khoresm).

The analysis of available data of pilot sites shows, that from year to year on the irrigated land there are facts of decrease in organic substance (humus) on the irrigated land, the principal cause of which being:
• insufficient or full absence of application of organic fertilizers;
• reduction of the area of crops of a lucerne and other legume crops, practically absence of the scientifically-proved crop rotation, i.e. a monoculture;
• way of soil' mulching with the residuals of plants and other materials is not practiced.

<table>
<tr><th colspan="3">Annual application rate of mineral fertilizers per 1 kg/ha</th><th rowspan="2">Annual application rate of manure tn/ha</th><th colspan="3">Total rate of mineral fertilizer in tons</th><th rowspan="2">Total rate of manure in tons</th></tr>
<tr><td>Nitrogen</td><td>Phosphorus</td><td>Potassium</td><td>Nitrogen</td><td>Phosphorus</td><td>Potassium</td></tr>
<tr><td colspan="8">Cotton 25 c/ha</td></tr>
<tr><td>216</td><td>173</td><td>62</td><td>15</td><td>2,160</td><td>1,730</td><td>0,650</td><td>150</td></tr>
<tr><td colspan="8">Wheat 35c/ha</td></tr>
<tr><td>120</td><td>120</td><td>60</td><td>10</td><td>1,560</td><td>1,560</td><td>0,780</td><td>130</td></tr>
</table>
</td></tr>
<tr><td>6.1.5 Loss of soil structural stability (severity, % of area affected, ha)</td><td>It is necessary to notice the fact, that during the last period, the works directed on improvement of fertility of a soil cover on the irrigated land have considerably weakened by the farmers, namely including:
• untimely ploughing of soils;
• compaction of the top layer, destruction of structure of soils;</td></tr>
</table>

	• decrease in application of organic fertilizers. Loss of structural stability of soil during the last period in Dashoguz region decreases, as farmers substantially apply manure, adhere to requirements of agro-technical practices. Nevertheless, while the advanced systems of an irrigation are poorly applied. Therefore more norms of irrigation are being used. Farmers have been given the land on a long-term basis on a rent bases, therefore they do not aspire to avoid losses, and try to improve condition of structure of soil
6.1.6 Loss of agrobiodiversity (description, severity, % of area affected,ha)	The area of Tugay forests makes less than 1 % of Khoresm. Comparing results of 1990 and 2003 it is possible to see, that about 40 % of the area of forests have been transformed into "other forest land” (forests have become thinner and strongly degraded), as a result rates of degradation of forests make 3,1 %. Nevertheless, these areas can be recycled by natural way or by rehabilitation. If to unite forests and other lands of forests, 17 % of their total area will be transformed into arable lands during this period that corresponds to annual percentage of deforestation of 1,3 %. Because of a heavy use of these farmlands, these territories cannot be restored in tugay forests. Thus, 1.3 % should be considered as a conservative estimation of deforestation. Tyhay forests are the important place for habitant and for maintenance of a high bio-diversity. Characteristic types include *Populus euphratica*, *Populus pruinosa* and *Elaeagnus oxycarpa* with mixed types, such as *Tamarix* spp and *Phragmites* spp. Forests support some bio-species of the limited birds, such as steppe owl Otus brucei, white fly forestpecker Dendrocopos leucopterus and the Turkestani titmouse, Parus bokharensis plus globally threatened types, including pale pigeon Columba eversmanni (VU), flying and wintering Big Aquila clanga (VU) and colonial breeding waterfowl, such as night heron Nycticorax Nycticorax. Some mammals otter Lutra Lutra (NT), cane cat Felis Chaus Oxiana and regional subspecies of a red deer (a Bukhara deer) Cervus elaphus bactricanus. Forests are rich also invertebrate, including regionally localized types, such as Glaucopsyche charybdis and Laothe philerema. Annually Amudarya is used by birds, and forests give a valuable place of a stop and wintering for many types of birds. Because of degradation of tugay forests an inhabitancy is under the threat now: three globally threatened types (two birds and one mammal), together with water-marsh lands, providing an inhabitancy to 11 migrating types of birds and one type of mammal. (Tupiza, 2010, the dissertation) Usually, development of the microorganisms promoting mobilization of nutrients amplifies at creation favorable condition in soil. Many authors prove, that for activisation of microbiological processes, the leading role is played by loosening (with a layer turn). Development of number of micro flora, such, as bacteria, actinomycete, mildew of mushrooms and others in soil has a direct relation to the content of manure and manure + limestone. Regular application of organic substances (manure) considerably raises total of microorganisms in soil. Application of organic fertilizers with minerals provides high biological activity of soils. Also other fauna, for example, cordlike (Flagellate), rhizopod(Chiropody) and infusorians (Ciliate), and also earthworms, vertebrate animals are also of great importance at fertility improvement through creation of air in soil. Soils of an Aral Sea basin are the poorest because of above-stated agro-biodiversity and reasons of which include: • application of high doses of defoliants in soil (1980-2010) as a result of which many species of microorganisms and animals were lost;

	• mechanical consolidation of the top layer of land; • the lowest humus content in soil. Causes of loss and decrease of agro-bio-diversity are: -Losses of micro-organisms in the soil occurs because of application of high doses defoliants in soil; -Impact of soil salt on plants. There are no new technologies of decrease in impact of salts on plants. - Negative impact of an environment; - Change of volume weight of soil to 1,60-1.72g/cm^3. Source: Scientific and technical report of the Tashoguz experimental station 2010 г
6.1.7 Other types of land degradation that are significant (description, severity, % of area affected)	As a result of decrease in water-security, the most part of the irrigated land of R. Karakalpakstan, especially under rice crops remained as not sown. Within 15-20 years these lands have not been used in an agricultural production and became uncultivated. On these lands in the beginning (1990-1995) at close level of subsoil waters a process of secondary salinity took place, and the soil lost the fertility and has passed to saline types. For their repeated introduction in an agricultural rotation, great volumes of capital investments will be required. One more factor which will lead to gradual degradation of soils is a monoculture, which takes place within last 20-30 years. For the last years in farms achievements of scientific and technical progress and the best practices designed on reception of high crops of agricultural crops do not take root. Low level of farming practices at above stated and other factors leads to regular decrease of soil' fertility. In Republic Turkmenistan: 1 % of the land is subject to water erosion, vegetation degradations (not used or widely used land) - 74,9 %, deflations (wind erosion) - 2 %, other processes (technological, desertification, flooding of pastures) - 2 %, salinity of the irrigated land - 11 % and other types degradation - 9,6 %.
6.2 Degradation trends	
6.2.1 Reclamation of salinized lands (% of area treated)	In R. Karakalpakstan ameliorative conditions are characterized as follows: • the high quality lands have increased from 1985 to 2010 on 89,73 th. ha (84 %); • the lands of satisfactory quality have decreased from 1985 to 2010 on 45,43 th. ha or 13 %; • the lands of unsatisfactory quality have increased from 1985 for 2010 on 15,9 th..ha or 18 %. *The distribution of irrigated lands by their reclamation status in the Republic Karakalpakstan for the period of 1985-2010.*

Yrs	Total area of irrigated agricultural lands, th. ha	Characteristics of reclamation of irrigated land								
		Good		Satisfactory		Unsatisfactory		Including, th. ha		
		th. ha	%	th.ha	%	th. ha	%	On allowable depth	On salinity	On both reasons
1985	455,10	16,77	4	349,44	77	88,890	20	25,00	9,89	54,00
1990	495,30	18,00	4	367,30	74	110,00	22	39,90	6,40	63,70
1991	494,75	15,50	3	370,25	75	108,90	22	45,90	8,10	54,90
1992	496,50	19,70	4	361,80	73	115,00	23	53,80	7,80	53,40
1993	498,80	27,90	6	357,90	72	113,00	23	47,40	7,80	57,80
1994	499,10	29,00	6	357,00	72	113,00	23	65,20	5,80	42,00
1995	500,90	29,00	6	358,90	72	113,00	23	50,60	7,50	54,90
1996	498,10	28,22	6	349,88	70	120,00	24	54,00	8,00	58,00
1997	500,90	28,30	6	362,60	72	110,00	22	47,10	8,00	54,90
1998	500,00	20,00	4	328,30	66	151,70	30	75,40	34,70	41,60
1999	500,80	37,30	7	343,50	69	120,00	24	69,30	7,00	43,70
2000	500,10	41,20	8	355,50	71	103,40	21	27,50	47,60	28,30
2001	500,20	48,70	10	351,50	70	100,00	20	8,000	61,10	30,90
2002	500,20	66,60	10	332,80	67	100,80	20	28,30	60,70	11,80
2007	504,00	85,02	17	308,54	61	110,44	22	43,99	15,25	51,20
2008	504,53	102,33	20	294,52	58	107,68	21	38,94	19,68	49,06
2009	515,05	107,62	21	302,03	59	105,40	20	38,15	36,48	30,78
2010	515,29	106,50	21	304,01	59	104,79	20	45,86	25,69	33,24

6.2.2 Increase in soil erosion (description, % of area affected)

Soil erosion increase in Aral Sea Basin was not almost observed. Every year reduction of soil erosion шт Dashaguz region ща R.Turkmekenistan is observed, as necessary investments are allocated for development of water sector. Improvement the condition of water systems has positively affected conditions of the irrigated land for soil erosions, salinity and waterlogging.

On given materials of Dashaguz region, investments (see more in resulted below Table) have been allocated for improvement of fertility of soil .

Investments into development of water sector, million dollars.

Years	Dashaguz region
2001-2005	168
2006-2010	542
2011-2015	44
2016-2020	80

<table>
<tr><td></td><td><table><tr><td>2021-2025</td><td>122</td></tr></table></td></tr>
<tr><td>6.2.3 Lowering of groundwater tables (% of area affected, range of change of groundwater levels (m))</td><td>
Mineralization of ground water in Khoresm region is divided on following categories (according to Soil Institute (2003)). Fresh water is 0-1 g/l, very little salted 1-3 g/l, low-salted 3-5 g/l, medium-salted 5-10 g/l, strong-salted 10-25 g/l. In Khoresm 6,4 % of territory is occupied by fresh subsoil water, 36,1 % of territory is occupied by too low-salted, 29,9 % of territory is occupied by lower-salted, 17,3 % of territory is occupied by medium-salted, 10,3 % of territory by strong-salted soil water.

For 17 years (1990-2006), level of ground water (GWL) in Khoresm has shown similar intra-annual tendencies. GWL usually sharply increases from 2 m (± 0) from a surface in December-January to 1,1-1,4 m (± 0) in March as a result of pre-season leaching . After short falling in April-May (1,2-1,5 ± 0 m, the period without an irrigation, except a winter wheat), GWL on all regions rise owing to an irrigation (0,9-1,4 ± 0 m in July). In October, GWL falls gradually to about 1,4-2,0 m (+ -.47-0.66) and further by December. Observable values in the summer show, that close ground waters prevail in majority of Khoresm region during the vegetative period.

Territory of Republic Karakalpakstan, Dashaguz and Kizilorda regions is characterized with close level of ground water and accordingly high salinity of soils. Character of change of level of ground water depends from some factors, including:
• water security of year;
• presence of a drainage and its working capacity;
• an operational experience of irrigators;
• conditions of irrigating systems, etc.
As a rule, in days of the normal and high supply, level of ground water is close to a surface of the land and fluctuates:
• not vegetative period - 0,2-1,5 m;
• during the vegetative period - 1,5-2,2 m.
In shallow years in connection with decrease in size of specific water consumption, level of ground water is sharply reduced (not depending on drainage) and at places decreases to 4-5 m (2000-2001).

During the last years in connection with performance of a government program of land reclamation in Republic Uzbekistan (2008-2012) huge volumes of civil work (reconstruction, repair-regenerative works) have been carried out, that has in turn led to overall decrease in level of ground water, that led to drying the top layer of soils and accordingly to supply of additional volume of irrigation water.
On picture 6.1. There are data on fall of level of ground water on Republic Karakalpakstan.
</td></tr>
</table>

6.2.4 Other significant degradation trends (description, % of area affected)	GWL at Aral Sea basin, including in Khoresm region was comparatively deeper in 1990 rising gradually in consequent years, excluding slight fall in dry 2000 and 2001 years. Standard deviations make 0.47-0.58 m.
Socio-economic descriptors	

7. Demography

7.1 Population

7.1.1 Total population of site, thousand

Total population of site

Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
thousand	3737,2	3815,1	3904,1	3992,8	4075,4	4154,2	4230,2	4304,9	4375,0	4498,0	4534,6	4581,3	4624,2	5095,7	5238,2

There are no data on population in Kizilorda region.

7.1.2 Percentage of rural population of site, %

Percentage of rural population of site, %

Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
%	64,7	65,2	66,1	66,4	65,9	65,4	65,4	65,5	65,6	65,9	65,2	65,3	60,9	61,2	55,3

There are no data on population in Kizilorda region.

7.1.3 Age distribution of rural population.

Age distribution of rural population	Age (under 5 yrs)	Age (from 5 to 7 yrs)	Age (from 7 to 16 yrs)	Age (from 16 to 45 yrs)	Age (from 45 to 60 yrs)	Age (from 60 yrs and higher)
	225420	74735	336775	954544	222575	90827

Age indicators are for 01.01.2011

No data for Kizilorda and Dashaguzskiy regions.

7.2 Poverty

Poverty headcount ratio at $1.25 a day (PPP) (% of population)

	1990	1995	2000	2005	2010
Turkmenistan	14	64	25	..	..
Kazakhstan	0	5	14	0	0
Uzbekistan	..	..	..	..	..

Headcount index: This is the share of the population whose income or consumption is below the poverty line, that is, the share of the population that cannot afford to buy a basic basket of goods.

Source: World Bank
http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=1&REPORT_ID=1336&REQUEST_TYPE=VIEWADVANCED&HF=N

Poverty gap at $1.25 a day (PPP) (%)

	1990	1995	2000	2005	2010
Turkmenistan-Turkmenistan	2	26	7	..	..
Kazakhstan-Казахстан	0	1	4	0	0
Uzbekistan-Узбекистан	..	..	..	..	..

Source: World bank

http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=1&REPORT_ID=1336&REQUEST_TYPE=VIEWADVANCED&HF=N

Poverty gap: This provides information regarding how far off households are from the poverty line. This measure captures the mean aggregate income or consumption shortfall relative to the poverty line across the whole population. It is obtained by adding up all the shortfalls of the poor (considering the non-poor has having a shortfall of zero) and dividing the total by the population. Put differently, it gives the total resources needed to bring all the poor to the level of the poverty line (divided by the number of individuals in the population). This measure can also be used for non-monetary indicators, provided that the measure of the distance is meaningful. The poverty gap in education could be the ‘number of years of education missing to reach the defined threshold’

Conditions of a life of the population in Turkmenistan improve every year. Gas, the electric power and food salt is given to the population free of charge.

7.2.1 Poverty amongst rural population (description, %)

Population with low income prevail in the rural areas.
In Turkmenistan rural people have an own household plots with size 0,8-0,16 hundred square metres of land. Besides, there are arid lands from 3 to 10 ha.

7.3 Nutrition and health

Morbidity of population, number of patients per 1000 men

Regions	1980	1985	1990	1995	2000	2003	2006	2007	2008	2009	2010
Khoresm	453	492	535	632	577	573	654	871,3	887,6	903,9	798

P.Karakalpakstan	Нет инфор	380	475	462	505	Нет инф.	435	683,5	697,8	653,2	676,2
Dashaguzcкая	49	47	43	40	32	33	368	Нет инф.	Нет инф.	Нет инф.	Нет инф.
Tottal	502	919	1053	1134	1114	606	1457	1554,8	1585,4	1557,1	1474,2

Source: Health in Uzbekistan, statistics data book. Tashkent, pages 2012,233

7.3.1 Nutrition and health status of rural population

Sharp deterioration of ecological conditions in Aral Sea basin, connected with drying of Aral Sea, decrease in volume of a river drain and deterioration of its quality finally has led to universal deterioration of health of the population, living in this zone.

The structure and dynamics of separate forms of diseases on Republic Karakalpakstan is subject only to growth: congenital anomalies in 2000 in comparison with 1990 have increased in 6-8 times, ischemic disease of heart - 8,7 times, hypertensive diseasees in 8 times, a stomach ulcer in 5 times, a stomach cancer in 2,2 times, cholelithiasisin 17 times.

Main indicators of the health of population in R.Karakalpakstan

№	Indicator	2001	2002	2003	2007	2008	2009	2010
1.	Morbidity per 100,0 th.people	47486	44553	50460	43011,6	43464,6	40223,4	40819,7
2.	Disabled people per 100 people	4	3,3	3,9	2,3	2,2	1,9	1,9
3.	The birth rate per 1000 people, %	24,0	21,9	21,8	23	24,1	24,7	22,7
4.	Mortality rate per 100 people, %	6,0	5,8	5,9	5,3	5,4	5,0	5,0
5.	Infant mortality rate per 1000 live births	21,0	22,5	23,1	14,1	13,9	13,9	11,8
6.	Maternal mortality per 100 thousand newly born	38	41,5	42,7				

Source: Health care of Uzbekistana, Statistic publication. Tashkent 2012, page 233

The increase in disease is observed among the population in countryside. The selective inspection was carried out in territory of farm «Uykala» of Ellikkalinsky area of Republic Karakalpakstan.

Frequency of disease among population of Rural Clinic (hereinafter SVP) «Uykala» Ellikkalinsky area of Republic Karakalpakstan (the general. K-in the population) is given below

№	**The Names of Diseases**	2006	2007
1.	Some infectious and parasitic Diseases	31	34
2.	Newly revealed patients with malignant tumours	8	5
3.	Diseases of endocrineous system and a metabolism	63	65
	Diabetes	6	7
	Goitre	57	58

4.	Anemias	604	674
5.	Nervous Diseases	70	70
6.	Eye Diseases	12	12
7.	Chronic otitises	13	13
8.	Diseases cardiovascular system systems	135	139
9.	Diseases of respiratory system	106	105
10.	Diseases of bodies of digestion	240	241
	Chronic gastritis	130	130
	Chronic hepatitis	38	38
	Chronic cholecystitis	31	38
	Stomach ulcer and duodenum.	32	32
11.	Diseases of bodies urinary tracts systems	70	70
12.	Diseases of a skin	2	1
13.	Congenital anomalies	2	2

7.3.2 % of children below 5 years of age at risk of malnutrition

There are no data

7.4 Employment

7.4.1 Gender-related aspects of work in rural households

Gender aspects

years	2005	2006	2007	2008	2009	2010	2011
men	13967,6	14320,8	14587,4	14965,4	14442,2	13863,3	13851,1
%	35,2	32,8	32,6	33,0	33,4	29,0	29,8

No data for Kizilorda region.

For Republic Karakalpakstan % of women in the managerial positions out of total

	1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Men									11718	11988	12177	12464	11833	11144	11022
%									28,7	29,9	29,9	31,1	31,6	29,1	29,6

7.4.2 Types and importance of non-agricultural employment, %

Non-agricultural employment in %

Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
%	53,5	54,9	51,8	53,8	53,9	54,0	55,8	55,5	55,9	55,9	55,1	48,8	50,5	50,1	49,6

No data for Kizilorda region.

8. Agricultural systems

8.1 Classification

8.1.1 General classification

Information on R.Karakalpakstan, by types of farms.

№	All types of households including	Irrigated land, plain							
		Total, ha	Most cultivated crops (crops, type of cattle)						
			Cereals	cotton	Potato	Vegetabls	melons	Forage crops	Other cropss
1.	All types of farms, including	262964	100159	100971	5946	6756	5912	35417	7803
2.	Farm businesses	227084	85786	100266	3141	2822	2836	28915	3318
3.	Dehkan farms	31187	15408	0	2720	3795	3000	5291	973
4.	Agricultural enterprises	4693	1965	705	85	139	76	1211	512
	Total	262964							

No data for other regions

8.2 Descriptors related to cropping component

8.2.1 Average farm holding size (ha)

Average farm holding size (ha)

Republic, region	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Uzbekistan	16,4	17,2	19,2	23,9	23,7	22,5	27,1	31,8	34,7	37,8	36,1	38,2	63,3	90,6	107,7

Average size of farm in Dashaguz region 3-10 ha

No data for Kizilorda region.

8.2.2 Type(s) of rotation

There is no scientifically based rotation (by the years) in almost all of the farmer households in the irrigated area.

In cotton growing area, the crop rotation is carried out at the discretion of individual farms.
In 70-80% of cotton fields , the crop rotation is not implemented, i.e. there is a monoculture practice.
In some cases, wheat and other crops alternate cotton in the rotation (this is not permissible). At the same time according to the government calendar, there is no area under alfalfa, which was previously used as the alternate crop in rotation.

But some farmers apply the following scheme of crop rotation: Cotton-Wheat, Cotton 1-3 years, followed by 1-2 years of a winter wheat and other crops, such as mung-bean, soya, corn, sunflower and vegetables.

For soils/regions with low land quality (<= 40) in Khoresm the lucerne crop rotaion (Medicago Sativa L) is recommended within 3 years, then 2 years of a cotton, and annual rotation of a winter wheat with mungbean (summer), with the subsequent cultivation of a soya (Glycine max (L.) Merr.) and a cotton, among proposals on sustainable manufacture of a cotton (Khalikov 2010).

Thus, two basic strategic crops-cotton and winter wheat (Bobojonov 2009; Djanibekov 2008) cover the most part of the area of the irrigated land in Khoresm. On the basis of remote and field classification of crops in Khoresm in 2009 Konrad and others (2006) have found out that 32 % and 27 % of a total area is occupied by Cotton and Wheat accordingly. On the areas, not occupied by cotton, and after a winter wheat, farmers grow corn, sorghum, potato, water-melons, melons, pumpkins, vegetables (Bobojonov and others, 2012). Besides, grapes, fruit-trees and other plantings of trees are met in some parts of the region (Conrad and coauthors, 2006). At present, the recommended crop rotations of a soya or mungbean are not met in official statistics of Khoresm.

Latest results have shown, that cultivation of a cotton without a crop rotation within six years and more does not reflect a reality any more - the crop rotation occurs, at least on 3/4 areas. While only on 16 % of arable lands in Khoresm, Cotton-Wheat is grown more than five years, on 20 % of cultivated land in Khoresm, Cotton continues to be grown as a monoculture for sequence of six years, and even more. Besides, more than half of arable lands, at least once during the period between 2000 and 2009 were used for cotton cultivation in sequence for more than three years.

Crop rotation in Dashaguz region:
cotton-wheat-lucerne
cotton-wheat three years, then lucerne.

No data on Kizilorda region.

8.2.3 Cropping intensity

The intensity of the harvest depends on the type of crops. Below in the table there is information on timeline and the intensity of the harvest.

Type of crop	months									
	IV	V	VI	VII	VIII	IX	X	XI	XII	Duration of harvest, days
cotton	-	-	-	-	-	+	+	-	-	40-60
wheat	-	-	+	+	-	-	-	-	-	25-35

rice	-	-	-	-	-	+	+	-	-	40-60
alfalfa	-	+	-	+	-	+	-	+	-	35-40
vegetables	-	+	+	+	+	+	+	-	-	30-150
melons	-	-	-	+	+	+	+	-	-	40-80

8.2.4 Source(s) of water supply for crop production

The main sources of irrigation are water of river Amudarya and irrigation canals. Water intake from sourcea is carried out on large irrigation to systems as Suenli, Kiziketen, Pahtaarna, Pitnjak-Arna, Tashsaka, Shavat. Delivery of water to farmers is carried out on dense systems, channels. Collector waters is practically not used, (0,1-0,2 million m3 in a year) in view of high mineralizations. For the technical and economic reasons, underground water is not used for irrigation. An atmospheric precipitation practically has no role in irrigation (100 mm a year).

8.2.5 Implements/machinery used, degree of mechanization

In all farmer households of R.Karakalpakstan and Khoresm region for the work of general purposes the most rational is to use the crawler tractors, traction-class T-4A.

- To perform the cotton seeding work, the tractors MTZ-80x, TTZ 8010 and TTZ 8011 with the capacity of 80 horsepower are used.
- The plows TL-3-35, PD-3-35 are used for fall tillage.
- Pre-sowing mineral fertilizers are applied by the chisel device 4KU-4.
- To conduct the land leveling on the fields, the long-baseline levelers-P-2, 8 are used.

650 combine harvesters, 1300 ploughing tractors and 2500 tractors-cultivators, and also seeders, levelers and other technics and the equipment have been bought for the last four years in Republic Turkmenistan. On November, 26 of the last head of Turkmenistan state took the decision on acquisition of 270 more combine harvesters of three leading world brands, which are planned for using in different regions of the country. In Turkmenistan there are more than 2 thousand combine harvesters, 2,5th. Ploughing tractors and more than 3 th. Tractors-cultivators.

Available technology, tools / equipment in the Khoresm region.(regional statistics), pieces

Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total tractors	10835	10028	9537	8964	8857	7518	6789	5933	5461	3419
Cultivators	2982	2888	2581	2429	2185	1994	1742	1425	1206	824
Seed planters	1483	1705	1588	1601	1535	1511	1455	1392	1507	1062
Combines	844	827	772	721	698	626	550	453	341	224

Information on types of farms in Khoresm region

№	Name	Dated for 1.01.2006			Dated for 1.01.2007			Dated for 1.07.2007			Growth or reduction in omparison with 1.01.2006			
		Total	including		Total	including		Total	including		Total	including		в %
			Tractors	Combines and cotton harvesting machines		Tractors	Combines and cotton harvesting machines		Tractors	Combines and cotton harvesting machines		Tractors	Combines and cotton harvesting machines	
1	MTP (Machine-Tractor Parks)	338	248	90	302	227	75	312	241	71	-26	-7	-19	-8%
2	Alternative MTP	4771	4589	182	3800	3673	127	3680	3558	122	-1091	-1031	-60	-23 %
3	Farm businesses	1896	1824	72	2752	2649	103	3094	2973	121	1198	1149	49	63 %
4	Other (legal and physical entities)	6987	6732	255	8099	7761	338	8355	7986	369	1368	1254	114	20 %
Total		13992	13393	599	14953	14310	643	15441	14758	683	1449	1365	84	10 %

Source: D.Niyazmetov,Masters theses

8.2.6 Degree of commercialization

Sold products (thou.t).

Crops	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
cotton	269,5	373,498	479,455	324,407	257,511	172,165	164,061	306,654	303,85	294,512	18,775	0,237	258,02	
wheat	28	73,508	100,534	110,752	61,006	77,533	91,207	70,263	83,104	102,849	112	70,7		
potatoes	28	33,6	56,3	61,6	18,3	30,8	22,5	26,3	26,5	33,5	33,4			
Rice		81,142	64,92	2,427	0,363	31,346	20,655							

Republic of Karakalpakstan

Types of crops	years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cotton	Gross harvest	269,5	156,6	189,4	125,4	111,6	72,6	88	184,1	212,6	193,7	185	165,8	182	188	195,4
	Sale	269,5	156,6	189,4	125,4	111,6	72,6	88	184,1	212,6	193,7	185	165,8	182	188	195,4
	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Cereals	Gross harvest	49,2	56,4	74,7	89,2	42,7	56,6	137,4	155,1	162,6	215,6	243,1	182,1	183,8	201,3	172,4
	Sale	24,5	33,4	49,1	50,5	19	20,5	65,7	57,7	65	78,4	78,9	53,1	82,9	86,3	80,2
	%	49,8	59,2	65,7	56,6	44,5	36,2	47,8	37,2	40,0	36,4	32,5	29,2	45,1	42,9	46,5
Wheat	Gross harvest	49,1	56,3	74,6	89,2	42,7	56,5	137,3	154,9	162,1	215,2	216,6	181,8	183,5	201	172,1
	Sale	24,5	33,4	48,1	50,5	19	28,5	65,7	57,4	65	78,4	78,8	52,1	82,9	86,8	80,2
	%	49,9	59,3	64,5	56,6	44,5	50,4	47,9	37,1	40,1	36,4	36,4	28,7	45,2	43,2	46,6
Rice	Gross harvest	116,3	137,2	171,0	14,2	1,1	36,0	114	43,9	25,7	55,5	42,0	15	33,7	79,5	5,6
	Sale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potato	Gross harvest	11,7	8,7	8,5	88	6,8	6,8	8,3	13,8	13,2	15,5	17	21,6	25,1	29,2	32,9
	Sale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

All agricultural products in Dashaguz region, including cotton, rice, sugarbeet are grown on the bases of state order.

No information on Kizilorda region.

8.2.7 Spatial organization of cropping in relation to environmental differences (mountains, foothills, plain, etc.)

Height <100 Under the sea level	Height 100-500	Height 500-900	Height 900-1300	Height 1300-1700	Height <1700-2000	Height 2000-2400	Height 2400<
All crops are cultivated							

8.3 Descriptors related to animal component

Livestock is an important part of Republic Karakalpakstan agriculture, contributing to the insuring of the population with food and industries by the raw materials. Depending on the natural-climatic conditions of the region, livestock can be divided into intensive (industrial), extensive (grazing), and domestic. Dairy cattle breeding, poultry farming is concentrated in the suburban area of irrigation.

- Pasture livestock is concentrated in the area with the low natural resource potential and domestic livestock -on private lands.

- Sheep breeding - the most common type of livestock activity. The main breeds of sheep are “karakulskaya”. On the average on the maintenance of one sheep in one year it is required 400 c.u and it covers annual requirement to 80-85 % at the expense of pastoral forages, the rest animal receives in the form of concentrates, rough and other types of forages during the winter period. One of the original and also export-demanded skin is karakul (astrakhan) skins of sur color.

- Goat breeding. This type of activity is practiced everywhere, they breed basically local coarse-haired goats in private farmsteads. The basic production of goat breeding is meat. From a goat they receive on the average 11-15 kg meat in one year and about 0,5 liter of milk a day. For the last 5-10 years there was a sharp increase in a livestock of goats that is probably explained by their unpretentiousness and high reproducibility.

- Camel breeding. Basically they breed one and two-humped camels for manufacture of milk, meat and a wool. Here basically local people breed Turkumensky Arvana (one-hump camel). This refers also to Sakarchaginsky and Erbentsky meat and dairy types, the weight of which makes 610-720 kg with a milking of 440-350-4400 litre, with fat content of 3,5 %

- Horse breeding. Local people breed horses of local population and use them as transport means and for sports competition. Their livestock is much less than sheep and goats and large cattle.

- Cattle breeding. Republic Karakalpakstan is presented by local low productive zebu cattle and partially with its hybrids with red-steppe and black-motley breed. They are characterized with low dairy efficiency (1100-1300 gram on a head in a year) with the fat content in milk of 3,8-4,0 % with average live weight of cows 260-3020 kg and adult bulls of 380-460 kg. All cattle in territory belong to local population and in a year 100 cows usually give 71-75 calves.

Breeding cattle in all farms has meat and dairy orientation and very low productivity (2-4 liters of milk per day).

8.3.1 Main animal species or races kept (thousand).

Breeds and types of livestock in Khoresm region and in R.Karakalpakstan, thousand.

Breeds	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Cattle	822,2	835,9	831,3	830,8	829,5	838,6	893,2	961,3	1022,5	1056,9	1207,3	1290,6	1334,9	1391,5	1454,4
Goats and sheep	634,8	639,1	638,6	646,3	654,9	666,0	708,0	773,9	831,5	880,9	926,8	970,5	1001,4	1074,5	1119,7
soliped	21,8	22,3	21,4	21	20,3	20	19,7	20,1	20,5	20,7	21	21,6	22,6	23,2	23,4
poultry	1852,6	1991,2	2003,3	1912,6	1906,6	1974,5	2161	2392,9	2543,6	2818,9	2889,5	3076,8	3834,2	4277,3	4617,3
Other	38,8	39,0	39,4	39,2	39,6	38,6	39,4	39,1	39,8	39,7	39,1	39,5	40,3	46,6	47,9
Camel	5,1	4,7	4,7	4,5	4,6	4,6	4,6	4,8	4,9	4,9	5,1	5,3	5,3	5,4	5,4

There is no separate information on Dashaguz region, but it is available on Republic Turkmenistan (see below)

The basic development indicators of agro-industrial complex of Turkmenistan for the period 2011-2015

Indicators	Unit.	2010	2011-2015 (Mean annual)
Total volume the agriculture foodstuffs	Mln. Mln.	2968,0	3459,0
Total volume of the foodstuffs of the industrial goods	Mln. ман.	2090,7	2457,5
Manufacture of the main types of the foodstuffs:	th. tons.	31,4	34,9
Meat (live weight)	th. tons.	37,9	40,8
Milk	th. tons.	4,4	5,0
Wool (physical weight)	tonsна	2945	3130
Fish and fish products	th. tons.	13,7	14,0
Meat	th. tons.	91,3	96,8
Vegetable oil	th. tons.	11	15
Sugar	th. tons.	551,2	565
Flour	th. tons.	318,2	347,5
Fibre of raw Cotton	th. heads	54,1	57,6
Cattle	th. heads	1,1	1,3
Horses	th. heads	-	-
House poultry	th. heads	15,5	16,7
Camels	th. heads	1979,3	2296,2
Gotas and sheep	Mln. штук	12	12
Saplings	Mln. ман.	2390,2	1486,3
Volume large capital investments	чел.	68289	76855
Number of workers	$ Mln.	488,3	549,6
External trading management	$ Mln.	237,6	248,1
Export-Total	$ Mln.	250,7	301,5

No data for Kizilorda region.

8.3.2 Feed systems

There are two types of animal industries: large-scale (LS) farms and containing cattle in house conditions.
Both use four power supply systems:

1. Pastures for grazing of cattle.
2. Grazing on vegetation near to channels, lakes, the rivers, forests and fields.
3. Grazing on stubble (basically in the autumn and in the winter). Some lay lands also are used for grazing.
4. Cattle feeding in house conditions by collected forages (basically during the winter period).

All territory of Karakalpak Kizilkum for vegetative groupings is divided into a number of areas. In mountain areas - Sultan-Uizdaha vegetation is very poor, both on number of types, and by quantity of species and is presented basically by types of grey-fill bushes.

Leading plants of this area are a wormforest, kurchatka, ephedra, kuziniya, as an impurity in a cover participate turf of bluegrass bulbous, epher cover makes a basis of fodder stocks for karakul sheep breeding of sandy deserts.

Buhansky uplands - the basic vegetative groupings are wormforest and wormforest-bush thickets: a wormforest, fluffy glasswort keyruk, annual ephemers, desert dormouse, teresken and others. In these areas the crop of vegetative weight does not exceed 1,0 - 2,5 centner/ha.

Areas of the salted hollows are richer glasswort, as biyurgun, sarsazan and a dwarfish saxaul. The most part of the area of Karakalpak Kizilkum is made of sandy areas, where wormforest thickets, black and sandy saxaul, a reed, jantak (bur), a wormforest (white), straw (wheat), ephemers, cereal on village are considerably widespread
cereal on village etc.

Fodder value of some plants Kizilkuma

№	Plant' names	Feed unit, kg	Digestible prtotein	Calcium, gram	Phosphorus, gram	Carotin, gram
1.	Reed	0,26	30	2,5	1,2	10
2.	Selets	0,43	36	4,2	2,5	10
3.	Jantak (bur)	0,18	19	4,4	0,7	40
4.	Wormforest (white)	0,19	25	3,3	0,9	20
5.	Straw (Wheat)	0,22	10	4,4	0,7	5
6.	Ephemer	0,17	14	2,9	0,9	12
7.	Lucerne (hay) (Alfa-alfa)	0,49	116	17,7	2,2	45

In a northwest part of Karakalpak' Kizilkum, around the old-alluvial deposits occupying huge falls, the basic background of vegetation of pastures is formed by biyurgun. It is added by annual glasswort and ephemers, and also a wormforest and a black

saxaul. Kizilkums, territories of Kara-Kalpak occupying the most part, differ by a considerable variety of a biological structure and geo-morphological conditions.

