

Annex 6

Environment

ANNEX 6

ENVIRONMENT

A6.1 Environmental Organization

A6.1.1 Department of Environment

In Iran, the Department of Environment (DOE) is responsible for the protection and enhancement of the environment, the prevention and control of any form of pollution or degradation leading to the disturbance of environmental balance, and for conducting all matters related to wildlife and the aquatic biota of the territorial waters. The Vice President of the Islamic Republic, who directs the daily operations of DOE heads the department with 4 deputies.

DOE is responsible for 10 national parks with a total area of 1,277,560 hectares, five national monuments covering 1,798 hectares, 25 wild life refuge measuring 1,921,504 hectares, 47 protected areas spread over 4,813,086 hectares and 17 wetlands. The sum of these area equals to 8,013,948 hectares or 5% of the entire land area¹.

Each province of Iran has a DOE provincial directorate, which monitors all the aspects of environmental protection and the implementation of the department's programs. DOE is in-charge for defining the national regulations and standards for preserving and enhancing the quality of environment.

The Environmental Protection Act (1974) is the major law for environmental conservation in Iran. The Supreme Council of the Environment is a legislative body that enacts relevant regulations for the environmental protection. It is chaired by the President of the Islamic Republic and the other members of the council are the Ministers of Agriculture, Foreign Affairs, Industry, Interior, Health and Medical Education, the Heads of the Department of Administration and Planning and the Institute of Standard and Industrial Research.

According to Article 50 of the Constitution of IRI, "the protection of environment, in which the present and future generations must lead an ever-improving community life, is a public obligation. Therefore, economic or other activities which cause pollution or other irreversible damage to environment are prohibited".

A6.1.2 Kermanshah Provincial Directorate of Environment

The Kermanshah provincial directorate of environment is responsible for the protection of national environmental sites in the Kermanshah province and to carry out the environmental activities including environmental monitoring, and environmental training to its staff and the local population. The Kermanshah provincial directorate of environment has the district/township environment inspection/protection offices at the following locations:

1. Javanrood environment office
2. Hashilan environment inspection office
3. Paveh environment office
4. Harshin environment office

¹ A Glance at the Department of the Environment of the Islamic Republic of Iran

5. Qasr-e-shirin environment office
6. Sarpol-e-Zahab environment office
7. Lashkargah environment office
8. Gilan-e-gharb environment office
9. Songhor-va-Koliyai environment office
10. Kangavar environment protection office
11. Beranjan environment inspection office
12. Seyyed khani environment inspection office
13. Bisotun environmental protection office
14. Ghalaje environment protection office
15. Kaliyan environment inspection office and
16. Eslam Abad-e-gharb environment protection office

The provincial directorate is responsible for making the evaluation and approval of Preliminary Environmental Impact Assessment (pre EIA) and detailed EIA. When any industry or factory is set up in the province, permission needs to be obtained from the department of environment based on the regulations of DOE. For eg., when a big industry/factory is to be established, it should be set up in the industrial or commercial areas which are included in the development plans of the city and should be at a considerable distance away from the city as defined by the regulations of the DOE.

EIA needs to be carried out for the following projects:

- Petroleum industries of any kind
- Refineries
- Power stations with capacity of more than 100 MW
- Steel industries
 - a) Units of melted materials with a capacity of 300,000 ton/year
 - b) Units of forming with a capacity of 100,000 tons/year
- Dams of more than 15m high with area more than 400 ha area
- Dams which keep pollutant materials in any measure should be evaluated by the environmental office.
- Man-made lakes with area more than 400 ha area
- The size of the lakes that breed fish with an area of less than 400 ha should be supervised by the department of agriculture.
- Irrigation and drainage projects with an area of more than 5,000 ha
- Airports with a landing area of more than 2,000m
- Projects of oil or gas pipeline transportation

The main works of the provincial environment directorate are mentioned below:

1. Proposing proper locations and activities of industrial service and production units in consideration of regulations related to industries and also giving suggestions and recommendations related to industrial zones and cities.
2. Preventing environmental destruction and imbalance caused by agriculture and industrial activities
3. Investigation of offense against the laws and regulations of environmental protection and improvement and hunting & fishing
4. Formulating the laws and regulations of environmental standards to the managers and organizations who are incharge of industries and services.
5. Preparation and implementation of proper plans and programs to environment

protection

6. Issuance of hunting and fishing allowances considering the laws and regulations
7. Implementation of environmental development projects and describing their results
8. Protection of control zones, making the national parks to visit with ease for the visitors and providing educational facilities
9. Study on the pollution sources of soil, water and weather and the related factors
10. Study on ecosystems and biospheres and making arrangements to protect the systems
11. Recognition of fauna and flora in the region and taking necessary measures to protect them
12. Study on environmental effects of use of resources and providing reasonable solutions for sustainable development.

The main duties of environment protection offices are mentioned below:

1. Recognition of the following subjects and preparing the needed data according to the instructions and methods
 - a) Environmental pollution and causes
 - b) Locations of workshops and industrial, agriculture, urban and development units
 - c) Ecosystems, regions and the main fauna and flora
2. Coordination and control of the sub divisions and units of environment
3. Issuance of hunting and fishing licenses considering the regulations
4. Investigation of offense against environment protection and improvement of hunting/fishing regulations
5. Providing special facilities for the visitors and tourists and giving guidance to them to improve their knowledge on environment
6. Cooperating with other organizations, institutions, educational centers, mosques and media for enhancing the people's knowledge about environment
7. Formulating the environmental standards, instructions, regulations on environment destruction and pollution factors and to provide control.
8. Formulating the regulations and instructions related to environmental protection and improvement for hunting and fishing in the region

The main duties of environment inspection offices are mentioned below:

1. Participation and preparation of scientific studies and data in the protected area
2. Environmental protection and improvement, and instructing hunting and fishing based on the regulations
3. Investigation of offence against environmental regulations
4. Preparation of inspection programs
5. Making facilities for the tourists
6. Operation and maintenance of the facilities belonging to environmental organization

The duties of inspection units are mentioned below:

1. Participation and preparation of scientific studies and data
2. Finding the environmental crimes and arresting the criminals based on the laws and regulations
3. Environmental protection and improvement, and instructing hunting and fishing regulations
4. Giving licenses related to livestock grazing, hunting and fishing in the protected area and finally controlling their performance
5. Operation and maintenance of the facilities belonging to environmental organization

A6.2 Environmental Conditions and Problems of the Study Area and the Region

A6.2.1 Environmental Conditions of the Study Area

The springs and the ponds located in and around the Study area are of major importance from the environmental point of view, because these springs not only act as the water source of the irrigation in the Study Area and the region, but also serve as the local tourist spots in the Study Area. Besides, they are also habitats for fishes and other fauna and flora. The water quality of these springs is a major environmental factor to be considered. The main Springs and Ponds in the Study Area and Other Areas of Kermanshah Province are mentioned below.

Main Springs and Ponds in the Study Area and Other Areas of Kermanshah Province

Name of Springs or Ponds	District	Location / Dehestan	Area (ha)	Average Depth(m)
Ravansar	Ravansar	Ravansar	2	1
Yavari	Kermanshah	Miyandarband	6	2
Sarabele	Kermanshah	Miyandarband	2	1
Khezh-e-Zendeh	Kermanshah	Miyandarband	5	1.5
Khezh-e-Elyas	Kermanshah	Miyandarband	3	1.5
Nilufar	Kermanshah	Baladarband	10	2
Gharadaneh	Kermanshah	Sanjabi	2	1
Gharsu artificial lake	Kermanshah	Kermanshah	5	1.5

Ravansar spring is located in the northern part of the Site 1 and acts the main water source of the Ravansar river. It also functions as a very important tourist location in the Ravansar city. Yavari spring in Miyandarband and Nilufar spring in Baladarband are located closer to the Study Area.

There is also an unique wetland, which is called as 'Hashilan', which is located at about 30 km of the Study Area. The area of the wetland area is 450 ha, which is one of the most beautiful ecosystem in the region and has about 110 numbers of small islands.

The main plant species, which are growing in and around these spring areas are annual and perennial herbs, heliophytes including Carexdisance, Hispida, and some types of Junacaceae and Malvaceae families.

The main mammals in the area are rodents such as mouse, wolf, fox, rabbit, jackal and wild cat. The mountainous area surrounding the Study Area is a suitable place for wild goat. The birds in the region are duck (with green head), small wild duck (khotka), Gilar, small wild duck that has a white feather and flat beak, keysham, gray ghoose, changar, kakai (green beak), Eigrette (small & large), stork, green foot rail, eagle, starling, songhor, kurkur, small owl, green finch, bee eater, partridge, quail, dull-yellow partridge, and wagtail.

A6.2.2 Existing Environmental Problems of the Study Area and the Region

(1) Water Pollution and Water Quality

One of the most important problems in and around the Study Area is the water pollution of the surface water and groundwater, caused by the following ways:

i) By farming practices: All the agricultural pollutants including pesticides, fertilizers and salts are penetrated into the soil and drained into the river through the drainage water causing pollution.