8.3.3 Prevalent livestock diseases and mortality

Principal causes of death of the adult cattle were cold stress (two thirds of cases of an animal death occurs during winter time), connected with calving and accidents in large-scale cattle-breeding farms. Calves in large-scale cattle-breeding farms were lost from overcooling and a diarrhea. In some cases in both systems it has been noted that symptoms similar to foot and mouth disease also cause death. Some farms containing cattle in house conditions have specified a sting of insects as the reason of symptoms.

Herds of karakul sheep, camels and cattle are grazed on pastures and use collector water which causes various diseases. Close to wetlands in spring-and-summer time the gadfly (gadfly) appears which is source of parasitic diseases as an itch.

According to shepherds from disease of itch suffers basically cattle and horses, and approximately 10-15 % of animals from the general livestock, which leads to decrease in efficiency and in some cases there is a murrain of animals. Diseases among animals for the last 2006-2008 on separate selective farms are resulted below.

Information on diseases occurred among livestock animals in the past 2006/08 in selected farms of the Republic of Karakalpakstan.

Farms	Diseases, %	Types of animals								
		Karakul sheep			Cattle			Camels		
		2006	2007	2008	2006	2007 г	2008	2006	2007	2008
Mulk	Brucellosis	-	-	-	27,2	-		-	-	-
	Foot and mouth disease	-	-	-	-	-		-	-	-
	Pasteurellosis	2,7	20,1	5,7	-	-		-	-	-
	echinococcosis	9,1	6,3	5,1	-	-		-	-	-
	Teylerioz	-	-	-	36,3	21,4		-	-	-
	Mad cow disease	-	-	-	-	-		-	-	-
	mange	-	-	-	12,4	15,4	8,6	8,7	9,4	-
	Tuberculoses	-	-	-	-	-	-	-	-	-
Buhanmerey	Brucellosis	-	-	-	4,5	4,0	-	-	-	-
	Foot and mouth disease	-	-	-	-	-	-	-	-	-
	Fasciolez	4,9	5,4	3,4	-	-	-	-	-	-
	echinococcosis	-	-	-	-	-	-	-	-	-
	Teylerioz	-	-	-	28,5	17,9	6,8	-	-	-
	Mad cow	-	-	-	-	-	-	-	-	-

	disease										
	mange	-	-	-	8,5	9,4	9,9	11,3	13,4	14,7
	Tuberculoses	-	-	-	-	-	-	-	-	-
Kizilkum	Brucellosis	-	-	-	6,5	4,1	-	-	-	-
	Foot and mouth disea	-	-	-	-	-	-	-	-	-
	Fasciolez	6,5	8,1	7,3	-	-	-	-	-	-
	echinococcosis	3,8	6,3	4,4	-	-	-	-	-	-
	Teylerioz		-	-	7,5	8,3	5,3	-	-	-
	Mad cow disease		-	-	-	-	-	-	-	-
	mange		-	-	7,8	9,2	11,3	5,6	6,6	6,8
	Tuberculoses		-	-	2,1	2,1	2,9	-	-	-

8.3.4 Main animal products

1. Cattle: meat, milk, skin.
2. Goats and sheep (G&Sh): meat, milk, wool, skin.
3. Camel: meat, milk, wool, skin.
4. Horse: meat, milk, skin.

Main animal products in Khoresmski regions

Products	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Meat (beef), live weight, tons											74876	83964	89069		
Milk, tons	55800	52478	27947	27160	24296	19581	12386	9894	8015	7419	495353	567080	595776		
Eggs, th.pieces	106200	33085	20624	25290	23425	68438	22511	27763	32134	34716	160614	176050	210083		

No information for other regions.

8.3.5 Degree of integration with crop component

Now efficiency of pastures makes 1,5-3,5 centner/ha, security by forages makes 50-55 %. Thus desert fodder plants have low eating (15-30 %), digestion (50-55 %) nutritional value (0,3-0,5 feed unit and 30-35 protein in 1kg of a forage).

Therefore farmers are interested in feeding of animals on the basis of cultural plants, exceeding feed unit in 10-20 times in comparison with pastoral types of plant.

Especially in private farms feeding of animals is carried out by means of sowing cultural plants as: corn, a lucerne, jugara, pumpkin and other types. Most likely the basic livestock of animals in the future will be oriented on cultivation of agricultural

crops. Below in the table there are areas of forage crops of Republic Karakalpakstan.

Table. Sown area under fodder crops in Republic Karakalpakstan, (2011).

Indicators	Shirkats	Farm businesses	Dehkan farms	Total
Area,ha	2196	6485	1745	10426

No information for other regions.

8.3.6 Spatial organization in relation to environmental differences (mountains, foothills, plain, etc.)

The basic area of territory is made of plains with a high elevation of □100,0 m.above sea level and only total 8 % occupy heights from 100 to 500 m above sea level. (Except plateau Ustyurt). High elevations from 100 to 500 m are completely deprived of vegetation and are not suitable for animal husbandry (except plateau Ustyurt)
In table 8.4 there are types of animals grazing in various conditions.

Type of livestock	Above sea level ∠ 100,0 m.	from 100 to 500 m. above sea level
Sheep breeding	+	+
Goat breeding	+	+
Camel breeding	+	+
Horse breeding	+	+
Cattle breeding	+	-

8.3.7 Prevalent crop pests, diseases and parasitic flowering plants (parasitic weeds)

Pests downstream of Amudarya:
Apple seedworm-Cydiapomonella,
<http://www.pherotrap.ru/yablonnaya-plodozhorka>
Pea seedworm-Laspeyresianigricana,
<http://www.pherotrap.ru/gorokhovaya-plodozhorka>
Racemose leaf-roller moth-Lobesiabotrana,
<http://www.pherotrap.ru/grozdevaya-listovertka>
Cabbage cutworm-Mamestrabrassicae,
Exclamatory cutworm-Agrotisexclamationis,
Turkestan beetroot moth - Loxostege nudalis Hb., spider mite - Tetranychus turkestani Ug. et Nik,
The flour tick - Acarus siro L.,
Storage pest - Sitophilus granarius L.,
Tobacco thrips - Thrips tabaci Lind.,
Wheate thrips - Haplothrips tritici Kurd.,
Gumming - Xantomonas malvaceanum Dowson.,
Green apple louse aphis pomi deg,
Cereal plant louses - Metopolophium dirhodum Walk.,

Diseases:
Root rot - Rhizoctonia solani Kuehn,
Black root decay-Thielaviopsis basicola Ferraris f., Ordinary root decay - Helmintliosporium sativum,
Macrosporioses - Macrosporium macrosporum Morsy,
<http://agra.com.ua/field/242.htm>
Root rot - hymatotrichum omnivorum Duggar.
<http://agra.com.ua/field/253.htm>
Pink rot-Trichothecium roseum Link, <http://agra.com.ua/field/245.htm>
Grey rot - Botrytis cinerea Fr. <http://agra.com.ua/field/246.htm>
Fuzarios-Fusarium Link, Dark-brown spot - Bipolaris sorokiniana Shoemaker,
Mildew - Erysiphe graminis DC.

Spread of cotton diseases
1. leaf mottle - Verticillium dahliae Kleb,
2. fusarium -Fusarium oxysporum Schl. f. vasinfectum Bilai,
3. blackarm – Xanthomonas campestris hv. Malvaceaerum

<table>
<tr><td></td><td>
<table>
<tr>
<td>East striped billbug - Chromonotus confkiens Fahrs
Leech - Lema melonopus Li
Sunnpest - Eurygaster in tegrictps Put
Wheaten plant louse - Schizaphis graminum Rond.
Cereal plant louse - sitobion avenae F.
Field bug - Lygus pratensis Li.
Cicadas – Cicadinea.

Cotton pests
1. melon aphid – Aphis gossypii C, lov
2. alfalfa aphid - Aphis eraccivora Koch.
3. tobacco thrips – Throps tabaci Lind.
4. greenhouse whitefly – Trinlenrodes Vararariorrum westne
5. cotton whitefly - Bemisia tabaci
6. turnip moth – Agrotis segetum Den
7. cotton moth – Aclithis armigera
8. glasshouse spider mite – Tetranychres urtunal Koch.

Some weeds met in cotton and wheat plantings.
1. barnyard grass, millet - Echinochof cus-galli (Z) Beauv
2. field bindweed – Convolvulus arbensis
3. goosefoot family – Chenopodiacae
4. common reed – Phragmites communis Trin
Parasite plants
1. field dodder – cuscuta appoximata Robingt
2. . broomrape - orobanche</td>
<td>Spread wheat diseases
1. loose smut – Ustilago tritici (Pers) Jens
2. head smut – Tillettia tritici (Bjerk)
3. yellow rust – Pussinia striiformis West
4. brown rust - Pussinia triticina Erikss
5. powdery mildew – erysiphe graminis DC f. Tritici Marchal

Weeds:
1. Shirisa - Amaranthus retroflexus L.,
2. Saltbush-Chenopodium album L.,
3. Nightshadeblack - Solanum nigrum L.,
4. Purslane garden - Portulaca oberacea L.,
5. Trailing hollyhock - Hibiscus trionum L.,
6. Foxtail grey - Setaria glauca P. B,
7. Chicken millet dew - Echinochloa crusgalli L.</td>
</tr>
</table>
</td></tr>
<tr><td colspan="2">8.4 Market access and characteristics</td></tr>
<tr><td>8.4.1 Distance to closest local market (km, hours of travel) [in SRT2 regions often > 2 hours, in SRT3 regions often < 2 hours]</td><td>In each area there is one central market in Aral Sea basin. Some areas have 3-5 markets, however, some of these markets work in certain days of week. As a whole, the markets are scattered all over the region. Access to the nearest markets from settlements is in limits of 2-60 km and more. Only 15 % of settlements are located in more than 8 km from the nearest market. Thus, based on distances to the nearest market, 100 % of settlements can reach the market within 3 hours of driving.

Also it is possible to consider the market of regional level, as the majority of the population delivers agricultural production basically on the market located in the centre of an area. Separate farmers (who have transport, a motor vehicle or a tractor) deliver production in the regional centers in Nukus, Urgench, Dashauz and Kizilorda. As here they are more expensive (10-20 % and more) than in the market of the regional centre. There are cases of a daily delivery of agricultural production to the centre of farms.</td></tr>
</table>

	Thus the distance from a place of location of farmers to the small market, located in the centre of farm fluctuates from 2 to 100 km and time for is accordingly spent for reaching them, as it has been told above from 35 minutes to 3 hours (depending on a type of transport basically on bullock cart). As it was said above, whoever has own motor vehicle, those farmers deliver production in the regional centre (basically in radius of 100 km) and this distance depending on a site fluctuates from 20 to 100 km and time in a way accordingly from 1 till 4 hours.
8.4.2 Sizes of rural markets	The sizes of the rural markets depend on the sizes and efficiency of subsidiary and household farms. In territory of southern areas (Turtkulsky, Berunijsky, Ellikkalinsky, and Amudarya areas), where the population is basically dense and receive higher crop from subsidiary and household farms, the sizes of the rural markets fluctuate from 0,5-to 1,5 ha. In territory of northern areas of R. Karakalpakstan the size of this indicator is lower even more and makes 0,2 - 0,5 ha, it is necessary to notice, that in a countryside not in all farms there are markets, and they deliver their products to the area or regional central markets.
8.4.3 Competitiveness and access to local, national, regional, global markets	In the agricultural sector of the Republic of Uzbekistan, the government sets the orders for production of cotton, and has access to the world market through stock market (farmers do not have direct access to the world market). For other crops like wheat, rice and other vegetables, farmers have access to local and national markets (in this matter there are no specific difficulties) and they have comparative advantages in quality and environmental friendly products. It should be also noted, that farmers deliver and sell in the regional markets basically grapes, dry fruits, tomatoes (non mature).
8.5 Access to land, water and other inputs	According to the Constitution of the Republic of Uzbekistan and other legislations, the government shall regulate all land, water and other resources. For this, there are a number of government regulations (on the international and national levels), where the political, legal and economic aspects of the use of land and water and other resources, including the rights of citizens on access to land, water and other resources are defined.
8.5.1 Access to land	All land resources included in the unified state land fund, which, in accordance with the principal intended purposes are subdivided into the following categories: - agricultural land, provided to the farmers and other land users for agricultural purposes; - settlement lands (small households, municipal and other species); - land for industry, transport, nature reserves and other non-agricultural purposes; - The land of the state forest fund; - The land of state water fund; - The land of state reserve. The government establishes the basic rules of Land Management. Under the current land legislation of the Republic of Uzbekistan, the categories of land and land access shall be defined in accordance with their main intended purposes. Most part of the land fund

	is used for agricultural purposes. Brief information on the organization of farms. The farm in R. Uzbekistan is organized through a written application on a competitive basis in local authority (khokim) with instructions of a place and the area of a field, employees of the private farms, the planned specialization of farm, a rent and business plan condition. The land is given to a farm on the basis of long-term rent of the land area in the contract (till 50 years). The rights of farmers in renting of the land area is limited, and the land can't be transferred, advantage to owners while sale, mortgage and exchange of land is forbidden. The rented area farms of animal industries is directly connected with quantity of a livestock in the ratio 0,33 ha on an equivalent cattle, and should not be less than 30 heads of cattle equivalent, that will correspond to 10 ha of land. Except grazing of animals, cattle-breeding farms can grow commercial crops (Djanibekov, etc. 2012). Dehkan farms receive the land for lifelong inherited possession, the maximum size is 0,12 ha for habitation both for a domestic garden, and additional 0,12 ha of a distant field is used only for cultivation of agricultural crops (Djanibekov, etc. 2012). Agricultural co-operatives receive the land for constant possession for the purpose of its use for agricultural production (Djanibekov 2008).
8.5.2 Access to water	According to the law, each citizen has a right of access to safe water on both international and national levels. Access to the water resources can be carried out in the following ways: • for drinking purposes (water supply and sanitation); • for agricultural production; • for the industry; • to protect the environment. The main legislation on water use and water access exposed in the Constitution of the Republic of Uzbekistan (1992), the Law of the Republic of Uzbekistan “On the limited water use in the Republic of Uzbekistan” (1993), the Law “ On Water” and other legislative acts.
8.5.3 Access to other inputs (seed, fertilizer, etc.)	According to the agreement between farmers and suppliers, and by the request of farmers, the necessary inputs as fuel, seed, fertilizer, tractors (who do not have) are provided according to the established prices. According to the regulatory planning costs estimated for each farm at the end of the year (depending on the size and type of crops) the relevant services are being provided to farmers. Farmers make agreements (preliminary, advance) with the relevant organizations, for example with oil supply centers.

8.6 System problems	
8.6.1 Lack of market access	For all crops except cotton, there is an access to domestic markets. Exit to the world level is determined by the regulations of Republic Uzbekistan in the established order. Also backwardness of a market infrastructure (access/absence to the information, roads, to storehouses) and difficult customs rules limit access to the international markets.
8.6.2 Land fragmentation	The land allocation among farms in Uzbekistan is carried out on tender requirements of the existing legal documents. In the beginning, when the farms were developed on the basis of shirkat and farm businesses, the allocation of land between the farmers was carried out on conventional criteria (by the initiative of farmers and availability of land resources) and the area ranged from 1,3 hectares to 100 ha. This allocation of land has led to such undesirable consequences: - Reduction in crop yield due to a lack of mechanisms (tractors) and equipment; - Difficulties in operational services, financial accounting, cost; - In small farms (less than 3-4 ha) a monoculture had been admitted, and it decreased the productivity of the land (no crop rotation). Considering this, during past years (from 2008) the State Program on strengthening land resources by changing small farms on larger (minimum 20 ha, maximum - 200 ha) was adopted. The land allocation among farmers by using this principle has given positive results. Guarantee of possession of land in Republic Uzbekistan. As the unique owner, State of Uzbekistan can withdraw the land from farmers if conditions are estimated that this measure is required. Recent consolidation of the land has increased vulnerability of the leasing rights and has directed incorrect signals for investments into innovations for agriculture. The rights of the land user. The State of Uzbekistan forbids changes in land tenure from one type of manufacture of field crops to gardening or pastures. It limits activity of other types of farms, including cattle-breeding farms, which now avail insufficient areas of land for manufacture of forages. The same refers to the expansion of plantings and introduction systems of agro-forest-amelioration. Crop diversification: the policy of manufacture of cotton and wheat leads to absence of crop diversification. About half of agricultural land is allocated under cultivation of cotton and 25 % for winter wheat cultivation. Access to the land, consolidation of the land has led to an access inequality to the land. About half (50 %) of all farms in Khoresm in 2010 had the size less than 10 ha, occupied about 5 % of the areas of all farmland, were mainly specialised on gardening and vegetable growing. Farms grown cotton and wheat had on the average above 50 ha, and their number made 37 % of all farms and occupied 87 % of all agricultural land in 2010.

	Household plots, with the average area of 0.18 ha arable lands of dehkan farms does not allow self-sufficiency of wheat. Dehkan farms get a considerable share of wheat for house consumption and forages for cattle feeding. (Djanibekov 2008, Djanibekov. 2010, Djanibekov 2012).
8.6.3 Decline in animal feed from rangelands	Pastures can be divided on two types: irrigated pastures (located on the irrigated lands (internal) and periodically flooded beyond the irrigated area by flood river flows, non-irrigated pastures, which are irrigated by the precipitations, located in the territory of Uztyurt, Kizilkuma and Karakum. People, living next to the irrigated pastures, constantly graze their livestock on the village pastures without any system. In addition, the development of land on the large area, eventually affects its productivity, both on the quantitative and qualitative manners. This is also due to the sharp increase of local population. If in 1960-1970 the big development of animal industries has taken root in a zone of periodic flooding of Republic Karakalpakstan (Kungradsky, Chimbajsky, Karauzjaksky and Tahtakupyrsky areas), in territory of northern areas here the extensive areas were occupied by a reed (Phragnutes communis) and a broom (Calamagrostisdubia B де) as a water-loving plant. In connection with absence of water in these zones, their place have been replaced by shrubs as the camel prickle (Karelinia) and other types. The areas of the humidified pastures were reduced at 20-25 time, in comparison with 1965-1970. On the territory of non-irrigated pastures (Kizilkum, Karakum, Ustyurt) the day-and-night grazing of animals (sheep) causes a sharp dynamics of yield of forage mass. Crop of green mass in these regions doesn’t exceed 0,8-1,0 c/ha. The following plants are generally growing on these pastures: tamarisk (*Tamarix leptostachys Bunge*), Siberian salt tree (*Halimadendron*), haloxylon (*Haloxylon Bunge*), and other dwarf ephemeral plants, such as Circassian Richter salt grass (*Saisola Ricateri Kar*), alkali jovnik (*Anabasissalsa*) Siberian salt tree (Halitadendron) and other families of feed plants. Grazing – sheep and goat breeding, camel and horse breeding based on a full or partial grazing on the pastures, and its negative impact effect on soil, vegetation creates conditions for desertification of the territory and sharp decline in biological diversity.
8.6.4 Soil fertility decline	Despite the huge efforts to improve the productivity of crops, land productivity remains at low level. The main reasons for this are the following factors: • defiance of scientific-based cropping systems; • absence of crop rotation and the widespread introduction of monocultures; • poor quality agricultural activities (plowing, leveling), which is accomplishing not in full capacity • an extremely low level of humus in the soil. • a sharp reduction of the area under Lucerne;

	• the emergence of a dense moist plow stifle on the upper horizon below the layer of 20-25 cm, which leads to delay in development of the root system (the density of soils in some cases reaches 1,45-1,6); • NPK nutrients washed from the soil as a result of high rates of leaching irrigations; • high salts content in soil, which are concentrated in the top layer and thus only for cotton, yield losses are 5-10%. • insufficient application of organic fertilizers and mulching. • low farming culture and occurrence of weeds; • insufficient amount of NPK and violation of their relations, which lead to the reduction in land productivity and quality of products. According to the data of agro-chemical services on the average on Republic security nitric fertilizer makes 75-80 %, of potash 50-60 % and phosphorus 35-40 %. Set of these factors specifies, that productivity of cotton as a whole on Republic Karakalpakstan remains at level 1,4 t/ha, wheat 1,5 t/ha. Principal cause of such low return of the land is (on cotton) productivity: • in limits from 0,5-to 1,5 t/ha it is a problem of salinity of soils; • in limits from 1,5 to-2,2 t/ha the reason is untimely performance of all actions and shortage in soil of the content of nitrogen and phosphorus; • in limits from 2,2 t/ha and above- the low content in soil humus and potassium. Besides quality of soil in Uzbekistan is estimated by land quality (hereinafter bonitet). Soils bonitet is a relative estimation from 0 to 100, data specify in quality of soils and natural fertility (GKZGK 2009). Bonitet represents set of several parameters, beginning from field characteristics (morphology etc.), results of laboratory analyses for various properties of soil (fertility, chemistry etc.). As cotton is the basic agricultural crop in irrigated agriculture of Uzbekistan, it is used as basic crop in an estimation of a bonitet. In 2008 agricultural land resources made about 233 000 ha, which includes arable lands, trees, marginal land and pastures and their average bonitet made 53. Comparative data of soils bonitet from 1990 to 2006 shows, that no changes could be seen on the average bonitet of soils 54 (Yusupov and others, 2010). However, there are radical changes in the areas of soils, classified as high and high quality with 5,3 and 78,6 th. ha in 1990 to 0,1 and 61,1 th. ha in 2006, accordingly. For the same period, the area of soils of average quality has increased from 78 to 117 th. ha. Comparison of data from 1950 on 1959 of 0-30 and 30-50 cm layers of soil, since 1970 to 1990 shows the general tendency of decrease in organic substance. Meadow oasis soils located on ancient channels of the rivers and nearby-river deposits had the highest content of organic substance, then it was followed by irrigated meadow soils. The lowest content of organic substance was revealed on meadow soils, formed on recent deposits Amudarya.

8.6.5 Other system problems

The transition from command-centralized management in agricultural production to the free collective and private property during a short time has created big problems, which have already been resolved by the government, but still rising issues need to be solved. The main issues are:

- shortage of water resources, which in the conditions of Republic Karakalpakstan, located in downstream of river Amudarya becomes one of the main factors, preventing further development of an agricultural production;
- poor water control;
- for the present not readiness to adapt by farmers new system of market economy;
- rather low security of farms by agricultural machinery, fuel and lubricants and fertilizers;
- as a result of continuing decrease in the world prices on agricultural products and accordingly low incomes of agricultural producers (farmers) and the limited possibilities on transition to more profitable models, there is such low return of the irrigated hectare (this question is partially solved in the majority of farms);
- low level of introduction of scientific and technical, progressive technologies in the agriculture, directed on increase of returns from the irrigated hectare.

Availability of water, security, access to credits, 2005-2006 (Information on Khoresm regions)

Spheres	Barriers to growth
Procurement	• Absence of a freedom in choosing among cotton varieties. • Seeds of a cotton are not always of appropriate quality. • Absence of additional sources for acquisition of materials. • Commodity exchange is not popular among farmers. • □□□□□Bad work of the organizations on rendering of services, such as WUA, MTP. • Delay and insufficient delivery of materials. • The high prices for materials, such as an electricity (for irrigational pumps) or fuel.
Financial	• Absence of circulating assets (financial resources). • Unique type of payment for raw cotton is bank remittance, there is no cash on maintenance of families. • □□□□□ Delay in payments. • There is no access of farmers on their settlement accounts. • A lot of contingencies, obligatory donations on charity etc..
Processing of products	• Absence of preliminary processing (for preliminary drying of a raw cotton) and equipment for storage in the field. • Unfair estimation of quality of a raw cotton in ginneries and factories and, hence, decrease in profit of farmers. • Fixed state-set prices of a raw cotton • Time restrictions during harvesting.
Market	• Absence of the supplying organizations that leads to an insufficient competition and the high prices for materials.
Cotton growing	• Absence of trade channels (as an exception ginneries).

	Legislation	• Bulky procedures of the taxation demanding much time and efforts of farmers. • Weak legislative knowledge of farmers. • Contradictions between various statutory acts and decrees, an ambiguity, an opaque basis for agricultural activity.

8.7 System dynamics

8.7.1 Stability, stagnation or evolution towards other more/less productive/profitable/ environmentally sustainable systems

Many indicators define stability and development of the agricultural sector of Republic Karakalpakstan, for example, the value of agricultural products (crop production, cotton, wheat, and others), gross yield, crop yield, and livestock).

№	Indicators	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	Agricultural production (at current prices, billion sums)			36,8	47,3	72,1	119	126,3	198,6	248,3	301,7	324,7	378,7	482,4	581
2	Crop production			16,1	19,4	30,8	68	75,9	114,2	138,4	164,8	153,2	188	256,8	284,6
3	Livestock			20,7	27,9	41,3	51	50,4	84,4	109,9	136,9	171,5	190,7	225,6	296,4
4	Yield														
	Cotton	22,8	19,8	13,1	14,1	11,1	12,2	19,5	20,6	19,1	19,2	17,4	18,4	18,6	20,6
	Wheat	10	15,2	23	18,3	30,9	22,5	26,4	27,5	33,6	37,8	28,1	33,6	29,5	26,5

As it can be seen from the tables, in Republic Karakalpakstan the dynamics of development of the basic sectors of agriculture is stably growing in recent years. Cost of production of agriculture of plant growing during 2000 for 2011 has increased from 36,8 on 581,0 billion soums.
Also there is a total growth of cost of agriculture on plant growing and on animal industries.

In Khoresm there were 79,000 ha forests and other forest land in 1990, but only 60,000 ha. in 2005.
Khoresm forestry service has estimated approximately 39 000 ha forests in 2005 in comparison with 47 000 ha in 1990.
The area of forests makes about 7 % Khoresm that is above, than on the average 5 %.
Only 0,03 ha of forests are due on each inhabitant in Khoresm (Tupitsa 2010).

There are no data on Kizilorda and Dashaguzskiy regions.

8.7.2 Most common type of agricultural enterprises (e.g. individual/private, cooperatives, state farms)

Most common type of agricultural enterprises in Khoresm region and R. Karakalpakstan

Name	*Unit.*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Farmers	Number	2664	2413	3136	5791	7311	9351	12393	15445	22773	27186	28580	27652	16014	10169	8104
	Ср.пл.	18,1	18,1	20,9	24,5	23,4	22,1	26,3	29,6	29,0	29,6	28,5	29,9	52,0	80,8	98,8
	For	48210,2	43570,4	65510,8	141758,2	171048	206916,4	326525,5	456697,7	659293,6	804675	813600	827300	833152	821583	800574
Dehkans	Number	335360	348810	363116	369377	376604	385366	397667	398078	410102	420534	436396	436605	445269	482580	483401

	Ср.пл.	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,18	0,22	0,22	0,22	0,20	0,20
	For	61502	63905	66478,8	67932,4	69261,2	70583,6	73269,4	73259	75494,2	77411,2	96079	96099	96339	97085	97101
Agric enterprises	Number	220	213	216	195	185	237	228	157	98	105	27	25	25	25	25

No data for Kizilorda and Dashaguzskiy regions.

8.7.3 Presence of producer associations (e.g. farmers’ groups, water use associations, marketing associations, cooperatives)

Information on associations of producers in R.Karakalpakstan

№	Farms	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1.	Farm businesses	386	948	1220	2350	3015	3582	4016	4636	5250	6539	7832	9587	4680	4021	3354
2.	WUA				2	3	16	41	73	116	131	133	128	128	129	128

Information on Khoresm region

№	Agricultural organizations, providing services	Number, pieces
1.	Alternative MTP	119
2.	Networks for sale of mineral fertilizers	72
3.	Networks for fuel sale	105
4.	Minibanks	119
5.	Association of Water Consumers	115
6.	Networks on sale of breeding cattle and veterinary services	128
7.	Networks on purchase of agricultural production	
8.	Networks on maintenance with the information and consultations	
9.	"Uzagrosugurta" the State joint-stock insurance company	12
10.	Commodity exchange	6
Total for the region		676

Scheme of interaction between Farms and Organization of Agro-service in Republic Uzbekistan (D.Niyazmetovaa, 2007)

№	Agro-service organizations	Farms	Association of Farms	MTP	Networks for sale of mineral fertilizers	Networks on sale fuel and lubricants	Networks on sale of breeding cattle and veterinary services	Association of Water consumers	Commercial banks (branches and minibanks)	Commodity exchange	"Uzagrosugurta" the State joint-stock insurance company
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1.	Farms	X	Payment of annual membership dues	Payment of the mechanized services	Payment of mineral fertilizers	Payment for fuel and lubricants	Payment for breeding cattle and veterinary services	Payment for water and annual membership dues to WUA	Payment for bank services and interest for credits, microcredits	Purchase of the goods	Insurance payments
2.	Association of Farms	Rendering of legal and consulting services	x						Payment for bank services and interest for credits		
3.	MTP	Rendering of the mechanised services		x		Payment for fuel and lubricants			Payment for bank services and interest for credits	Purchase of the goods	Insurance payments
4.	Networks for sale of mineral fertilizers, “KhoresmKishlokHujalikHimyo”	Sale of mineral fertilizers			x	Payment for fuel and lubricants			Payment for bank services and interest for credits	Purchase of the goods	

	5.	Networks on sale fuel and lubricants “Urgenchnefte basa”	Payment for fuel and lubricants			Payment for fuel and lubricants	X			Payment for bank services and interest for credits		
	6.	Networks on sale of breeding cattle and veterinary services	Sale of breeding cattle and veterinary services					x		Payment for bank services and interest for credits		
	7.	Association of Water consumers	Maintenance with water						X	Payment for bank services and interest for credits		
	8.	Commercial banks (branches and minibanks)	Granting of credits and rendering of bank services	Granting of credits and rendering of bank services	Granting of credits and rendering of bank services	Granting of credits and rendering of bank services	Granting of credits and rendering of bank services	rendering of bank services	Granting of credits and rendering of bank services r	x	rendering of bank services	Granting of credits and rendering of bank services
	9.	Commodity exchange	Sale of the goods (fuel, mineral fertilizer, etc.)		Sale of the goods (fuel, mineral fertilizer, etc.)						x	
	10.	"Uzagrosugurta" the State joint-stock insurance company	Insurance of crops and other services of		Leasing, Insurance of crops and other services							x

			insuran ce									

9. Governance, institutions, policies	
9.1 Institutional support	To achieve the goal of economic efficiency, institutional measures in the management and use of land, water and other resources shall avail the following characteristics: • maintenance of stability of manufactures, that is protection against legal, physical aspects of uncertainty, and also against uncertainty in the rights of possession of the land and water. Users will carry out long-term, favourable investments of land-water resources only under condition of sufficient stability of their rights to water; • instructions for use of resources should be easy for understanding. Thus, institutional positions for distribution and using resources should provide system of investment with the rights, it is necessary, that these rights were well defined, applicable in practice, provide its transfer and show to users all social costs of their actions. Such properties allow creating the market of the rights which can react to demand change. Institutional support is carried out by creation of an organizational basis (the form and function, improvement a management in agrarian sector). All these positions are reflected by following legislative documents as Constitution of Republic Uzbekistan (1992), the decree of President Republic Uzbekistan «About the major directions of deepening of reforms in agriculture» and other documents. Stimulus and institutional structure: 1. Economic interest of the farmer in rational use of land-water resources. 2. Incentive - for rational use and saving of water resources. 3. Introduction system of penalties - for thriftless use of water etc.
9.1.1 Extension services and NGOs	Ministry of Agriculture and Water Resources of the Republic Karakalpakstan and its divisions have no official division or department on experience distribution. However, each department, depending on the needs within the year, organizes 2-3 seminars and workshops on all aspects of the agricultural sector, with involvement of all stakeholders. Also with the assistance of foreign experts and NGO, projects on an agricultural production are carried out. In Republic Uzbekistan at national, regional and areal levels activities on training of farmers and education, transfer of knowledge and technologies are carried out by establishments, having the mandate, such as local departments of Ministry of Agriculture and

	Water Resources, Associations of farms, also universities, which also have the mandate on dissemination of knowledge among the population, including farmers. Total, at least 14 types of agricultural organizations, rendering services (AgSO) in different degree have been involved in transfer of knowledge to agricultural population, but their influence has sporadic nature (Nazarov, 2008). AgSOs transfer knowledge in three ways: real transfer of knowledge (28 % AgSOs), implicit transfer of knowledge (28 %), and a pure transfer of assets or the service organizations (56 %) (Bekchanov, etc., 2009). Elements of transfer/introduction of agricultural knowledge can be tracked in mass-media and educational activity of NGO concerning protection of the environment and increase of ecological culture of the population as a whole.
9.1.2 Access to improved/adapted varieties/breeds	Many new promising (in local conditions) varieties were developed within the system of agriculture in Republic Karakalpakstan. By the request of farmers', the department on seed production supplies the released varieties of cotton, wheat and other crops of the 2nd and 3rd reproduction (in recent years the quality of varieties, especially of cotton decreased). Many animals are transferred now to private farmers. Farmers buy improved breeds through a state sector from other states (the limited quantity) or renew through the local markets in unlimited quantity. The organized system of breeding of highly productive cows for maintenance of farms and households, does not exist yet on a regular basis in Khoresm and Republic Karakalpakstan, but exists in other regions of Uzbekistan.
9.1.3 Access to animal health services	Department of animal industries of regional administrations of Agriculture and Water Resources are now the basic control bodies of cattle-breeding production. The regional Veterinary administration is also subordinate to this department which organizes training courses for cattle-breeding farmers, or sends them in other establishments for training. Each village has the private veterinary centre, accountable in veterinary administration. The private veterinary centers bear responsibility for diseases of cattle and mortality. Some inoculations among which on foot and mouth disease are obligatory and free, though veterinary surgeons receive a payment for their services. The veterinary centers render private paid services, for example: first aid, artificial insemination and consultations. In each region (even in separate farms) there are points of veterinary service and under applications of the farmers in need they carry out the veterinary aid. Access is unlimited.
9.2 Policies	
9.2.1 Pricing/subsidies for inputs (land, water, fertilizer etc.)	The government of Uzbekistan sets the prices for key resources (land use, fertilizers, machinery, etc.) taking into account the level of global and national market. Some farms, which do not have the funds, are provided by the government subsidies, covered by farmers after the harvest. Earlier it was possible to buy without VAT, but not any more. After gaining of independence, in R. Uzbekistan the agricultural sector remains subsidized by state directly and indirectly (World

	Bank 2005). Direct grants include expenses on the maintenance of irrigational and drainage networks, free water for irrigation, but farmers pay for services, write-off of debts for shirkats (till 2005), and also maintenance of an agricultural production, such as fertilizers and fuel under the low prices without VAT. Besides, indirect grants consist of soft loans under low interest rates and the low price of cotton oil for agricultural manufacturers. Last tendencies show, however, that along with privatization and re-structuring rural farms, various grants are gradually excluded. For example: Since 2006, farmers have been compelled to pay higher prices (with the VAT) on the basic materials of an agricultural production substantially, because of partial liberalization of the markets. The majority of farmers do not have enough cash money resources and other assets that raise demand for credits for cultivation of agricultural production. The state finances manufacture of a cotton and wheat under bank soft loans with the low interest rate (3 % annually, since 2005, Abdullaev, etc. 2007, Rudenko, 2008). Now grants are mainly applied in farms, engaged in cotton and wheat manufacture. For cotton and wheat cultivation, farmers can get fertilizers and diesel fuel under the prices, which are below market prices. The land tax is subsidized (on the average 25 dollars for hectare). The payment for water use includes only membership dues of association of water users (WUA) (10 US dollars for hectare). Inter-farm irrigating and drainage channels are supported at the expense of the state budget. On-farm irrigating and drainage channels are supported at the expense of collection of membership dues of WUA. Farmers fulfilling quota on cotton can get by-products of processing of cotton, such as cotton oil, ccotton cake for reduced prices. The planned agrarian policy in Dashoguzsky region provides: • Maintenance of stably high rates of growth of an agricultural production; • More effective development of branches at the expense of development of breeding and seed-growing, increase productivity of agricultural crops and efficiency of cattle; • Perfection structure of agriculture of the country, its approach to the consumer' market, introduction the scientifically-proved crop rotations for sustainable increase of land fertility; • Deepening the degree and quality of processing of agricultural raw materials; • Advancing development of the branches, production of which will promote export potential escalating; • Radical renovation of material base; • Perfection of specialisation and territorial placing of an agricultural production Mid-annual growth rates of gross output of agriculture in 2000-2005 will make 14,3 %, in 2005-2010. – 10,1%.
9.2.2 Pricing/subsidies for produce	Government of R.Uzbekistan sets the prices for agricultural production with the consideration of changes of the internal market. Pricing policy for each crop or other types of production is based on the contracts and agreements between farmers and government organizations.

The state defines procurement prices on cotton and wheat anew each agricultural season (Spechler coathors, 2004), and presumably (state) increases by 50-55 % a year (Ismailov 2003), this intention, however, not always reachable (Rudenko and Lamers, 2006). For cotton and wheat, the state procurement prices differ between the fixed price, which is paid for volumes of the state obligations and fluctuates depending on a variety of cotton and quality of wheat, on a contractual price (20 % the extra charge) on the remained volume of a cotton and wheat, which is above the state obligations. Additional possibilities exist for marketing of wheat, and farmers can use a difference in the price, and manufacturers of cotton, are compelled to run business with the exclusive government bodies and have limited possibilities in alternative marketing.

9.2.3 Policies related to access to land and water resources

The relevant regulatory documents were developed to obtain an access to land, which are reflected in the «Law on Land and Land Use», which was secured by legal legislations of Republic Uzbekistan.
In order to get access to water resources, it shall be required to have the following regulating documents:
- Plan for water-use based on the irrigation modulus of district;
-Approved documents of local administrative bodies on the size of irrigated areas in the context of crops;
- Application of water user in WUA, according to the plan of water use;
- An agreement between the water users and suppliers of water;
- Book for recording of water received, by the applications and contracts;
- An act of reconciliation of the water received.

9.2.4 Farmers’ autonomy to choose crops and crop areas,ha

The state order for crops production in R.Karakalpakstan

Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
cotton	1979* 100**	1686 100	1666 100	19337 100	14418 100	24435 100	41816 100	64694 100	82866 100	99748 100	105191 100	102124 100	99321 100	100263 100	93959 100
wheat	850 50	844 50	1138 50	2813 50	2642 50	2884 50	18847 50	22605 50	30532 50	36712 50	47746 50	50919 50	27154 50	54485 50	53348 50
potatoes	9 0	5 0	4 0	8 0	9 0	20 0	32 0	185 0	149 0	352 0	432 0	596 0	1017 0	3147 0	1790 0
fruit	179 0	263 0	278 0	304 0	348 0	623 0	740 0	1013 0	1337 0	2359 0	2503 0	2442 0	2478 0	2308 0	2360 0
vegetable	312 0	551 0	419 0	321 0	385 0	586 0	1144 0	972 0	1085 0	3256 0	3309 0	4957 0	4181 0	2822 0	3011 0
melons	703 0	1345 0	1674 0	1435 0	1385 0	1929 0	2740 0	2907 0	2241 0	3029 0	2834 0	3468 0	3844 0	2836 0	3658 0
rice	5327 0	3504 0	8767 0	15328 0	513 0	3904 0	24484 0	17204 0	10828 0	20400 0	14980 0	8402 0	11083 0		

* - cropped area
** - % state order

10. Opportunities for agricultural research	
10.1 Opportunities for research on land tenure policy, soil and water management, de-rocking, agro-biodiversity conservation, water harvesting for range shrub plantations, drought-resistant varieties, others	In the territory of Aral Sea basin there are following research institutes: 1. Karakalpak branch of Academy of Sciences of Republic Uzbekistan; 2. Karakalpak Research Institute for Farming; 3. Scientific Research Institute for Rice; 4. Karakalpak branch of Research Institute for Livestock; 5. Karakalpak branch of SANIIRI (Central Asian Irrigation Research Institute); 6. Khoresm branch UzNIIKH (Cotton Research Institute); 7. Khoresm branch of SANIIRI (Central Asian Irrigation Research Institute; 8. Khoresm branch of Farming Institute, etc. Within 40-50 years, these scientific divisions were engaged in creation of scientific bases for introduction of an agricultural production in Republic Karakalpakstan. Huge volumes of research works are conducted on ccotton growing, animal industries, cultivation of soils, fertilizers, irrigation of agricultural crops, plant' protection, pests and number of others. Theoretical and practical scientific bases are now created in the basic directions, the most part of which is introduced in manufacture. However, in connection with creation of farms, interest to scientific works has considerably weakened, that finally leads to decrease in efficiency of the land and accordingly to productivity of agricultural crops. Now there is a need in realization of reforms in the structure of research institutes and the centers, and also in the policy of scientific approach in an agrarian sector.

CRP1.1 Characteristics of the "FerganaValley" site SRT3-AS1

Introduction

The international research centers of the Consultative Group on International Agricultural Research (CGIAR) have launched the CGIAR Research Programs (CRP). ICARDA as the lead Center jointly with the other partners Centers, research and development organizations in more than 40 countries, regional fora, international development agencies and other relevant international organizations initiated the CGIAR Research Program (CRP1.1) - "Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas".

The Program aims to pursue new technology, institutional and policy options for enhancing productivity and managing risks through diversification, sustainable intensification and integrated agro-ecosystem approaches in dry, which ultimately will contribute to the improvement of living standards in the target regions.

During the global preparatory meeting in Nairobi, in July 2011, five sites (3 action and 2 satellite sites) have been selected together with national partners for Central Asia and the Caucasus Region. Conducting research and introduction of innovative approaches and technologies will be implemented in two key areas:

I. Reducing vulnerability in agro-ecosystems affected by degradation of natural resources.
   Actions Sites:
   1. Aral Sea Region, including the Dashauz province (Turkmenistan), Khorezm province and the Republic of Karakalpakstan (Uzbekistan), Kyzylorda province (Kazakhstan);
   2. Rasht Valley (Tajikistan and Kyrgyzstan).

II. The intensification of agricultural production in areas with potential for improving food security and improvement of living standards in the short to medium term.
   Action site:
   1. Fergana Valley, which includes Batken, Jalal-Abad and Osh provinces regions (Kyrgyzstan), Sogd province (Tajikistan), Andijan, Namangan and Fergana provinces (Uzbekistan).

   Satellite sites. Sites that complement Action Sites to sample the diversity of Target Areas, and will also help evaluate and assess innovations developed at the Action Sites for their suitability and user acceptance.
   2. Kura-Arax plain in Azerbaijan.
   3. Kashkadarya province in Uzbekistan.

In addition, 123 descriptors characterizing the climate, topography, soils, water resources, land use, land degradation, demography, agricultural systems, institutional systems and opportunities for agricultural research were identified.

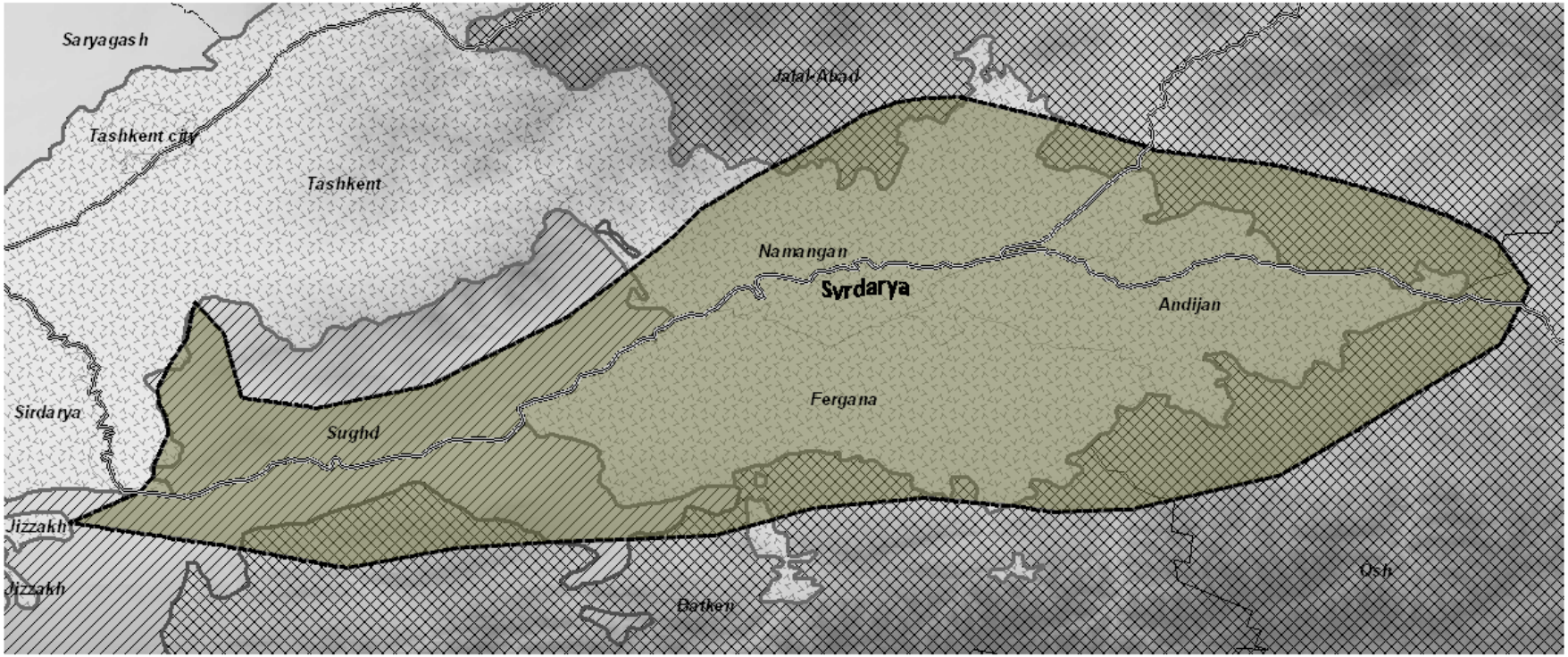
To collect the primary data, thirteen focal points from the Action Sites were involved. Data processing and compilation of the data was carried out by the interim Interdisciplinary Research Team (iIRT), coordinated by ICARDA.

A preliminary version of the characteristics of the Action Sites had been discussed during the preparatory meeting in Tashkent, May 15-17, 2012.

These characteristics of sites are not final. It is assumed that interested parties can contribute to the adjustment and the addition of data.

This material is collected and synthesized within the CGIAR Research Program (CRP1.1) - Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas", coordinated by the International Center for Agricultural Research in Dry Areas (ICARDA) in the Region of Central Asia and the Caucasus. The data, any inaccuracies or interpretations of the data presented herein are not the responsibility of the CGIAR and ICARDA. The final characteristics of the Site will be posted on the website of the CGIAR Regional Program (www.icarda.cgiar.org/cac).

SRT3. Action site 1: Fergana Valley



Kyrgyzstan Kazakhstan Tajikistan Uzbekistan

State borders Borders of provinces Borders of districts

Action site Border of action site Rivers

CRP1.1 Characteristics of the "FerganaValley" site SRT3-AS1

<table>
<tr><td colspan="2">1. Climate</td></tr>
<tr><td colspan="2">1.1 Precipitation</td></tr>
<tr><td colspan="2">Precipitation patterns</td></tr>
<tr><td>1.1.1. Range of long-term average annual totals (mm) across the site</td><td>Fluctuations in annual amount of precipitations within the entire site:
The flat part: 150-250 mm
The mountains, foothills -up to 300-600 mm</td></tr>
<tr><td>1.1.2 Number of rainy seasons</td><td>During the vegetation season:
1. spring
2. autumn</td></tr>
<tr><td>1.1.3 For each rainy season: start and end month(s)</td><td>Amount of precipitations for the season:
Spring: plains - 60-70 mm, foothills - 100-150 mm
Autumn: plains - 35-45, foothills - 65-75

80-90% of the annual amount of precipitations is during the period from October to May.

Number of days with precipitations (of 0.1 mm or more):

<table><tr><td>Winter</td><td>19-23</td></tr><tr><td>Spring</td><td>17-19</td></tr><tr><td>Summer</td><td>5-8</td></tr><tr><td>Autumn</td><td>10-12</td></tr></table></td></tr>
<tr><td>1.1.4 Number of years of daily rainfall records</td><td>Meteorological stations:
Andijan – from 1900 (112), Fergana - from 1910. (102), Kokand -from 1925 (87), Namangan – from 1891 (121).
The data are stored in the hydro -meteorological data fund of UZGIDROMET(in hard copy). The electronic version of the daily data is available starting from 1971.</td></tr>
</table>

Precipitation variability	
1.1.5 Inter-annual precipitation variability (CV %)	The coefficient of variation (CV) of annual precipitation in the region (n = 50) 24-35%
1.1.6 Severity and type of drought risk (e.g. delayed onset of the rainy season, lengthy gaps between the rains, early end to the rains)	The number of days per year with temperatures above 40 ° C: Maximum: 5-7; Average: 1-2. The number of days per year with an atmospheric drought (daytime humidity deficit≥ 50 hPa): Maximum: 17-19; Average 4-6. The major risks for the agriculture are water shortages in dry years and mudflows.
1.2 Temperature	
Temperatures means	
1.2.1 Range of annual mean temperature (°C) across the site	Average annual temperatures range from 7-11°C (foothills of the eastern part of the valley) and up to 14-15°C (plains).
1.2.2 Range of mean max. temperature of the hottest month (°C) across the site	Average maximum temperatures in July: from 34-35 ° C (plains) and up to 25-30 °C (foothills). The absolute maximum 43,9 ° C.
1.2.3 Range of annual mean min. temperature of the coldest month (°C) across the site	Average minimum of the temperatures in January: -3 .. - 2 ° C (flat part), -9 ... -4 ° C (foothills) The absolute minimum - 28,7 ° C (plains)
1.2.4 Number of years of daily temperature records	Meteorological stations: Andijan – from 1900 (112), Fergana- from 1910 (102), Kokand - from 1925 (87), Namangan- from 1891 (121) . The data are stored in the hydro -meteorological data fund of UZGIDROMET in hard copy. The electronic

<table>
<tr><td></td><td>version of the daily data are available starting from 1971</td></tr>
<tr><td colspan="2">Temperature variations</td></tr>
<tr><td>1.2.5 Intra-annual range of monthly temperature means (K)</td><td>Intra-annual variations of average temperature per month:

From - 0.2 to +28 °C (plains), from - 4 to +25 °C (foothills).

Inter-annual variability of average temperatures per month during the summer: 1,0-1,5 ° C, winter: 2-3,5°C</td></tr>
<tr><td>1.2.6 Diurnal temperature ranges throughout the year (K)</td><td>Fluctuations in average daily temperatures within the year during some years:
from -5.5 to +31 ° C (plains), from -15 to +26,5 °C (foothills).</td></tr>
<tr><td>1.2.7 Frost risk (severity and months of occurrence)</td><td>The risk of frost:

<table>
<tr><td></td><td colspan="3">Dates of extreme air frost</td><td colspan="3">Dates of extreme soil frost</td></tr>
<tr><td></td><td>The earliest</td><td>Average</td><td>The latest</td><td>The earliest</td><td>Average</td><td>The latest</td></tr>
<tr><td>Risk of spring frost</td><td>5.02-12.02</td><td>6.03-12.03</td><td>6.04-25.05</td><td>29.02-13.03</td><td>25.03-1.04</td><td>24.04-29.04</td></tr>
<tr><td>Risk of autumn frost</td><td>15.09-19.10</td><td>3.11-17.11</td><td>2.12-15.12</td><td>26.09-4.10</td><td>22.10-1.11</td><td>13.11-4.12</td></tr>
</table>

Within the flat area of the site, the maximum intensity of the frost during the spring is: at least -5 °C.
The frequency of frost with intensity of -3.1 - 4 °C does not exceed 8%.
The absolute minimum air temperature in April: from - 4,8 ° C to -2,3 ° C.
In September: from -4,0 °C to -1,0 °C.
The average number of days per year with minimum temperature below (- 10 °C) 4 -11 days
with a maximum -26-37 days.</td></tr>
<tr><td colspan="2">1.3 Indices</td></tr>
<tr><td>1.3.1 Range of annual growing</td><td>The sum of the effective temperatures:3500-3850 °C</td></tr>
</table>

<table>
<tr><td>degree days, base temperature 5°C (K, heat units) across the site</td><td></td></tr>
<tr><td>1.3.2 Ranges of mean length (days) of temperature and moisture-limited growing period(s) across the site for predominant agricultural soils</td><td>The average duration of the period with an average daily temperature within the plain area of the site:
<table>
<tr><td></td><td>Number of days</td><td>Crops</td></tr>
<tr><td>Higher then 5°C</td><td>260-270</td><td>Cereals, alfalfa, horticultural crops</td></tr>
<tr><td>Higher then 10°C</td><td>220-230</td><td>Cotton, maize</td></tr>
<tr><td>Higher then 12°C</td><td>204-207</td><td></td></tr>
<tr><td>Higher then 15°C</td><td>175-190</td><td>vegetables, melons</td></tr>
</table></td></tr>
<tr><td>1.3.3 Range of Aridity Index across the site</td><td>0,19-0,21</td></tr>
<tr><td>1.4 Climate change projections</td><td>According to the Second National Statement of Uzbekistan on Climate Change (2008)</td></tr>
<tr><td colspan="2">Scenario B2</td></tr>
<tr><td>1.4.1 Range of annual mean temperature change (K) across the site for time slices 2016-2045, 2036-2065, 2066-2080 in comparison to 1961-1990</td><td><table>
<tr><td>2016-2045(2030)</td><td>2036-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>1,6°C</td><td>2,3°C</td><td>3,4°C</td></tr>
</table></td></tr>
<tr><td>1.4.2 Range of relative annual precipitation change (%) across the site for time slices 2016-2045, 2036-2065, 2066-2080 in comparison to 1961-1990</td><td><table>
<tr><td>2016-2045(2030)</td><td>2036-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>104%</td><td>108%</td><td>111%</td></tr>
</table></td></tr>
<tr><td colspan="2">Scenario A2</td></tr>
<tr><td>1.4.3 Range of annual mean temperature change (K) across the site for time slices 2016-2045, 2036-2065, 2066-2080 in comparison to 1961-1990</td><td><table>
<tr><td>2016-2045 (2030)</td><td>2036-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
<tr><td>1,2°C</td><td>2,3°C</td><td>4,2°C</td></tr>
</table></td></tr>
<tr><td>1.4.4 Range of relative annual precipitation change (%) across</td><td><table>
<tr><td>2016-2045 (2030)</td><td>2036-2065 (2050)</td><td>2066-2095 (2080)</td></tr>
</table></td></tr>
</table>

the site for time slices 2016-2045, 2036-2065, 2066-2080 in comparison to 1961-1990	115% | 118% | 114%

2. Topography

2.1 Landforms (e.g. plains, hills, mountains) across the site (%)

FerganaValley consists of the following regions: Andijan, Fergana and Namangan regions of Uzbekistan, Sogd region of Tajikistan, Osh, Jalalabad and Batken regions of Kyrgyzstan

Altitude above the sea level

altitude above the sea level (m)	Territory of Uzbekistan, %	Territory of Tajikistan, %	Territory of Kyrgyzstan, %	Average value, %
< 1,000	100	30	5,8	45,3
1000 - 2000		25	22,6	15,9
2000 - 3000		35	30,6	21,9
3000 - 4000		10	34,0	14,7
> 4000			7,0	2,3

	Andijan	Fergana	Namangan	Sogd	Osh	Jalalabad	Batken
Latitude	40°47'00.89"N	40°23'17.39"N	41°00'04.25"N	40°17'02.66"N	40°31'51.05"N	40°55'37.36"N	39°57'07.71"N
Longitude	72°20'02.35"E	71°47'06.19"E	71°40'05.53"E	69°37'57.64"E	72°48'02.38"E	72°59'08.35"E	69°50'55.97"E
Altitude above the sea level	487 (Andijan city)	579 (Fergana city)	444 (Namangan city)	396 (Khudjant city)	1123 (Osh city)	811 (Jalalabad city)	931 (Batken city)

2.2 Elevation range across the site

Landscape	Territories in Uzbekistan, m	Territories in Tajikistan, m	Territories in Kyrgyzstan, m
Plain	300-500	300-500	390 -500

	Pied-mount, Mountains | 501-1000 | 501-4000 | 501-4500 and higher
2.3 Prevalent slope ranges (%) of different land forms of the site	

	Provinces in FerganaValley						
	Andijan	Fergana	Namangan	Sogd	Osh	Djalalabad	Batken
Plain	0,0001 – 0,00025 (80,6 %)	0,00010 – 0,00040 (100 %)	0,0001-0,00025 (90 %)	0,004-0,07 (100 %)	0,0002-0,01 (40 %)	0,00025-0,01 (40%) (500-900 m-55% arable lands)	0,00025-0,01 (50%) (400-1500 m -100%)
Hills	0,0003 – 0,01 (19,4%)		0,00025-0,01 (10%)		более 0,01 (60 %)	более 0,01 (60 %)	более 0,01 (50 %)

3. Soils

3.1 Types of soils	In the system of latitude soil-climatic zones, the flat part of the FerganaValley, is a desert area with the gray-brown, sandy desert and takyr soils. In a system of vertical zones (eastern zone) in the eastern part Republic of Uzbekistan, there are gray soils in the foothills and low mountains, brown and brownish black soils of the mountain-forests in medium-mountain zone and light-brown soils of grassland and steppe in highlands. According to the scheme of the provincial division, the FerganaValley is included in the Central Asian soil and climatic province, which is characterized by continental climate (dry) and specific subtropical soils differ from soils of the more northern regions of Eurasia. For the automorphic (zonal) soils of the latitudinal zone and altitudinal soil zones there is a specific number of hydromorphic (wet) soils. There is also a range of transition soils, combining the features of automorphic and hydromorphic soils. Irrigated soils - a number of specific soil types determined by the zoning of the soil and the degree of changes in soil resulting from the irrigated agriculture.

	Most of the heterogeneity of the genesis of the parent rocks, the complexity of their lithology, different hydrogeological conditions, combined with an arid continental climate and vegetation, led to the formation of variety of soils. Plots of land - part of the land surface having a certain natural historical features and allowing its use for specific purposes. As part of the land resources allocated for agricultural use (arable land, hayfields, pastures, fallow lands under permanent crops), there are lands occupied by households, under planted forests, reclamation constructions, water infrastructures, roads, buildings and other activities. *Soil rating* The main factor in the qualitative assessment of land is its fertility, which is defined by a score of soil quality (soil rating). Soil rating is a comparative evaluation of soil quality, and its productive capacity, with an average level of intensity of farming and agricultural machinery. Soil rating is based on the properties of the soil, both natural and acquired in the process of domestication, which is closely related to the crop yields. Soil rating is based on the methodological guidelines for the appraisal of irrigated soils, with consideration of the crops that are being cultivated. For the irrigated farming, the soil rating is conducted concerning cotton farming. Soil rating points are defined by taking into account the specific requirements of cotton production, and are suitable for the rating of irrigated soils too (with other cultivated crops). During the grading, the basic features of soil and environmental conditions are considering: soil type or subtype, the duration of irrigation, cultivation, and supply of thermal resources, texture, parent rocks, soil drainage, salinity, stoniness and gypsum content. Assessment is based on a closed 100-points scale. Highest score -100 points are given to the best soils, which have the highest productivity. This scale is adopted for the current level of agricultural production (0.4 t/ha for each point). In assessing the soil types, characterized by various combinations of the basic features, which reduce soil fertility, the appropriate reduction factors for salinity, texture, drainage, gypsum content, etc. are used. Considering the natural fertility of soils and potential productivity of irrigated lands by their productivity

<table>
<tr><td></td><td>and suitability for use in agriculture, ten classes of irrigated lands, which are involved in five agricultural cadastral zones (groups), were defined.

The results of adjusting of soil maps and soil rating indicates a worsening of the quality of land, the ongoing processes of soil salinization, increase of groundwater levels, development of water and wind erosion, digression and desertification in recent years.

Turan light serozem soils, as well as a small part of the meadow serozem soils.
The dark and ordinary serozem soils, light brown.
Light brown and dark serozem soils, light brown, dark brown, light brown, and the typical dark brown.
Turan light serozem soils and typical light brown and dark serozem soils, light brown, dark brown, light, typical-, and dark brown.</td></tr>
<tr><td>3.1.1 Major or agriculturally important soil types and soil associations across the site (classification units, %)</td><td>The soils ofthe FerganaValleyhavedistinctivevarietiesand groups thatdivided on serozemsoils,brown,meadow,swamp, sand, etc. (Table3.1).

The soil types ofthe land fund
<table>
<tr><th>№</th><th>Soil</th><th>in % of total area</th><th>Arable land, in % of total area</th></tr>
<tr><td>1.</td><td>Averageloamy</td><td>37,2</td><td>43,8</td></tr>
<tr><td>2.</td><td>Clayey and heavy loamy</td><td>22,9</td><td>21,0</td></tr>
<tr><td>3.</td><td>Light loamy</td><td>17,8</td><td>24,8</td></tr>
<tr><td>4.</td><td>Sandy loamand sandy</td><td>8,4</td><td>10,3</td></tr>
<tr><td>5.</td><td>Stonygravel, crushed stone on the surface ofsoil</td><td>10,8</td><td>0,1</td></tr>
<tr><td>6.</td><td>Water table</td><td>2,9</td><td></td></tr>
<tr><td></td><td>Total</td><td>100</td><td>100</td></tr>
</table>
In theareaof irrigated landsin theValley thereare mainly mediumloamy soil(43.8%), clay and loamy soil(21.0%), loamy(24.8%), sandy loamyand sandy soils(10.3%), stony gravel, crushed stone on thesurface of thesoil(0.1%).</td></tr>
<tr><td>3.2 Soil characteristics for each of</td><td>Soil characteristicsfor eachof the majorsoil types</td></tr>
</table>

the major soil types	The main factorsin thesoil-forming processare sludging due to irrigation,floodingand close(deep) shallow water table. • *Typicalserozem soils* are characterized by mediumand light-loamy soils, partially skeletal, with a 0.5-1 munderlain bygravel, humus (1.1-1.8%) and average carbonate content. • *Light serozemsoils* are characterized by the old irrigated soils, with the agro-irrigation horizon with 0.5-1 m, medium- and heavy loamy composition. Sometimes the soil underlain by gravel (1-2 m). Newly irrigated light serozem soils are medium loamy. At adyr places (0.3-0.5 m) they underlain by conglomerates, debris or tertiary clays. The content of humus in the plow layer of old irrigated soils is 0.8-1.2%, in the newly irrigated - 0.5-0.8%. Content of nitrogen in the soils is 0.05-0.10%. Soil is quite highly enriched with gross phosphorus and potassium (0.25-0.30% and 0,50-1,30%, respectively). The calcareous content of soils is high - between 8 and 10% of CO_2 carbonates, and gypsum -bearing is low (0.1-0.6% SO4). On the territory of Kyrgyzstan, light serozem soils lay within the altitude of 600-650 m and 700-800 m. Formation of light serozem soils is being in a strong lack of moisture and at relatively high average annual air temperatures (12-13C) under semi-arid ephemeral vegetation conditions. Parent rocks are stony-pebbly deposits, covered on top with a thin coat of fine earth. The texture of light gray soils is predominantly dusty light or medium loamy. The humus content is 1-1.5%, the ratio of carbon to nitrogen - 7, the reaction of the soil solution - alkaline: pH = 7.5 - 8.3. Light serozem soils are poorly supplied with nitrogen and phosphorus, so there is a need for application of organic and mineral fertilizers. • *Meadow- serozemsoils* have heavy andmedium loamy texture,sometimes underlain bygravel within two meters. There is relativelyhigh contentof humusin the plow layer(0.7-1.4%). In thesubsurfacehorizon and inlowerprofile,the amount of humusis reducedto 1.0and 0.4% respectively. The nitrogen contentranges from0.05 to0.14%.The ratio ofcarbon to nitrogen isnarrow(5-6), which indicatesthesaturationof thehumus bynitrogen.Number ofgross phosphorusin soilsranged from0.07 to0.12%, potassium -0.75 to1.56%. The calcareous content of soilsis high -7-10%CO_2carbonates.Gypsum-bearingsoilsin the profileis low (0.1-0.7% SO_4), which sometimesrisesin the lower horizons upto5-6% ofSO_4. Soils arepredominantlynon-saline, only sometimes there are some evidences of week salinity in the down-adyr depressions. • *Serozem- meadow soils* occur mainly on foothill rolling plains and detrital cones of rivers. They are formed because of transformation of serozem soils with raising groundwater level to 2-3 m. The soil

texture is hard- and medium loamy, below the agro-irrigation horizon with layers of light loamy and sandy loamy soils. At a depth of 1-2 m (sometimes closer), the soil underlain by gravel. Approximately, at the same depth there are some hydromorphic signs - the rusty and bluish spots gleying. There is less humus in serozem meadow irrigated soils than in meadow serozem soils. Its' quantity in the plow horizon is 0.5-1.1%, with nitrogen - 0,04-0,09%. There are 0,13-0,27% of gross phosphorus and 0,88-1,70% of potassium. Carbonates are uniformly distributed along the soil profile (from 6 to 8% CO_2). There is practically no gypsum in irrigated soils (0.07-0.10% SO_4). Serozem meadow irrigated soils are mainly non-saline, only in cones there are slightly saline soils with a maximum of salinity in the lower horizons (up to 0.5-1% of dry residue).

- *Typical turanserozem soils(ordinary)*are common inthe areas of lowmountains and piedmountfoothills within thealtitudes of700-1300 m. They are formed within the semi-desertclimatewith an average annualrainfall of 300-400mm andaverage annualair temperature of +11-12 C.The texture ofthe typicalserozem soils is dustymedium loamy, rarely - light. Soils have calcareous content onthe surface, the distribution of carbonatesin the soil profileuneven; their maximum content is observed often at a depth of40-60 cm.The reactionof the soil solutionis alkaline,pH =7-8,1. The humus contentin the typicalserozem soils isin the range of1.8-2.5%, sometimes riches 3%.The ratio ofcarbon to nitrogen is 7-9.Soils arepoorlyrichwith nitrogen andphosphorus, which necessitatesthe useof organic and mineralfertilizers.Typicalserozem soils- the mainirrigatedland fund offarmers.

- *Dark turan serozem soils* are formed within the altitudes of 1200-1500 m above sea level, under the couch grass-forb steppes with ephemeroid development cycle. Dark gray soils are dusty loam and characterized by significant accumulation of humus (2.1-4.6%) having the ratio of carbon to nitrogen equal to 7-9. The nitrogen content is 0.39 - 0.41% in the upper horizon. In the distribution of carbonates the following pattern is observed: a small amount of CO_2 (2 -4%) in the upper level and the maximum (10 -11%) - in a carbonate-illuvial horizon at a depth of 60 - 100 cm. Dark serozem soils have alkaline soil environment throughout the profile (pH = 6.8 - 7.5). Soils are poorly rich with the basic elements of plant nutrition, so it is necessary to apply organic and mineral fertilizers. Dark serozem soils used in rain-fed agriculture for cereal crops and perennial grasses.

- *Light-brown soils-* occurat the latitude range of1300-2000m abovesea level.The mainsoil-forming rocksarecalcareousproluvialand diluvialloams,underlain bypebblerocks at varying depths.The soil texturevaries fromlight to heavy loamy. Light-brown soils are characterized bya lowhumus

content(1.0 -2.0%), the CO_2 contentof carbonates is5-10%, the reaction of the soilenvironmentis alkaline (pH = 8.2-8.8). There are 0.10-0.25% ofnitrogen, 0.20-0.30% of phosphorus and2.0-2.5% of potassiumin the upper horizonof these soils.They aremore evenly distributedin the soil profile, especially in a depth of0.5 m,ratioof carbonto nitrogen isnarrow, from 4-5 to6-8.The composition ofhumus inlightbrown soilscharacterized by a predominanceofhumic acids overfulvic acids. The ratio ofhumic and fulvic acids,on average,equals to0.4-0.8. The absorption capacityof thesesoilsis lowand variesfrom 10 to 16mg/eqper 100g of soil.

- *Meadow soils* -are more widespreadthan otherirrigatedsoils. Their texture is heavy andmedium loamy. On a depth of0,5 m to 1-2 m,soilunderlain bygravelin some places, sometimes by arzyk at the depth. The content of humusin the plow layerof irrigated meadow soils issomewhat higher, ranging from 0.9to 1.9%. The content of nitrogenin the soil is0,05-0,and 12%. The ratio ofcarbon to nitrogen iswide(11-12), indicating a weakenrichmentof humus bynitrogen.Calcareous content of soils issomewhatinflated(7-8%CO2).In down-adyrdepressions andat the peripheries ofthe alluvial fans there someslightly salinesoils.

- *Marsh-meadow soils*confined todepressionson the periphery ofthe detrital conesof riversand theI-IIterraces above the flood plain. The water table isat a depth of0.5-1m. The texture ofthese soils isheavy andmedium loamy and the profile ismainly layered. Soilson river terraces sometimes are underlain bygravel in the depth of 0.5-1 m. Stronggleying ofsoilsbegins with asubsoil (below the plowable)horizon.The humus contentin the irrigated marsh-meadowsoils is0.5-1.9%. Close shallowwaters andstrongevaporation of moisture fromthe soil surfacecontribute tosoil salinity. There are weakly andnon-salinesoils on river terracesand weakly and moderately saline soilson the peripheryof detrital conesof rivers.

Source: Soil of Kyrgyz SSR. Academy of Sciences of Kyrgyz SSR , Publishing house «Ilim» Frunze 1974, page230.

3.2.1 Rooting depth

The depth of the root zone, cm

Cotton	Wheat	Rice	Alfalfa	Tomato
65-80	40-45	40-80	15-20, up to100 (3rd yr)	30-75

3.2.2 Water holding capacity (defined by measures of field

Water-retaining capacity of soil – ability of the soil to retain a certain amount of water due to the influence of sorption and capillary forces

capacity and wilting point)

Information about the MFM и SWM in irrigated area depending on mechanical structure and the type of soil:

Maximum field moisture-retention (MFM) capacity and steady wilting moisture (SWM)

№	Type of soil	MFM *	SWM **
1.	Average loamy	19-25	2-5
2.	Clay and heavy loamy	22-24	2-4
3.	Light loamy	17-21	1-3
4.	Sabulous and sandy	16-19	1-2
5.	Stony soil, pebbles,gravel chippings at the surface of the soil	14-18	1

Maximum field moisture-retention (MFM) capacity and steady wilting moisture (SWM)
By the type of soil:

№	Type of soil	MFM *	SWM **
1.	dark sierozem	18-22	4-5
2.	typical sierozem	20-22	4-6
3.	light sierozem	17-20	3-5
4.	sierozemic -meadow	14-26	5-6
5.	gray-brown sierozem	16-18	4-5
6.	meadow	20-21	3-5
7.	marshy - meadow	23-24	5-6
8.	gray-brown granitic and rubbly sierozem	16-18	3-4
9.	granitic	12-16	2,5-3,5

* maximum field moisture-retention
** steady wilting moisture

3.2.3 Measure of soil fertility - organic carbon%

In nature, the transformation of organic matter into humus is carried out in the soil with the participation of microorganisms, animals, oxygen, air and water. The remains of various species and other organisms after contact with a soil are decomposed by the microorganisms and used by them as a power source. In the process of decomposition, these residues become more mobile and simple compounds. One part is completely mineralized by microorganisms, and the other part is used for the synthesis of the secondary proteins, fats, carbohydrates, and other elements by the heterotrophic microorganisms. The humus and not humus substances are formed in the process of decomposition.

Not humus substances:
a) substances of plant or animal origin (carbohydrates, proteins, tannins, lignins, fats, etc.)
b) the substance of secondary forms of microbial synthesis (proteins, carbohydrates, fats).