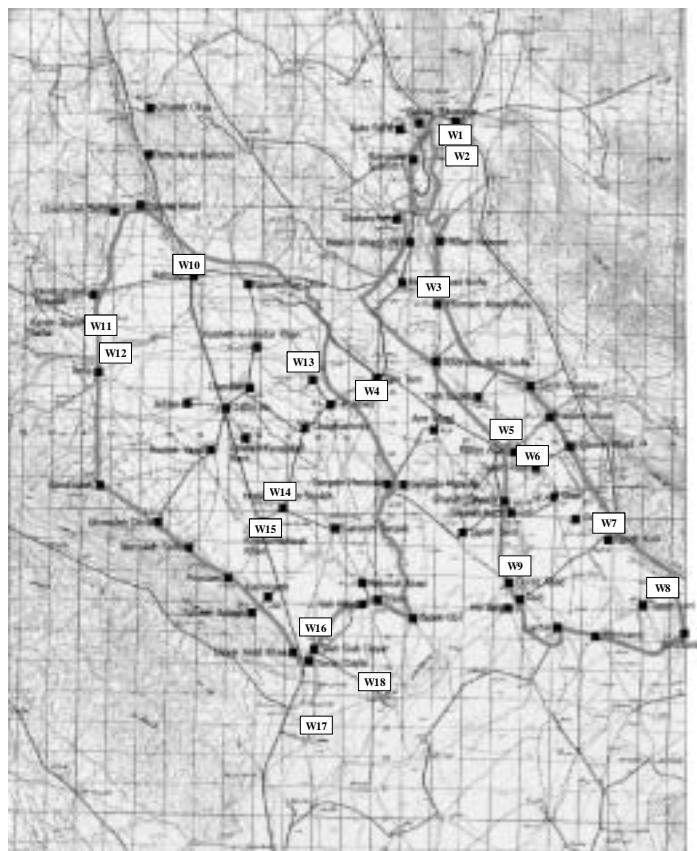
ii) There are small villages located near the rivers and the wastes from houses living closer to the river are also thrown into the rivers causing pollution.

iii) The wastes of the dairy farm are drained into the river causing pollution. Although the water pollution by the industries are controlled through environmental regulations, it is still impossible to control them fully.

iv) Water pollution caused by the slaughter-houses of the Ravansar town.

In order to analyze the water quality of the rivers, springs, canals and well water, water samples were taken during the 1st field survey in February 2003 in 18 locations as shown in the figure. The results of the water quality analysis are presented in Table A6.2.1.

The results of the water quality analysis conducted by the Kermanshah Provincial Directorate of Environment are shown in Table A6.2.2. The results of the water quality analysis conducted by the Kermanshah Water Organization are shown in Table A6.2.3. Iran Water Quality Standard for Discharge Water is shown in Table A6.2.4; Guideline for Interpretations of Water Quality for Irrigation is shown in and Recommended Maximum Concentrations of Trace Elements in Irrigation Water is shown in Table A6.2.5 and Table A6.2.6 respectively.



Location of the Water Quality Sampling Carried out in the Study Area (February, 2003)

According to USDA classification, the water of Gharasu river is in the range of C1S1 to C2S1, and the salinity of water is in the lower to medium level. EC values measured at different periods do not vary significantly and they are mostly lesser than the medium level of 0.75 mS/cm. Therefore, irrigation water does not cause serious salinity problems, if the soils are properly drained. Only the shallow well located in the southern part outside the Study Area has a higher salinity (C4) with an EC of 3.03 mS/cm. However, during the field survey, it was reported that there is salinity problem only in that area.

pH of the water is within the normal range of 6.5 to 8.5, except for some cases (W3 – river near Khoram Abad and W-6 Canal Tapeh Rash) where the pH is above 8.5 mainly due to carbonate. Although there is a slight amount of nitrogen, the level of other elements including P, K, Fe, Mn, Cu, Zn and B are in a much lower or negligible level. Total dissolved solids (TDS) are lower than the critical level of 450 mg/l for irrigation water. Dissolved Oxygen (DO) values of the rivers and springs are higher than 5 mg/l for most cases. Biological Oxygen Demand (BOD) is much lower than the critical level of 50 mg/l. Similarly Chemical Oxygen Demand (COD) is also much lower than the critical level of 100 mg/l.

Results of water quality survey of the springs in the Study Area and the region made by Kermanshah Environmental Directorate is shown below.

Results of Water Quality Survey of the Springs in the Study Area and the Region
Made by Kermanshah Environmental Directorate (January, 1995)

Name of Spring (1)	Elevation (metres) (2)	Average Discharge (l/s) (3)	pH (4)	EC mS/cm (5)	Turbidity ntu (6)	DO mg/l (7)	BOD mg/l (8)	COD mg/l (9)
Ravansar	1380	2586.5	7.00	0.100	8	8.7	Trace	10
Jaberi	1360	305.8	7.00	0.100	6	7.5	6	10
Ghare daneh	1400	192.0	7.10	0.200	3	7.5	16	32
Nilufar	1328	1000.0	7.20	0.400	8	7.2	18	34
Sabzali (Hashidan)	1320	343.0	7.40	0.400	8	8.2	8	16
Yavari	1306	506.6	6.80	0.300	11	7.5	20	40

As shown in the Table, the pH is within the range of 6.5 to 7.5 and EC is lower than 0.4 mS/cm. Dissolved Oxygen is well above the critical level of 2 mg/l and similarly BOD and COD are also much below the critical level and turbidity is also lower.

In general, it can be concluded that the water quality of both spring water and rive water is suitable for irrigation, although there are some water pollution problems caused by house wastes and agriculture drainage water.

(2) Other Environmental Problems in the Region

- 1) Since the springs act as an important tourist attraction, the trashes left by the tourists and the passengers passing through these springs cause pollution.
- 2) There are some lime factories in the Study Area causing atmospheric pollution.
- 3) There is the herbicide production factory, and the discharge of this factory is one of the major pollutants of the region.
- 4) Irregular grazing and unbalance of livestock & pastures, resulting in soil erosion and sedimentation problems at the time of heavy rainfall. Some times causing flooding problems.
- 5) Illegal farming at the foot of the mountains leading to soil erosion and removal of soil depth.

A6.2.3 Environmental Problems Reported During Participatory Workshops

The major environmental problems reported during the participatory workshops in the 5 villages are summarized below. They mainly reported the health and sanitation as the major environmental problem of their villages as listed below.

(1) Health and Sanitation

- 1) There is no proper sewage and other sanitation facilities in the villages
- 2) The villagers reported that the animal wastes are mostly kept outside the homes causing air pollution and uncleanliness of the villages. Trashes of the towns and villages are stored in piles at some places and are distributed to other places by wind causing pollution.
- 3) There is no health center or poor facilities in the centers
- 4) Poor or no drinking water facilities.
- 5) There is no public bath facilities

6) Poor road and transport conditions

(2) Problems of Grazing and Range Areas

The farmers reported that the grazing area for their animals are too far with poor roads. They complained that government program to convert the grazing areas to agro-forestry (Toba plan) is not supportive of grazing.

(3) Social problems in water distribution

The farmers pay the water fee to the water organization for receiving irrigation water. However, there is no clear rule in regard to water distribution. There is also no water users association in the Study Area. Therefore, naturally, the farmers in the upstream side are more benefited compared to the farmers in the downstream side. Some times, it also creates social problems between two villages.

(4) Influence of Kilanbar Dam

Although the Kilanbar dam is at the study stage, some of the people in the Reis village, which is located within 1 km at the downstream part of the dam site expressed their concern about the compensation for the loss of their land due to submergence. It is also reported that a part of the village Kilanabar Oliya, which is at the upstream side of Kilanbar dam site will be submerged. The average elevation of the village is 1420 m, which is about 20m higher than the estimated highwater level of 1398m. It was reported that some part of this area belongs to the farmers of Reis village. While many farmers expressed their hope that the dam will be beneficial for irrigating their lands, they reported that the farmers who might loose their lands should be properly compensated.

A6.3 Initial Environmental Examination (IEE)

Initial Environmental Examination (IEE) is undertaken at the outset of the development project planning stage to determine the environmental impacts that may be created by the particular project based on existing data and information related to the particular project, and the comments and judgments of specialists who are familiar with the environmental impacts of past similar projects. IEE is the preliminary environmental review to assess whether Environmental Impact Assessment (EIA) is necessary or not for the development plan.

Major study components of IEE include identification of project outline, and site environmental conditions (Project Description and Site Description), preliminary assessment on negative environmental impacts of a proposed project and evaluation of whether EIA is required for the development plan. IEE supports an important premise of environmental consideration that sustainable development is achieved most efficiently when negative environmental impacts are identified and addressed at an earliest possible study stage. Along with these lines, IEE is considered as one of the important methods of environmental consideration.

In general, IEE is carried out in a short term with the use of existing data and experience of similar projects. IEE for this Study is carried out together with the counterpart of Kermanshah Provincial Directorate of Environment and Kermanshah Jiahd-e-Agriculture Organization.