Analysis of long-term data on sampling in experimentation sites and at regional level reveals an extremely low content of humus in the soils of the FerganaValley.

5 kinds and 9 types of soils are the most widespread within the irrigated lands:

Humus content by mechanical content of soil

№	Type of soil	Humus content
1.	Clay and heavy loamy	0,75-1,3%
2.	Average loamy	1,0-1,9%
3.	Light loamy	0,7-1,4%
4.	Sabulous and sandy	0,5-1,2%
5.	Stony soil, pebbles,gravel chippings at the surface of the soil	0,5-0,9%

Humus content by the type of soil

№	Type of soil	Humus content
1.	dark sierozem	0,6 - 2,0 %
2.	typical sierozem	0,8 - 1,5 %
3.	light sierozem	0,6 - 1,3 %
4.	sierozemic -meadow	0,7 - 1,9 %
5.	gray-brown	0,4 0,7 %
6.	meadow	0,8 - 2,4 %
7.	marshy - meadow	0,7 - 1,8 %
8.	gray-brown granitic and rubbly sierozem	No data
9.	granitic	No data

<table>
<tr><td></td><td></td></tr>
<tr><td>3.2.4 Soil pH</td><td>Physic-chemical absorption capacity of soils explains the nature of soil acidity and alkalinity, which play an important role in agronomic practices.

Soil acidity is caused by hydrogen ions. At the same, pH = 7 describes a neutral reaction, pH <7 – acid, pH >7 alkaline.

Usually in the soils of Fergana Valley pH ranges from 4 to 8,5 (see below).

The ratio of crops to the pH
<table>
<tr><th>№</th><th>Crop</th><th>Optimum pH</th><th>Grows in the pH range of</th></tr>
<tr><td>1.</td><td>Cotton</td><td>7,0-7,5</td><td>6 - 8</td></tr>
<tr><td>2.</td><td>Maize</td><td>6,0-7,6</td><td>-</td></tr>
<tr><td>3.</td><td>Alfalfa</td><td>7,0-8,4</td><td>6 - 8</td></tr>
<tr><td>4.</td><td>Wheat</td><td>6,0-7,0</td><td>5 - 8</td></tr>
<tr><td>5.</td><td>Potato</td><td>5-5,1</td><td>4 - 8</td></tr>
</table>
Ratio of soil type to the pH
<table>
<tr><th>№</th><th>Type of soil</th><th>in the pH range of</th></tr>
<tr><td>1.</td><td>light sierozem</td><td>7,5-8,3</td></tr>
<tr><td>2.</td><td>sierozemic -meadow and meadow -sierozemic</td><td>7,0-8,0</td></tr>
<tr><td>3.</td><td>gray-brown granitic and rubbly sierozem</td><td>7,3-8,5</td></tr>
<tr><td>4.</td><td>Granitic soil</td><td>7,7-8,1</td></tr>
<tr><td>5.</td><td>typical sierozem</td><td>7,0-8,15</td></tr>
<tr><td>6.</td><td>dark sierozem</td><td>6,8-7,5</td></tr>
</table></td></tr>
<tr><td>3.3 Soil problems posing serious management challenges</td><td>The mountains, foothills, intermountain basins, mountain plains are located in unbreakable physical and geographic relationship, and they have their own specifics in the economic development and use, the use of tools and processing equipment. A complex combination of natural conditions and the existence of salt rocks, management operations, etc. cause widespread reclamation of disadvantaged lands - saline, alkaline, eroded, rocky, marshy, which determines the complex, often dysfunctional, land-reclamation status.</td></tr>
</table>

3.3.1 Salinity (severity, soil types and % of area affected)

Within the territory of the irrigated lands (there are all kinds and types of soils, but in the selection of samples for salinity, they are not considered separately) there is a dense network of sampling.
There is detailed information on their salinity degree. The results are shown in Table 3.1.

Table 3.1.Averaged value of the degree of soil salinity in the FerganaValley for the period of 1997 - 2011.

Yrs	The total irrigated area th, ha	Area under the observation th, ha	Degree of soil salinity (0-100 cm layer)							
			Not saline		Low salinity		Average salinity		High salinity	
			th, ha	%	th, ha	%	th, ha	%	th, ha	%
1997	988,099	863,246	564,839	57,1	291,013	29,5	97,369	9,9	34,878	3,5
1998	984,381	858,854	584,346	59,4	191,588	19,5	88,069	8,9	120,378	12,2
1999	979,523	857,479	564,894	57,7	237,56	24,3	117,986	12,0	59,083	6,0
2000	982,51	860,396	588,198	59,9	222,508	22,6	122,627	12,5	49,177	5,0
2001	979,216	856,071	590,856	60,3	245,844	25,1	102,493	10,5	40,023	4,1
2002	975,274	852,129	591,673	60,7	241,345	24,7	104,084	10,7	38,172	3,9
2003	977,453	853,439	600,041	61,4	259,068	26,5	74,678	7,6	43,666	4,5
2004	975,157	853,283	601,162	61,6	238,18	24,4	99,391	10,2	36,424	3,7
2005	980,878	862,076	599,563	61,1	244,694	24,9	99,768	10,2	36,853	3,8
2006	985,364	850,753	605,721	61,5	261,74	26,6	81,057	8,2	36,846	3,7
2007	984,618	859,624	612,323	62,2	256,322	26,0	84,321	8,6	31,652	3,2
2008	984,09	861,364	614,818	62,5	253,19	25,7	81,531	8,3	34,551	3,5
2009	985,026	861,131	620,168	63,0	242,716	24,6	85,402	8,7	36,74	3,7
2010	984,106	858,678	612,155	62,2	258,289	26,2	81,002	8,2	32,66	3,3
2011	984,13	856,907	616,949	62,7	254,998	25,9	80,132	8,1	32,051	3,3

Source of information - Hydro geological reclamation expedition in regions

Information is not available for Sogd, Osh, Batkent and Jalalabad regions.

3.3.2 Sodicity (severity, soil types and % of area affected)

Information from Republic Kyrgyzstan, th. ha

№	Region	Saline	Alkaline	Waterlogg□d	Granitic	Wind erosion	Water erosion
1.	Batken	17,8	6,2	1,3	29,6	30,2	36,6
2.	Jalalabad	7,8	2,3	0,8	56,5	92	103,3
3.	Osh	10,9	6,5	8,8	68,2	89,3	91,8

Source of information: The report of the National consultant "Research of the socio-economic factors promoting desertification of land in Kyrgyzstan, and the formulation of necessary reciprocal strategy", Bishkek 2000. page 103.

3.3.3 Al-toxicity (severity, soil types and % of area affected)

This is no such type of soil in the region

3.3.4 Low chemical fertility (organic carbon, CEC, etc.) (description, severity, soil types and % of area affected)

Compounds of chemical elements in soils consist of oxygen, silicium, aluminum, nitrogen, phosphor, sulfur, potassium, calcium and magnesium.

In all soils of FerganaValley, there is a low content of elements such as silicium, aluminum, sulfur, calcium and magnesium.

For the normal growth and development of plants, it is essential to have nitrogen, potassium and phosphor in the soil (see down).

Selective quantification of these elements in the soils of FerganaValley showed in the following Table:

№	Type of soil	Content		
		Phosphor	Kalium	Nitrogen
1.	Average loamy	low	low	average
2.	Sabulous and sandy	low	low	average
3.	Light loamy	low	low	average
4.	Sabulous and sandy	low	low	low
5.	Stony soil, pebbles,gravel	low	low	low

	<table><tr><td></td><td>chippings at the surface of the soil</td><td></td><td></td><td></td></tr></table>
3.3.5 Phosphorus fixation (severity, soil types and % of area affected)	Information is not available
3.3.6 Poor profile development (soil types and % of area affected)	Information is not available
3.3.7 Rockiness, stoniness (severity, soil types and % of area affected)	There are no rocky and stony areas in the irrigation zones.
3.3.8 Very compact subsoils (soil types and % of area affected)	Requires a collegial discussion of descriptor values
3.3.9 Poor drainage, waterlogging (severity, soil types and % of area affected)	Information is not available
3.3.10 Excessive drainage (soil types and % of area affected)	There is no over drainage, as they were built in accordance with the project
3.3.11 Flooding (severity, soil types and % of area affected)	The flooding almost does not occur in the irrigated area of all types of soil ,as well as the ground water table (GWL) is lower than 3 m Therefore, flooding and water logging is not observed. Source: Annual report Hydro geological expedition (HGE)
3.3.12 Other management problems (description, soil types and % of area affected)	Despite the significant reduction in consumption of chemicals in agricultural production (for the last 10-15 years, the volume of pesticides and chemical fertilizers decreased by 3-4 times), the problem of soil pollution by the toxic substances of residues do not lose its vitality. Research in this area and monitoring of the status of soil pollution are being accomplished be three agencies: the State Committee on Geology and Mineral Resources, UZGLAVGIDROMET (Gydromet Department of Uzbekistan)and the State Committee for Nature Protection. The State Committee on Geology and Mineral Resources published the Geological Atlas of the ecological maps of Uzbekistan.

UZGLAVGIDROMET conducts the annual observations (monitoring) of soil contamination in the main agricultural areas of the Republic (by the residues of the organochlorine pesticides, organophosphoric pesticides, herbicides and defoliants). State Scientific Research Institute of Soil Science and Agricultural Chemistry published the Atlas of the soil surface of the Republic of Uzbekistan (2010).

On the territory of the Fergana Valley, there are some types of erosion: water and irrigation, devastating mudslides, wind erosion and direct harmful effect of wind on plants. These processes occur due to peculiarities of soil and climatic and relief conditions of the areas.

Among the all types of soil erosion within the site, the most widespread is wind erosion.

Mudslides are causing great damage to the economy of the FerganaValley.

Protecting land from wind and water erosion is one of the most pressing issues for further development of agricultural production, protection and improvement of land use.

Factors adversely affecting the productivity of land, their causes and consequences.

Problems	Causes	Consequences
The absence of science-based agricultural zoning	Raw materials focus on the production of raw cotton	Extensive development of agriculture, poor land management
salinization	Insecurity and poor exploitation of drainage system	The deterioration of soil fertility, increased consumption of irrigation water, tools, fertilizer and labor
Rocky lands	The reclamation of rocky land	Low fertility, increased consumption of irrigation water, and labor cost
Gypsum content	Reclamation of lands with gypsum content	Low soil fertility, water logging, salinity, karst phenomena

Untimely structure of sown areas	Monoculture	The lack of crop rotation, increased consumption of fertilizers and pesticides
Irrigation erosion	Inadequate irrigation techniques, land reclamation	Depression, leaching and removal of topsoil
Wind erosion	The absence of an effective system of shelter belts	Blowing away of fertile topsoil
Water erosion	Plowing of steep slopes	Sealing and destruction of soil protection from erosion, depression, gullying
The reclamation of low fertile and highly salinized lands	Development of water-intensive agricultural production, the prospect of exploration and exploitation of the land	The low fertility, high consumption of irrigation water resources, labor and fertilizer

The problems of water management

Analysis of the results of studying the needs and requirements of farmers showed that the situation is as follows:

- Farmers do not have enough information about the irrigation techniques and technology of irrigation scheme (the length of irrigation furrows are established without regard to slope fields and soil permeability). Many farmers do not have permanent and experienced irrigators who are well aware of the characteristics of their fields. Very often, farmers carry out the long furrow irrigation. In many areas, there is a shortage of experienced irrigators.
- Farmers have no idea about the rules of watering. It is difficult for them to determine the timing and duration of irrigation. They use excessive norms of irrigation accompanied by the large losses of water.
- Late receipt of required amount of irrigation water.
- Farmers do not have the means of water accounting and, accordingly, the water is used carelessly, where it is enough.
- There are no skills and experience at the farmer household level(in the areas where the water tables

	rise). All these facts lead to deterioration of land reclamation, reduction of soil fertility and decrease of crop yields.

4. Water resources	
4.1 Irrigation water availability	The main sources of water in the Fergana Valley are: • River Karadarya - mixed filling; • Naryn river - mixed filling; • Maylisay and Tentaksay - snow filling; • Syrdarya River. The largest mountain rivers are Padshaata, Kasansay, Gavasay, Karaungir, Kurgart, Akburasay, Aravansay, Isfairamsai, Shahimardonsay, Sokh, Isfara, Hodzhabakyrgan and other rivers. Irrigation draft consist of the system of springs, water-collecting header and drainage systems, wells for the irrigation and vertical drainage. River flows of Karadarya, Naryn and Akburasay are regulated (Andijan reservoir, Toktogul reservoir, Papan reservoir (last two are located in the territory of Kyrgyzstan)), the river flows of Aravansay, Maylisay and Tentaksay - not regulated. *The change in volume of annual runoff of major water sources of the Fergana Valley for the period of 1997 to 2011, million m^3*

Sources, region	Yrs														
	1997	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***

Karadarya	1806	1853	2467	558	1651	1990	1984	1874	1961	134	1415	1354	1697	2249	1569
Naryn	840,6	649	826,0	886,0	849,2	766,0	656,0	660,0	758,3	769	750	627	604,4	1264	772
Akburasay	55,0	60,8	75,7	62,7	45,7	49,4	49,4	77,5	61,0	49,3	48,3	35,7	34,0	40,2	34,1
Aravansay	4,7	5,4	4,	19,4	8,2	3,5	8,0	25,7	20,2	142	8,5	8,4	9,48	9,2	7,1
Maylisay	61,0	39,0	81,0	40,0	7,8	12,0	9,0	20,0	31,4	22,2	31,5	14,6	16,4	34,7	17,0
Naryn - Syrdarya	2176,1	2276,7	2268,6	2141,9	2450,2	2659,5	2667,1	2676,7	2558,8	2182,6	1982,8	1681,1	1735,6	2199,2	2086,4
Big Fergana Canal	1259,14	1391,9	1441,5	1265,55	1443,1	1659	1633,4	1684,4	1652,6	1365,8	1293	1128,7	1163,3	1464,4	1396,4
Big Andijan Canal	625,88	663,2	555,2	618,35	726	713,1	788,2	731,7	667,8	587,8	515,5	437,1	429,3	576,5	533,5
Syrdarya pump/st.	291,05	221,6	271,9	257,98	281,1	287,4	245,5	260,6	238,4	226,3	174,4	115,3	143	158,4	156,4
Karadarya (SFC)	682,21	469,1	661,7	605,68	648,6	649	692,2	697,5	675	634,5	593,7	483,7	601,3	788	761,1
Melkisay	1306,9	1255,5	1215,6	1116,3	1060,4	967,8	1089	1246,2	1177,5	1104,7	1026,4	805,5	805,1	1084,8	1049
Collector-Drainage System	200,72	1154	224,4	293,5	330,1	270,8	171,3	153,6	71,6	65,4	105,5	173,04	144,6	166,3	151,5
Vertical drainage									95,7	126,2	90,2	182	118,7	126,4	76,6
Batken				663	709	920	635	635	605	621	610	620	602	630	651,98
Jalalabad				1255	1390	711	625	700	577	644	655				886
Osh				2576	1269	1522	1402	1320	1489	1365					1174,3
Sogd														3198	3889,8

Averaged data on water demand for the past 15 years:

irrigation	7133,2 - 11217,5 mln m^3	94,0 – 96%;
drinking water supply	225 –354,0 mln m^3	3,2 - 4,5%
production	17,8 - 37,5 mln m^3	0,007-0,076%

95-97% of water (in low water year) is used for irrigation.
Source: Annual report of Narin-Kara-darya and Sokh-Syrdarya River Basin Authority

4.2 Quality issues (e.g., waste re-use)

In the Fergana Valley, the quality of irrigation water meets the requirements. Salinity of water in the rivers and small streams is low. In the flood period, and heavy rains (April, May), the silt content in rivers and small streams increases, it is noticeable especially in the foothill areas (Kurgantepa, Djalakuduk, Hadjaabad, Bulakbashi). Moreover, in the rest of the year in the initial part of the source water is almost clean. Downstream silt content increases due to wastewater and channel deformations.

At the south part of the Andijan region (Booz, Ulugnar, Balykchy), collected drainage water is used. Its salinity is low and it meets the requirements for irrigation.

The details on the silt content in the water of the Karadarya River:

The average silt content in the Teshiktash stream of the Karadarya river (by months)

Months	Yrs						
	1960-63	1985	1995	2000	2005	2010	2011
January	0.21	0.14	0.22	0.23	0.21	0.15	0.05
February	0.47	0.19	0.38	0.45	0.06	0.29	0.05
March	0.47	0.76	0.49	0.40	0.14	0.37	6.14
April	0.40	2.10	0.56	0.37	0.11	4.68	5.18
May	0.42	6.70	0.89	0.35	1.60	7.99	7.54
June	0.24	22.0	0.70	0.32	4.50	21.36	8.70
July	0.27	9.70	0.65	0.79	1.10	26.04	12.25
August	0.32	1.20	0.54	0.72	0.29	17.9	9.46
September	0.14	0.28	0.34	0.45	0.56	12.92	2.92
October		0.98	0.20	0.02	037	6.49	0.25
November		0.72				0.62	0.53

December		0.90				0.15	0.05
Average	0.20	3.80	0.41				

Fractional composition of suspended water sediment of the Karadarya river

№	Phase of regime	Characteristics of sediment content	Particle content (% by weight) with the diameter, mm								
			>1,0	1-0,5 and >0,5	0,5-0,2 and >0,2	0,2-0,1	0,1-0,05	0,05-0,01 and <0,05	0,01-0,005 and <0,01	0,005 - 0,001 and <0,005	<0,001
1.	Underwater	Big		2,9	23	23,3	33	1,2	16,6		
		Average			2,4	2,9	4,3	33,8	15,4	31,8	9,4
		Small		0,2	0,2	0,7	0,5	13,6	84,9		
2.	Dry spell	Big		2,8	14,9	20,7	12,5	49,1			
		Average			2,9	2,6	1,8	37,7	21,5	26,1	7,4
		Small		0,1	0,7	1,9	1,7	15,5	80,1		

Water salinity is low and water quality is good.

The chemical content of water is provided in the following tables.

The dynamics of water quality within the Andijan region.

№	Indicators	Standard	2000	2002	2008	2010
1.	dry residues, mg/l	1000	410-1210	532-1331	200-990	885-1450
2.	chlorides, mg/l	350	6,9-12,5	7,9-19,5	1,4-5,8	8,0-62,6
3.	sulfates, mg/l	500	40-125	70-191	75-197	84-262
4.	total hardness, mg (milliequivale□ts per liter concentration)	7,0	2-5,41	3-3,5	2-3	3,5-7,0

The dynamics of water quality within the Namangan region.

№	Indicators	Standard	2001	2005	2008	2011
1.	dry residues, mg/l	000	350-1010	421-1114	150-790	755-1130
2.	chlorides, mg/l	350	6,5□12,9	6,9-12,5	1,7-5,1	6,2-16,2
3.	sulfates, mg/l	500	40-125	70-151	75-137	74-222
4.	total hardness, mg (milliequivalent□ per liter concentration)	7	2-5,41	3-3,1	1,8-3,2	3,7-7,6

Many areas in Sogd region are irrigated with collector water, as the Chkalovsky massive-2200 hectares, and partially Kanibadam - 1022, Asht - 2500 hectares. About 500 hectares are in other areas**.**

5. Land use / land cover

According to «AP» of the press-secretary of the lower chamber of parliament of Tajikistan, it has been underlined, that now a share of each inhabitant of Tajikistan makes about 0,08 hectares of the irrigated land, and the given indicator is the lowest among the countries of the Central Asia. Along with it, in Tajikistan the requirement for agricultural production for the last 11 years has increased in 2,5 times.

Also it has been underlined, that the ameliorative condition of over 40 thousand hectares of the irrigated land in R.Tadzhikistan is in a poor condition and for their return in agriculture rotation it is necessary to accept effective measures (the Source: from October 31, 2009 «On measures on improvement of an ameliorative condition of the irrigated land of republic for 2010-2014**»).**

5.1 Kinds of agricultural / non agricultural land

№	Title	Regions						
		Andijan	Fergana	Namangan	Batken	Jalalabad	Osh	Sogd
1.	The total area	430,3	676	744	123,4	3365,3	2919,3	600
2.	□armlands	273,5	318,453		882,4	1211,1	822,2	
	including:							
	Arable land	203,7	249,148	224	72,4	168,1	187,7	237,4

	Perennial plantings	28,9	45,822		17,4	9,5	10,5	
	Pastures	21,3	23,483		600,5	1674,7	1480,4	
3.	Under the rivers and artificial reservoirs, canals	39	51,333					
4.	Roads	10,9	25,249					
5.	Under the buildings and settlements	21,1	30,1		3278	5325	1218	
6.	Unused lands	105,4	186,692		1387,2	2154,2	2117,1	

5.1.1 Extent of rainfed cropland across site (ha, %)

The area of rainfed lands in Sogd region of the Republic of Tajikistan, ha

Yrs	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ha	82314	79830	85165	81408	79827	81848	65660	68214	64585	64573	64603	64460	64372	61924	61905

5.1.2 Main rainfed crops or varieties grown (ha)

Reinfed crops in Sogd region (data for 2011)

Wheat	Potato	Horticultural crops	Melon crops	Other crops
22910	349	324	75	47348

5.1.3 Extent of irrigated cropland across site (ha, %)

Yrs	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
thou ha	3198,72	3173,46	3728,33	3830,83	3810,57	3810,57	3815,09	3802,66	3798,22	3799,77	3802,48	3808,60	3809,88	3593,86	3793,048

5.1.4 Main irrigated crops or varieties grown (ha)

The main crops in the Fergana Valley are cotton, wheat, vegetables, melons, orchards and vineyards, perennial plants, and other crops. The leading crop is cotton. The area under cotton covers 35-40% of the total area in the Andijan region. The total area of it ranges from 99.6 to 110.0 thousand hectares.
Varieties C-6524, An-35, An -36, An- 37, Namangan-77, Sulton, etc. are also cultivated on this area.

The wheat production was started from 1990, and in recent years, the area under wheat - 60-82 thousand hectares.

During this period, within the Fergana Valley , the main areas under the irrigated crops (hectares) varied within the following ranges:

№	Crops	Regions								
		Andijan		Fergana		Namangan	Batken	Jalalabad	Osh	Sogd
1.	Cotton	99,6	110	103,6	127,33	81,1-108	0,1-0,9	9,8-30,9	7-12	50-58
2.	Cereals	60	82	92	133,3	80-92,9	34,1-40,1	6,4-48,3	6,6-74,5	80-108,
3.	Vegetables	4,5	15,3	11,5	16,9	9-13,1	2,-2,3	6,2-9,1	5,8-6,5	8-11,4
4.	Melons	4,1	5,8	0,99	3,0	0,98-2,3	0,2-0,3	0,9-3,5	1,4-1,8	4-5,3
5.	Gardens and perennial plantings	20,1	25,8	40	99,4	60-83,2	0,3-8	8,3-14	6,2-14,9	8-16,8
6.	Crops for farm gardening	25,4	38,6	38,7	62,9	40-50	1,8-2,2	6,9-7,6	8,2-10,2	6-25,2
7.	Other crops	6,2	56,3	5,5	7,7	0,08-4,4	0,3-4,8	14-20	15,4-47,28	0,4-15

5.1.5 Extent of pastures across site (ha, %)

Yrs	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
thou. ha	22,4612	22,4618	26,5338	26,1814	26,2863	26,4740	25,5066	25,60541	25,5138	25,3337	25,5133	5,33279	5,32260	25,7077	24,95646

5.1.6 Extent of rangelands across site (ha, %)

Information on Sogd region

Yrs	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2□09	2010	2011
thou. ha	22,236	22,178	22,069	21,817	21,361	20,447	20,092	19,602	19,187	18,394	17,873	17,454	17,067	16,596	16,301

No information others oblasts.

5.1.7 Extent of other major land use/land cover types across site (description, ha, %)

Other types of land use in the Fergana Valley (2011).

№	**Types of land use**	Regions						
		Andijan	**Fergana**	**Batken**	**Jalalabad**	**Osh**	**Sogd**	**Totally**
1.	perennial plantations	202	42,1	1740	950	1450		6209,1
2.	gardens and vineyards	20505	4843	187	943	265		26743
3.	farm gardening	47537	62314	14805	31421	37714		193791
4.	forestry		14	216807	294387	99781		610989
5.	neglected fields						9619	9619
6.	hayfields						1062	1062

5.2 Land use trends

5.2.1 Increase/decrease in irrigated cropland due to availability/decline of groundwater resources (severity, % of area affected)

Reduction of irrigated arable area in Andijan, Fergana and Namangan region occurred due to the construction of various buildings (houses, gas stations, etc.) The area of irrigated lands in the Andijan region in 1990 was 282 thousand hectares, and in 2011 it was 273 5 thousand hectares, the reduction of the area is 3.01%, in the Namangan region - 10%, Fergana region - 4.5%, in Sogd - 1.31%.

Arable land of the Republic of Kyrgyzstan, for the last few years decreased to 103,377.7 hectares. (transform. land). Lands were allocated for buildings (a transition from one category to another).

5.2.2 Changes of land use/land cover types (description, % of area affected)

After the independence of Uzbekistan, country faced the problem of providing the population with grain products, and therefore the area under wheat increased, and today, this area reached 80.2 hectares. In 1990 it was 7.8 hectares

Due to the development of farmer households, there are some changes such as the reduction of area under

<table>
<tr><td></td><td>alfalfa.

During the recent years, within the Kyrgyz Republic, the pasture and forest areas, used by other users, were returned (the lease by other republics), this territory increased on+ 8693.1 ha.
The reasons of change of types of land tenure on Sogdijsky area are the following:
1) Planting of new gardens and vineyards - 12094 hectares.
2) Allocation for personal plots and population household farms - 35116 hectares.</td></tr>
<tr><td>5.2.3 Other significant changes in land use (description, % of area affected)</td><td>In part of the Fergana Valley, occupied by the Republic of Uzbekistan, following changes in land use took place due to reduced runoff (water supply is now reduced by 15-20% and 30-40% during dry years):
• Farmers generally sow cotton and grain (Gov’t order).
• In recent years, much attention is paid to the food security, therefore from year to year (2010-2012) the area under fruits and vegetables increasing.
• the area under rice was drastically reduced. The actual planting of rice depends on the water runoff of the year, so these figures vary widely. For example, in 2008, sowing of rice was canceled at all, and in 2010 was the opposite.

In recent years, 100.7 hectares (within the Kyrgyz Republic) were given for the construction of public buildings.</td></tr>
<tr><td colspan="2">6. Land degradation</td></tr>
<tr><td colspan="2">6.1 Type and current severity of particular types of land degradation</td></tr>
<tr><td>6.1.1 Salinization (severity, % of area affected)</td><td>In Fergana valley salt affected soil is observed mainly as 13,2 %(1997), 11,4 % out of total irrigated area (see sector 3.3.1).</td></tr>
<tr><td>6.1.2 Water erosion (description, severity, % of area affected)</td><td>Information on irrigated soils, the erosion in the Fergana Valley (Average data on Fergana, Namangan, Andijan and Sogd regions):

<table><tr><td>not eroded</td><td>82,1</td></tr></table></td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>low eroded</td><td>7,0</td></tr>
<tr><td>average eroded</td><td>8,4</td></tr>
<tr><td>very eroded</td><td>2,5</td></tr>
</table>
No information from Kyrgyzstan
Great damage to the national economy of the republic is caused by mudslides. Protection of land from wind and water erosions is one of the most pressing issues for further development of agricultural production, protection and improvement of land use. The Institute "Uzdaverloyiha" together with the research and project organizations of the republic developed a "scheme of erosion control measures in the Republic of Uzbekistan", which defines the series of measures on erosion control, and their scale and sequence of operations.

To protect lands of the region from the erosion it is necessary to plant defensive forest strips; plant terraces on eroded hillsides; consolidate and afforest sands, along a large trunk canals, rivers, reservoirs and around the ravines.
It is necessary to create a stand, to build additional mudslides' water reservoirs, to take measures on enhancement of rivers' coasts, build tracts to combat mudslides, protective levees and upland ditches; reconstruct the irrigation networks; build various hydro-technical erosion control constructions; and organize a planning of irrigation maps.

The annually complex of agro-technical and economic-organizational activities should be carried out by the efforts of farmer households and other agricultural enterprises.
Effective organization of irrigation is vital, especially in the adyr lands, where erosion of the fertile surface of soil occurs due to the surplus of water in the furrows and poor organization of irrigation, including the abandonment of fields during the irrigation.
The most important organizational and economic activities include:
• strict compliance of norms on rational use and protection of lands against the all types of soil erosion by the all households;
• maintenance of crop rotations with varying degrees of saturation of perennial and annual grasses;
• compliance of the norms on grazing;
• rational use of water resources;
• prohibition of grazing;
• maintenance of pasture rotations
</td></tr>
<tr><td>6.1.3 Wind erosion</td><td>By the nature of wind activity in the Valley there are three areas:</td></tr>
</table>

(severity, % of are affected)

• Area with weak wind (wind speed -up to 6 m / s)
• Area with average wind (wind speed - 6-12 m / s)
• Area with strong wind (wind speed - over 12 m / s).

Wind erosion and the harmful effect of wind on plants appear on small area of the valley.

The information is given for the Sogd region

Degree	Yrs														
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
High	1764	1815	1898	1967	1888	2067	17941	1664	1785	1954	1873	1782	1666	1778	1807
Average	13552	14307	14112	15178	14783	14448	13868	14166	14328	14229	13798	14115	13822	14229	14155
Low	30890	30211	29916	28856	29165	30557	31012	30298	30016	29787	30266	30318	29755	29889	30188

6.1.4 Loss of soil organic matter (severity, % of area affected)

The information is given for the Sogd region

Degree	Yrs														
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
High	6127	6654	6812	6998	7227	7288	7314	7657	7112	7449	7882	7963	8094	8213	8556
Average	2218	2361	2587	2742	2897	2969	3074	3196	3261	4356	3647	3864	4117	4422	4522
Low	558	669	701	754	883	962	1076	1142	1251	1306	1386	1462	1573	1689	1767

Degree: high (from 3 to 5 %); average (from 1 to 2 %); low (up to 1 %).

6.1.5 Loss of soil structural stability (severity, % of area affected)

The information is given for the Sogd region

Degree	Yrs														
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	200	2011
High	7361	7452	7561	8288	8827	9314	9627	9941	10214	10367	11124	11454	11892	12147	12442
Average	3122	3247	3861	4124	4447	4764	4992	5127	5691	5989	6213	6667	6813	6991	7102
Low	856	969	1172	1483	1747	1924	2123	2467	2703	2863	2945	3167	3281	3359	3487

Degree: high (from 5 to 7 %); average (from 2 to 4 %); low (up to 2 %).

<table>
<tr><td></td><td>The loss of structural stability of soil (data from the experimental sites).

It should be noted that in recent years, there is significant decline in farmers' work on improvement of the fertility of soils in the irrigated areas, specifically:
• untimely tillage of the soil;
• consolidation of the top layer of soil, fracture of soil structure;
• reduction in use of organic fertilizers/</td></tr>
<tr><td>6.1.6 Loss of agrobiodiversity (description, severity, % of area affected)</td><td>The information is given for the Sogd region, ha

<table>
<tr><td>Degree</td><td>1997</td><td>1998</td><td>1999</td><td>2000</td><td>2001</td><td>2002</td><td>2003</td><td>2004</td><td>2005</td><td>2006</td><td>2007</td><td>2008</td><td>2009</td><td>2010</td><td>20</td></tr>
<tr><td>high
average
low</td><td>1714
454
163</td><td>1792
558
192</td><td>1814
602
232</td><td>1883
667
329</td><td>1961
751
473</td><td>2024
794
529</td><td>2098
844
588</td><td>2153
879
647</td><td>2203
894
681</td><td>2284
927
932</td><td>2318
989
979</td><td>2414
1021
998</td><td>2526
1093
1022</td><td>2616
1124
1054</td><td>
2
1
1</td></tr>
</table>
Degree: high (from 1 to 1, 5 %); average (up to 1 %); low (from 0, 5 to 1 %).</td></tr>
<tr><td>6.1.7 Other types of land degradation that are significant (description, severity, % of area affected)</td><td>Because of decrease in water availability, the most part of the irrigated lands especially under rice has remained uncultivated.
Within 15-20 years, these lands were not used in agricultural production and were out of rotation
These lands, in the beginning (1990-1995), were effected by the process of secondary salinization at the shallow groundwater levels, and soil lost its fertility and became salineland.
To return those lands for agricultural purposes, a large amount of capital investment is required. Other factors of a gradual degradation of the soil are monoculture practices, which lasting during the last 20-30 years.

In recent years, the achievements of scientific and technological progress and innovative experiments designed to obtain high crop yield are not being implemented at the farmer households.
The low level of farming, in the context of mentioned and other factors, leads to a systematic decrease of soil fertility.

In addition:
• in the light sierozem soils of Sogd region, the desertification has reached 0.2% (5035 ha);
• in the sierozem -meadow soils and meadow- sierozem soils, the logging reached 0.08% (164 ha);</td></tr>
</table>

• gray-brown stony and sierozem rubbly soils overgrown by shrubs and herbaceous forests on 0.1% (211 ha);
• stony soils are effected by irrigation erosion on 0.9% (1553 ha).

The data were obtained from the experiments (2011)

6.2 Degradation trends

6.2.1 Reclamation of salinized lands (% of area treated)

There are no data on land reclamation in Sogd region.

According the reclamation data, the situation is characterized as follows:
• The lands of good quality have increased on 5.36 thousand.ha over the period of 1997 – 2010 (5,6 %);
• The lands of satisfactory quality have decreased on 17.3 thousand.hectares from 1997 to 2010 (1,8 %).
• The lands of unsatisfactory quality have decreased on 3.0 thousand.ha from 1997 to 2010 (3,1 %).

The distribution of irrigated lands by their reclamation status in the Fergana Valley for the period of 1997-2011

(Fergana, Namangan, Andijan, Jalalabad, Osh and Batken region)

Yrs	Total area of irrigated agricultural lands, th. ha	Characteristics of reclamation of irrigated land							
		Good		Satisfactory		Unsatisfactory		Including, th. ha	
		th. ha	%	тыс. га	%	th. ha	%	Invalid depth of groundwater level	Invalid depth and soil salinity
1997	965,96	477,94	49,5	399,01	41,3	89,01	9,2	47,06	40,64
1998	962,73	478,55	49,7	386,65	40,2	97,53	10,1	49,26	47,04
1999	958,85	482,4	50,3	372,99	38,9	103,46	10,8	5□,85	51,32
2000	1236,72	681,72	55,1	437,43	35,4	117,57	9,5	50,8	53,72
2001	1237,45	729,99	59,0	402,79	32,6	104,67	8,5	48,41	46,07
2002	1237,64	697,33	56,3	428,79	34,6	111,52	9,0	51,1	50,25

2003	1238,07	700,13	56,6	430,14	34,7	107,8	8,7	50,8	196,86
2004	1237,85	694,93	56,1	431,72	34,9	111,2	9,0	53,5	194,89
2005	1238,55	688,73	55,6	439,02	35,4	110,8	8,9	51,4	195,69
2006	1242,41	708,11	57,0	426,7	34,3	107,6	8,7	50,5	194,87
2007	1245,7	728,28	58,5	416,05	33,4	101,37	8,1	56,34	37,04
2008	1245,36	729,94	58,6	425,58	34,2	89,84	7,2	47,92	33,9
2009	1247,82	728,71	58,4	431,96	34,6	87,15	7,0	40,02	39,14
2010	1251,83	732,37	58,5	434,97	34,7	84,49	6,7	38,02	38,84
2011	1251,97	739,27	59,0	429,47	34,3	83,23	6,6	35,66	40,15

Ниже были даны информации мелиорация земель Sogd region.

Годы	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
%	1,66	1,90	1,83	1,97	2,12	2,31	2,21	2,67	2,52	2,39	2,57	2,36	2,42	2,46	2,54

6.2.2 Increase in soil erosion (description, % of area affected)

Strong uneven territories of Sogdijsky area and weak stability of soils, frequent rainfalls of high intensity, rare grassy vegetation in aggregate with misuse of land strengthens erosive soil processes, but there are no concrete information.

6.2.3 Lowering of the groundwater tables (% of area affected, range of change in the groundwater levels (m))

The flat area of the Fergana Valley is characterized by a shallow groundwater level and salinity of soil, respectively. The nature of changes in groundwater level is dependent on two factors:
- Water availability during the year;
- The presence of drainage, and its performance.

As a rule, during the years with the normal and high availability of water, the groundwater level is close to the surface and ranges:
- during the non-growing season - 1.5-3.5 m;
- during the growing season - 1,1-2,8 m

In dry years, due to the decrease in water utilization, the groundwater level is declining dramatically (not depending on the availability of drainage) and sometimes drops to 4 or more 5 m

In recent years, due to the implementation of the State program on land reclamation of the Republic of

Uzbekistan (2008 - 2012.), the significant construction work (reconstruction, maintenance and repair work) was done, which led to a widespread decline in groundwater, which in turn, led to the desiccation of the upper surface of soil and thus use of an additional amount of irrigation water.

Groundwater level in Fergana Valley (2011) – depth

2,2 % of territory 0-1 m
8,4 % of territory 1-1,5 m
25 % of territory 1,5-2 m
17,8 % of territory 2-3 m
28,5 % of territory 3-5 m
18,1 % of territory >5 m

6.2.4 Other significant degradation trends (description, % of area affected)

No data

Socio-economical descriptors

7. Demography

7.1 Population

7.1.1 Total population of site

Total population *in Fergana Valley*

Yrs	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
thou. people	6374,2	6478,7	8984,9	10827,7	10983,3	11141,3	11389,7	11552	11729,2	11893,2	12075,2	12268,2	12501,1	12708,6	12957,4

7.1.2 Percentage of rural population of site

Yrs	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
%	71,4	71,8	72,0	74,4	74,2	74,5	74,3	74,4	74,4	75,0	75,1	75,2	63,2	63,3	50,2

7.1.3 The age distribution of the rural population

Age (under 5 yrs)	Age (from 5 to 7 yrs)	Age (from 7 to 16 yrs)	Age (from 16 to 45 yrs)	Age (from 45 to 60 yrs)	Age (from 60 yrs and higher)

415374,4	709744,5	1144443,6	2533555,5	1349726,2	351770,6

Data on 01.01.2011

7.2. Poverty

Poverty headcount ratio at $1.25 a day (PPP) (% of population)

	1990	1995	2000	2005	2010
Tajikistan	..	..	49	21	7
Kirgiz	0	19	34	23	6
Uzbekistan	..	..	..	..	..

Headcount index: This is the share of the population whose income or consumption is below the poverty line, that is, the share of the population that cannot afford to buy a basic basket of goods.

Source: World Bank
http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=1&REPORT_ID=1336&REQUEST_TYPE=VIEWADVANCED&HF=N

Poverty gap at $1.25 a day (PPP) (%)

	1990	1995	2000	2005	2010
Tajikistan	..	..	15	5	1
Kirgiz	0	9	9	6	1
Uzbekistan	..	..	..	..	..

Source: World bank

http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=1&REPORT_ID=1336&REQUEST_TYPE=VIEWADVANCED&HF=N

Poverty gap: This provides information regarding how far off households are from the poverty line. This measure captures the mean aggregate income or consumption shortfall relative to the poverty line across the whole

<table>
<tr><td></td><td>population. It is obtained by adding up all the shortfalls of the poor (considering the non-poor has having a shortfall of zero) and dividing the total by the population. Put differently, it gives the total resources needed to bring all the poor to the level of the poverty line (divided by the number of individuals in the population). This measure can also be used for non-monetary indicators, provided that the measure of the distance is meaningful. The poverty gap in education could be the ‘number of years of education missing to reach the defined threshold’

According to data on Inspection of a standard of living in Tajikistan (2007) Experts of Children's Fund of the United Nations Organization (UNICEF)

Poverty line at parity of Purchasing Power (PPP) of 2.15 US Dollars, poverty level in Tajikistan makes 40.9 %
Absolute poverty line of
<table>
<tr><td>The population, living in poverty (poverty line)</td><td>53.5%</td></tr>
<tr><td>Poverty among children (0-14 years)</td><td>57.6%</td></tr>
<tr><td>Poverty among adults (15 years and more)</td><td>51.3%</td></tr>
<tr><td>The population living in an extreme poverty (line of an extreme poverty)</td><td>17.1%</td></tr>
<tr><td>Extreme poverty among children (at the age of 0-14 years)</td><td>19.2%</td></tr>
<tr><td>Extreme poverty among adults (at the age of 15 years and more)</td><td>15.9%</td></tr>
</table>

Poverty status in Sogd region
Poor - 68.8%
Non-poor 31.2%</td></tr>
<tr><td>7.2.1 Poverty among the rural population (description, %)</td><td>Poverty percent in countryside is higher on 40 %.

In Tajikistan - high, but decreasing level of poverty (89 % in 1999, 64 % in 2004 and 53 % in 2007), mainly because of economic growth and remittances (the Analysis... 2010: 9), poverty is more widespread in rural areas and areas where the cotton is grown.</td></tr>
<tr><td>7.3 Health and</td><td></td></tr>
</table>

nutrition

Nutrition of the population of the Kyrgyz republic (2010)

№	Basic products	Milled and hulled products	Wheat	Potato	Vegetables and melons	Fruits and berries	Meat	Milk	Eggs, mln. units.	Vegetable fat	Sugar, bakery products
1.	Storage at the beginning of the year, thou. t	1143,1	432,6	755,3	268,4	22,8	4,6	25,1	15,5	17,9	94,5
2.	Produced in the country, thou. t	1510,9	746,2	1334,9	947	185,4	185	1273,5	369,3	18,3	10,9
3.	Imported, thou. t	531,1	451	0,7	8,5	80,4	50,9	36	22,7	25,1	65,7
4.	Used, thou. t	2040,2	1151,5	1410,2	934,6	283,2	236,3	1275,3	386,1	35,2	115,5
5.	Storage at the end of the year, thou. t	1144,9	478,3	680,7	289,3	5,4	4,2	59,3	21,4	26,1	55,6

Source: Information bulletin of KR on food security, National Statistic Committee of KR, Bishkek 2009, page 62.

Consumption of iodine salt in Sogd region
Non-iodine salt 6.4%
Less than 15 ppm iodine 28.8%
More than 15 ppm iodine 64.9%

7.3.1 Nutrition and health status of rural population

Food consumption per capita, ine 2007

Groups of products for years	consumption per capita per day, grams
Grain, total	518
Wheat	481
Potato	98
Sugar	22

Vegetable oil	33
Vegetables	472
Fruit	155
Meat	71
Eggs	12
Milk	396

Data: FAOSTAT

Total indicator of available calories per capita a day in Uzbekistan in 1992, 2003 and 2007 (calories per capita a day)

Groups of products	1992.	2003.	2007.
The grain	1627	1415	1464
Potato	49	55	65
Sugar	125	43	78
Nuts	5	11	8
Seed oil	7	11	9
Vegetable oil	292	268	289
Vegetables	94	82	112
Fruit	44	44	78
Meat	150	139	160
Animal fat	33	18	21
Eggs	17	13	16
Milk	243	229	238
The fish	3	1	1
In total	2689	2329	2539

Data FAOSTAT

Risks of decrease in level of food safety in Uzbekistan (i) high density, growth of a population and (ii) decrease in volumes of manufacture owing to degradation of ameliorative condition of land, deteriorations of irrigation and drainage systems, (iii) insufficiently developed market, transport, communication and industrial infrastructure.

Main indicators of the health of population

The basic indicators of health of the population (the general factors of birth rate, death rate and a population natural increase (on 1000 population)

№	Indicators	Andijan					Fergana					Namangan				
		2007	2008	2009	2010	2011	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011

1.	Birth rate on 1000 people	22,6	25	24,5	22,6	21,2	23,6	22,4	22,6	22,1	22□5	24	24,4	22,9	21,5	21,8
2.	Death rate on 1000 people	5,1	5,1	4,8	4,9	5,3	5,1	5,2	5,0	5,0	5,0	4,6	4,6	4,3	4,5	4,7
3.	Natural growth	17,5	19,9	19,7	17,7	15,9	18,5	17,2	17,6	17,1	17,5	19,4	19,8	18,6	17	17,1

According to the data of the Republic of Kyrgyzstan (2010), the infant mortality rate in rural area (children under 1 year per 1,000 live births):
Batken region: - 27,0
Jalalabad region: - 20,7
Osh region: - 20,8

Infant mortality rate in rural area (children under 1 year per 1,000 live births):
Batken region: - 39,1
Jalalabad region: - 26,4
Osh region: - 29,4

Source: Stat. Department, 2011 (Statistic Department 2011. Republics Kyrgyzstan and Tashkent 2012 (Health care in Uzbekistan)

7.3.2 % of children below 5 years of age at risk of malnutrition

According to the data of Statistical Committee of the Republic of Kyrgyzstan, caloric value of food consumed by children of 1-17 years is 20 126 kcal, which is on 96 kcal more than the daily requires norm (1920 kcal). Consumption of other important elements, such as fats and proteins were below the daily-required norm on 16 and 13 g, respectively. Children of 1- 3 years old lose the necessary nutrients from the daily norm. Among children of 1-11 years, 6.9% were identified as malnourished. The number of malnourished preschool children (1-6 years) is 7.4%. The highest share of underweight children is among the children under one year (18.0)

7.4 Employment

7.4.1 Gender-related aspects of work in rural area

№	**Gender aspects of work in rural area**	*Andijan*	*Fergana*	*Namangan*	Batken	Jalalabad	Osh
1.	Number of females	1326500	1609400	1176500	21715	517762	561550
2.	% from total population	46,7	42,1	35,7	49,2	50	49,7
	Number of unemployed females				11200	16600	19200

1.	Percentage of women share in the total number of senior□positions				19	19,8	20,5
2.	Percentage of women share in the total number of qualified positions				42	40,1	40
3.	Percentage of women share in the total number of unqualified positions				5,8	3,3	3,8
4.	Percentage of unemployed women share				33,2	36,8	35,7

Share of economically active population on Sogd region persons from 14-64 years- 44.9 %
Share of economically active man's population on Sogd region among persons from 14-64 years - 63.9 %
Share of economically active female population on Sogd region among persons from 14-64 years-28.5%

7.4.2 Types and importance of non-agricultural employment, %

Non-agricultural employment

Regions	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Fergana	29,1	28,9	28,8	28,6	28,4	28,2	28,1	28	27,8	58,8	58,6	58,6
Batken												50,8
Jalalabad												50
Osh												50,3

No information others oblast

8. Agricultural systems

8.1 Classification

Structural changes in irrigated lands

Yr	Association of Water Users (AWU) or farmers (kolkhoz)				Farmer households		Other types		Homestead lands	
	Amount	Area	including:							
			WUA	Area	Amount	Area	Amount	Area	Amount	Area
	Units	ha	Units	ha	Units	ra	Units	ra	Units	ra
2000	781	864978			7129	72364	12883	14793	358395	99194
2001	765	859018			7966	84939,4	26334	16075	437951	102927
2002	745	850245	16	38594	10504	140374,8	43949	17211	492598	106234
2003	650	791083	16	38594	13465	211945,6	76375	18742	545589	111339

2004	606	740932	26	69578	16357	285450,4	98307	20990	738825	132305
2005	451	585591	79	189227	22589	388867	485292	71093	745843	133366
2006	341	419365	131	277184	44037	647864,5	509754	69492	752116	136248
2007	236	361407	162	350339	54782	784743	510581	65359	758986	139633
2008	230	361460	164	350339	42560	790591	518037	65113	849283	142148
2009	216	361101	162	351939	33807	788747	518189	64501	880389	143154
2010	174	361978	119	351939	25044	785746	515084	59242	891912	139498

No information on the Republic of Kyrgyzstan (Osh, Jalalabad and Batken regions) and Sogd region, Tajikistan.

8.1.1 General classifications

Types of households	Irrigated lands , the plains							
	Totally ha	Preferable cultivated (crops, type of cattle)						
		Cereals	cotton	Potato	Vegetables	melons	Forage crops	Horticultural crops
All types of households including	750556	289119	294531	23563	42585	5104	70705	24949
Farmer households	649087	266898	292067	11598	22514	2464	38587	14959
Dekhans households хозяйства	9494	14789	0	8347	19556	2496	11991	2315
Agricultural enterprises	44965	2688	10208	3598	515	144	20137	7675

No information on the Republic of Kyrgyzstan (Osh, Jalalabad and Batken regions) and Sogd region, Tajikistan.

8.2 Descriptors related to cropping component

8.2.1 Average farm holding size (ha)

Republic, region	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Uzbekistan	6,9	7,0	6,9	14,3	15,0	16,1	15,4	16,2	16,1	26,8	40,1	42,3
Kyrgyzstan											0,9	2,0

According to data on Survey of living standards in Tajikistan (2007) by UNICEF experts average size of households in Sogd region makes 0.011ha (2007)

8.2.2 Type (s) of crop rotation

There is no scientifically based rotation (by the years) in almost all of the farmer households in the irrigated area.

In cotton growing area, the crop rotation is carried out at the discretion of individual farms.
In the 70-80%, the crop rotation is not implemented in cotton growing, i.e. there is a monoculture practice.
In some cases, wheat and other crops alternate cotton in the rotation. At the same time according to the government calendar, there is no area under alfalfa, which was previously used as the alternate crop in rotation.

The proper and scientifically proved crop rotations were not applied for the last years in economy of Sogd region, and the areas under long-term grasses were sharply reduced; in farms until 2008 on the area of 70 % from land, the farmers grew cotton. After 2008, when the future's company has been cancelled, they had conducted diversification of an agricultural production that has served decrease in the areas under cotton. The released areas depending on region are used under vegetable and grain crops. New gardens and vineyards are cultivated on the unproductive lands. For the last 3 years, the area of new gardens and vineyards has increased on 13 thousand hectares. For the given period farms, themselves develop structure of areas under crops with the account of natural-climatic conditions and closeness to the market. The good tendency is visible that the farms for the last years have increased use of organic fertilizers, which favorably influencing efficiency and fertility of soil..

8.2.3 Crop intensity

The intensity of the harvest depends on the type of crops.

Timeline and the intensity of the harvest.

Type of crop	Months									
	IV	V	VI	VII	VIII	IX	X	□I	XII	Duration of harvest, days
cotton	-	-	-	-	-	+	+	+	±	40-70
wheat	-	-	+	+	-	-	-	-	-	25-35
rice	-	-	-	-	-	+	+	-	-	40-60
alfalfa	-	+	-	+	-	+	-	+	-	35-40
vegetables	-	+	+	+	+	+	+	-	-	20-180
melons	-	-	-	+	+	+	+			30-90
tobacco	-	-	-	-	+	+	+	+	-	45-80
oil crops	-	-	-	-	-	+	+	+	-	30-60
potato	-	-	+	-	-	+	+	+	-	20-60

<table>
<tr><td>8.2.4 Source (s) of water for the crop production</td><td>The main resources of irrigation in Fergana Valley are: river Syr Darya, Isfara, Isfayram, Kayindy, Kodjo-Bakirgan, Sokh, Shahimardan, Gauyan, Karaungur-Say, Kasan-Say, Kanish-Kaya, Kurgat, Pashsa-Ata, Sumsar-Say, Changent-Say, Chachkan, Shaydan- Say, Kara-Darya, Arvan-Say, Akbuura, Abshir-Say, Gulcha, Karakuldja, Kizil Suu, Yassy, Kyrgyz-Ata rivers.

The river Karadarya -mixed fed steam, the Ak-Bura and Aravansay- glacier-fed stream, the Maylisay- snow-fed river, water draw-off is made of a spring system, collector-drainage chain and from wells for irrigation and vertical drainage. Bring in of water to farmers is carried out by thick system, channels. The average annual use of collect water is 30-60 million m^3.</td></tr>
<tr><td>8.2.5 Implements / Machinery used, the degree of mechanization</td><td>In all farmer households for the work of general purposes, the most rational is to use the crawler tractors, traction-class T-4A.

To perform the cotton seeding work, the tractors MTZ-80x, TTZ 8010 and TTZ 8011 with the capacity of 80 horsepower are used.
The plows TL-3-35, PD-3-35 are used for fall tillage.
Pre-sowing mineral fertilizers are applied by the chisel device 4KU-4.
To conduct the land leveling on the fields, the long-baseline levelers-P-2, 8 are used.

Available technology, tools / equipment in the Republic of Kyrgyzstan, pieces
<table>
<tr><th>№</th><th>Technology/ tools</th><th>Batken</th><th>Jalalabad</th><th>Osh</th></tr>
<tr><td>1.</td><td>tractors</td><td>1 411</td><td>3 724</td><td>4 404</td></tr>
<tr><td>2.</td><td>tra□tor plows</td><td>394</td><td>887</td><td>865</td></tr>
<tr><td>3.</td><td>cultivators</td><td>75</td><td>536</td><td>472</td></tr>
<tr><td>4.</td><td>seed planters</td><td>50</td><td>372</td><td>414</td></tr>
<tr><td>5.</td><td>combines</td><td>97</td><td>317</td><td>411</td></tr>
<tr><td>6.</td><td>grain harvesters</td><td>-</td><td>19</td><td>3</td></tr>
<tr><td>7.</td><td>forage harvesters</td><td>-</td><td>-</td><td>2</td></tr>
</table>
According to the data of department of mechanization of Sogdijsky Regional Agro-Industrial Complex, data is available for May-1 about a condition of agricultural machinery. It is necessary to notice, that for the last 15 years renovation of machine-tractor park was carried out not completely, the basic part of technics to 60 % are in the</td></tr>
</table>

worn condition, but after the organisation of Department AGROLEASING, some farms get the new technics but in insufficient quantity in view of absence of financial assets. Therefore, the farmers use all old technics which demands expensive repair and thus leading to not qualitative work on soil processing.

8.2.6 The degree of commercialization, % of sold products

Sold products (thou.t).

№	Crops	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1.	cotton	1064,517	1120,28	1070,24	806,209	987,691	1070,8	938,006	986,57	906,53	928,36	989,92	978,07
2.	wheat	1308,299	1389,1	166,81	1774,47	1697,03	1067,9	1727,483	1796	1782,1	1252,3	2251,7	1793,1
3.	potatoes	310,829	316,213	342,727	404,241	431,357	444,84	479,045	592,92	670,97	712,01	911,94	615,86
4.	horticultural crops	345,272	344,771	352,511	301,913	340,181	361,22	423,964	420,61	475,71	508,23	654,37	333,95
5.	vegetable	768,57	796,292	812,434	864,552	907,817	940,21	1095,273	1226,7	1330,5	1442	1789,8	952,05
6.	melons	46,235	46,338	51,416	60,15	59,41	67,811	86,168	109,17	136,2	157,6	288,16	93,904
7.	other crops	84,955	133,906	159,591	155,409	156,341	162,92	179,442	194,41	227,42	282,54	277,97	287,56

No information on the Republic of Kyrgyzstan(from 2000 to 2009).

8.2.7 Saptial organization of cropping in relation to environmental differences

Height <100 Under the sea level	Height 100-500	Height 500-900	Height 900-1300	Height 1300-1700	Height <1700-2000	Height 2000-2400	Height 2400<
All crops		In the mountains of Fergana Valley, the following crops are grown: Natural feeds, almonds, walnuts, wild rose. On the foothills: Wheat, barley, alfalfa, sainfoin, horticultures, large fruits and potato. On the plains: Wheat, cotton, tobacco, maize, potato, onion, carrot, beans, vegetables, melons, fruit and berry crops, alfalfa, greenhouse crops, etc.					

8.3 Descriptors, related to animal component	Livestock is an important part of the Fergana Valley's agriculture, contributing to the insuring of the population with food and industries by the raw materials. Depending on the natural-climatic conditions of the region, livestock can be divided into intensive (industrial), extensive (grazing), and domestic. Dairy cattle breeding, poultry farming is concentrated in the suburban area of irrigation. Pasture livestock is concentrated in the area with the low natural resource potential and domestic livestock -on private lands. Depending on the natural-climatic conditions of the region it can be divided into intensive (industrial), extensive (grazing), and domestic livestock. Dairy cattle breeding, poultry farming is concentrated in the suburban irrigated area. Sheep breeding - the most common type of livestock activity. The main breeds of sheep are "kyrgyzskaya" with fine wool, merinos, "gissarskaya" and other local breeds. Pasture forages cover 60 - 89% of the total forage needs of livestock, the other gets in the form of concentrates, and other coarse fodder during the winter. Meat, wool consumed locally, woolfell are exported Goat breeding. Goat breeding is popular in the middle mountain regions, mainly local breeds. The population consumes meat and milk; fur fiber is exported. Last years, people consume more goats' meat, since it is more easily digested and not increase blood pressure. Cattle breeding. Almost every rural family has at least one cow. From late May until the autumn, cattle is grazing on remote pastures, as in the valley area the land is cultivated. Meat and milk sold in the markets. Breeds are mostly local. Horse breeding. Horses forage indoors only during the wintertime, the rest of the time they are forage outdoors on the spring-summer and autumn pastures. They are used for meat production, koumiss (milk), to participate in the national games as ulak tartysh, kiz kuumay, alaman bayga, jorge salysh for money. In addition, horses are used for plowing and field treatment, where is no any opportunity to use technology. Breeds are local (Orlov, Don, Don, blooded mingy). Yak breeding They are mostly grazed on the high mountain pastures, and used for meat and sometimes for milk.

Pigs. Pigs are ranched in small quantities, by people living in suburban areas (in home conditions) for the meat

8.3.1 Main animal species or races kept (thou. heads)

The main breeds of livestock

Breeds and types of livestock	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Cattle	641,944	665,773	693,617	721,69	760,619	769,551	852,951	859,09	908,708	1918,182	2021,734	2213,377	2325,912	2494,584	2023,453
small cattle	1217,946	1224,229	1257,539	1249,423	1300,29	1326,986	1435,123	1502,56	1572,245	2635,154	2745,98	3037,739	3208,684	3364,104	4114,108
soliped	3,15	3,26	3,24	3,45	3,6	3,9	4,45	5,47	5,58	17,02	17,55	18,27	18,78	18,8	155,131
poultry	1107,354	1200,958	1324,848	1507,53	1684,861	1854,359	2111,079	2392,468	2876,764	5329,369	5787,656	6988,37	7876,062	9481,281	8261,242
Other	0,61	0,63	0,44	0,73	0,9	0,67	0,73	1,49	1,59	7	5,79	5,05	4,9	5,7	0,994
rabbits															3,277
bee community, units															74,37

There is no information on Batken, Jalalabad and Osh regions (from 1997 to 2010)

8.3.2 Feed systems

In the Fergana Valley, especially in the Andijan region, the livestock is popular at the farm level due to the limited pasturelands. There are irrigated lands for the production of forage crops within the farmer households.
Feeding systems consist of: forage, hay, alfalfa, sainfoin, silage, pressed forage, corn, and oats.

According to the data of department of Livestock of Sogdijsky Regional Agro-Industrial Complex, after 2002 basically cattle and goats and sheep have been left on the balance of large-scale farms, who were allocated land areas in conformity to existing specifications, but for cultivation of thoroughbred breeds, 24 various farms were left on balance of public sector, and also 6 large specialized poultry-farming factories carry out the activity in the region. Large pastures are available in insufficient quantity; therefore, farms themselves are engaged in manufacture and preparation of forage.

8.3.3 Prevalent livestock diseases and mortality

Livestock is developing mainly in the farm, where special care and veterinary control of animal diseases organized.

Common diseases:

- Cattle: rabies, aphthous fever, cholera, anthrax, emkar, braxy, leptospirosis.
- Small cattle: rabies, aphthous fever, pox, cholera, anthrax, brucellosis, salmonellosis, enterotoxemia, bradsot.
- Horses: covering disease, anthrax.
- Poultry: Newcastle disease (cholera), pullorosis.

Information on diseases occurred among livestock animals in the past 2010/11 years within 3 areas of the Republic of Kyrgyzstan.

Region	Diseases, %	animals											
		Cattle			Small cattle			Horses			Poultry:		
		1995	2000	2011	1995	2000	2011	1995	2000	2011	1995	2000	2011
Batken	rabies			+			+						
	aphthous fever												
	pasteurellosis						+						
	Siberian plague												
	emkar												
	braxy												
	leptospirosis												
	pox												
	brucellosis			+			+						
	salmonellosis												
	Newcastle disease (cholera)												
	pullorosis											+	
	covering disease									+			
Jalalabad	rabies			+			+						
	aphthous fever			+									
	pasteurellosis												
	Siberian plague												
	emkar												
	braxy												
	leptospirosis			+									
	pox												

	brucellosis						+						
	salmonellosis												
	Newcastle disease (cholera)												+
	pullorosis												
	covering disease									+			
Osh	rabies			+			+						
	aphthous fever												
	pasteurellosis												
	Siberian plague			+									
	emkar												
	braxy												
	leptospirosis												
	pox						+						
	brucellosis			+			+						
	salmonellosis												
	Newcastle disease (cholera)												
	pullorosis												
	covering disease									+			

According to the data of veterinary service of Sogd region, there is an annual mortality among home livestock; for the period from 1997 to 2011 mortality as a whole made in cattle-2213, sheep and goats -99176, poultry -783514. There is a tendency of reducing morbidity and mortality among the cattle for the last 5 years.

8.3.4 Main livestock products

Meat, milk, sour cream, butter, cream, yogurt, chalap, cheese, kurut, koumiss, wool, woolfell, fur fiber, eggs, silk cocoon, honey.

Products	Measuring unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2
Meet	th. t	55,324	55,945	56,728	61,811	66,498	70,475	73,166	76,455	81,015	86,139	279,668	1
milk	th. t	334,633	338,937	344,699	369,015	392,926	419,798	428,903	446,51	477,973	506,479	1900,83	1
Eggs	mln. units.	96,714	97,584	101,585	134,636	138,491	144,586	156,665	176,7	182,674	200,414	226,879	3

wool	dt.	16583	16789	16840	15657	15790	15826	15921	16883	17389	17551	18469	

Source: Agriculture, Kyrgyzstan, Bishkek, 2011 and Stat. Management, Uzbekistan

8.3.5 Degree of integration with crop component

Farmers are interested in the crops- based feeding. Especially in the private farmer households, feeding is based on such crops as wheat, oats, and maize for silage and for grain, alfalfa, sainfoin, straw brick, sorghum and other crops. Probably, in the future, the main livestock will be based on the agricultural crops

Sown area under fodder crops

Indicators	Farmers households	Small farmer households (dekhans)	Totally
Area, ha	33956	6363	40319

According to the data of department of Livestock of Sogdijsky Regional Agro-Industrial Complex, at the expense of production of feed crops and cereals, as well as after harvesting of repeated crops, annually 6,8 feed unit are produced per cattle, and also feed is bought from outside

8.3.6 Spatial organization in relation to environmental differences

Type of livestock	asle < 100,0 m. Baltic sea	from 100 to 500 m. Baltic sea
Sheep breeding	+	+
cattle breeding	+	+

8.3.7 Prevalent crop pests, diseases and parasitic flowering plants (parasitic weeds).

Some weeds on cotton and wheat fields.

1. barnyard grass, millet - *Echinochof cus-galli (Z) Beauv*
2. field bindweed - *Convolvulus arbensis*
3. goosefoot family - *Chenopodiacae*
4. common reed - *Phragmites communis Trin*

Parasitic plants

Pests of wheat

- turnip moth - *Agrotis segetum Den Et Schiff*
- cereal leaf beetle - *Lema melonopus Li*
- sunn pest - *Eurygaster in tegrictps Put*
- wheat aphid - *Schizaphis graminum Rond.*
- greenbug - *sitobion avenae F.*
- tarnished plant bug - *Lygus pratensis Li.*
- cicada - *Cicadinea.*

	1. field dodder - *cuscuta appoximata Robingt* 2. broomrape - *orobanche* 3. pests of cotton 4. melon aphid - *Aphis gossypii C, lov* 5. alfalfa aphid-*Aphis eraccivora Koch.* 6. tobacco thrips - *Throps tabaci Lind.* 7. greenhouse whitefly - *Trinlenrodes Vararariorrum westne* 8. cotton whitefly-*Bemisia tabaci* 9. turnip moth - *Agrotis segetum Den* 10. cotton moth - *Aclithis armigera* 11. glasshouse spider mite - *Tetranychres urtunal Koch.*	Common diseases of cotton 1. leaf mottle - *Verticillum dahliae* 2. fusarium - *Fusarium oxysporum. F vasinfectum* 3. angular leaf spot - *Xanthomonas campestris hv. Malvaceaerum* Common diseases of wheat 1. loose smut - *Ustilago tritici (Pers) Jens* 2. head smut - *Tillettia tritici (Bjerk)* 3. yellow rust - *Pussinia striiformis West* 4. brown rust - *Pussinia triticina Erikss* 5. powdery mildew - *erysiphe graminis DC f. Tritici Marchal*
8.4 Market access and characteristics		
8.4.1 Distance to closest local market (km, hours of travel time)	The most people sell their agricultural products at the local market mainly located in the center of the district. Individual farmers (who have a vehicle or tractor) transport their products to the regional centers of the Fergana Valley, as there prices are higher (on 10-15%) compared to the district market. There is a case of daily supply of agricultural products in the center of the farms. The distance from farmers to small market, located in the center of the farms, varies from 2 to 20 km, and time to reach it ranges from 35 minutes to 1 hours (depending on the type of transport (mostly on araba cart)). Distance from district center to the farmer households varies from 5 to 25 km, depending on the type of transport travel time may vary from 10 minutes to 60 minutes. Those who have own cars, deliver their products to the regional center (mostly within 10-60 km). Distance, depending on the location, varies from 10 to 70 km and travel time takes from 30 minutes to 2 hour. Information on Sogd region: depending on areas and the location: the local markets, where farmers basically hand over their production in the first turn- to Isfarinsky-110 km, Khojend, Kanibadam-75 km, B.Gafurovskij-10 km, J.	

	Rasulovsky - 15 km, Spitamenski-35 km, Mastchinsky - 65 km. The central market is in Sogd region and in the city of Khojend. Wholesale buyers buying production in the local markets realize them in the central market, or after storage resale it to wholesale buyers. Also, there are markets depending on type of production, for example the basic market on onions sale is in Istarashan and Spitamen, on sale of fresh fruit - in Asht, on sale of dried fruits - in Isfara.
8.4.2 Sizes of rural markets	Sizes of rural markets depend on the size and productivity of smallholding and subsidiary personal plots. Within the territory with dense population, farmers get a higher yield on their plots, and the size of rural markets ranges from 0.5 to 1.5 hectares, and more. On the territory of the northern regions, the magnitude of this figure is even lower, 0.2 - 0.5 hectares. It should be noted, that in rural areas, not all farms have their own markets, and they deliver products to the district or regional central markets. The size of markets: 1. Up to 100 m^2 2. From 100 to 500 m^2 3. from 500 to 1000 m^2 4. from 1,000 m2 to 10,000 m^2 5. More than 1 hectare, depending on population density.
8.4.3 Competitiveness and access to local, national, regional and global markets	In the agricultural sector of the Republic of Uzbekistan, the government sets the orders for production of cotton, and has access to the world market through stock market (farmers do not have direct access to the world market). For other crops like wheat, rice and other vegetables, farmers have access to local and national markets (in this matter there are no specific difficulties) and they have comparative advantages in quality and environmental friendly products. In the other republics such as Kyrgyzstan and Tajikistan, there are no any government orders; all growing crops can be sold at the regional and world markets. Cotton, fur fiber, partially dried apricots exported to the world markets. Tobacco, meat, vegetables, rice, dried fruits, fruit, honey are for sale on the regional markets Tobacco, cotton, meat, milk, cream, butter, sour cream, yogurt, chalap, cheese, kurut, koumiss, wool, woolfell, eggs, etc. are for sale on the national and local markets.

8.5 Access to land, water and other inputs	According to the Constitution of the Republic of Uzbekistan and other legislations, the government must regulate all land, water and other resources. For this, there are a number of government regulations (on the international and national levels), where the political, legal and economic aspects of the use of land and water and other resources, including the rights of citizens on access to land, water and other resources are defined.
8.5.1 Access to land	All land resources included in the unified state land fund, which, in accordance with the principal intended purposes are subdivided into the following categories: - agricultural land, provided to the farmers and other land users for agricultural purposes; - settlement lands (small households, municipal and other species); - land for industry, transport, nature reserves and other non-agricultural purposes; - The land of the state forest fund; - The land of state water fund; - The land of state reserve. The government establishes the basic rules of Land Management. Under the current land legislation of the Republic of Uzbekistan, the categories of land and land access shall be defined in accordance with their main intended purposes. Most part of the land fund is used for agricultural purposes. According to the Law of the Kyrgyz Republic, 75% of the total arable land area was allocated among each residents of the republic. All citizens have the land share from 0.03 to 5 ha, and they have the right to sell, lease, and donate it. In conformity with acts of Republic Tajikistan and to the Law on farm-dehkan farms, accepted in 2009, all citizens have access to land tenure for cultivation of agricultural crops and for the use of their needs. Process consists that the citizen writes applications to Local governments, where the decision is made and is transferred in Land committee of area, after registration in Land committee of republic, the farmer receives the certificate on land use when due hereunder. Also, he\she is obliged to promptly submit reports to corresponding bodies about the activity.
8.5.2 Access to water	According to the law, each citizen has a right of access to safe water on both international and national levels. Access to the water resources can be carried out in the following ways: • for drinking purposes (water supply and sanitation); • for agricultural production;

	• for the industry; • to protect the environment. The main legislation on water use and water access exposed in the Constitution of the Republic of Uzbekistan (1992), the Law of the Republic of Uzbekistan “On the limited water use in the Republic of Uzbekistan” (1993), the Law “ On Water” and other legislative acts. The problem of water supply is quite acute. It is multifaceted and complex. Approximately 90% of water resources in Uzbekistan are formed outside of the country. The water distribution become complicated and the water supply is being reduced each year, which is leading to the yield losses due to the following reasons: establishment of independent states, which have government borders; the reorganization of agricultural enterprises and the increasing of number of water users in the form of farmer households and farms, small agricultural enterprises; population growth; obsolescence of hydro-technical structures, irrigation and collector and drainage networks, pumping stations. The problem of optimal water supply more often occurs with water sources that are not regulated, especially in the Fergana Valley, where the excess of water in cross-border small rivers during the flood period and the deficit during the growing season take place. In the midst of the growing season, the pumping water stations are activated to recharge the shallow water sources. In addition, outdated pumping stations and hydro-technical structures are characterized not only by the complexity, but also by their expensiveness. The budget funds allocated for their use and repair is clearly not enough, and besides, they are decreasing every year. At present, within the all soil-climatic regions, the limiting factor of increasing the productivity of cotton is an increasing shortage of irrigation water during the most critical period - watering during the growing season. Therefore, it is necessary to achieve a stable and sustainable harvest of cotton by the use of science-based modes of irrigation and irrigation technology, and increasing water productivity. Considering the fact that 60% of the population in the Republic of Uzbekistan engaged in agricultural production and about 90% of food products produced on irrigated agricultural lands, the solution of the water management problem is seen in increasing of water and land productivity. The Fergana Valley, in particular the Andijan, is the most populous region in the Republic, where the agricultural production is higher in comparison with the other regions of the country.