A6.3.1 Joint Screening and Scoping

Screening is undertaken to determine whether the development study requires environmental

consideration, i.e., IEE or EIA. Scoping is the process to identify the significant impacts to be assessed in IEE or EIA. Screening and scoping were conducted based on the information collected and discussion with the Kermanshah Provincial Directorate of Environment. Joint screening and scoping were undertaken together with the counterparts of the Environment and Agriculture and the checklists were prepared as shown in Tables A6.3.1 to A6.3.3.

As shown in the Tables, most of the environmental issues have positive environmental impacts because of the agricultural development of the area through the improvement of irrigation and drainage system. However, agricultural development also results in increased use of agricultural fertilizers and chemicals, which induce pollution in the river. Water quality is one of the most important environmental aspects, for which regular monitoring is necessary. The activities related to agriculture development such as agro-industries might also result in atmospheric pollution.

A6.3.2 Project Description

In the project description, the outline and components of the proposed project including 1) the project background, 2) general information such as objectives, executing agencies, beneficiaries and area of proposed project, 3) project components and scale are described. The major environmental aspects and impacts to be reviewed or assessed in the environmental consideration process can be preliminarily selected after clearly identifying the project components. The Project is described in more detail in the main report.

A6.3.3 Site Description

The environmental conditions with particular significance in the Study Area are described in the site description. The site description is shown in the standard formats in Table A6.3.4. As it can be seen from the Table, there is no environmentally sensitive area in the Project area.

A6.3.4 Preliminary Assessment of Environmental Impacts

In general, the environmental impact means significant adverse impact to be caused by the project on the existing overall conditions of air, water, soil and the living things, assets, social information and circulation of goods, which are related to human life or their combined structures.

The negative impacts to be caused by a project can be divided into two parts. One is a negative impact in the short term, which is perceived at the moment of execution of the project. In this case, it is important to consider the environment in such a way as to harmonize the development activities and the conservation of the environment. Another is irreversible negative impact in the long run, which is perceived after finishing the project and this negative impact may exert a significant influence on the environment. At the present stage of the Study, the new project components are not finalized and therefore the present environmental problems due to the irrigation and drainage and agricultural development projects in the Study Area are addressed as the significant environmental impacts. The mitigation measures to be undertaken are also discussed along with the environmental impacts.

Based on the joint screening and scoping and in consideration of site description and project description and the project activities to be undertaken, the major environmental impacts to be assessed are as follows:

1. Water contamination and deterioration of water quality including eutrophication
2. Soil erosion, sedimentation and flooding

3. Soil contamination by agrochemicals
4. Influence on surface water hydrology
5. Influence of groundwater hydrology
6. Atmospheric Pollution
7. Health and sanitation

(1) Water contamination and deterioration of water quality including eutrophication

Water contamination and deterioration of water quality in the Gharasu river and the springs is the most important environmental impact in the Study Area. Through the agriculture development, all the agricultural pollutants including pesticides, fertilizers and salts are drained into the river through the drainage water causing pollution.

Regular monitoring of water quality in the rivers and springs and appropriate use of fertilizers and agriculture chemicals are necessary.

(2) Soil erosion, sedimentation and flooding

Since there are few or no tree covers in the upstream side watershed areas, the water drained this area brings along a heavy volume of sediments, which are flown into river. If suitable watershed management activities (check dams, contour farming, agro forestry etc.) are not carried out at the upstream side, then soil erosion, sedimentation and flooding will occur at the downstream side.

(3) Soil contamination by agrochemicals

The soils will be contaminated with high residual toxicity because of the agricultural development using of agriculture fertilizers and chemicals. It causes agrochemical contamination of farm products and causes harmful impact to human and animals through progressive biological concentration of toxic substances in the food chain.

Regular monitoring of soil properties and proper recommendation of fertilizers and chemicals are necessary. Use of fertilizers and agrochemicals having no or limited residual toxicity and extension of appropriate application methods of chemicals are necessary.

(4) Influence on surface water hydrology

Gharasu river, Kilanbar river and Gharab river and other small rivers and springs are the major sources of irrigation in the Study Area. Through construction of reservoirs or new irrigation and drainage projects at the upstream part of the Study Area, the farms at the downstream sides will receive a low amount of irrigation water resulting in poor yields. Some farms at the upstream side of the river pumps the water from the rivers when ever it is available.

Improper use of surface water in the study area should be controlled through regular monitoring of surface water. Proper distribution and usage of surface water and use of water saving methods are necessary.

(5) Influence of groundwater hydrology

Agriculture development project in the Study Area also has a significant influence on groundwater hydrology, especially in the Site 2 of the Study Area. Groundwater is depleted by pumping through wells and used for agriculture cultivation. Improper depletion of

groundwater in the study area should be controlled through regular monitoring of groundwater. Proper drainage system is needed in order to avoid the ponding and drainage problems. Research and extension of water saving irrigation methods are necessary.

(6) Atmospheric Pollution

Agricultural development activities might cause atmospheric pollution because of the use of chemical spraying. Besides, setting up of new agro-product industries might also result in atmospheric pollution. Regular monitoring of atmospheric pollution and adoption of proper farm management practices are necessary.

(7) Health and Sanitation

One of the most important problems existing in the Study Area is the location of many villages near the river. In this case, the human sewage and also the agricultural drainage including agro chemicals cause the pollution of the river and cause diseases on fishes. Monitoring of regulations of waste disposals and provision of waste disposal measures are necessary.

A6.3.5 Environmental Monitoring and Management System (EMMS)

An environmental monitoring and management system shall be established to monitor the project's environmental impacts on the project area and the surrounding areas, aiming at adequately protecting the environment both during and after the project implementation. EMMS should include suitable environmental monitoring and management measures to avoid or mitigate potential adverse impacts. The monitoring and management measures corresponding to potential adverse impacts mentioned above are listed below.

1. Regular monitoring of water quality in the rivers and springs and appropriate use of fertilizers and agriculture chemicals
2. Regular monitoring of soil properties and proper recommendation of fertilizers and chemicals
3. Inclusion of proper drainage system
4. Proper distribution and usage of surface water and use of water saving methods
5. Regular monitoring of groundwater and use of water saving methods
6. Regular monitoring of atmospheric pollution and adoption of proper farm management practices
7. Monitoring of regulations of waste disposals and provision of waste disposal measures.

Kermanshah Provincial Directorate of Environment and Kermanshah Jihad-e-Agriculture Organization shall coordinate together in establishing EMMS for the Province.

A6.3.6 Positive Impacts of the Project

The agriculture development through irrigation and drainage projects will have the following the significant positive effects in the Study Area and the region:

- Increased food production through the effective utilization of the wide area of the plain
- Settlement of the people who have a strong nomadic culture
- New economic activities through marketing and agriculture processing
- Expansion of employment opportunities of the local population
- Substantial improvement in way of life
- Reduction of inundation and flood by watershed management projects

In line with the Government policy of agriculture development of the region, the positive impacts due to the projects weigh much higher than the negative impacts to be caused by the project. However, suitable monitoring and management system of environment is necessary for the sustainable development of the region.

A6.3.7 Necessity of Environmental Impact Assessment (EIA)

As per the regulations of Iran, EIA needs to be executed for the following projects related to irrigation and drainage and agriculture development.

- New irrigation/drainage project, which exceeds the size of 5000 ha or more.
- Dam of more than 15m high with area more than 400 ha area
- Man-made lake with area more than 400 ha area

At the present stage of the Study, the scope of the Project such as the size of the project, necessity of constructing dams etc. is not yet finalized. At the end of the phase-1 study, the candidate sites for the Phase-II feasibility study will be selected. If the Kilanbar or Gharab dam sites will be selected, then EIA should be conducted, since the proposed dam heights are higher than the EIA standard height of 15 m. Some of the main features of Kilanbar and Gharab dam are mentioned below:

Features of Kilanbar Dam and Gharab Dam (proposed by a study)

Main Features	Kilanbar Dam	Gharab Dam
Dam Height	33 m	23.3
Crest Length	630 m	400 m
Reservoir area	200 ha	67.70 ha
Reservoir Volume	14.0 MCM	4.5 MCM
Watershed Area	10,776 ha	4,944 ha
Irrigation area	2000 ha	420 ha

Note : Data is based on previous studies by Jihad-e-Agriculture Organization

During the participatory workshop in Reis village, which is located within 1 km at the downstream part of the dam site, the farmers expressed their concern about the compensation for the loss of their land due to submergence after construction of dam. It is also reported that a part of the village Kilanabar Oliya, which is at the upstream side of Kilanbar dam site will be submerged. The average elevation of the village is 1,420 m, which is about 20 m higher than the estimated highwater level of 1,398m. In regard to Gharab dam site, only a small part of the cultivated land will be submerged and there is no other submergence problem.

Based on the results of the Phase-I Study, the candidate sites for the Phase-II Feasibility Study will be selected. If Kilanbar or Gharab dam sites will be selected, then EIA should be conducted, since the proposed dam heights are higher than the EIA standard height of 15 m. EIA should be carried out and should be submitted to the directorate of environment, before the implementation of the project.