	Reclamation of new lands has almost ended during the Soviet period, but the population and the need for agricultural products still growing rapidly. Therefore, it is vital to use the water resources rationally, increase the productivity of agricultural crops and water / land productivity. In addition, in recent years, the intensity of the various cataclysms in the climate-ecological aspects has increased dramatically. The most shallow and most high-water years, which previously were repeated only once in the century, now occurs during last three years. For example, in 2008, there was lack of water, in 2010 was opposite. Water professionals had to manage the water resources in the extreme situations; moreover, the several mistakes in agricultural production took place because of the low inexperience of farmers and changed climatic conditions. Land users in the Kyrgyz Republic have access to water resources. For the distribution of irrigation water among the water users in the country, there are 477 water user associations (WUAs) managing about 80% of the total irrigated area. Water is free for an irrigation in Republic Tajikistan, but there are payments for water supply, as water is supplied through pump stations; for 1 m^3 water in conformity of the Decree of antimonopoly committee from April 1, 2011 the farmer should pay 1,5 dirham and + VAT, in total for cubic meter of water it is necessary to pay 1, 77 dirhams.
8.5.3 Access to other inputs (seed, fertilizer, etc.)	According to the agreement between farmers and suppliers, and by the request of farmers, the necessary resources as fuel, seed, fertilizer, tractors (who do not have) according to the established prices are being provided. According to the regulatory planning costs estimated for each farm at the end of the year (depending on the size and type of crops) the relevant services are being provided to farmers. Farmers make agreements (preliminary, advance) with the relevant organizations, for example with petroleum tank farms. Seed producing farms in Kyrgyzstan provide farmers with seeds of cotton, wheat, maize, tobacco, rice, vegetables, fruits and berry crops. The seeds of good varieties of tomatoes, peppers, melons, vegetables, etc. are imported from the other countries. Fertilizers are not produced in the Kyrgyz Republic and mostly are imported from Uzbekistan and Russia. Plant protection products are imported. Motor fuels are mainly imported from Russia and Kazakhstan.

	Seeds of agricultural crops in Sogd region are bought at seed-growing and private persons, but mainly farmers themselves are engaged in seed growing. 9 specialized seed-growing farms function In Sogd region on cotton, grain, potato growing. The regional management conducts all process of seeds control. Also, in the region functions Regional vegetable seed department, which is engaged in delivery and realization of seeds from abroad. There are representations of international companies.
8.6 System problems	
8.6.1 Lack of market access	For all crops except cotton, there is an access to domestic markets. Exit to the world level is determined by the government regulations. Almost in all districts and big villages in Kyrgyzstan there are markets, where the villagers can buy or sell food, agricultural products, livestock animals, building materials, household equipment, exchange currency (as the markets neighboring with Uzbekistan and Tajikistan). In remote villages, there are no markets.
8.6.2 Land fragmentation	The land allocation among farmer households in Uzbekistan was based on tender requirements of the existing legal documents. In the beginning, when the farms were developed on the basis of farmer households (shirkat), the allocation of land between the farmers was carried out on conventional criteria (by the initiative of farmers and availability of land resources). That area ranged from 3 hectares (gardening) to 100 ha, or more (cotton and cereals). This allocation of land has led to such undesirable consequences: - Reduction in crop yield due to a lack of mechanisms (tractors) and equipment; - Difficulties in operational services, financial accounting, cost; - In small farms (less than 3-4 ha) to a monoculture had been admitted, and it decreased the productivity of the land (no rotation). Considering this, during past years (from 2008) the State Program on strengthening land resources by changing small farms on larger (minimum 20 ha, maximum - 200 ha) was adopted. The land allocation among farmers by using this principle has given positive results. All land areas were divided into equity and rural residents received their own land. Currently, in the Republic of Kyrgyzstan, the size of the biggest and the smallest land equity is: 0.05 ha -1, 5 ha, respectively. On the basis of the application and the decision of the regional Government of Sogd region, the land is equally

	distributed among farmers and their share is defined, that is the land belonging directly to the farmer; the size of the land share depending on areas varies within 0,6-1,5 hectares on one farmer.
8.6.3 Decline in animal feed from rangelands	Due to global warming and decrease of rainfall in the highland pastures, the forage grasses quickly dry up. Due to the over grazing, pastures are degraded. The winter of 2011 - 2012 continued longer and in remote regions of the Fergana Valley, farmers' forage reserves were finished until the end of winter, which brought to the loss in livestock. The percentage of feed decrease on pastures is 10-15%. Pastures can be divided on two types: irrigated pastures (located on the irrigated lands (internal) and periodically flooded beyond the irrigated area by flood river flows, non-irrigated pastures, which are irrigated by the precipitations. People, living next to the irrigated pastures, constantly graze their livestock on the village pastures without any system. In addition, the development of land on the large area, eventually affects its productivity, both on the quantitative and qualitative manners. This is also due to the sharp increase of local population. On the territory of non-irrigated pastures, the day-and-night grazing of animals (sheep) causes a sharp dynamics of yield of forage mass. The following plants are generally growing on these pastures: tamarisk (*Tamarix leptostachys Bunge*), Siberian salt tree (*Halimadendron*), haloxylon (*Haloxylon Bunge*), and other dwarf ephemeral plants, such as Circassian Richter salt grass (*Saisola Ricateri Kar*), жовник солончаковый (*Anabasissalsa*) and other host plants Grazing – sheep and goat breeding, based on a full or partial grazing on the pastures, and its negative impact effect on soil, vegetation, and creates conditions for desertification of the territory and sharp decline in biological diversity. Reduction of forages and pastures in Sogd region as a whole depends on suitably climatic conditions and rational use of existing pastures. In addition, Saxaul crops are annually produced, including also other types in 30-45 hectares by Pasturable ameliorative station in Sogd region.
8.6.4 Soil fertility decline	Despite the huge efforts to improve the productivity of crops, land productivity remains at low level. The main reasons for this are the following factors:

	• defiance of scientific-based cropping systems; • Absence of crop rotation and the widespread introduction of monocultures; • poor quality agricultural activities (plowing, leveling), which is accomplishing not in full capacity; • an extremely low level of humus in the soil; • a sharp reduction of the area under Lucerne; • the emergence of a dense moist plow stifle on the upper horizon below the layer of 20-25 cm, which leads to delay in development of the root system (the density of soils in some cases reaches 1,45-1,6); • NPK nutrients washed from the soil as a result of high rates of leaching irrigations; • high salts content in soil, which are concentrated in the top layer and thus only for cotton, yield losses are 5-10%; • lack of organic fertilizers and mulching; • occurrence of weeds; • insufficient amount of NPK and violation of their relations, which lead to the reduction in land productivity and quality of products. Soil fertility decreases with each passing year. Organic fertilizers are applied, but not in a required amount. Phosphorus, potassium almost not applied. Mostly the nitrogen is applied, but the price on it rising every year. These factors too much influence on soil fertility. It is necessary to notice, in Sogd region of R.Tajikistan till 2008, when futures' company has been strongly developed, there was a tendency of the maximum application of mineral fertilizers and pesticides, and there was a tendency of annual increase in the areas under a cotton; the accepted crop rotation was not practically applied, and reduction of natural fertility of soil started taking place, organic fertilizers were used in not a significant amount. However, for the last 3 years, the tendency of increase in application of organic is observed, as it occurs much cheaper, and more comprehensible. In addition, principal causes of decrease fertility of soil are not correct agricultural practices, not timely processing of soil, not rational use of irrigating water, weak introductions of energy saving technologies. In addition, low (only 5 %) use of phosphoric and potash fertilizers, as in the region there is no manufacture of mineral fertilizers.
8.6.5 Other system problems	The transition from command-centralized management in agricultural production to the free collective and private property during a short time has created big problems, which have already been resolved by the government, but still rising issues need to be solved. The main issues are: • lack of crop rotation and the widespread introduction of monoculture (which crop rotation is necessary); • poor quality agricultural activities, which are implemented inappropriately (plowing, leveling);

<table>
<tr><td></td><td>
• an extremely low level of humus in the soil;
• lack of applying organic fertilizers and mulching;
• low level of farming and the weeds;
• lack of water resources;
• poor water control;
• farmers are not ready to adopt to the new market economy system;
• the relatively low supply of agricultural machinery, fuel and fertilizer;
• limited opportunities to shift to more cost-effective model due to low returns per irrigated hectare (as the result of the continuing decline of world prices for agricultural products and, accordingly, low-income of agricultural producers (farmers) (this issue is partially solved in most households));
• low level of implementation of scientific, technical, advanced technologies in agriculture;
• shortage of competent experts in Sogd region;
• deterioration of machinery;
• deterioration of pump stations;
• absence of water measuring devices;
• a lack of financial assets;
• weak introduction of technology for dry and over-humidified period.
Also:
There is a lack of techniques for cultivation.
Approximately, there are 2.5 units of tractors for 100 hectares of land (One (1)-tractor tills 40 hectares of land per the season).
</td></tr>
<tr><td colspan="2">8.7 System dynamics</td></tr>
<tr><td>8.7.1 Stability, stagnation or revolution towards other more / less productive / profitable / environmentally sustainable systems</td><td>
Many indicators define stability and development of the agricultural sector, for example, the value of agricultural products (crop production, cotton, wheat, and others), gross yield, crop yield, and livestock).

Stability and development of the agricultural sector in Andijan region
<table>
<tr><th>№</th><th>Indicators</th><th>2000</th><th>2001</th><th>2002</th><th>2003</th><th>2004</th><th>2005</th><th>2006</th><th>2007</th><th>2008</th><th>2009</th><th>2010</th></tr>
<tr><td>1.1</td><td>Agricultural production (at current prices, billion sums)</td><td>31,95</td><td>66,85</td><td>91,1</td><td>137,9</td><td>185,24</td><td>313,03</td><td>467,17</td><td>544,33</td><td>510,92</td><td>545,31</td><td>644,2</td></tr>
<tr><td>1.2</td><td>Crop production</td><td></td><td>142,33</td><td>175,49</td><td>189,26</td><td>206,69</td><td>212,86</td><td>292,55</td><td>539,02</td><td>627,69</td><td>859,8</td><td>1162,85</td></tr>
</table>
</td></tr>
</table>

1.3	Livestock		85,17	105,02	113,25	123,69	136,39	148,91	285,06	335,38	369,1	436,08
2.1	Yield: (thou. t)											
	Cotton	337,41	381,66	372,53	274,07	316,66	318,79	269,05	310,02	316,76	305,55	293,1
	Wheat	504,88	532,01	555,39	554,79	472,25	486,28	483,79	513,15	518	530,89	556,97
	Rice	8,72	6,18	0,9	1,57	2,58	3,46	3,66	4,01	4,32	13,73	12,79
	Vegetables										754,1	861,7
	Potato										150,7	169,5

Stability and development of the agricultural sector in Fergana region

№	Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1.1	Agricultural production (at current prices, billion sums)	231,51	341,57	411,01	458,44	572,31	644,62	780,20	953,33	1064,01	1281,29
1.2	Crop production	140,42	197,39	239,25	256,81	360,03	392,69	483,96	609,67	676,42	822,16
1.3	Livestock	91,09	144,18	171,77	201,63	212,28	251,93	296,24	343,65	387,60	459,13
	Yield: (thou. t)										
	Cotton										
	Wheat									725,2	739,8
	Rice										
	Vegetables									420,1	459,4
	Potato									157,7	170,1

Stability and development of agrarian sector of Namangan region

№	Indicators	2009	2010
1.1	Agriculture production (in the actual prices, billion soums)	983,2	1162,9
1.2	Plant growing	614,5	719,7
1.3	Animal industries	368,7	443,2
	Productivity: (thousand tons)		

	Cotton		
	Wheat	434,8	441,0
	Vegetables	394,4	439,4
	Potato	135,4	152,8

Source: Statistics of the regions of Uzbekistan, Tashkent 2011.

Stability and development of the agricultural sector in Kyrgyzstan

№	Indicators	1990	2000	2005	2006	2007	2008	2009	2010
1.1	Agricultural production (at current prices, billion sums)				72103,1	89736,5	112017, 1	111073,5	115023,2
1.2	Crop production				40739,4	50436,4	63137,5	59547,9	59620,4
1.3	Livestock				30359,3	37721,8	47156,5	49236,9	52874,9
2.1	Yield: (thou. t)								
	Cotton	17,7	26	26,1	25,6	27,4	29,1	29,1	27,9
	Wheat	26,2	23,4	23,6	20,7	20	19,4	26,3	21,7
	Rice	11,1	26,3	28	28,4	27,6	28,4	30,7	30,5

As can be seen from the tables, in Andijan and Fergana regions, the dynamic of the basic sectors of agriculture is mostly stable growing in recent years. In addition, there is a general increase in crop production and livestock.

In the Kyrgyz Republic, livestock sector is stable growing during the past years, but in the crop production (from 2006 to 2008) the increase was changed by later decline due to the decrease in cotton yield and increased cost of fuel, fertilizer, seeds, etc.

In Republic Tajikistan in Sogd region there is an annual increase of the indicator: in average in plant industry sector by 8,3-10,3, livestock sector by 4,6-7,9 %.

Source: Annual publishing of GDP and collection of works devoted to 20-anniversary of independence of Republic Tajikistan in Sogd region, 2011.

8.7.2 Most common type of agricultural enterprises (e.g. individual / private,

Information on Fergana valley (except for Sogd region).

Types of household	Measuring unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010

cooperatives and state owned farm (sovkhoz))

farmer	Amount	4360	4554	4776	6593	8375	10321	25736	54057	55553	32300	20947	20522
	ha	34700	36200	37500	87700	127200	168000	397200	873200	486100	492997	505597	858739
	Average, ha	6,9	7,0	6,9	14,3	15,0	16,1	15,4	16,2	16,1	26,8	40,1	42,3
dekhkan	Amount	12654	26118	481666	531583	565180	569899	570060	1461922	906291	910987	911113	1486529
	ha	1395	2879	54422	59977	63717	64251	64268	172178	101417	99505	99123	168133
	Average, l, ha	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,12	0,12	0,11	0,11	0,11
shirkat	Amount	122358	198364	249523	298652	337985	338123	338236	5	5	5	5	5
state	Amount								285	269	242	253	226
state	ha											1956685	
collective	ha											209466	
peasant	ha							182775	186369	184454	184536	186494	
smallholding	ha											835	
private	Ha											80346	
horticultural business	ha											265	

Information on Sogd region.

Name of farms	Ед.изм.	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Dehkan farm	Кол-во	2491	3534	4049	5025	5651	6282	7487	8439	15262
Collective and state farms	Кол-во	64	50	28	20	11	0	0	0	0
Cooperatives	Кол-во	112	110	80	90	68	85	45	221	395

Tendency of reduction COOP until 2010 and tendency of increasing for 3 years are in unification of farmers.
Source: Sogd Regional statistics.

8.7.3 Presence of producer associations (e.g.

The presence of associations of producers in Fergana Valley

farmers' groups, water use associations, marketing associations, cooperatives)

Producers	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Farmer households	7129	7966	10504	13465	16357	22589	44156	53926	42560	33807	25044	17331
Water users associations		1	40	57	83	169	324	522	525	683	564	536
Agricultural cooperatives											22	22

The quantity of associations, as Association of Agrobusiness of Tajikistan (1), Associations of Water users (187), the Union of Business Association of Sogd (1), Production co-operatives, consumer co-operative societies, 187 farmer groups on manufacture of an organic cotton in "Biokishovarz" the enterprise for processing and realisation of dried fruits has increased for the last 3 years in Sogd region (9).

9. Governance, Institutions, Policies

9.1 Institutional Support

To achieve the goal of economic efficiency, improve institutional measures in the management and use of land, water and other resources, the following measures were developed for farmers in Uzbekistan:

- trainings on farmer' rights, learning the basics of agronomy and farming for the users of land and water resources for the effective use and ensure the stability of agricultural production;
- provide access to electronic information on water conservation through the publication of information brochures, posters and other printed materials in a language understandable for the users;
- increase the capacity of land and water resource users through the trainings on agricultural production management;
- monitoring the effectiveness of use of water and land resources, practical application of scientific and practical recommendations.

In Kyrgyzstan, the following organizations are providing the services on the implementation and dissemination of best practices: the Ministry of Agriculture and Land Reclamation, Department of Water Resources, Department of pastures management, Departments for support of WUAs, Department on agricultural development, regional and district

	akimiats, rural districts, research institutions. NGOs and PF: Rural counseling services, learning centers, consultations and innovations, “Tes” Center, “Bioservis”, “Mehr Shavkat”, “Tayan”, “Agroline”, “Bilek”, “Agrobazar”, Association of Agricultural Services, DCCA, Association of fruit and vegetable farmer households, etc.
9.1.1 Extension services and NGOs	Within the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan and its departments, there is no any official division or department providing extension services. However, each department, depending on the needs within the year, organizes several seminars and workshops on all aspects of the agricultural sector, with involvement of all stakeholders. The results of experiments of the various projects, implemented with financial support of donors, are being disseminated in the region. For example, within the project on "Improving water productivity at plot level" financed by SDC, the Information Center was developed with the involvement of SANIIRI. Based on the activity of Information Centre, the several stakeholders’ training - seminars, site visits of scientists and experts, the experimental sites for the introduction and learning effective methods of water conservation are being organized. Adjusted recommendations, booklets and brochures to share the experiences in agricultural production are being published based on the systematic monitor. Kyrgyz Research Institute of Agriculture, Irrigation Research Institute, Research Institute of Veterinary, Research Institute of pastures and forages, Research Institutes of the National Academy of Sciences are working on the development of improved locally adapted varieties, animal breeds and technologies. The Central administrative board of agriculture of the region is engaged in development of Agrarian policy in Sogd region, which has in its structure 14 regional managements and 26 subordinated organizations in all directions connected with agriculture. Also all international organizations are engaged in distribution of high technologies, rural population makes including local NGO, as a great mass of population, therefore tendency of increase of work for rural population annually increases. There also exist advisory services of a private sector or services, organized after the termination of the international projects, which successfully carry out the activity in the region in distributions of technologies and knowledge among farmers. For the last 5 years private or individual advisory activity is practiced from leading experts and scientists of a various direction..
9.1.2 Access to improved / adapted varieties / breeds	Many new promising (in local conditions) varieties were developed within the system of agriculture. By the request of farmers', the department on seed production supplies the released varieties of cotton, wheat and other crops of the 2nd and 3rd reproduction (in recent years the quality of varieties, especially of cotton decreased).

	In Sogd region there are seed-growing farms, and also in the region there is an institute of farming, which successfully works in developing agricultural practices, introduction and breeding of cotton and other agricultural crops. Saplings are produced in 6 large nurseries and even distributed in southern regions of Republic Tajikistan. Seeds of vegetable crops are basically are bought in seed-growing farms; hybrids are bought from private businessmen, manufacture of hybrids in the region is not caried out. Cultivation of melons of Dutch varieties is practised for the last 2 years.
9.1.3 Access to animal health services	In each region Republic of Uzbekistan (even in some households), there are small departments for providing the veterinary services. Access is unlimited. In many rural districts of the Republic of Kyrgyzstan, there are veterinarians. But there are some problems on the places: 1. Not in all rural districts, neighborhoods, villages there are primarily veterinary centers; 2. There are no legal ownership documents for animals; 3. There is no primary records of animals (owner has the record books); 4. Rules on transportation, sale, animal management, drugs storage, etc. are not performed appropriately; 5. In the markets, processing plants, and outside marketplaces, the veterinary service is not up to par; 6. The rights, duties and responsibilities of private veterinarians are not defined. It is necessary to notice, that veterinary service are available to all subjects in all categories of public and a private sector and the association of veterinary surgeons functions in Sogd region, where 1000 veterinary doctors have been registered. Medicines are basically bought from other countries. .
9.2 Policies	
9.2.1 Pricing / subsidies for input (land, water, fertilizer, etc.)	The government Republic of Uzbekistan sets the prices for key resources (land use, fertilizers, machinery, etc.) with the taking into account the level of global and national market. Some farms, which do not have the funds, are provided by the government subsidies, covered by farmers after the harvest. The credits are provided by the government for the production of the government ordered crops (such as cotton and wheat) including the fuel to use machinery; fertilizers, etc. Price formation in R.Tajikistan and R.Kyrgyzstan is established according to acting legislative covenants. Fuel and lubricants and seeds are provided in critical situations from state reserve

9.2.2 Pricing / subsidies for produce

Government sets the prices for agricultural production with the consideration of changes of the internal market. Pricing policy for each crop or other types of production is based on the contracts and agreements between farmers and government organizations.

9.2.3 Policies related to land and water resources

To obtain a stable and secure access to water, the relevant regulatory documents were developed in accordance with the laws of the Republic of Uzbekistan and implemented in the selected farmer households:

- Plan for water-use based on the irrigation modulus of district;
- Approved documents of local administrative bodies on the size of irrigated areas in the context of crops;
- Application of water user in WUA, according to the plan of water use;
- An agreement between the water users and suppliers of water;
- Book for recording of water received, by the applications and contracts;
-Journal of monitoring
- An act of reconciliation of the water received.

9.2.4 Farmers' autonomy to choose crops and crop areas, ha

The state order for crops production in Uzbekistan

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
cotton	1979	1686	1666	19350	14431,9	24449	41830	64709	82885	99774	105269	102230	99420,9	100363	94059
wheat	850	844	1138	2823	2652,33	2894,7	18858	22616	30546	36731,3	47806	51004	27242,5	54565,2	53428
potatoes	9	5	4	8,55	9,6	20,55	32,53	185,56	149,71	353,03	435,1	600,18	1021,85	3152,69	14,69
fruit	179	263	278	307,1	351,37	626,41	743,54	1016,6	1341,4	2365,24	2521	2468,26	2504,78	2336,69	2388,7
vegetable	312	551	419	322,4	386,67	587,51	1145,6	973,7	1087,2	3259,41	3318,6	4969,48	4193,99	2836,75	3025,8
melons	703	1345	1674	1435	1385,07	1929,1	2740,1	2907,1	2241,1	3029,18	2834,5	3468,9	3844,77	2837,2	3659,2
rice	5327	3504	8767	15328	513	3904	24484	17204	10828	20400	14980	8402	11084,9	3	3

In the Republics of Kyrgyz and Tajikistan, the crop to grow is selected by the choice of farmers and land users. There is no any government restriction on the planting of a particular crop.

In Uzbekistan, cotton and wheat are grown according by the government order.

Farmers autonomy in choice of crops and cropping areas in Sogd region

The name of crops	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cotton	30	30	30	30	30	30	30	30	30	30	30	30	60	85	85
Vegetables	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Grain crops	70	70	70	70	75	75	75	90	90	90	90	90	90	90	90
Grapes															80
Potato															50
Melons															75
Fruit															80
Fodder crops															20

Нет информации по Ферганской region, Р.Каракалпакстан и Р.Кыргызстан.

10. Opportunities for Agricultural Research

10.1 Opportunities for research on land tenure policy, soil and water management, de-rocking, agro-biodiversity conservation, water harvesting for range shrub plantations, drought-resistant varieties, and others

On the territory of the Fergana Valley, there are several research institutes, such as branch of Asaka Cotton Research Institute in Uzbekistan (UzCRI), Research Institute for grain production and Andijan Agricultural Institute, Branch of SANIIRI in Fergana and other RIs, which have separate educational and experimental sites (households).

Branch of UzCRI is mainly engaged in cotton production, where scientists are working with hot and drought-resistant varieties. The last varieties developed by the Institute are An-35, An -36, An-37, etc.

Branch of UzCRI (Kuva district) is mainly engaged in cotton production, where the scientists are working with the drought-resistant and early maturing varieties.

There is a plot-site of SANIIRI (SANIIRI - Central Asian Research Institute for Irrigation) in Fergana region

There are all possibilities in the Sogd region for carrying out of agricultural practices, as many international projects

	practice different management methods in managing water-land resources. For the beginning of research, there is soil-meliorative station, institutes of agriculture, gardening animal industries and others. Таких как: In the Tajikistan have Regional Administration on Melioration and Water Resources, “IAC” Ltd Irrigation and Agricultural Consulting, "Zarzamin"Ltd consulting services, "Tajigiprovodkhoz» and Advisory Training and Information Center. In the Kyrgystan have Institute for Irrigation Kyrgyz Scientific and Research Institute of Irrigation, Rural Advisory Services, CECI Centre Canadien d’Etude et de Coopération Internationale, WUA Support Unit. Republic Institute of grain production is engaged in seed production of varieties, various researches and production of recommendations for farmers. There are several opportunities to conduct research in the following areas: 1. Development of irrigation regime for various crops. 2. The introduction of water saving irrigation technology in the lowland and foothill areas (mulching, improved furrow irrigation technology, contour-furrow irrigation, etc.). 3. Drip irrigation for the gardens on the slopes and vegetables in greenhouses. 4. Technology of rainfall, storm runoff and melt water (in mountain areas) harvest. 5. Enhancing the role of Water User Association (WUA) in the fair water distribution and development of WUA. 6. Determination of productivity of irrigation water for different crops. 7. Integrated water resources management - improving the relationship between the district offices of Water Resources, WUA, rural districts and water users. 8. Integrated management of agricultural production - improving the relationship between crop production, arable farming, animal husbandry, forestry and pasture. 9. The introduction of innovations of Institute of Agriculture, irrigation, veterinary, pastures and forages. 10. Drought resistant and early- maturing varieties of wheat, rice, maize and other crops. 11. Development of new breeds of cattle for meat and dairy products production. 12. Development of new breeds of small ruminants for meat production. 13. Goat breeding (meat and fur fiber production).

Characteristics of the site «Rasht Valley» SRT2-AS2

Introduction

The international research centers of the Consultative Group on International Agricultural Research (CGIAR) have launched the CGIAR Research Programs (CRP). ICARDA as the lead Center jointly with the other partners Centers, research and development organizations in more than 40 countries, regional fora, international development agencies and other relevant international organizations initiated the CGIAR Research Program (CRP1.1) - "Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas".

The Program aims to pursue new technology, institutional and policy options for enhancing productivity and managing risks through diversification, sustainable intensification and integrated agro-ecosystem approaches in dry, which ultimately will contribute to the improvement of living standards in the target regions.

During the global preparatory meeting in Nairobi, in July 2011, five sites (3 action and 2 satellite sites) have been selected together with national partners for Central Asia and the Caucasus Region. Conducting research and introduction of innovative approaches and technologies will be implemented in two key areas:

I. Reducing vulnerability in agro-ecosystems affected by degradation of natural resources.
   Actions Sites:
   1. Aral Sea Region, including the Dashauz province (Turkmenistan), Khorezm province and the Republic of Karakalpakstan (Uzbekistan), Kyzylorda province (Kazakhstan);
   2. Rasht Valley (Tajikistan and Kyrgyzstan).

II. The intensification of agricultural production in areas with potential for improving food security and improvement of living standards in the short to medium term.
   Action site:
   1. Fergana Valley, which includes Batken, Jalal-Abad and Osh provinces regions (Kyrgyzstan), Sogd province (Tajikistan), Andijan, Namangan and Fergana provinces (Uzbekistan).

   Satellite sites. Sites that complement Action Sites to sample the diversity of Target Areas, and will also help evaluate and assess innovations developed at the Action Sites for their suitability and user acceptance.
   2. Kura-Arax plain in Azerbaijan.
   3. Kashkadarya province in Uzbekistan.

In addition, 123 descriptors characterizing the climate, topography, soils, water resources, land use, land degradation, demography, agricultural systems, institutional systems and opportunities for agricultural research were identified.

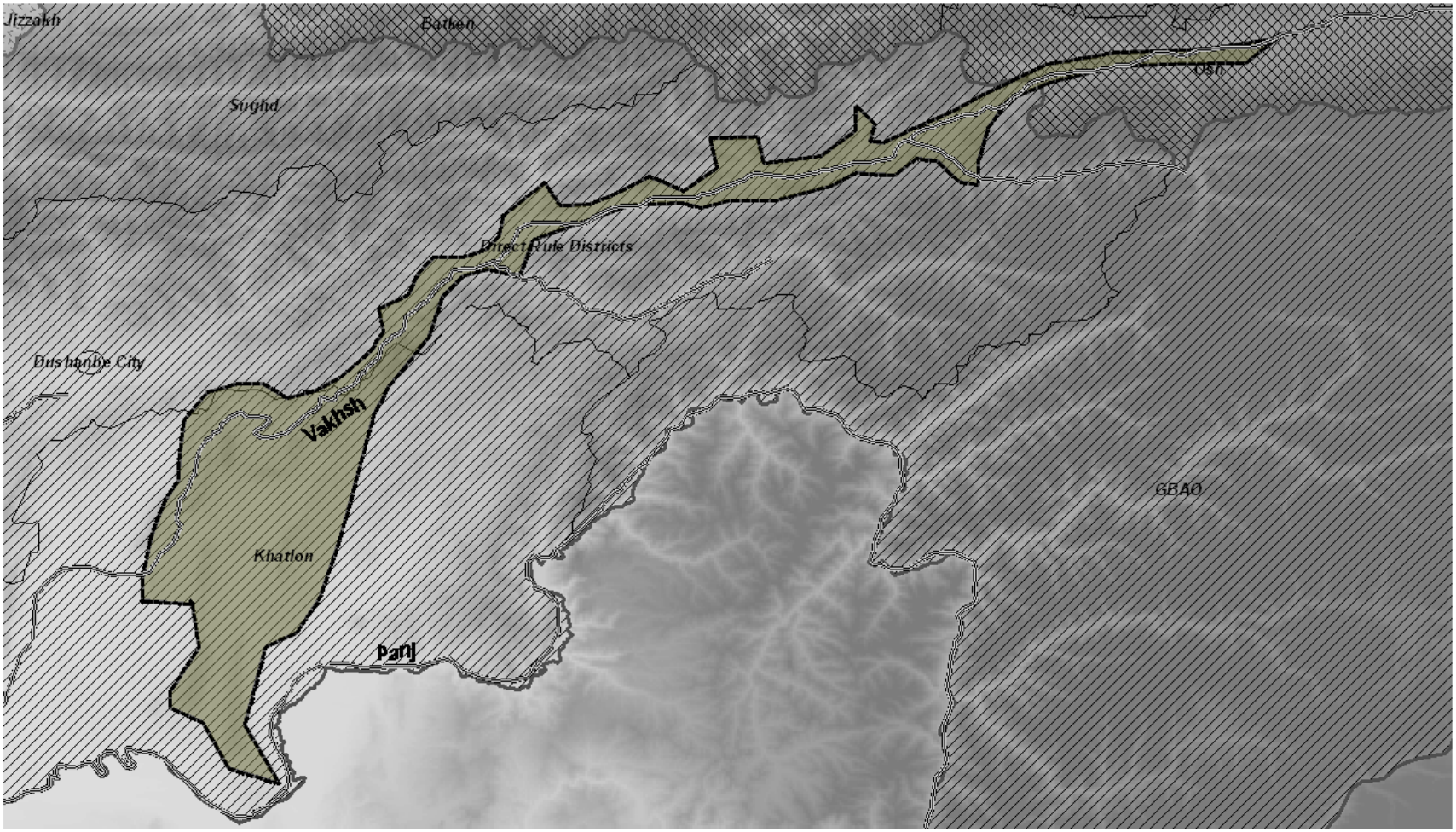
To collect the primary data, thirteen focal points from the Action Sites were involved. Data processing and compilation of the data was carried out by the interim Interdisciplinary Research Team (iIRT), coordinated by ICARDA.

A preliminary version of the characteristics of the Action Sites had been discussed during the preparatory meeting in Tashkent, May 15-17, 2012.

These characteristics of sites are not final. It is assumed that interested parties can contribute to the adjustment and the addition of data.

This material is collected and synthesized within the CGIAR Research Program (CRP1.1) - Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas", coordinated by the International Center for Agricultural Research in Dry Areas (ICARDA) in the Region of Central Asia and the Caucasus. The data, any inaccuracies or interpretations of the data presented herein are not the responsibility of the CGIAR and ICARDA. The final characteristics of the Site will be posted on the website of the CGIAR Regional Program (www.icarda.cgiar.org/cac).

SRT2. Action site 2: Rasht Valley



Characteristics of the site «Rasht Valley» SRT2-AS2

Country: Tajikistan, name of the site: Rasht valley
Name of the information compiler: Kh.M.Akhmadov.