Table A6.2.1 Results of Water Quality Survey in the Study Area (1st Field Survey, Jan-Feb 2003)

Sample No.	Source	pH	EC mS/cm	SAR	SSP %	Classification (**)	Cations and Anions, milliequivalents per liter								Nutrients/Elements, Parts Per Million (P.P.M)							TDS mg/l	DO	Temp Deg C	
							Na ⁺	Ca ⁺⁺ +Mg ⁺⁺	Sum Catio	Cl ⁻	SO ₄ ⁻	CO ₃ ⁻	HCO ₃ ⁻	Sum Anio	N	P	K	Fe	Mn	Cu	Zn				B
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(8)	(9)	(11)	(12)	(13)		(14)	(16)	(17)	(18)	
W1	Main Spring in Ravansar	7.50	0.250	0.04	1.56%	C1S1	0.06	3.80	3.86	0.35	0.00	0.00	3.50	3.85	9.10	0.00	0.60	0.05	0.00	0.00	0.00	0.09	160	10.81	14.4
W2	Spring Jaberi near Ravansar	7.65	0.245	0.04	1.29%	C1S1	0.05	3.80	3.85	0.35	0.00	0.00	3.50	3.85	23.80	0.24	0.60	0.02	0.00	0.00	0.00	0.29	157	7.00	15.9
W3	River Near Khorram Abad	8.75	0.245	0.05	1.72%	C1S1	0.07	4.00	4.07	0.25	0.00	0.80	3.00	4.05	13.30	0.41	0.60	0.03	0.00	0.00	0.00	0.21	157	-	-
W4	Well near Tam Tam (deep well >100 m)	7.95	0.320	0.17	5.26%	C2S1	0.25	4.50	4.75	0.50	0.00	0.30	4.00	4.80	-	-	-	-	-	-	-	-	205	-	-
W5	River Near Karim Abad	8.00	0.280	0.04	2.22%	C2S1	0.10	4.40	4.50	0.35	0.15	0.00	4.00	4.50	22.40	0.09	1.00	0.11	0.00	0.00	0.00	0.02	179	8.10	9.6
W6	Canal Tapeh Rask	8.83	0.275	0.11	3.84%	C2S1	0.15	3.75	3.90	0.40	0.00	0.55	2.95	3.90	18.20	0.00	1.30	0.07	0.00	0.00	0.00	0.21	176	19.00	4.0
W7	Canal at Tapeh Kuik	7.00	0.380	0.14	4.45%	C2S1	0.22	4.8	4.97	0.50	0.00	0.00	4.47	4.97	24.50	0.14	1.30	0.03	0.00	0.00	0.00	0.00	243	9.41	2.9
W8	Gharasu River near Tapeh Lori	8.42	0.300	0.10	3.10%	C2S1	0.15	4.70	4.85	0.40	0.25	0.50	3.70	4.85	20.30	0.33	2.00	0.07	0.00	0.00	0.00	0.00	192	10.05	7.0
W9	River at Goraz Abad	7.95	0.320	0.10	3.10%	C2S1	0.15	4.8	4.90	0.35	0.15	0.00	4.40	4.90	-	-	-	-	-	-	-	-	205	-	-
W10	Gharab River	8.35	0.340	0.17	5.26%	C2S1	0.25	4.50	4.75	0.50	0.00	0.45	3.80	4.75	18.90	0.28	2.60	0.06	0.00	0.00	0.00	0.17	218	14.10	10.0
W11	Spring near Kareh Galeh Sefid	8.00	0.330	0.15	4.48%	C2S1	0.23	4.90	5.13	0.40	0.00	0.30	4.40	5.10	30.10	0.23	0.06	0.00	0.00	0.00	0.00	0.00	211	-	-
W12	Kilanbar River	8.10	0.285	0.15	5.00%	C2S1	0.20	3.80	4.00	0.50	0.00	0.15	3.30	3.95	23.80	0.10	2.00	0.10	0.00	0.00	0.00	0.36	182	13.65	4.0
W13	River near Kolah Kabood	7.95	0.290	0.71	2.44%	C2S1	0.10	4.0	4.10	0.35	0.15	0.00	3.60	4.10	-	-	-	-	-	-	-	-	186	4.35	12.8
W14	Well near Shaleh (deep well >100 m)	7.60	0.350	0.18	5.35%	C2S1	0.28	4.95	5.23	0.70	0.00	0.00	4.50	5.20	-	-	-	-	-	-	-	-	224	-	-
W15	River at Kalave Haiderkhan	7.60	0.315	0.17	5.49%	C2S1	0.25	4.3	4.55	0.30	0.30	0.00	4.55	5.15	23.80	0.89	4.00	0.10	0.00	0.00	0.00	0.33	202	-	-
W16	Well near Siah Siah (deep well >100 m)	7.50	0.290	0.20	6.86%	C2S1	0.28	3.8	4.08	0.50	0.00	0.00	3.58	4.08	19.60	0.00	0.60	0.01	0.00	0.00	0.00	0.18	186	6.00	14.5
W17	Spring at Chagha Gazan	8.25	0.320	0.09	2.96%	C2S1	0.11	3.6	3.71	0.40	0.00	0.30	3.00	3.70	-	-	-	-	-	-	-	-	205	16.00	6.0
W18	Well near Khaibar (shallow well - 12m)	6.80	3.030	2.40	19.48%	C4S2	12.00	49.6	61.60	24.60	27.00	0.00	10.00	61.60	21.00	0.00	49.00	0.04	0.00	0.01	0.01	0.20	1,939	-	-

Table A6.2.2 Results of Gharasu River Water Quality Survey Made by Kermanshah Environmental Research Center

Sample No. (1)	pH (3)	EC mS/cm (4)	Turbidity ntu (5)	DO mg/l (6)	BOD mg/l (7)	COD mg/l (8)	TSS mg/l (9)	TDS mg/l (10)
May-97								
1	8.20	0.327	3	9.8	Trace	Trace	8.0	226
2	8.40	0.315	4	9.6	10	12	24.3	204
3	8.10	0.371	91	7.8	10	10	116.0	238
4	8.40	0.842	47	7.2	8	20	36.0	598
5	8.30	0.402	98	6.8	10	8	102.1	264
6	8.30	0.458	127	7.1	Trace	8	114.3	321
7	8.20	0.325	20	9.4	Trace	10	22.7	215
8	8.50	0.392	103	8.9	8	10	63.3	267
9	8.70	0.309	77	8.4	10	10	58.1	223
10	8.80	0.383	60	6.4	20	24	54.7	265
11	8.70	0.385	72	7.2	Trace	15	39.3	249
12	8.60	0.381	68	8.2	Trace	8	21.6	271
Jun-97								
1	7.90	0.325	3	9.8	8	10	16.5	231
2	7.50	0.505	4	9.8	13	20	21.7	346
3	7.50	0.581	39	8.1	8	14	64.6	442
4	7.90	0.584	62	6.2	16	24	108.4	402
5	8.10	0.839	37	8.2	18	30	74	513
6	8.00	0.397	49	8.6	16	28	52.1	293
7	8.20	0.554	27	7.1	20	32	36.2	405
8	8.10	0.572	28	7.2	20	32	24.5	397
9	7.70	0.625	14	6.2	34	44	39.8	459
10	7.60	0.644	6	7.4	10	20	17.0	467
11	8.90	0.584	3	8.4	6	10	8.4	424

Sample No. (1)	pH (3)	EC mS/cm (4)	Turbidity ntu (5)	DO mg/l (6)	BOD mg/l (7)	COD mg/l (8)	TSS mg/l (9)	TDS mg/l (10)
Aug-97								
1	7.80	0.306	2	9.6	8	16	3.1	200
2	7.50	0.375	2	9.0	16	30	4.0	254
3	7.80	0.382	14	7.6	10	22	6.0	243
4	7.60	0.426	29	8.9	14	28	2.4	279
5	7.70	0.496	32	7.4	18	32	4.0	352
6	8.30	0.439	30	6.9	21	40	3.6	273
7	7.40	0.857	44	4.6	36	62	10.7	532
8	7.20	0.798	13	7.1	24	28	5.6	557
9	7.50	0.737	16	8.4	8	15	3.4	510
Nov-97								
1	7.60	0.339	6	9.2	16	20	3.4	212
2	8.10	0.358	19	9.1	16	26	12.6	232
3	8.30	0.482	51	7.9	16	28	64.1	334
4	8.50	0.738	21	7.3	14	24	19.5	453
5	8.20	0.539	45	6.9	20	30	28.5	337
6	8.40	0.587	43	7.3	26	30	36.2	369
7	7.60	0.377	143	6.4	28	48	91.0	231
8	8.40	0.475	116	6.6	26	48	76.2	315
9	8.10	0.497	39	5.0	42	60	24.6	336
10	7.80	0.563	32	4.0	56	88	33.5	403
11	8.20	0.576	21	7.2	28	34	24.7	389
12	8.30	0.581	16	8.0	12	22	17.3	394

Table A6.2.3 Results of Water Quality Survey at the Ravansar Station in the Study Area by Water Organization