<table>
<tr><th>1. Climate</th><th></th></tr>
<tr><td>1.1 Precipitation</td><td></td></tr>
<tr><td>Precipitation patterns</td><td></td></tr>
<tr><td>1.1.1 Range of long-term average annual totals (mm) across the site</td><td>Fluctuations in annual amount of precipitations within the entire site:
from 416 to 915 mm.
Mean annual fluctuations on the site: from 230 to 700 mm in Lyahsh from 600 to 1500 mm in Tavildar.</td></tr>
<tr><td>1.1.2 Number of rainy seasons (winter and spring).</td><td>75-85% of the annual amount of precipitations is during the period from December to May</td></tr>
<tr><td>1.1.3 For each rainy season: start and end month(s).</td><td>Number of days with precipitations (of 0.1 mm or more):

<table><tr><td>Winter</td><td>21-52</td></tr><tr><td>Spring</td><td>28-53</td></tr><tr><td>Summer</td><td>7-20</td></tr><tr><td>Autumn</td><td>9-19</td></tr></table>
In winter the rains begin in December and come to an end in February, in spring, accordingly-March-May, in summer and in the autumn the rains are seldom and short-term.</td></tr>
<tr><td>1.1.4 Number of years of daily rainfall records</td><td>Not less than 15 years</td></tr>
<tr><td>Precipitation variability</td><td></td></tr>
<tr><td>1.1.5 Inter-annual precipitation variability</td><td>The coefficient of variation (CV) of annual precipitation in the region: 20-24%</td></tr>
<tr><td>1.1.6 Severity and type of drought risk (e.g. delayed onset</td><td>All agricultural crops are irrigated and consequently the delay or the termination of rains influences their development in a little degree. The main reason of a delay of the beginning of field works is clearing fields from</td></tr>
</table>

of the rainy season, lengthy gaps between the rains, early end to the rains)	snow. Later thawing of snow can negatively influence the beginning of field works. Mass planting of potato and cultivation of gardens begin since May 15.
1.2 Temperature	
Temperature means	
1.2.1 Range of annual mean temperature (°C) across the site	*Average annual temperatures in the site* range from 5,7 to 11,7 °C
1.2.2 Range of mean max. temperature of the hottest month (°C) across the site	*Average maximum temperatures* in July from 21,8-25,7-°C The absolute maximum in the site is 37- 40,0°C .
1.2.3 Range of annual mean min. temperature of the coldest month (°C) across the site	*Average minimum of the temperatures in January* from –5,1°C to –12,5°C The absolute minimum in the site: от –27°C to –34 °C
1.2.4 Number of years of daily temperature records	Not less than 15 years
Temperature variations	
1.2.5 Intra-annual range of monthly temperature means (C)	*Intra-annual variations of average temperature per month* from –10 to +25°C
1.2.6 Diurnal temperature ranges throughout the year (C)	Average from –26,5 to +40,0°C
1.2.7 Frost risk (severity and months of occurrence)	The risk of frost*:* from October to May
1.3 Indices	
1.3.1 Range of annual growing degree days, base temperature 5°C (C, heat units) across the site	Total of efficient temperatures- from 3286 to 3778°C
1.3.2 Ranges of mean length (days) of temperature and	Duration of vegetation period (number of days) on site:

<table>
<tr><td>moisture-limited growing period(s) across the site for predominant agricultural soils</td><td>potato 120-140
wheat 120-200
orchards 160-180

Depending on sowing term: Winter grain - 180-200 days as crops are made in September, and harvesting in the end of June</td></tr>
<tr><td>1.3.3 Range of Aridity Index across the site</td><td>0,35-0,65</td></tr>
<tr><td>1.4 Climate change projections</td><td>Source: http://seakc.meteoinfo.ru</td></tr>
<tr><td>Scenario A1b</td><td></td></tr>
<tr><td>1.4.1 Range of annual mean temperature change (C) across the site for time slices (periods) 2011-2030, 2041-2060, 2080-2099 in comparison to 1980-1999</td><td><table><tr><td>2011-2030</td><td>2041-2060</td><td>2080-2099</td></tr><tr><td>0,8-1,6°C</td><td>2,2-3,2°C</td><td>3,3-5,1°C</td></tr></table></td></tr>
<tr><td>1.4.2 Range of relative annual precipitation change (%) across the site for time slices (periods) 2011-2030 r.r., 2041-2060, 2080-2099 in comparison to 1980-1999</td><td>% out of basic rate<table><tr><td>2011-2030</td><td>2041-2060</td><td>2080-2099</td></tr><tr><td>Winter 109,5
Spring 99,4
Summer 94,3
Autumn 102,3</td><td>109,4
95,9
87,9
96,5</td><td>116,2
94,5
80,1
99,7</td></tr></table></td></tr>
<tr><td>Scenario A2</td><td></td></tr>
<tr><td>1.4.3 Range of annual mean temperature change (C) across the site for time slices (periods) 2011-2030, 2041-2060, 2080-2099 in comparison to 1980-1999</td><td><table><tr><td>2011-203</td><td>2041-2060</td><td>2080-2099</td></tr><tr><td>0,8-1,6°C</td><td>1,9-2,9°C</td><td>4.0-5,8°C</td></tr></table></td></tr>
<tr><td>1.4.4 Range of relative annual precipitation change (%) across the site for time slices (periods)</td><td>Data is not available</td></tr>
</table>

2080-2099 in comparison to 1980-1999	

2. Topography		
2.1 Landforms (e.g. plains, hills, mountains) across the site (%)	The relief of the chosen site is characteristic for high-mountainous areas. 100 % of territory refers to mountain area. Crests of ridges have typical Alpine nature with abrupt sharp peaks in height of 5500 meters. Valley of the rivers Surhoba, Obihingou and Vakhsh form narrow deep gorges. Rasht valley is located between 38^0 40` and $33^0$89` longitude, $69^0$55` and $71^0$45` longitude. The total area of territory makes 1682,9 th. hectares	*Source: Tajikistan (nature and natural resources),Donish, Dushanbe, 1982*
2.2 Elevation range across the site (m)	*1200-6785 m. above sea level in Baltiysk sea.*	*Source: Atlas of Tajik SSR, Dushanbe-Moscow, 1968*
2.3 Prevalent slope ranges (%) of different land forms of the site	The areas with a slope to 0,3640 (in per million) are made 5 %, from 0,3659 to 0.5774 - 20 % and more than 0.5797 - 75%.	*Plains are presented in the form of river above the flood plain terraces*
3. Soils		
3.1 Soil types		
3.1.1 Major or agriculturally important soil types and soil associations across the site (classification units, %)	***Type 1. Mountain brown typical soils*** *are extended in a medium and top part of a belt of brown soils and occupy heights from 1600 to 2600 m above sea-level. They refer basically to medium mountain areas, and for the diversified elements of a mountain relief. The climate is more humid, than in a zone of brown carbonate soils, a dry season is shortened, and humid becomes longer (till 7-8 months). Annual quantity of deposits - to 700-950 mm, and in some areas of Hissar mountains - to 1400mm. In the most humid areas of this belt (Gissarsky, Karateginsky, Darvazsky ridges) mesophilous wide-leaf forests and shrubbery vegetation are extended - a walnut, a maple, an apple-tree, pearl-bush. The grassy vegetation in the given belt is developed better and differs by the variety of types, than the belt of underlying brown carbonate soils. Their total area makes about 70 % of territory of the region.* ***Type 2. High-mountainous meadow-steppe soils*** *are extended in the high-mountainous belt laying above a belt of mountain brown soils on slopes Gissarsky, Turkestani, Karateginsky, Zaalajsky, Darvazsky, Vahshsky and other ridges of Central Tajikistan at height of 2800-3200 m above sea-level and are the most productive pastures and good haying lands. Their total area makes about 15 % of territory of the region.* ***Type 3. High-mountainous steppe*** *soils occur on Zeravshansky, Turkestani, Darvazsky, Vanchsky, Zaalajsky*	

ridges and on Peter I ridge, above a subalpine belt with high-mountainous meadow-steppe soils. On Zeravshansky and Turkestan ridges, they fall in to a subalpine belt. Sites with high-mountainous steppe soils in the Alpine zone of semi-humid area of high mountains Tajikistan are a low - and medium productive outrun pastures. Their total area makes about 12 % of territory of the region.

***Type 4. High-mountainous meadow soils** in mountains occur in a complex with zonal soil formations. On slopes of high-mountainous ridges Darvaza, Karategin and Gissar meadow soils are available on absolute Height 2700 4500 m in the conditions of constant or repeatedly humidifying time, as a result of thawing snows and glaciers, and also on the sites, located in intermountain valleys and hollows, under the influence of soil and river waters. High-mountainous meadow soils occupy the insignificant space (nearby 30 th. hectares), but are the most productive and have high economic value as pastoral lands, and in some places are used as haymaking. Their total area makes about 3 % of territory of the region*.

Soil groups of land fund of Rasht valley

№	Soil	Total area, th.ha	%	Irrigated arable land, th.ha	%
1.	Mountain brown (typical)	1024.6	60.9	26.2	00
2.	High-mountain meadow-desert	278.4	16.5		
3.	High-mountain desert	332.5	19.8		
4.	High-mountain meadow soil	47.4	2.8		
	Total	1682,9	100	26.2	100

Sources: *Kuteminsky V.Y, Leonteva R. S. Soils of Tajikistan, Irfon, Dushanbe 1966;*
Tajikistan (the nature and natural resources), Donish, Dushanbe, 1982;
Ahmadov KH.M. Soil' erosion in Tajikistan and division into districts on methods of its combating in the region. Dushanbe,2010.

3.2 Soil characterizations for each of the major soil types

3.2.1 Rooting depth, cm	potato	orchards	Lucerne	wheat	*Source:* *Kuteminsky V.Y, Leonteva R. S. Soils of Tajikistan, Irfon, Dushanbe 1966. Tajikistan (the nature and natural resources), Donish, Dushanbe, 1982*
	Up to 0,50	Up to 2,0	Up to 1,0	Up to 0,40	

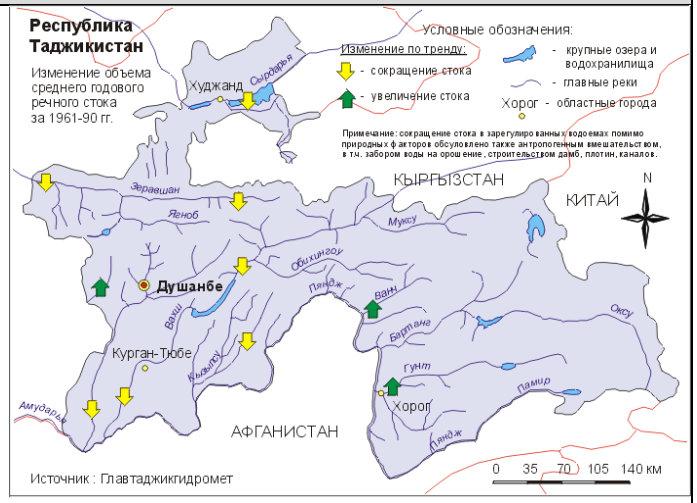
3.2.2 Water holding capacity	Type 1	Type 2	*Note:*

<table>
<tr><td>(defined by measures of field capacity and wilting point)</td><td></td><td>8,2-15,4%</td><td colspan="4">The soils of the region have not been properly studied, and there are not many soil data</td></tr>
<tr><td rowspan="2">3.2.3 Measure of soil fertility – OC%</td><td colspan="2">Type 1</td><td>Type 2</td><td>Type 3</td><td>Type 4</td></tr>
<tr><td colspan="2">From 2-3 washed and 5-12.2 in non-washed</td><td>Up to 15, in lower horizons 2-3</td><td>4,8-6,8</td><td>from 5.8 to 8.5%, in lower horizons 1,9-2,0</td></tr>
<tr><td>3.2.4 Soil pH</td><td colspan="5">Soil acidity –from weak acidic to weak alkaline reaction, pH = 5.41 -8.48
<table>
<tr><th>№</th><th>Soil</th><th>Grows at interval pH</th></tr>
<tr><td>1.</td><td>Mountain brown (typical)</td><td>6.66-8.48</td></tr>
<tr><td>2.</td><td>High-mountain meadow-desert</td><td>6.00-7.40</td></tr>
<tr><td>3.</td><td>High-mountain desert</td><td>6.00-6.60</td></tr>
<tr><td>4.</td><td>High-mountain meadow soil</td><td>5.41-6.10</td></tr>
</table>
Sources: Kuteminsky V.Y, Leonteva R. S. Soils of Tajikistan, Irfon, Dushanbe 1966;
Tajikistan (the nature and natural resources), Donish, Dushanbe, 1982;
Ahmadov KH.M. Soil' erosion in Tajikistan and division into districts on methods of its combating in the region. Dushanbe,2010.

The ratio of crops to the pH
<table>
<tr><th>№</th><th>Crop</th><th>Optimum PH</th><th>Grows in the PH range of</th></tr>
<tr><td>1.</td><td>Potato</td><td>5,0</td><td>6.60-8.50</td></tr>
<tr><td>2.</td><td>Alfalfa</td><td>7,0-8,0</td><td>6.00-8.50</td></tr>
<tr><td>3.</td><td>Wheat</td><td>6,0-7,0</td><td>6.60-8.50</td></tr>
</table></td></tr>
<tr><td colspan="6">3.3 Soil problems posing serious management challenges</td></tr>
<tr><td>3.3.1 Salinity (severity, soil types and % of area affected)</td><td colspan="5">Considered soils are not salted</td></tr>
</table>

3.3.2 Sodicity (severity, soil types and % of area affected)	In viewed soils there is no sodicity			
3.3.3 Al-toxicity (severity, soil types and % of area affected)	All soils in Tajikistan with regard to al-toxicity are not toxic.			
3.3.4 Low chemical fertility (organic carbon, CEC, etc.) (description, severity, soil types and % of area affected)	*Mountain soils are subject to various degree of erosion, in this regard all chemical indicators depend on degree of erosion. They distinguish three degrees of soil erosion: poor - medium - and strongly eroded soils*.			
3.3.5 Phosphorus fixation (severity, soil types and % of area affected)	*Region' soils are poorly studied also many soil data are absent*			
3.3.6 Poor profile development (soil types and % of area affected)	Type 1	Type 2	Type 3	Type 4
	The soil profile is well developed	From depth of 50-90 cm large fragments of original rock	Profile of these soils (50-70 cm) is shortened	From depth of 30 cm marlaceous of original rock
3.3.7 Rockiness, stoniness (severity, soil types and % of area affected)	Type 1	Type 2	Type 3	Type 4
	Non rocky	high (from 20 to 90);	from 19.8 to 88% in humus and 61-90 deeper 50 cm	high (from 28 to 87);
3.3.8 Very compact subsoils (soil types and % of area affected)	These soils possess good structure and porosity.			

3.3.9 Poor drainage, waterlogging (severity, soil types and % of area affected)	These soils possess good water penetration
3.3.10 Excessive drainage (soil types and % of area affected)	No excessive drainage
3.3.11 Flooding (severity, soil types and % of area affected)	These soils are not flooded as are located on high altitude
3.3.12. Other management problems (description, soil types and % of area affected)	The main problem of the given region is shortage of soil-cultivating equipment

4. Water resources	
4.1 Irrigation water availability	*The given region is well provided by water. The river Surhob, which originates in Kyrgyzstan, where it is called Kizilsu, after a confluence of river Muxu receives his name. River Suhab has a lot of inflows which originate from glaciers and are distinguished by rough character and an abundance of thresholds. The river Vakhsh is formed after merge of river Obihingou and river Surhob,.* Change of an annual river flow for the period of 1961-1990 for the Republic Tajikistan is shown on mapping material (see map). *Source: Tajikistan (nature and natural resources), Donish, Dushanbe, 1982* 

Information on change of an annual river flow for many years from different sources in Rasht valley for the period 1997-2011

Источник	Годы	1997	1198	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
р. Сурхоб – гп. Тавильдара	Обём стока в млн. $м^3$	12350	12050	11850	12300	5900	11800	11850	12100	11850	12200	12250	11700	12350	11700	12370
р. Обихингоу – гп. Тавильдара		5775	5970	6100	5700	12200	6050	6100	6025	6140	5900	5750	6150	6150	6100	6285
р. Вахш –гп. Дарбанд		18125	18020	17950	18000	18100	17850	17950	18125	17990	18100	18000	17950	18500	17800	18655

Источник: Гидрометеослужба РТ, Душанбе, 2012

4.2 Quality issues (e.g. waste water reuse)	*The module of a drain of the suspended deposits here makes 10-20 g/s for 1 km2. Quarterly deposits are widely developed here and at the expense of erosion the washout module increases. It is an agricultural zone. There are no large enterprises here and consequently a problem of secondary use of sewage or other problems, related to water quality are absent.*

5. Land use/land cover

5.1 Types of agricultural/non-agricultural land

1. Total area of land fund territory – 1682.9 th.ha.
2. Agricultural lands -586.1 th.. ha, out of which occupied:
   - Arable land - 13,5 th.. ha.
   - Perennial plantings – 3.1 th.. ha.
   - Pastures - 516.2 th.. ha.
   - Hay making – 2.2 th.. ha.
3. Under the rivers - 21.4 th.. ha.
4. Roads - 2.8 th.. ha.
5. Under the buildings – 3.2 th.. ha.

Explanation: the Information on the land of agricultural purpose is resulted without account of household plots, additional farms, forests, swamps, bushes and other land.

Source: Land fund of RT, Dushanbe, 2012

5.1.1 Extent of rainfed cropland across site (ha, %)	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Source of data:* RT Regions, Agency on statistics at President of RT
	5.7 0.3	5.6 0.3	5.7 0.3	5.7 0.3	5.7 0.3	5.4 0.3	5.5 0.3	5.8 0.3	5.6 0.3	5.7 0.3	5.3 0.3	5.4 0.3	5.2 0.3	5.2 0.3	5.2 0.3	

5.1.1 Extent of	wheat	Source

rainfed cropland across site (ha, %)	4936							Regions of Republic Tajikistan, Agency on statistics at President of Republic Tajikistan								
5.1.3 Extent of irrigated cropland across site (ha, %)	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Source of data: Land Fund* RT, Dushanbe, 2012
	21.2 1.3	21.2 1.3	21.2 1.3	21.2 1.3	21.2 1.3	21.2 1.3	21.2 1.3	22 1.3	24.2 1.4	24.6 1.5	25.7 1.5	25.8 1.5	26 1.5	26 1.5	26 1.5	
5.1.4 Main irrigated crops or varieties grown (ha)	Potato		Orchard crops			Cereals and legumes			Vegetables			Oil seed crops				
	7574		3287			12147			1416			382				
	Source: Final report on agricultural crops, ASPRT, Dushanbe, 2012															
5.1.5 Extent of pastures across site (ha, %)	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Source of data: Land Fund* RT, Dushanbe, 2012
	496.8 29.5%	493.2 29,3	495.8 29,4	495.8 29,4	496.5 29.5	495.9 29,54	496.0 29,5	504.2 30,0	506.4 30,31	506.4 30,1	561.7 33,4	561.7 33,4	561.5 33,4	552.3 32,8	516.2 30,7	
5.1.5 Extent of pastures across site (ha, %)	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Source of data: Land Fund* RT, Dushanbe, 2012
	1048.4 62.3	1048.4 62.3	1048.4 62.3	1048.4 62.3	1048.4 62.3	1048.2 62.3	1049.3 62.4	1042.1 61.9	1042.1 61.9	1042.1 61.9	994.5 59.1	994.5 59.1	994.5 59.1	994.5 59.1	994.5 59.1	
5.1.7 Extent of other major land use/land cover types across site (description, ha, %)	*1. Perennial plantings: Horticulture is widely developed in a valley. Its general area makes 2,8 th. hectares (02 %).* *2. Household plots: The second for the importance of cultivation of agricultural crops - household plots. Their total area makes about 14154 hectares (1%).* Source: Land Fund of Republic Tajikistan*. 2012*															
5.2 Land use trends																
5.2.1 Increase/decrease in irrigated cropland due to availability/decline of groundwater resources (severity, % of area affected)	*Ground water in this zone is below 3 meters*															

5.2 Land use trends	*Potato and other fruits are traditionally grown in Rasht valley. Other type of farming is not strongly developed. Over the last years this type of farming remains as permanent.* *Source of information: Scientifically based farming system of Tajikistan, Dushanbe, 2010)*
5.2.1 Increase/decrease in irrigated cropland due to availability/decline of groundwater resources (severity, % of area affected)	*Significant changes didn't take place over the last 10 years*

6. Land degradation

6.1 Type and current severity of particular types of land degradation

6.1.1 Salinization (severity, % of area affected): *Soil of this zone is not saline*

6.1.2 Water erosion (description, severity, % of area affected)

1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	**Source:** *Ahmadov Kh.M. Erosion of soils in Tajikistan and division into districts on methods of its combating*, Dushanbe, 2010
High 83	85	85	85	87	87	87	87	89	89	89	91	91	91	91	

Within low mountain zones poorly-eroded sites are located on a surface of cones of outlet and river terraces. Medium mountain zone is in a average and strong degree subject to water erosion that is promoted by loss of a considerable volume of deposits, a steepness of slopes and other natural factors. This zone is strongly dismembered by erosion-denudation relief forms. On a greater part of a high-mountainous zone, there exit weak-washed dense radical rocks, and there are colluvial, prolluvial deposits, soils are also strongly subject to erosion. The percentage of poor-eroded soil

<table>
<tr><td></td><td>fluctuates from 6 to 22 %, medium-eroded-24-31 % and strong-eroded - 33-63 %. On the average, erosion in a valley makes 91 %.

Source: Ahmadov Kh.M. Erosion of soils in Tajikistan and division into districts on methods of its combating, Dushanbe, 2010</td></tr>
<tr><td>6.1.3 Wind erosion (severity, % of area affected)</td><td>There is no wind erosion in Rasht valley</td></tr>
<tr><td>6.1.4 Loss of soil organic matter (severity, % of area affected, ha)</td><td>
<table>
<tr><td>1997</td><td>1998</td><td>1999</td><td>2000</td><td>2001</td><td>2002</td><td>2003</td><td>2004</td><td>2005</td><td>2006</td><td>2007</td><td>2008</td><td>2009</td><td>2010</td><td>2011</td><td rowspan="2">Source: Ahmadov Kh.M. Erosion of soils in Tajikistan and division into districts on methods of its combating, Dushanbe, 2010</td></tr>
<tr><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td><td>Cp. 20-30</td></tr>
</table>
</td></tr>
<tr><td>6.1.5 Loss of soil structural stability (severity, % of area affected, ha)</td><td>All considered not washed soils possess good structure. Structural stability of a soil depends on degree of soil erosion. Strongly eroded soils, when soil forming rocks move on a surface are characterized by low structure. In this connection loss of structural stability is closely connected with erosion and in percentage parity similar data are absent.</td><td>Source Kuteminsky CV.Y, Leonteva R. S. Soils of Tajikistan, Irfon, Dushanbe 1966.</td></tr>
<tr><td>6.1.6 Loss of agrobiodiversity (description, severity, % of area affected,ha)</td><td colspan="2">Data on agro-biodiversity losses are absent. However on our data (measurements were carried out on reference sites) in connection with loading reduction, there is a biodiversity restoration in pastures. Loss of agro-biodiversity does not occur, as the local population aspires to keep and increase various types of trees.</td></tr>
<tr><td>6.1.7 Other types of land degradation that are significant (description, severity, % of area affected)</td><td colspan="2">
<table>
<tr><td>Type 1</td><td>Type 2</td><td>Type 3</td><td>Type 4</td><td>Type 5</td><td>Type 6</td><td>Type 7</td><td>Type 8</td></tr>
<tr><td>High up to 73%</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
In this zone most water erosion has a wide circulation, including linear, ravine, undulated. However in a high-mountainous zone, there is pastoral erosion (Type 1). Summer pastures are located 2000 m above level of Baltic sea. Conducted research shows, that 73 % of their total area is subject to strong or very strong erosion. Some strongly eroded sites as a result of intensive grazing of cattle and destruction of grassy vegetation are cut strongly by erosive forms and, finally are transformed into wastelands. Medium eroded land on summer pastures make 16 % from a total area, and weak-eroded - 1 %. Strong washout of soil on strong - and medium-eroded summer pastures is connected by that in a high-mountainous zone during the summer period there are rainfalls, which lead to intensive washout of not protected surface of soil.</td></tr>
</table>

	Source: *Ahmadov Kh.M. Erosion of soils in Tajikistan and division into districts on methods of its combating, Dushanbe, 2010*
6.2 Degradation trends	
6.2.1 Reclamation of salinized lands (% of area treated)	Amelioration of land is not carried out due to the lack of salt affected land in the valley.
6.2.2 Increase in soil erosion (description, % of area affected)	*The description: Increase of eroded soils is fixed on the basis of space photos and reference sites. The average percent area of increase of eroded soils makes 2 % and basically it occurs in medium mountain and high-mountainous zones. As a whole for 15 years the area of eroded land has increased by 8 %, thus there is a reduction of category of weekly wash out and increase medium washed, strong and the very strongly washed off soils. The area of eroded soil on Rasht valley has increased (from all area of territory) from 83 % in 1997 to 91 % - 2011. (Item 6.1.2.). Monitoring of soil erosion is carried out on reference sites periodically - once in 3-4 years. Researches show, that for the specified period, there is an increase at 2 %. The main reason is the irrational use of the land and intensive grazing of cattle.* ***Source:*** *Ahmadov Kh.M. Erosion of soils in Tajikistan and division into districts on methods of its combating, Dushanbe, 2010*
6.2.3 Lowering of groundwater tables (% of area affected, range of change of groundwater levels (m))	*Ground water level is deeper (below 3 meters), thus changes are not fixed.*
6.2.4 Other significant degradation trends (description, % of area affected)	*There are no other significant degradation tendencies*.

Socio-economic descriptors
7. Demography
7.1 Population

7.1.1 Total population of site, thousand	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	**Source** Regions of RT, Dushanbe, 2011
	215.6	218.9	224.6	229.5	234.7	240.4	245,2	255.0	260.0	265.7	273.0	279.4	285.0	282.5	286.9	

7.1.2 Percentage of rural population of site, %	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	**Source** Regions of RT, Dushanbe, 2011
	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	

7.1.2 Percentage of rural population of site, %	In Dzhigatalsky, Tavildarinsky and Todzhikobodsky areas the agricultural population makes 100 %, in Nurabadsky and Rashtsky areas accordingly - 98,1 и 88.0% **Source** Regions of RT, Dushanbe, 2011.

7.1.3 Age distribution of rural population.	Age (up to 4 years)	Age (5-7 years)	Age (8-16 years)	Age (from 17 to 45 years)	Age (from 46 to 60 years)	Age (from 61 and higher)	*Note:* Age distribution is given according classification of Statistic Agency at the President RT.
	39.4	19.5	59.7	118,4	28.7	12.6	
	Source: Census of population and residential fund of Republic Tajikistan for 2010//Population of Republic Tajikistan by gender, age and marital status, volume- II, Dushanbe, 2012						

7.2 Poverty.

Poverty prevails in a countryside where the share of the needy population makes 40-80 %. Besides, across the valley, people, covered by a drought on number had the greatest share among low income population.

In Tajikistan - high, but decreasing level of poverty (89 % in 1999, 64 % in 2004 and 53 % in 2007), mainly because of economic growth and remittances (the Analysis... 2010: 9), poverty is more widespread in rural areas and areas where the cotton is grown.

Data of report prepared within implementation of the EU project of «Technical Assistance to the Program of Support for formation of a policy in the sphere of social protection - a component of the Labor related Politics».
The information on labor market of Tajikistan, and also reports were used from:
«The analytical report on carrying out of inspection of a labor in Tajikistan (July-August, 2004)»;
«Inspection of living standards in Tajikistan, 2007», «The Migration Review in Tajikistan. August 2009»,
«Employment in informal sector of economy in Tajikistan. Dushanbe 2005»

7.2.1 Poverty amongst rural population (description, %)		*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
	%	80	80	78	75	72	70	69	66	64	62	59	57	54	52	48
	There is a single rate of national currency to $US in the market and National Bank															

7.3 Nutrition and health.

Population growth - one of the principal causes of reduction source of subsistence in CA countries. The annual increase in population in Tajikistan makes approximately 2 %. (Source: The Regional Environmental Centre for Central Asia (CAREC). The Central Asia: the Progress Review in realization

of agenda for 21 century, page 56). According to UNICEF research (NMSS - NISM, 2009), 12.5 % of weighed children are exhausted and 29.1 % suffer a growth inhibition. The percent of women with weight below an average (deficiency of weight of a body) has increased from 7.7 % (SMBP, conducted in April, 2011) to 11,8 % - the pre-obesity percent (to adiposity) has decreased from 19.5 % to 13.9 %. The obesity index (an adiposity indicator) remained without changes: 7.1 %. These results are similar to results of NRF (National Research on a Food) 2006. Weight is lower among women, probably, as a result of absence of a variety of a food, fast changes in a way of life, and indirectly results of the high prices for a foodstuff, which is defined by a choice at purchase of a foodstuff.

7.3.1 Nutrition and health status of rural population	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	Source: statistical yearbook, Dushanbe, 2010-2011
	low	low	low	low	low	low	medium	medium	medium	medium	medium	medium	medium	medium	medium	
	Rate of growth of the population during 1997 - 2011 varies from 101.5 to 104.3 %, at the maximum value 117.9 (Tavildara, 2007) and minimum-91,2 (Jirgatal, 2010). The birth rate during 1997-2011 makes from 20.6 (Tojikobod, 2004) to 41.8 (Tavildara, 2008) The death factor (died on 1000 persons of the population) varies from 2.7 (Tavildara, 2005) to 4.8 (Rasht, 2007) Natural increase of the population from 354 (Tavildara, 2004) to 2740 (Rasht, 2010) people Population natural increase (on 1000 persons of the population) from 16.1 (Tojikobod, 2004) to 38,7 (Tavildara, 2008)															
7.3.2 % of children below 5 years of age at risk of malnutrition	No such information															

7.4 Employment																
7.4.1 Gender-related aspects of work in rural households. 1- From an aggregate number of managerial posts, how many percent is occupied by women 2. From an aggregate number of the qualified posts, how many percent is occupied by women; 3. From an aggregate number of not qualified posts, how many percent is occupied by women;		*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*201 0*	*2011*	**Source** statistical yearbook, Dushanbe, 2010-2011
	1	3	3	3	3	3	3	5	5	5	5	7	7	7	8	8	
	2	5	5	5	5	5	5	5	7	7	7	7	8	10	10	10	
	3	30	30	30	30	30	30	30	30	30	30	35	35	35	32	32	
	4	70	70	70	67	67	63	63	62	58	57	56	54	50	50	50	

4. From an aggregate number of the unemployed, how many percent of women																

7.4.2 Types and importance of non-agricultural employment, %.	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
1	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

1. Considered region is an agrarian and consequently the basic part of the population is occupied in agricultural sector. We have included workers in a category of not agricultural sector like local government, educations, culture, public health services, students, the technical personnel, etc., and their number remains almost invariable.
2. Some small processing and sewing enterprises which play an insignificant role in the region development operate here. The basic income is made by remittances of labor emigrants which makes more than 50 % of all income of local population.

8. Agricultural systems

8.1 Classification

8.1.1 General classification

#	years	State farms		Collective farms		Dehkan (farmer) farms		Household plots	
		No	Area, th.. ha.	Number	Area, th.. ra.	Number	Area, th.. ra.	Number	Area, th.. ra.
1.	2000	47	235.6	20	71.7	1037	99.6		6.5
2.	2001	44	232.9	18	53.8	1095	98.9		6.5
3.	2002	26	163.4	6	23.9	1072	132.0		6.5
4.	2003	33	147.5	5	19.7	1168	215.7		6.6
5.	2004	25	105.5	3	6.8	1384	268.6		7.7
6.	2005	22	97.8		4.2	1613	291.7		10.2
7.	2006	12	60.9			1865	292.7		10.3
8.	2007	12	59.4			1955	281.1		12.9
9.	2008	12	59.2			1988	275.9		12.9
10.	2009	10	48.3			2268	282.3		14.4
11.	2010	8	40.8			2674	278.8		14.1
12.	2011	8	40.1			3013	275.0		14.2

п/н	years	State farms	Collective farms	Dehkan (farmer) farms	Household plots

		Number	Area, th., ha	Medium Area, ha	Number	Area, th., ha	Medium Area, ha	Number	Area, th., ha	Medium Area, ha	Number	Area, th., ha
1.	2000	47	235,6	5012,8	20	71,7	3585,0	1037	99,6	96,0		6,5
2.	2001	44	232,9	5293,2	18	53,8	2988,9	1095	98,9	90,3		6,5
3.	2002	26	163,4	6284,6	6	23,9	3983,3	1072	132	123,1		6,5
4.	2003	33	147,5	4469,7	5	19,7	3940,0	1168	215,7	184,7		6,6
5.	2004	25	105,5	4220,0	3	6,8	2266,7	1384	268,6	194,1		7,7
6.	2005	22	97,8	4445,5		4,2		1613	291,7	180,8		10,2
7.	2006	12	60,9	5075,0				1865	292,7	156,9		10,3
8.	2007	12	59,4	4950,0				1955	281,1	143,8		12,9
9.	2008	12	59,2	4933,3				1988	275,9	138,8		12,9
10.	2009	10	48,3	4830,0				2268	282,3	124,5		14,4
11.	2010	8	40,8	5100,0				2674	278,8	104,3		14,1
12.	2011	8	40,1	5012,5				3013	275	91,3		14,2

Name of crops	*Agricultural enterprise*	*Population*	*Farm business*
Cereal and legumes (ha)	*554*	*2854*	*8739*
Potato (ha)	*397*	*3595*	*3582*
Oil seed crops (ha)	*19*	*102*	*261*
vegetables *(ha)*	*20*	*1165*	*231*
Feed crops	*499*	*1508*	*3085*
Orchards	*353*	*2150*	*5463*

8.2 Descriptors related to cropping component

8.2.1 Average farm holding size (ha)	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Source of data:* Goscomzem (State Land Committee)
	1.9	2.0	2.0	2.0	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	

<table>
<tr><td>8.2.2 Type(s) of rotation</td><td>Applied crop rotations in Rasht valley: the Potato-lucerne (esparcet) potato-grain -potato. The following crop rotation is applied: 3-4 years farmers grow potato, after they sow a lucerne usually for three years, if esparcet, then for 2 years, after again potato, sometimes in a crop rotation grain crops etc. are used for one year

Source data: scientifically proved system of conducting agriculture in Tajikistan, Dushanbe, 2010</td></tr>
<tr><td>8.2.3 Cropping intensity</td><td>Yield of cereals and legumes makes around -15-28 c/ha; Vegetables- 79-191 c/ha; Potato-195-250 c/ha; Fruits - 8-81 c/ha.

Source of data: Regions of Republic Tajikistan, Statistics Committee, 2010

Term and Intensiveness of harvest of crops depends on Type of crop.
<table>
<tr><td rowspan="2">Intensiveness of harvest of crops
Type of crop</td><td colspan="9">Months</td><td rowspan="2">Duration of harvesting, days</td></tr>
<tr><td>IV</td><td>V</td><td>VI</td><td>VII</td><td>VIII</td><td>IX</td><td>X</td><td>XI</td><td>XII</td></tr>
<tr><td>Cereals and legumes</td><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td></td><td></td><td></td><td>Within 10 days</td></tr>
<tr><td>Potato</td><td></td><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td></td><td></td><td>15-20 days depending on the elevation of place</td></tr>
<tr><td>Orchards (fruits)</td><td></td><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td>+</td><td></td><td>15-20 days depending on variety and type of fruit crops</td></tr>
<tr><td>Lucerne/Esparcet</td><td></td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td></td><td></td><td>4 hay crops, and the fifth hay crop (in November) are used for grazing a cattle</td></tr>
<tr><td>Vegetables</td><td></td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td></td><td></td><td>40-90 days depending on Type of vegetable crops</td></tr>
<tr><td>Oil seed crops</td><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td></td><td></td><td></td><td>7-10 days depending on elevation above sea level</td></tr>
</table>
Maturing of crops in Rasht zone depending on district elevation occurs stage by stage. Harvesting of some crops begins in August and proceeds within two months. Harvesting of fruit is also closely related to elevation of district and varieties of crops and proceeds to the beginning of November; crops are stored till March-April and provide during the winter period Dushanbinsky and the CIS markets.</td></tr>
<tr><td>8.2.4 Source(s) of water supply for crop production</td><td>Sources of water supply for production of agricultural crops are the rivers Surhob and Obihingou, and also their small inflows.</td></tr>
</table>

	Source of in data: (Scientifically proved system of conducting agriculture Tajikistan, Dushanbe, 2010).
8.2.5 Implements/machinery used, degree of mechanization	*Small dehkan farms have mini-equipments. Except that farms have potato harvesting, loosening, soil-cultivating and other equipment.* *Source of data: Scientifically proved system of conducting agriculture in Tajikistan, Dushanbe, 2010.*

8.2.6 Degree of commercialization		*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	Source: Regions Tajikistan, Dushanbe, 2011
Potato (1) Fruit (2) Other, honey, herbs and others (3)	1	60	60	60	60	60	60	60	65	65	65	65	65	70	70	70	
	2	35	35	35	35	35	35	35	30	30	30	30	30	25	25	25	
	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	

8.2.7 Spatial organization of cropping in relation to environmental differences (mountains, foothills, plain, etc.)	Height 900-1300	Height 1300-1700	Height <1700-2000	Height 2000-2400	Height 2400<			*Source: Scientifically based system of agriculture of Tajikistan, Dushanbe, 2010*
	Potato, vegetables, fruit-trees, lucerne and grain crops							

8.3 Descriptors related to animal component																	
8.3.1 Main animal species or races kept (thousand). Cattle (1) Goats and sheep (2) Poultry (3)		*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Source: Scientifically based system of agriculture of Tajikistan, Dushanbe, 2010*
	1	48.4	51.3	55.9	59.4	65.4	72.8	78.4	84.2	92.6	96.0	103.8	114.7	122.6	132.5	143.7	
	2	160,8	162,7	165,3	167,4	170,4	174,8	180,4	183.4	266.4	274.5	297.1	356.6	251.1	370.1	397.9	
	3	94,5	104,5	114,7	121,6	126,9	134,7	145,1	157.6	159.8	182.2	197.7	223.7	230.0	239.1	251.6	
8.3.2 Feed systems	*Type cattle feedings in various zones of republic is defined by specificity of feed production. Therefore while working out of diets for cattle in Tajikistan, the farmers have allocated in the basic two zones differing on natural-economic conditions. The first zone - irrigation agriculture, where the basic branch is cotton production. This branch includes cotton growing farms, suburban farms (vegerable-growing) where the cattle of a dairy and dairy-meat*																

	direction is developed. Here the basis of feeding of cattle is made by the forages , produced in the irrigation land in a cotton complex - a lucerne, corn, cereals-bean rotation, a beet and a waste of the cotton industry (a peel and cotton cake). *In foothill and mountain zones the basis of feeding of cattle in an annual period is made by pastures, in the winter ⌈- hay of natural haymaking, straw and juicy forages (a silo, a beet).* *In valley zones diets should provide requirement of animals taking into account their all-year round the stabling. Usually duration of winter feeding averages 155 days, annual - 210 days.* *In foothill and mountain zones duration of the pastoral period makes 155 days, stable - 210 days.* *In structure of a diet of milk cows relative density of the concentrated forages should make 20-25 %, and at highly productive cows with a yield of milk of 3500-4000 kg - 30-35 %. At feeding enough good bean hay, a high-quality silo, root crops and green forages, counting on 1 kg of milk ,the following expense of concentrates is recommended: 150-180 gram at a daily yield of milk of 10 kg, 180-200 g - at a yield of milk from 10 to 15 kg, 200-250 g - at a yield of milk from 15 to 20 kg, 250-300 g - over 20 kg of milk.* *It is important to increase feeding level of cows, especially in first third of lactation for the account higher feeding by root crops and the grain forages rich with carbohydrates. It allows to compensate the deficiency which has developed in an organism of energy for this period. In dry stable period a feeding level as the factor promoting the best growth of foetus and increase milkiness of cows, also should be increased by 20-25 %.* *The diet of dry stable cows should provide restoration of expenses during the previous period of a lactation, creation in an organism reserves for maintenance of high level of efficiency in the beginning of lactation , and also normal development of a foetus. It is necessary to consider as the most expedient structure of a diet 30-40 % of hay, 35-40 % of juicy forages and 20-25 % of concentrates.* *On 100 kg of live weight it is necessary to provide on 2 and 2,5-3 kg of good-quality hay and root crops, the high quality silo is fed to 10-15 kg a day.* *The organization of milking of cows is the important technological element in milk production. It is expedient to start with about 10-15 days after calving, gradually increasing level of a dry matter to 3,5 kg counting on 100 kg of live weight or 1,2-1,3 k.unit on 1 kg of milk with advance additional feeding on 2 k.unit on a milk increase. The basic forages (hay, heylage, the silo, straw) during this period make to 70 % of nutritious diet. The concentrated forages are included in a diet depending on efficiency with gradual increase in their volume. With achievement of high level of milking, the raised norm of feeding should be kept within not less than 5 months.* *Feature of feeding dry stable cows is differentiation of norms on the periods. In the first decade after start they establish norm of nutrients within 80 % from average, in the second decade a feeding level is increased up to 100 %, in the third and fourth-to 120 %. Last 10-15 days to calving at the lowered appetite of animals it is necessary to stimulate the raised requirement for nutrients with introduction in a diet of high-quality concentrates and hay.* *Recommended approximate diet for incalver dry stable cows and heifers: 3-5 kg of hay, 1,5-2 kg of straw, 8-10 kg haylage, 10-12 kg of a silo, 2-3 kg of mixed fodder, 80-100 г fodder phosphate in the winter, a green lucerne of 35-40 kg and mixed fodders of 2-3 kg - year.* *By research experiments it is established, that the feeding of cattle by homogeneous feed premix provides increase of eating to 95 % and more, that is more on 15-20 % in comparison with separate than their feeding. At feeding large horned livestock a mix of hay, straw, haylage, a silo and root crops, dairy efficiency of cows, intensity of growth of young growth and a return of forages production is on 8-10 % higher, than at their use separately. It is explained first of all that for maintenance of optimum synthesis of fabrics of a body and milk secretion, the animal organism should receive all necessary substances simultaneously and in certain parity. At feeding of forages in high-grade feed mix there is a considerable conservation of energy in an organism of an animal at the expense of reduction of energy by chewing, a cud and work of a gastroenteric path in comparison with a usual multi-component diet* *The basis of feeding of sheep and goats is based on maximum use of pastoral forages. Relative density of concentrates is low and makes 10-15 % from the general cost of forages. The most difficult and responsible period in sheep and goat breeding is wintering. At this time it is necessary to organize uninterrupted feeding of animals by the high-quality rough, juicy and concentrated forages and to provide completely*

<table>
<tr><td></td><td>requirement of an organism for nutrients - a protein, macro-and microcells (Ca, P, S, Cl), vitamins.
It is well-known, that in the conditions of republic, sheep and a goat receive now to 90 % of forages from pastures, and practically they are not fed by the concentrated forages.
Till 1997 the livestock of sheep and goats of state farms Rashtsky, Nurabadsky, Jirgitalski, Fajzabadsky areas and state farm "Sagirdahst" of Darvazsky area GBAO were on non distant pasture-stall maintenance in mountains in the basic territory of land tenure of farms. In the future development of considerable areas of winter pastures under irrigation arable lands compels to transfer sheep breeding in a number of mountain areas on the semistall maintenance. For this purpose it is necessary to construct premises for sheep, cattle passage roads and bridges to inaccessible now suitable pastures in natural boundaries «Dubursa», «Garif», "Dashti-Hirson" in Rashtsky area, in downstream of river Obihingou in Nurabadsky, natural boundary «Tupchak» Dzhirgitalsky and on a river left bank Hingou in Darvazsky areas with a view of their inclusion in pasture rotation.