Date	pH	EC MicroS/ cm	SAR	%Na	Classification (**)	Cations and Anions, milliequivalents per liter										TDS mg/l	Discharge m ³
						Na ⁺	Ca ⁺⁺	Mg ⁺⁺	Sum Cations	Cl ⁻	SO ₄ ²⁻	CO ₃ ⁻	HCO ₃ ⁻	Sum Anions			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
1991/1/26	8.0	0.398	0.08	2.78		0.11	2.70	1.15	3.96	0.15	0.71		3.05	3.91	255	1.453	
1991/3/2	8.3	0.313	0.06	2.55		0.08	2.40	0.65	3.13	0.17		0.4	2.5	3.07	200		
1992/7/20	7.7	0.39	0.12	4.12		0.16	2.86	0.86	3.88	0.28	0.27		3.3	3.85	249	1.03	
1992/9/29	8.3	0.384	0.1	3.66	C2S1	0.14	2.84	0.84	3.82	0.25	0.15	0.5	2.9	3.8	245	20l/s	
1992/1/30	7.5	0.364	0.06	2.22	C2S1	0.08	2.84	0.68	3.6	0.2	0.1		3.3	3.6	233	2.129	
1993/4/2	7.7	0.396	0.05	1.78	C2S1	0.07	2.54	1.42	3.93	0.2	0.3		3.4	3.9	253	4.856	
1993/11/3	7.5	0.398	0.12	4.04		0.16	2.80	1.00	3.96	0.3	0.27		3.35	3.92	254	1.806	
1993/1/25	7.1	0.368	0.06	2.2		0.08	3.10	0.46	3.64	0.2	0.53		2.85	3.58	235	4.307	
1993/2/28	7.9	0.379	0.09	3.19		0.12	3.28	0.36	3.76	0.22	0.3		3.2	3.72	242	4.544	
1994/4/11	7.4	0.371	0.04	1.62		0.06	3.00	0.64	3.7	0.17	0.43		3.05	3.65	237	7.006	
1994/7/31	8.2	0.391	0.1	3.61		0.14	3.00	0.74	3.88	0.2	0.15		3.4	3.85	250	0.03	
1994/11/9	7.1	0.365	0.07	2.76		0.1	2.90	0.62	3.62	0.2	0.25		3.5	3.6	233	5.403	
1994/11/29	8.0	0.342	0.06	2.38		0.08	2.80	0.48	3.36	0.15	0.24		2.9	3.29	218	6.938	
1994/12/28	8.1	0.378	0.09	3.24		0.12	3.00	0.58	3.7	0.25	0.25		3.15	3.65	242	3.376	
1994/1/26	8.3	0.271	0.16	6.71		0.18	1.74	0.76	2.68	0.15	0.3	0.6	1.6	2.65	173	4.365	
1995/5/4	7.9	0.296	0.17	6.89		0.2	1.95	0.75	2.9	0.27	0.27		2.3	2.84	189	7.222	
1995/11/5	7.9	0.32	0.14	5.39		0.17	1.90	1.08	3.15	0.18	0.21		2.7	3.09		0.644	
1995/12/17	7.6	0.408	0.11	3.74		0.15	2.82	1.04	1-Apr	0.25	0.2		3.5	3.95		0.356	
1995/1/15	7.6	0.375	0.15	5.4		0.2	2.10	1.40	3.7	0.2	0.18		3.25	3.63		0.392	
1995/2/10	7.4	0.378	0.17	5.91		0.22	2.17	1.33	3.72	0.28	0.18		3.2	3.66		1.843	
1995/3/1	7.7	0.361	0.21	7.6		0.27	2.40	0.88	3.55	0.3	0.23		2.95	3.48		3.231	
1996/4/8	7.2	0.364	0.13	4.73		0.17	2.60	0.82	3.59	0.19	0.23		3.1	3.52		6.026	
1996/4/23	7.2	0.422	0.13	4.55		0.19	2.78	1.20	4.17	0.23	0.2		3.7	4.13		8.322	
1996/6/6	7.3	0.36	0.14	5.1		0.18	2.35	1.00	3.53	0.25	0.11		3.1	3.46		2.548	
1996/7/14	7.6	0.335	0.1	3.93		0.13	2.20	0.97	3.3	0.19	0.13		2.9	3.22		0.413	
1996/8/18	7.4	0.329	0.12	4.63		0.15	2.27	0.82	3.24	0.17	0.2		2.8	3.17		0.376	
1996/10/22	7.9	0.473	0.14	4.406		0.21	3.10	1.40	4.71	0.25	0.4		4	4.65	302	0.35	
1996/12/15	7.3	0.429	0.1	3.28		0.14	2.68	1.44	4.26	0.2	0.2		3.5	4.2	274	0.823	
1996/1/13	7.5	0.375	0.09	3.22		0.12	2.75	0.85	3.72	0.25	0.13		3.3	3.68	240		
1997/11/17	7.3	0.337	0.14	5.37		0.18	2.54	0.63	3.35	0.17	0.1		3.05	3.32	215	1.475	
1997/1/17	7.5	0.326	0.12	4.62		0.15	2.70	0.39	3.24	0.15	0.09		2.95	3.19	208	2.196	
1997/2/14	7.7	0.311	0.1	3.98		0.12	2.48	0.48	3.08	0.12	0.1		2.8	3.02	199	5.058	
1998/4/15	7.3	0.333	0.086	3.32		0.11	2.71	0.49	3.31	0.14			3.15	3.29	213	6.918	
1998/5/19	7.8	0.341	0.15	5.63		0.19	2.76	0.42	3.37	0.17	0.07		3.1	3.34	218	3.559	
2002/11/21	7.5	0.342	0.24	8.87	C2S1	0.3	2.00	1.08	3.38	0.35	0.2		2.8	3.35	219	0.11	

Table A6.2.4 Iran Water Quality Standard for Discharge Water

Item	Pollutants	Discharged to surface water , mg/l	Dicharged to wells, mg/l	Used in Agriculture and Irrigation, mg/l	Item	Pollutants	Discharged to surface water , mg/l	Dicharged to wells, mg/l	Used in Agriculture and Irrigation, mg/l
1	Silver (Ag)	1	0.1	0.1	24	Nitrite Nitrogen (NO ₂)	10	10	-
2	Aluminium (Al)	5	5	5	25	Nitrate Nitrogen (NO ₃)	50	10	-
3	Arsenic (As)	0.1	0.1	0.1	26	Phosphate (based on Phosphur)	1	1	
4	Boron (B)	2	1	1	27	Lead (Pb)	1	1	1
5	Barium (Br)	5	1	1	28	Selenium (Se)	1	0.1	0.1
6	Beryllium (Be)	0.1	1	0.5	29	Sulphide (SO ₃ -)	1	1	1
7	Calcium (Ca)	75	-	-	30	Sulphate (SO ₄ -)	400	400(note2)	500
8	Cadmium (Cd)	0.1	0.1	0.05	31	Vanadium (V)	0.1	0.1	0.1
9	Chloride (free)	1	1	0.2	32	Zinc (Zn)	2	2	2
10	Chloride (Cl-)	600 (note 1)	600 (note 2)	600	33	Greasy and oily matte	10	10	10
11	Cyanide (Cn)	0.5	0.1	0.1	34	Detergent (ABS)	1.5	0.5	0.5
12	Cobalt (Co)	1	1	0.05	35	Biological Oxygen Demand (BOD ₅)	50	50	100
13	Chromium (Cr+6)	0.5	1	1	36	Chemical Oxygen Demand (COD)	100	100	200
14	Cr+3	2	2	2	37	Dissolved Oxygen (DO)	2	-	2
15	Copper (Cu)	1	1	0.2	38	Total Dissoloved Solids (TDS)	note 1	note 2	-
16	Flouride (F)	2.5	2	2	39	Total Suspended Solids (TSS)	40	-	100
17	Iron (Fe)	3	3	3	40	pH	6.5-8.5	5 to 9	6-8.5
18	Mercury (Hg)	very low	very low	very low	41	Turbidity (NTU)	50	-	50
19	Magnesium (Mg)	100	100	100	42	Colour (PTC)	75 clour units	75 clour units	75 clour units
20	Manganese (Mn)	1	1	1	43	E-Coli (Nos. in 100 m	400	400	400
21	Molybdenum (Mo)	0.01	0.01	0.01	44	MPN (Nos. in 100 ml)	1000	1000	100
22	Nickel (Ni)	2	2	2	45	Parasitic worm eggs (nematode)	1/ 1000 ml	1/ 1000 ml	1/ 1000 ml
23	Ammon. Nitrogen (NH ₄ -N)	2.5	1	-					

Note 1: Discharge with concentration level in excess of the level specified in the table shall be permissible, if the discharge does not increase the chloride sulfate and dissoloved substances of the receiving body at a 200m diameter, in excess of 10%.

Note 2: Discharge with concentration level in excess of the level specified in the table shall be permissible, if the increase induced by dishcharge of the choloride sulphate and dissolved substances in the consumed water does not exceed 10%.

Ref : The Executive Bylaws for Paragraph (C) of Article 104 and Article 134, DOE (2001)

Table A6.2.5 Guideline for Interpretations of Water Quality for Irrigation

Potential Irrigation Problem	Degree of Restriction on Use		
	None	Slight to Moderate	Severe
Salinity			
EC, mS/cm	<0.7	0.7 – 3.0	>3
Total Dissolved Solids, TDS, mg/l	<450	450-2000	>2000
Specific Ion Toxicity (affects sensitive crops)			
Sodium (Na+) (adj. SAR)			
Surface irrigation	<3	3-9	>9
Sprinkler Irrigation	<3	>3	>9
Chloride (Cl-), meq./lit			
Surface irrigation	<4	4-10	>10
Sprinkler Irrigation	<3	>3	>10
Miscellaneous Effect (Affects susceptible crops)			
Nitrate – N (NO ₃ -N), mg/l	<5	5-30	>30
Bicarbonate (HCO ₃), me/l (Overhead sprinkling)	<1.5	1.5-8.5	>8.5
pH	Normal range 6.5 – 8.4		

(Source : Water Quality for Agriculture, FAO Irrigation and Drainage Paper No.29)

Table A6.2.6 Recommended Maximum Concentrations of Trace Elements in Irrigation Water

Element	Recommended Max. Con. (mg/l)	Remarks
Copper (Cu)	0.20	Toxic to a number of plants at 0.1 to 1.0 mg/l in nutrient solutions
Zinc (Zn)	2.0	Toxic to many plants at widely varying concentrations
Manganese (Mn)	5.0	Toxic to a number of crops at a few-tenths to a few mg/l, but usually only in acid soils
Iron (Fe)	5.0	Not toxic to plants in aerated soils, but can contribute to soil acidification and loss of availability of essential phosphorus and molybdenum. Overhead sprinkling may result in deposits on plants and equipment.

(Source : Water Quality for Agriculture, FAO Irrigation and Drainage Paper No.29)

Table A6.3.1 Joint Screening Checklist (1)

1) The Study Title : The Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province

2) Name of the Country : The Islamic Republic of Iran

3) Criteria on IEE and EIA in the Recipient Country

Project Component	Development Type	Development Scale which requires	
		IEE	EIA
Irrigation	New Project	Discuss the necessity with Environment department	Above 5000 ha
	Rehabilitation		
Drainage	New Project	Discuss the necessity with Environment department	Above 5000 ha
	Rehabilitation		
Land Clearing & Leveling	New Project	Discuss the necessity with Environment department	Discuss the necessity with Environment department
	Rehabilitation		
Sea/Swamp reclamation	New Project	Discuss the necessity with Environment department	Discuss the necessity with Environment department
	Rehabilitation		
Land Consolidation	New Project	Discuss the necessity with Environment department	Discuss the necessity with Environment department
	Rehabilitation		
Settlement	New Project	Discuss the necessity with Environment department	Discuss the necessity with Environment department
	Rehabilitation		
Dam and reservoir	New Project	Discuss the necessity with Environment department	Area of above 400 ha
	Rehabilitation		Dams of more than 15m high
Substantial Changes in Farming System	New Project	Discuss the necessity with Environment department	Discuss the necessity with Environment department
	Rehabilitation		
Others	New Project	Discuss the necessity with Environment department	Discuss the necessity with Environment department
	Rehabilitation		

4) Area under specific designation

Environmentally Sensitive Area	Applicable or Not	
	In the project Area	Vicinity of Project Area
a. Habitat of fauna and flora listed in CITES	applicable	applicable
b. Wetland designated in Ramsar Convention	not applicable	not applicable
c. National Park, natural reserve, etc.	not applicable	not applicable
d. Others	not applicable	not applicable

Table A6.3.2 Joint Screening Checklist (2) (1/2)

Environmental Issues	Potential SEI	Evaluation	Evaluation Bases
I Social Environment			
1. Socioeconomic Issues			
Will the Project significantly affect socioeconomic activities in and around the Project site, such as daily human life, economic activities, transportation, community, institution, customary practices?	1. Planned agricultural settlement	No	
	2. Involuntary resettlement	Not confirmed	
	3. Substantial changes in way of life	Yes	Positive Impact
	4. Conflict among communities or people	Yes	Conflict between upstream and downstream area
	5. Impact on ethnic minorities, nomads	No	
	6. Population increase	Yes	Migration to cities will be prevented.
	7. Drastic changes in population composition	No	
	8. Relocation of bases of economic activities	Yes	Positive Impact
	9. Occupational change, loss of labor opportunity	Yes	Positive Impact
	10. Increase in income disparities	No	
	11. Adjustment and regulation of water or riparian rights	Yes	
	12. Changes in social and institutional structures	Yes	Positive Impact
	13. Changes in existing institutions and customs	No	
2. Health and Sanitary Issues			
Will the Project significantly affect hygiene in and around the Project area or induce water related diseases?	1. Increased use of agrochemicals	Yes	Due to fertilizer and agrochemicals use
	2. Outbreak of endemic diseases	No	
	3. Prevalence of epidemic diseases	No	
	4. Residual toxicity of agrochemicals	Yes	Due to fertilizer and agrochemicals use
	5. Increase in domestic and other human wastes	Yes	Because of population increase
3. Cultural Issues			
Are any historically, culturally, aesthetically or scientifically important areas situated in the Project site?	1. Impairment of historic remains and cultural assets	No	
	2. Damage to aesthetic sites	No	
	3. Impediment of mineral resources exploitation	No	

Table A6.3.2 Joint Screening Checklist (2) (2/2)

Environmental Issues	Potential SEI	Evaluation	Evaluation Bases
II Natural Environment			
4. Biological and Ecological Issues			
Are any habitats for rare species or ecologically sensitive areas located in the Project or surrounding areas?	1. Deterioration or degradation of vegetation	No	
	2. Negative impacts on important fauna and flora	No	
	3. Degradation of ecosystem with biological diversity	No	
	4. Proliferation of exotic and hazardous species	No	
	5. Encroachment on wetland and peat swamp	No	
	6. Encroachment on tropical forests	No	
	7. Destruction or degradation of mangrove forests	No	
	8. Degradation of coral reef	No	
5. Soil and Land Resources			
Will the Project significantly induce land devastation, soil erosion, soil contamination, etc.?	1. Soil erosion	Yes	
	2. Soil salinization	Yes	
	3. Deterioration of soil fertility	No	
	4. Soil contamination by agrochemicals	Yes	Due to fertilizer and agrochemicals use
	5. Devastation or desertification of land	No	
	6. Devastation of hinterland	No	
	7. Ground subsidence	No	
6. Hydrology and Air and Water Quality Issues			
Will the Project significantly affect hydrological regime of river, lake and swamp, and groundwater hydrology or the atmosphere?	1. Changes in surface water hydrology	Yes	
	2. Changes in groundwater hydrology	Yes	
	3. Inundation and flood	Yes	Positive Impact; Inundation conditions will be reduced.
	4. Soil sedimentation	Yes	
	5. Riverbed degradation	No	
	6. Impediment of inland navigation	No	
	7. Water contamination and deterioration of water quality	Yes	Due to fertilizer and agrochemicals use
	8. Water eutrophication	Yes	Due to fertilizer and agrochemicals use
	9. Sea water intrusion	No	
	10. Low irrigation water temperature	No	
	11. Atmospheric pollution	Yes	Due to fertilizer use
Overall evaluation			

Table A6.3.3 Joint Scoping Check List (1/2)

- 1) Applicable development activities : Irrigation, drainage,
- 2) Applicable development type : New project, Rehabilitation
- 1) Applicable environmentally sensitive areas : Arid and semi-arid lands

I Social Environment

Category of Environmental Impact		Evaluation of SEI 1*				Evaluation Base 2*
		A	B	C	D	
1. Socioeconomic Issues						
(1) Social Aspects						
1.	Planned Agricultural Settlement		X			Positive impact
2.	Involuntary resettlement			X		
3.	Substantial changes in way of life	X				Positive impact
4.	Conflict among communities and people		X			
5.	Impacts on ethnic minorities and nomads			X		
6.	Others			X		
(2) Demographic Issues						
1.	Population Increase		X			Migration to cities will be prevented.
2.	Drastic changes in population composition			X		
3.	Others			X		
(3) Economic Activities						
1.	Relocation of bases of economic activities		X			Positive impact
2.	Occupational change, loss of labor opportunity		X			Positive impact
3.	Increase in income disparities			X		
4.	Others			X		
(4) Institutional and Customs related issues						
1.	Adjustment and regulation of water or fishing rights	X				
2.	Changes in social and institutional structures		X			
3.	Changes in existing institutions and customs			X		
4.	Others			X		
2. Health and Sanitary Issues						
1.	Increased use of agrochemicals	X				Due to fertilizer and agrochemicals use
2.	Outbreak of endemic diseases			X		
3.	Prevalence of epidemic diseases			X		
4.	Residual toxicity of agrochemicals	X				Due to fertilizer and agrochemicals use
5.	Increase in domestic and other human wastes		X			Because of population increase
6.	Others			X		
3. Cultural Issues						
1.	Impairment of historic remains and cultural assets			X		
2.	Damage to aesthetic sites			X		
3.	Impediment of mineral resources exploitation			X		
4.	Others			X		