Data Source: Scientifically based system of agriculture of Tajikistan.- Dushanbe, 2010</td></tr>
<tr><td>8.3.3 Prevalent livestock diseases and mortality</td><td>In Rasht valley there are such diseases: sheep bratzot, helminthiasis diseases of animals, sometimes brucellosis and foot and mouth disease of cattle, and lately there outbreaks of pleuropneumonia in goats.

Data Source: Rules of a capture and transfer of a pathological material for laboratory research, Dushanbe, 2008:</td></tr>
<tr><td>8.3.4 Main animal products</td><td>The basic livestock products: Milk, meat, fur and skin.

Data Source: Statistic Committee

The basic products' production on 2010: meat - 7.6 th. tons, milk - 27 th. tons and a wool 0.2 th. tons.

Source: Regions of Republic Tajikistan (Statistical data), Dushanbe, 2011</td></tr>
<tr><td>8.3.5 Degree of integration with crop component</td><td>Degree of integration of development of animal industries and plant growing is very high. Gardening, potato growing and planting of forage crops is well combined. From forage crops most widespread are lucernes, esparcet and cereals. Lately the farmers sow corn.

Data Source: Scientifically based system of agriculture of TAJIKISTAN. - Dushanbe, 2010</td></tr>
<tr><td>8.3.6 Spatial organization in relation to environmental differences (mountains, foothills, plain, etc.)</td><td>
<table>
<tr><td>Height 900-1300</td><td>Height 1300-1700</td><td>Height <1700-2000</td><td>Height 2000-2400</td><td>Height 2400<</td></tr>
<tr><td colspan="5">Cattle (1), Sheep and goats(2), Poultry (3)</td></tr>
</table>
Data Source: Scientifically based system of agriculture of Tajikistan.- Dushanbe, 2010</td></tr>
</table>

8.3.7 Prevalent crop pests, diseases and parasitic flowering plants (parasitic weeds)	**Pests**	**Diseases**	**Weeds**
	Codling moth (Laspeyresia Pomonellal L.) *Turkistan browntail (Porthesia cargalia Mogre.)* *Apple-leaf moth (Heponomeuta malinellus Zell.)* Ccommon hawthorn moth *(Hyponemeuta padellus L.)* Olive *(parlatoria) scale (Parlatoria Oleae Colvee.).* *Black pine-leaf scale (Quadraspidiotus porniciosus comst.).* *Apricot eurytomid wasps (Eurytoma Samsonowi Was.)* *Lesser bud moth (Recurvaria nanellia Hb.)* Aarachnoid tick*(Schirotetranichus pruni Oud),* *Aphid (Eriosoma lanigerum Haus.).* *Apple and leaf louse (Ahis pomi Degeer Dusaphis mali Ferr.).* *Colorado potato beetle (Leptinotarsa decemlineata Say.).*	*Diseases of fruit crops* Scab of apple and peach (Venturia inaegualis Wint. и V. pirina Aderh.). T*tree wart (Sphaeropsis malorum Peck.).* *Fruit rot (Monilia fructigena Pers.) -* *Apple mildew (Podosphaera Leucotricha Salm.)* *Stone-fruit Clasterosporium (Clasterosporium carpophilum (lev.) Aderch).* *Peach leaf-curl mosaic* 85 *Plum pockets (Exoascus pruni Sadaeb – Taphrina).* *Phytophthora (Phytophthora infestans)* *Dry leaf blight (Macrosporium solani Ell. et Mart.).*	*Family of blue grass (Poaceae Barnhart) or cereals (Gramineae Juss.)* *Family blue grass (Poaceae Barnhart) or cereals (Gramineae Juss.)* *Family buck-wheat (Polygonacea Juss.)* *The goosefoot family (Chenopodiaceae Vent.)* *The madder family (Rubiaceae Juss.)* *Family of violae (Violaceae Batsch)* *Family of Amarantus (Amaranthaceae Juss.)* *Family of cabbage (Brassicaceae Burnett) или Cruciferae (Cruciferae Juss.)* *Family Malvaceae (Malvaceae Juss.)* *Family Solanaceae (Solanaceae Juss.).* *Family Asteraceae (Asteraceae Dumort) или Compositae (Compositae Gisee)* *Family Broomrape (Orobanchaceae)* *Family strangleweed (Cuscutaceae)* *Family bindweed (Convolvulaceae Juss.)* *Family buckwheat (Poligonaceae Juss.)* *Family day nettle (Lamiaceae Linal.), или Labiate (Labiatae Juss.).* *Family Asteraceae (Asteraceae Dumort) или Family of Compositae (Compositae Gisee)*
	Data Source: Scientifically based system of agriculture of Tajikistan.- Dushanbe, 2010		

8.4 Market access and characteristics																
8.4.1 Distance to closest local market (km, hours of travel) [in SRT2 regions often > 2 hours, in SRT3 regions often < 2 hours]		*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	Source: Statistic report of RT, Dushanbe, 2011
	1	30	30	30	35	35	35	35	35	35	35	30	20	20	20	20	
	2	70	70	70	65	65	65	65	65	65	65	70	80	80	80	80	
	The majority of farms realize their production in the big cities which are located at a distance more than 100 km, especially after construction of new road (from border of Kirghizia to a city Dushanbe).															

<table>
<tr><td>8.4.2 Sizes of rural markets</td><td colspan="4">From 100 to 500 m2</td></tr>
<tr><td></td><td colspan="4">The sizes of the rural markets basically make from 100 to 500 m2 and they are basically located within large settlements.</td></tr>
<tr><td rowspan="3">8.4.3 Sizes of rural markets</td><td>national</td><td>regional</td><td>world</td><td rowspan="2">Note: Degree,available, limited, not available</td></tr>
<tr><td>available</td><td>limited</td><td>limited</td></tr>
<tr><td colspan="4">Part of agricultural production (potato) is exported to Kyrgyzstan. Fruits (apples and peaches) are exported to Russia. Other products are sold within the country.</td></tr>
<tr><td colspan="5">8.5 Access to land, water and other inputs</td></tr>
<tr><td>8.5.1 Access to land</td><td colspan="4">Almost 90 % of land in the project area belongs to dehkan farms. The Dehkan (farmer) farm is the independent managing subject who is carrying out the activity without formation of the legal person, and based on personal work of one person or members of one family and other persons in common making agricultural production, which is based on the land area and other property belonging to members of dehkan farm. Spouses, children adopted, parents and other persons occupied in work in the general farm can be members of dehkan farm. The persons working in dehkan farms on hire are not part of dehkan farm and their labor relations with dehkan farm, are regulated by legislation of Republic Tajikistan on labor.
The Dehkan farms independently defines structure and a way of production, taking into account the interests and can be engaged in any type of the activity, not forbidden by legislation of Republic Tajikistan. Intervention in economic activities of dehkan farm from the state bodies and officials is not allowed, except for the bases, provided by the legislation.
Each capable citizen of Republic Tajikistan has the right to creation dehkan farm.
The Dehkan farm can have the following forms:
dehkan farm based on individual business;
dehkan farm, the enterprise activity of which is carried out in the form of family business and based on joint property;
dehkan farm created in the form of simple association on the basis of the general share of property and based on the contract on joint activity.

Dehkan farm and its members have the right:
independently to manage the land;
to hand over the land area or its part in rent in case of time invalidity, an appeal in ranks of the army on an active</td></tr>
</table>

	service, studies and in other cases, defined by legislation of Republic Tajikistan; *in case of withdrawal of the land area by the state, to receive full indemnification of costs for increase of land fertility and for the losses, including the missed income;* *to be the proprietor of made production and incomes out of its realization, to demand the share;* *voluntarily to refuse land tenure;* *to leave structure of dehkan farm according to the share without the consent of other members of dehkan farm;* *to use when due hereunder mineral deposits (sand, rubble, clay, stones, sources of waters) and other useful properties of the land area of dehkan farm;* *to get, rent or to temporarily use property of the organizations and individual persons;* *to conclude contracts for realization of enterprise activity;* *to have other rights, provided by the legislation of Republic Tajikistan.* *Hunting, fishery, collecting of fruits, including nut-fruits, medicinal grasses, shrub fruits, other natural production, or other activity on given land area of dehkan farm are possible only with the consent of the head of dehkan farm, or on the basis of the agreement of the parties.* *If on the land area there are the constructions, multi-visible plantings or other objects, which cannot be moved on other site, dehkan farm compensates to the former land user other costs, unless the parties agree about the other order. Then the given facilities will be transferred to dehkan farm.* *Dehkan farms and its members having the land share, are obliged to:* *effectively use the land according to a special-purpose designation, raise its fertility, carry out a complex of actions for protection of the land, wood, water and not allowed for deterioration of an ecological condition as a result of the economic activities;* *in due time to bring a rent and other types of tax for land tenure;* *promote an effective utilization of land, increase productivity of agricultural crops, in due time to represent to local authorities of the area (city) the information, demanded by the law about own activity and land use;* *indemnify a loss when due hereunder for decrease in land fertility, admitted because of the land user;*

	observe treaty obligations and credit-settlement discipline; *-not to break the right of other land users.*
8.5.2 Access to water	*Maintenance of rational use, protection and reproduction of natural resources is one of the primary goals of economic-social development of Republic Tajikistan (RT) in the coming XXI- century, important part of which being working out of measures on regulation of the water resources directed on strengthening of their positive role and the greatest possible liquidation of destructive actions. The decision of such questions will provide in RT protection of soils and vegetation from degradation, will improve the condition of the irrigated land and its drainage network, and will remove threat of washout and formation of floods.* *Water influence on a land surface begins, when the first drops of a rain or a portion of thawed and irrigation water fall on it. All water streams formed on a surface of the land, as it is accepted are divided on slope, time and constant. They are also subdivided on agents of distant (river) and close carrying over (all the others) of erosion products.* *Now, in connection with a basic change of land and water use and occurrence of private enterprises, it will be necessary to comprehend in a new fashion rich material of erosion experts of RT for the successful decision of system «protection - use - reproduction of water-land resources». Thus it is necessary to give special attention to erosive processes in an irrigated zone, since 90 % of population in RT is concentrated here and this zone undergoes ever growing old anthropogenous loading. About 90 % of the foodstuffs and agricultural raw materials are produced here.* *The big damage to the irrigated land is made by outlets from irrigated fields in a drainage network, which is estimated in 30-35 % from an irrigation norm. Thus drains become salt affected, their depth decreases, and the width extends, especially in some places there are running in soil -grounds. This demands more frequent very voluminous clearing works. Lack of capital investments because of economic situation in RT on the maintenance of a drainage network in working order started to affect deterioration of an ameliorative condition of the land: rising of level of ground water, increase in evaporation from their surface and, as consequence, secondary salinity and decrease in fertility of soil.*
8.5.3 Access to other inputs (seed, fertilizer, etc.)	*The basic sources for getting seed, mineral fertilizers and equipment –local and national markets.*
8.6 System problems	
8.6.1 Lack of market access	*The considered region has access to the national and regional markets.* Availability of the markets is a determinative for economic development and employment. Besides, availability of the market influences economic structure. It can so happen, that market conditions will go in a direction of undesirable shift from production of the final goods to sectors with the low added value that can be observed in economy of Tajikistan.

	The location increases a role of the local market, while the consumption level in the local market is low. It is possible, that efforts for expansion of the markets are not sufficient. On materials of the report, prepared within implementation of the EU project «Technical assistance Program of Support of formation of a policy in sphere of social protection - a component of the Labor Policy». The information was used related to labor market of Tajikistan, and also reports: «The analytical report on carrying out of inspection of a labor in Tajikistan (July-August, 2004)»; «Inspection of a standard of living in Tajikistan, 2007», «the migration Review in Tajikistan. August 2009», «Employment in informal sector of economy in Tajikistan. Dushanbe 2005»
8.6.2 Land fragmentation	*In 2004 Governmental order of RT had approved «The Concept of Land use in Republic Tajikistan», which accurately reflects the further management and rational use of land resources. In the republic land reform in agriculture is almost finished now, where dehkan (farmer) farm will be organized on the basis of state farms. Now 99 % of them are reorganized. There remains 1 % - seed-growing and breeding farms which, according to the Governmental order are not subject for re-organization. 6 thousand 705 dehkan (farmers) farms have been organized in Rasht valley till date.*
8.6.3 Decline in animal feed from rangelands	*Natural pastures and haymaking in Tajikistan occupy more than 432,2 th. hectares, and they are the major source of high-grade and various forages for animal industries (Land fund of Tajikistan, 2011). The stock of forages on pastures according to experts makes more than 907,2 th. tons of dry weight per annum. The pastoral animal industries is favorably economical - it gives the cheapest production, the cost price of which is much below than the cost of production, received at the stall maintenance of cattle during the winter period.* *The modern condition of pastures of the Republic is characterized by progressing decrease in their fodder efficiency under the influence of anthropogenous factors. Productivity of pastures strongly fluctuates within the years and productive animals are seldom provided to constant quantity of forages. For maintenance of a stable livestock of cattle in the greatest fodder stresses, it is required to provide additional feed to animals. In this connection, strategy of use of pastures and the cattle maintenance should be diversified in the regions of Republic.* *Under the influence of unlimited grazing of cattle, anti-erosion quality of a grassy cover considerably falls, the herbage is broken, some plants are destroyed, slowing down growth of others and soil is rather easily exposed to destructive processes. Development of processes of washout and soil washout affects not only quantity indicators of a condition of pastoral plants, but also leads to reorganization phytocenoses. In connection with unequal adaptation of plants to adverse soil conditions in the places subject to erosion, there is a change of one type by others. All pastoral lands are strongly subject to soil erosion. Some strong eroded sites as a result of intensive grazing of cattle and destruction of grassy vegetation are strongly subject to erosive forms and finally they are transformed into badlands. Soil washout here reaches 4,7 th. m3/hectares/year (Ahmadov, 2011).* *At extensive grazing, the eaten grasses almost completely loose generation, shoot and morphologic structure*

	changes, plants become stocky, elevated system of sprouts partially get rosette form, leaves decrease in 2-3 times, height of a herbage is reduced several times (on low grass-meadow pastures about 40-50 cm to 3-5 cm), the elevated weight of plants is basically concentrated in the lowermost land layers. Valuable fodder grasses drop out of herbage first of all: meadow grass Bukhara and bulbous, Zeravshansky meadow foxtail, a cock's-foot grass, meadow oat grass, Gissar and the Asian onions. Conducted by us on basic types of pastures and haylages numerous field experiences have shown, that at extensive use of pastures, there is a decrease in fertility of soils that leads to deterioration of quantitative structure of herbage on pastures. There is a sharp decrease in productivity. *Long and excessive grazing has transformed pastoral sites into failure (non-convenient). 75-90 % of weight of a herbage make not eatable grasses, thus productivity of fodder weight has decreased at 5-10 times.*
8.6.4 Soil fertility decline	*The main reason of intensive development of degradation of soils in a zone of rain-fed agriculture - development of abrupt slopes, bottom and slopes of negative forms of a relief, the water modular areas of the small rivers, ignoring anti-erosion actions and others. The powerful drain is formed in spring during floods on the opened slope and in a bottom of negative forms of a relief, which washes off the top fertile layer of land and numerous gullies and small ravines, gradation of which leads to formation of the large-goffered forms of a relief.* *Under rain-fed agriculture, slopes by steepness to 25 ° are widely used since recently. It is established, that slopes of 10-25 ° - strongly washed, and washout of soils reaches 920 m3/hectares; 5-10 ° are subject to various degree of washing (from weak to very strong) and to 5 ° - week washed (Ahmadov, 2011).* *In mountain territory of Republic, they widely used rain-fed terracing under perennial crops. However wrong construction of these terraces leads to intensive development of erosive processes.* *Display of erosive processes in a rain-fed zone of agriculture in a great extent depends on culture of land cultivation. In many farms of southern, southeast and southwest parts of Tajikistan, cultivation of land is carried out along a slope. Fall of even insignificant quantity of deposits here leads to intensive development of erosive processes and formation of numerous linear forms. At regular processing, these lands turn to the goffered sites and numerous hollow type falls are formed on their surface. In due course on these lands owing to strong goffered nature it will be impossible to cultivate agricultural crops and the land will grow with weeds, turning in waste, reminding badlands.* *On the irrigated land as a result of irrigation the process of wash off and washout is taking place, which are called as the irrigational erosion, causing a huge damage to a national economy.* *Major factors of activity of the person, influencing in occurrence and development of irrigational erosion in the course of development and use of the land are:* □□*technology of land development with subsidence of ground; leveling of fields; placing of crops; development of crop rotations; ways and techniques of irrigation; efficiency of irrigating system and its links;* □□*factor of land use; presence of a condition of a water catchment and outlet network; the control on carrying out of irrigation;*

	□□qualification and professional skills of attendants. *In the mountain territory lately massive are intensively developing with considerable slopes of a surface (7-15 and more degrees) where superficial gullies are formed at the first irrigation, and on borders of fields - small ravines. Sometimes as a result of irrigational erosion, capacity of a soil cover decreases to 80 cm, thus capacity of a soil cover in an irrigated zone reaches 2.5 m.* *Display of ravine and linear erosion in a zone of irrigated agriculture is in many respects defined by the depth of basis of erosion: not regulated discharge of irrigating water from fields on the pipes, having deep cut of basis of erosion, leads to intensive formation and growth of ravines.* *Irrigation of agricultural crops in a greater part of Republic is carried out by surface irrigation method and only on the insignificant area - sprinkler irrigation. Other ways of irrigation are applied on pilot or industrial - pilot sites in small areas. Despite advantages of surface irrigation, it does not meet the increased requirements of rural farming: water delivery is imperfect, distribution across the field is non-uniform, expenses of irrigating water and size of superficial discharge exceed norm. All that in the presence of slopes of a surface and subsidence of ground leads to irrigational erosion.*
8.6.5 Other system problems	*Other available problems in a system:* – *Weak explanatory work among members of farms about various categories of land, located in farm;* – *Irrational use of water for an irrigation;* – *Shortage of the irrigated land;* – *Poor quality of a seed material;* – *Necessity of carrying out of seminars and trainings on the land tenure rights;* – *Shortage of the literature;* – *Insufficient knowledge of local population on fundamental laws on land tenure;* – *Surpluses of the pastoral land (to conclude the contract with others farms about their use);* – *Absence of a commodity market and the low prices on agricultural production;* – *Low knowledge of local population of rational use of slope land;* – *Low knowledge on legislatively statutory acts;* – *Error of the previous administration of farm on the conclusion of use of the land in rent;* – *Almost there is no information on land reform;* – *Absence of corresponding techniques;* – *Shortage of potable water;*

	– *Reduction of the pastoral areas at the expense of increase in arable lands around settlements;* – *Question of allocation of pastoral land between kishlaks (villages) for grazing of private cattle;* – *Indemnification of losses to dehkan farms for carrying out various building and communal works;* – *Low knowledge of local population on traditional methods of managing agriculture;* – *Deterioration of agricultural machinery and absence of renovation of tractor-machine park;* – *Shortages of mineral fertilizers, pesticides, etc.;* – *Absence of independence at planning and the account of agricultural crops;* – *Shortages of progressive technology and cultivation methods of agricultural crops in irrigated territories.*

8.7 System dynamics

8.7.1 Stability, stagnation or evolution towards other more/less productive/profitable/environmentally sustainable systems

1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Slow development										Stable development				

Till 2006 development of agricultural farms of the region was in slow rates. The accepted number of decisions of Government Republic Tajikistan in last five years has given a push to development of a Rasht valley. During the period from 2007 for 2011 in a valley there is some stable development, especially in the field of potato growing and gardening.

8.7.2 Most common type of agricultural enterprises (e.g. individual/private, cooperatives, state farms)

		1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
1 (dehkan individual)	Number th..	1.4	1.6	1.7	2.0	2.4	2.6	2.8	3.0	3.1	3.4	3.5	3.7	3.8	4.0	4.1
	%	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0,9	0,9	0,9	0,9
	ha	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
2 (household)	Number, th..	37	37	37	38	38	40	40	41	41	42	43	43	44	45	46
	%	0.4	0.5	0.5	0.5	0.3	0.3	0.3	0.4	0.6	0.6	0.8	0.8	0.8	0.8	0.8
	ha	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

8.7.3 Presence of producer associations (e.g. farmers' groups, water use associations, marketing associations, cooperatives)

There are associations of farms and water users In the valley.

№	Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	Farm businesses (dehkan) farm	5	5	5	5	5	5	5	5	5	5	5	5
2	WUA	5	5	5	5	5	5	5	5	5	5	5	5

Note: One association of farms and water users is organized in each area of a valley. Associations of farms include all farmers of the

	region. The total number of farms in the region (in five areas) makes quantities of farms of 3013 (data on a condition to 01/01/2012) Source: Land fund RT, Dushanbe, RT, 2012

9. Governance, institutions, policies										
9.1 Institutional support										
9.1.1 Extension services and NGOs	*There are pilot sites of the Tadjik academy of agricultural sciences in Rasht valley which, together with local government and experts of the ministry of agriculture, the ministry of water resources, committee on land management and a geodesy both other ministries and departments, NGO and MO hold seminars on dissemination of experience and managing rural farms.*									
9.1.2 Access to improved/adapted varieties/breeds	wheat	potato	fruits	vegetable					*Note*	*reference*
	Access is available	*Access is available*	*Access is available*	*Access is available*					Access is available, limited, non available	MAWR RT
	Tajik Academy of Sciences has released for agriculture new, perspective varieties of crops. By applications of farmers (dehkans) seeds departments render support at procurement of released new varieties agricultural varieties, or they buy these seeds in the markets on market prices).									
9.1.3 Access to animal health services	Cattle	Goats and sheep	Poultry						*Access is available*, limited, non available	*Reference* MAWR RT
	In many rural areas of the valley there are veterinary doctors to render services to animals.									
	Access is available	*Access is available*	*Access is available*							
9.2 Policies										
9.2.1 Pricing/subsidies for inputs (land, water, fertilizer etc.)	**Land.** According to the land code of Republic Tajikistan, the land is a sole state property, and the state guarantees its effective use in interests of the people. Land use in Republic Tajikistan is paid. The payment for the land is raised annually in the form of the land tax, and terms of rent payment have been established (in edition of Law RT from 28.02.2004r.N23). Rates, an order of the taxation and a rent for the land, the land tax and its rate are defined by Tax code of Republic Tajikistan (in edition of Law RT from 12.05.01 N 15). The Rent of agricultural land is defined depending on quality and a site of									*reference* Land code of Republic Tajikistan and the Order of the State agency on an antimonopoly policy and business support at President RT

	the land area, taking into account a cadastral estimation (in edition of Law RT from 12.05.01 N 15). Rates of payments for use of other types of land are defined taking into account their site, nature of use, ecological and social and economic features. **Water**. According to the Constitution of Republic Tajikistan, water is a sole property of the state and the state guarantees its effective utilization and protection in interests of the people. Using water facilities for needs of rural farm is carried out in the general, and the special water use order. Watering, irrigation, drying and collector-drainage systems and systems of agricultural water supply, and also separate water economic constructions and the devices belonging to physical and legal bodies can be applied at special water use. According to the order of the State agency on an antimonopoly policy and business support at Government of Republic Tajikistan for № 45 from April 1, 2011, the payment for delivery 1 meter3 of water makes 1,5 dirhams.	
9.2.2 Pricing/subsidies for produce	The price acts as one of levers of distribution of incomes and raising efficiency of an agricultural production. The price, as it is well- known shows term of money of cost of the goods and at a stage of an exit of production from production is formed on the basis of action of the law of cost. However, action of the law of cost in farming, first of all in agriculture, has certain features. Major of them consists that public cost and consequently also the price of agricultural production is defined not by average conditions of production, as it takes place in the industry, but production conditions on rather worst in fertility lands and location of a commodity market near land sites. The price for production, produced in the worst conditions, should provide a covering of production costs, rent payment (there where it is) and reception of average profit. The second feature of pricing in agriculture consists in necessity of maintenance of a principle of equivalence for an exchange between the industry and agrarian sector. The third feature of pricing on agricultural production consists of the fact that direct or indirect differentiation of the prices is provided for natural-climatic zones. At reference of this or that area to corresponding zone, characters of soils and climatic conditions are considered, which influence productivity of agricultural crops, the cost price and production fund-consumption, profitability level and so forth. In other words, pricing on agricultural production cannot exclusively develop	*reference* Data analyses of Agency on statistics of RT and State Investment Committee

according to market economy laws.

Pricing on production of rural farm is the economic phenomenon of key value as stability of reproduction in many respects depends on it in the central link of agriculture and thus including a satisfaction of requirements of the population in the basic foodstuff, a standard of living on village as well. The problem of formation of effective system of pricing within the limits of all national farm and its separate branches has always been important in our country. During the long period of time in a counterbalance to objective economic laws the pricing issue was carried out in centralized and planned order. Procurement and retail prices for agricultural products were established compulsorily and contradicted interests of productions. Along with it they did not answer a problem of the effective expanded agrarian reproduction and a parity of the prices on agricultural and an industrial output. Such mechanism of pricing has negatively affected profitability of all rural farms and its consequences are notable till date. The prices and absence of the effective mechanism of their formation are one of the principal causes of unprofitability of many agricultural enterprises. Thereupon the solution of a problem of optimization the system of pricing on production of rural farms in frameworks both separate region, and all country as a whole becomes especially vital.

In the cost structure for production, considerable specific weight is occupied by tangible costs of an industrial origin, especially in branches of plant growing. In animal industries branches, the growth of these costs is also observed. From here it is doubtless, that the decisive influence on level of the cost price of production of rural farm is rendered both by a price level on the industry of production, given in agriculture, raw materials, and means of production.

Specific all wages, fertilizer, fuel and lubricants and other expenses are considerable in general in plant growing: accordingly 28,1, 14,7, 19,7 and 20,5 %. But in animal industries costs for forages make about 57 %. Other costs make 12 %. Though specific all wages in the cost price are considerable, however from the point of view of real requirements, they are very scanty: i.e. the absolute size makes from 7 to 12 US dollars, that we cannot stimulate workers with this level on growth of production of agricultural production.

Subsidies.

The agriculture is subsidized in the form of financing of Government programs for development of this or that under-sector from the state budget. There were 16 such programs in 2011, from which 14 are financed. In 2011 volume of financing of these

	programs has made 20,0 million somoni, from which 13,5 million somoni have been allocated in the first half of the year. From 2005 to 2011 growth of the allocated means in types of state support has grown from 2,9 million somoni to - 20,0 million and for this period has made 93,6 million somoni. 32,3 million of them makes means directed on support of the seed-growing, 19,0 million - on agricultural machinery acquisition, 17,8 mln. - on pest control of gardens and vineyards, 12,3 - on anti-epizootic works.	
9.2.3 Policies related to access to land and water resources	*The Parliament and the Government of the country developed and approved many acts and regulations on land management:* – *Land Code, 1996 and additions and changes 2003;* – *Code «On administrative offences», 2000;* – *Water Code, 2001;* – *Civil Code, 1999;* – *Forestry Code, 1993;* – *Tax Code, 1998;* – *Law «About wildlife management», 1993;* – *Law «About land reform», 1992;* – *Law «On reserves», 1994;* – *Law «On protection and use of vegetation and fauna preservation», 1994;* – *Law «On land estimation» - 2001;* – *Law «On land management» - 2001.* – *Law of Republic Tajikistan «On dehkan (farmer) farms» accepted in 1992. Changes have been made to the given law and additions, and the new wording has been accepted in 2002;* – *Law of Republic Tajikistan «On an economic estimation» accepted in 2001;* – *Decree of President Republic Tajikistan «On reorganization of agricultural enterprises» № 522 from June 25th, 1996;* – *Decree of President Republic Tajikistan «On realization of the right of land use» №1021 from June 22nd, 1998.* – *Resolution of Republic Tajikistan «On measures of performance the Decree of President Republic Tajikistan « On realization of the right of land use» № 244 from 1998, and others.*	*reference* Laws of RT

9.2.4 Farmers' autonomy to choose crops and crop areas,ha	*The state does not establish areas under crops. Dehkan (farmers) farms cultivate those crops which they choose. In the law about dehkan (farmer) farms it has been stipulated: the dehkan farm independently defines the structure and a way of production taking into account the interests and can be engaged in any type of the activity, not forbidden by legislation of Republic Tajikistan. Intervention in economic activities of dehkan farm from the state bodies and officials is not allowed, except for the bases provided by the legislation. (The law about farmer (dehkan farm), 2002.)*	
10. Opportunities for agricultural research		
10.1 Opportunities for research on land tenure policy, soil and water management, de-rocking, agro-biodiversity conservation, water harvesting for range shrub plantations, drought-resistant varieties, others	*The basic problems on the way to introduction of scientific achievements in production include: debts of the most agricultural enterprises for budget of Republic due to lack of financial means for introduction of new scientific developments, the small-scale managing of a great bulk of agricultural productions, absence of advertising and propagation of new developments, low level agricultural knowledge of the majority of workers of sector, etc.* *For elimination of the specified problems, it is necessary to organize preferential crediting of priority directions of development of branch, to create centers of consulting services in the villages, to improve legislative base of scientific maintenance of branch, to continue reorganization agricultural enterprises in a direction of the optimum sizes of their functioning.* *Breeding and seed-growing and also consulting services are the basic sphere, where agricultural research can qualitatively improve a life of agricultural population, taking into account vertically-zone allotment of the land of an agricultural purpose.* *Old type thinking is the basic barrier on a way of development, which prevents elimination of poverty in countryside. Till date the rural worker thinks that the state should provide him/her with all necessary resources of production. The strong consulting push of market thinking is necessary for elimination of this way of thinking (change of way of thinking of farmers (dehkans).* ***Priority directions of research in a Rasht valley*** *1. Working out technologies for reception of high crops and breeding new varieties of grain, leguminous, oil seed and forage crops with high potential of efficiency.* *2. Breeding of new varieties of grain, leguminous crops with the high maintenance of gluten and the protein.* *3. Carrying out breeding works with leguminous crops on creation of varieties resistant to*	*reference* Отчет по УУЗР, Dushanbe, 2010

	ascochyta-leaf spot. *4. Improvement technology of adaptable process of agricultural crops to climate change.* *5. Collection, studying and preservation of genetic resources of plants for the foodstuffs and agriculture.* *6. Sustainable use of genetic resources of plants for the foodstuffs and development agriculture for the purpose of decrease in level of poverty in countryside.* *7. Expansion and improvement of genetic base of agricultural crops, increase their stability and efficiency.* *8. Improvement technology of stability of genetic resources, their adaptable possibilities to unforeseen changes of environmental conditions.* *9. Collection and studying of rare and disappearing local varieties of grain, leguminous crops and their wild relatives.* *10. Carrying out of breeding-genetic research and creation of varieties - donors of grain and leguminous crops as sources of an initial material.* *11. Working out water-saving and other technologies for increase of soils' fertility.* *12. Improvement anti-erosion technologies and improvement condition of soil' fertility.* *13. Improve an ameliorative condition of land, ground water.* *14. Studying ecology and soil' fertility.* *15. Development of resource-saving technologies for livestock production in the conditions of new forms of managing with decrease in level of poverty of the population.* *16. Preservation of genetic resources of types and breeds of animals, increase their efficiency on the basis of breeding and biotechnology methods.* *17. Improvement of technology of beekeeping, comparative studying breeding of bees, reception early queens.* *18. Development effective technologies of restoration of the pastoral land and improvement assortment and efficiency of feed crops.* There is a Lyahsh base station of the institute of horticulture and vegetable growing of Tajik Academy of Agricultural Sciences in the territory of Rasht valley, which, together with Institutes of farming, animal industries and the National-republican centre of genetic resources carries out priority researches in the above-stated thematic directions. There are limited financial assets for performance of large-scale scientific research works.	