1* Applicable columns with the following impact degree are marked with 'x'

- A: The subject SEI is unquestionably induced by the Project
- B: The subject SEI is likely to be induced by the Project
- C: There is no possibility of the subject SEI being induced by the Project
- D: The SEI is unknown

2* Potential Impacts are stated referring to 'Significant Environmental Impacts and Issues'

Table A6.3.3 Joint Scoping Check List (2/2)

- 1) Applicable development activities : Irrigation, drainage,
 2) Applicable development type : New project, Rehabilitation
 1) Applicable environmentally sensitive areas : Arid and semi-arid lands

II Natural Environment

Category of Environmental Impact	Evaluation of SEI 1*				Evaluation Base 2*
	A	B	C	D	
4. Biological and Ecological Issues					
1. Deterioration or degradation of vegetation			X		
2. Negative impacts on important or ind. fauna and flora			X		
3. Degradation of ecosystem with biological diversity			X		
4. Proliferation of exotic and/or hazardous species			X		
5. Encroachment of wetland and peat swamp			X		
6. Encroachment on tropical forests			X		
7. Destruction or degradation of mangrove forests			X		
8. Degradation of coral reef			X		
9. Others			X		
5. Soil and Land Resources					
(1) Soil Resources					
1. Soil erosion		X			
2. Soil salinization	X				
3. Deterioration of soil fertility			X		
4. Soil contamination by agrochemicals	X				Due to fertilizer and agrochemicals use
5. Others			X		
(2) Land Resources					
1. Devastation or desertification of land			X		
2. Devastation of hinterland			X		
3. Ground subsidence			X		
4. Others			X		
6. Hydrology and Air and Water Quality Issues					
(1) Hydrology					
1. Changes in surface water hydrology	X				
2. Changes in groundwater hydrology	X				
3. Inundation and flood	X				Positive impact
4. Soil sedimentation	X				
5. Riverbed degradation			X		
6. Impediment of Inland navigation			X		
7. Others			X		
(2) Water quality and temperature					
1. Water contamination and deterioration of water quality	X				Due to fertilizer and agrochemicals use
2. Water eutrophication	X				Due to fertilizer and agrochemicals use
3. Sea water intrusion			X		
4. Low irrigation water temperature			X		
5. Others			X		
(3) Atmosphere					
1. Atmospheric pollution		X			Due to fertilizer and agrochemicals use
2. Others			X		

1* Applicable columns with the following impact degree are marked with 'x'

- A: The subject SEI is unquestionably induced by the Project
 B: The subject SEI is likely to be induced by the Project
 C: There is no possibility of the subject SEI being induced by the Project
 D: The SEI is unknown

2* Potential Impacts are stated referring to 'Significant Environmental Impacts and Issues'

Table A6.3.4 Site Description (SD) - 1/2

1.	Study Title (Project Name) : The Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province	
2.	Present Socioeconomic Status of the Study Area	
(1)	Land ownership, etc.	In the Study Area, mostly the lands are owned by individual land owners.
(2)	Economic activities in and around the Study	Agriculture and animal husbandry are the primary economic activities in and around the Study Area. There are also activities of trade and services, and lime factories in the Study Area.
(3)	Customs (riparian rights, water rights etc.)	In regard to water rights, Kermanshah Province Water Organization is responsible for regulating water. The famers pay the 'water fee' to the Water Organization. Since there is no clear direction on the water use, the farmers at the upstream side are more benefited, which also create social problems.
(4)	Community or Host people	Mostly the people of Kurdish origin live in and around the Study Area.
(5)	Public Hygiene and Health	Well water and spring water is used as drinking water. There are no proper drainage facilities in the villages and the house garbage are thrown into rivers, springs and canals which pollute the water.
(6)	Population	The rural popuplation of the Study Area is 10,235 (1997, estimated by MPO)
3.	Natural Conditions of the Study Area	
(1)	Climate	Described in detail in the main report & Annex 2.
(2)	Topography	Described in detail in the main report & Annex 2.
(3)	Hydrology and Drainage	Described in detail in the main report & Annex 2.
(4)	Soils	The soils are deep soils with heavy texture. Most of the soils are clay or silty clay.
(5)	Vegetation	Agriculture is mostly practiced in the Study Area with the main crops of wheat, barley, corn etc.
(6)	Rare species or fragile ecology	There is no environmentally sensitive area in the Study Area. However, There is also an unique wetland, which is called as 'Hashilan', which is located at about 30 km of the Study Area.

Table A6.3.4 Site Description (SD) - 2/2

Environmentally Sensitive Areas in the Project Site or Vicinity

Environmentally Sensitive Area		Applicable or Not					
		In the Project Area			Vicinity of Project Area		
		Appl.	Not App.	Unknown	Appl.	Not App.	Unknown
Area under specific designation							
S1.	Habitat of fauna and flora listed in CITES		X		X		
S2.	Wetland designated under the Ramsar Convention		X		X		
S3.	Heritage sites listed in the World Heritage Convention		X			X	
S4.	National park, natural reserve, etc.		X		X		
S5.	Others		X			X	
Socioeconomically sensitive area							
S6.	Areas inhabited by indigenous people, ethnic minorities, nomads etc.		X			X	
S7.	Historical remains, cultural assets, aesthetic sites		X			X	
S8.	Area likely to suffer from significant negative economic impact		X			X	
S9.	Others		X			X	
Environmentally sensitive natural land							
S10.	Arid and semi-arid lands (incl. savanna, rangeland, etc.)	X			X		
S11.	Tropical forests and wildlands		X			X	
S12.	Wetlands or peat lands						
	Wetlands	X			X		
	Peat lands		X			X	
S13.	Coastal zones						
	Mangrove forests		X			X	
	Coral reefs		X			X	
S14.	Mountainous, steep sloped, erodible or devastated lands		X			X	
S15.	Closed water bodies such as lakes, swamps or reservoirs		X		X		
S16.	Others		X			X	

Annex 7

Soil and Water Quality Survey

ANNEX 7

SOIL AND WATER QUALITY SURVEY

A7.1 Soil Survey

A7.1.1 Soil Survey Carried Out in the Study Area

Soil profile survey is carried out at 18 locations as shown in the figure, and soil samples were collected from each profile and detailed soil analyses were carried out in the laboratory.

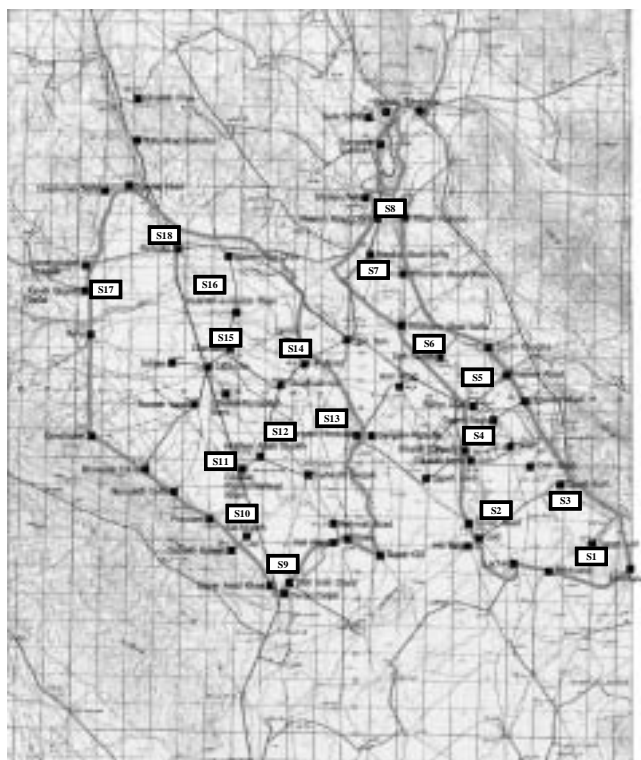
The site characteristics of the Soil Profiles Surveyed in the Study Area are shown in Table A7.1.1. The results of the soil analysis for the 18 profile locations are shown in Tables A7.1.2. Interpretation of soil analysis in the Kermanshah province is shown in Table A7.1.3 and the fertilizer recommendation is normally made based on this interpretation. The results of the infiltration rate are shown in Table A7.1.4. The results of the soil profile examination is shown in Table A7.1.5.



A7.1.2 Characteristics of the Soils of the Study Area

Based on the results of the soil survey, field survey, and the other information collected, the characteristics of the soils of the Study Area are described below.

The soils in the Study Area are mostly classified as Vertic Haploxerepts and Vertic Calcixerolls. Most of the land class of the soil is 4 vh/A₁-E₀ IIst (permeability = 4 (slow-0.1-2.0 cm/h), vh – very heavy soil, slope A1 = 0-2%; E₀ – No erosion; Land class – II with limitation of soil and topography). There are also other land classes in the areas near Kola kabood (profile 8), Deh Rash (profile 13) and Kare Kaleh Sefid (profile 17), which fall in the land class III mainly due to high topographic limitation. The climate is Mesic Xeric (soil temperature Mesic - 8-15°C; soil moisture – Xeric – deficient water with dry cropping season) and the drainage condition is poor because the high clay content of the soil. Although there are some areas with higher slope, most of the study area is plain with a slope of less than 1%.



Location of the Soil Survey Carried out in the Study Area (Feb, 2003)

The erosion is less and run off is slow. Subsoil permeability is slow in the range of 0.1 – 2.0 cm/h.

As mentioned in Table A7.1.2, the pH of the soils are mostly in the neutral range (7.0) and in some cases, it is slightly higher than 7.5. Above pH 7.0, there is an increasing liability of deficiency of micronutrients. EC of the soils are in the lower range of less than 2 mS/cm and the average value is about 0.5 mS/cm. Therefore, the salinity effects are mostly negligible. The average value of Cation Exchange Capacity (CEC) is about 25 me/100g and therefore, the general fertility of these soils can be considered as medium. The average level of organic carbon is 0.86% and total nitrogen is 0.08% which are in the lower to medium level. Phosphorus is in the medium level of about 7.3 ppm and potassium is in the higher level of above 200 ppm. While comparing the level of micronutrients, iron and manganese are in the average range of 10 ppm, and the average of copper is in the higher range of 2 ppm. However, the average level of zinc is in the lower level of 0.50 ppm, which is less than the critical level of 1 ppm. Zinc deficiencies occur mostly in basic soils, and in soils cropped to high zinc demand plants, such as corn, sorghum etc.

The physical characteristics of the soils indicate the major limitation of these soils, which is the very heavy texture of the soils a high clay content. Except for the area around Jehan Abad (profile 14), all the area mostly have a very heavy texture soil of silty clay or clay with the average clay content of 48%. In Jehan Abad area, there are some locations with sands and these soils have a medium loam texture. It is the major limitation which restricts these soils to class II. The heavy clay content is seen in all the profiles of the soil. The heavy clay content restricts the movement of machinery and also causes poor aeration in the soil. The subsoil permeability is in the lower level of 0.1 to 2.0 cm/h. As shown in Table 3.2.4, the basic infiltration rate of the ploughed layer is in the moderately slow range of about 2.0 cm/h. Field capacity (FC) is about 33% (w/w (44% v/v)) and permanent wilting point is 16% (w/w (21% v/v)) and the average water holding capacity is 23 cm/m depth (6.8 cm at root zone depth of 30 cm).



Infiltration Test

A7.2 Water Quality Survey

A7.2.1 Water Quality Survey Carried Out in the Study Area

In order to analyze the water quality of the rivers, springs, canals and well water, water samples were taken during the 1st field survey in February 2003 in 18 locations as shown in the figure. The results of the water quality analysis are presented in Table A7.2.1.

The results of the water quality analysis conducted by the Kermanshah Provincial Directorate of Environment are shown in Table A7.2.2. The results of the water quality



Water Quality Survey

analysis conducted by the Kermanshah Water Organization are shown in Table A7.2.3. Iran Water Quality Standard for Discharge Water is shown in Table A7.2.4. Guideline for Interpretations of Water Quality for Irrigation is shown in and Recommended Maximum Concentrations of Trace Elements in Irrigation Water is shown in Table A7.2.5.

A7.2.2 Water Quality of the Study Area

According to USDA classification, the water of Gharasu river is in the range of C1S1 to C2S1, and the salinity of water is in the lower to medium level.

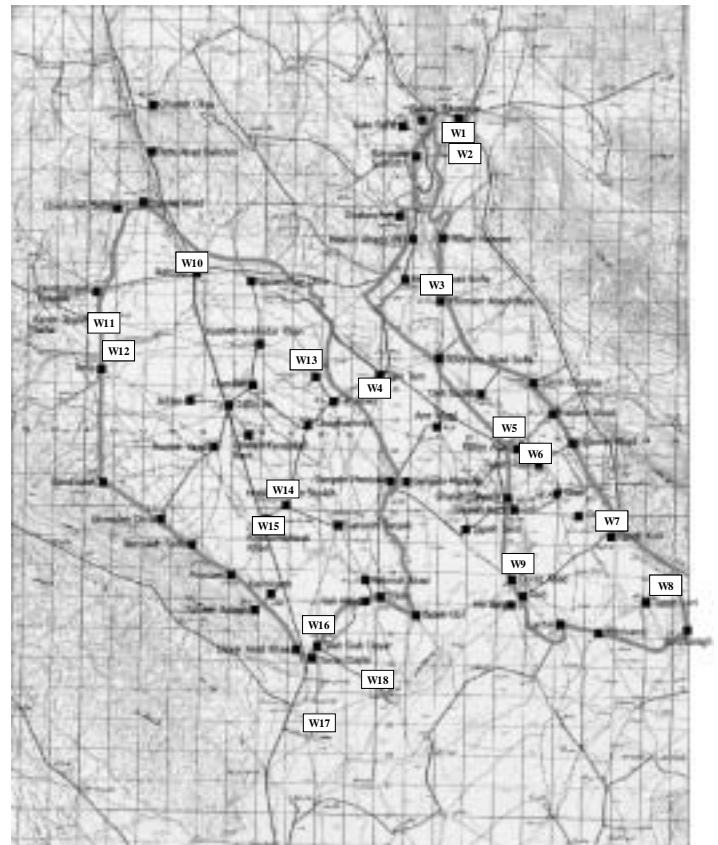
The EC values measured at different periods do not vary significantly and they are mostly lesser than the medium level of 0.75 mS/cm. Therefore, the irrigation water does not cause serious salinity problems, if the soils are properly drained. Only the shallow well located in the southern part outside the Study Area has a higher salinity (C4) with an EC of 3.03 mS/cm. However, during the field survey, it was reported that there is salinity problem only in that area.

pH of the water is within the normal range of 6.5 to 8.5, except for some cases (W3 – river near Khoram Abad and W-6 Canal Tapeh Rash) where the pH is above 8.5 mainly due to carbonate. Although there is a slight amount of nitrogen, the level of other elements including P,K, Fe, Mn, Cu, Zn and B are in a much lower or negligible level. Total dissolved solids (TDS) are lower than the critical level of 450 mg/l for irrigation water. Dissolved Oxygen (DO) values of the rivers and springs are higher than 5 mg/l for most cases. Biological Oxygen Demand (BOD) is much lower than the critical level of 50 mg/l. Similarly Chemical Oxygen Demand (COD) is also much lower than the critical level of 100 mg/l.

In general, it can be concluded that the water quality of both spring water and rive water is suitable for irrigation, although there are some water pollution problems caused by house wastes and agriculture drainage water.



Water Sampling in the Ravansar Spring



Locations of Water Quality Survey in the Study Area (Feb, 2003)

Table A7.1.1 Site Characteristics of the Soil Profiles Surveyed in the Study Area

	Location	Coordinates	Soil Classification	Land Class	Elevation m	Climate	Drainage	Natural Vegetation	Land Use	Relief	Slope	Erosion	Runoff	Flooding	Subsoil Permeability
1	Tapeh Lori	34°34'49" N 46°44'31" E	Vertic Haploxerepts	4vh/A ₁ -E ₀ IIst	1450	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
2	Goraz Abad	34°34'49" N 46°40'56" E	Vertic Calcixerolls	4vh/A ₁ -E ₀ IIst	1347	Mesic Xeric	Poor	Graminae/ legume	Wheat	1	0.8%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
3	Tapeh Quick	34°35'23" N 46°42'49" E	Vertic Haploxerepts	4vh/A ₁ -E ₀ IIst	1459	Mesic Xeric	Poor	Graminae/ legume	Wheat	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
4	Tapeh Rash	34°35'56" N 46°41'56" E	Vertic Haploxerepts	4vh/A ₁ -E ₀ IIst	1455	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
5	Hassan Abad	46°41'57" N 34°37'49" E	Vertic Haploxerepts	4vh/A ₁ -E ₀ IIst	1440	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
6	Deh Sadeh	46°41'57" N 34°37'49" E	Vertic Calcixerepts	4vh/A ₁ -E ₀ IIst	-	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
7	Khoram Abad	34°38'58" N 46°39'52" E	Vertic Haploxerepts	4vh/A ₁ -E ₀ IIst	1365	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.2%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
8	Kolah Kabood	34°40'05" N 46°39'30" E	Vertic Haploxerepts	4vh/cb ₁ -E ₁ IIIst	1426	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	6.0%	E ₁	Medium	No	4 (slow) 0.1- 2.0 cm/h
9	Siah Siah	34°35'42" N 46°36'59" E	Vertic Haploxerepts	4vh/A ₁ -E ₀ IIst	1332	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	0.8%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
10	Kuchi gineh	34°35'23" N 46°35'40" E	Vertic Calcixerolls	4vh/A ₁ -E ₀ IIst	1328	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
11	Ghale Khoda moratkhan	34°35'49" N 46°35'51" E	Vertic Calcixerolls	4vh/A ₁ -E ₀ IIst	1296	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
12	Shaleh	34°36'03" N 46°36'14" E	Vertic Calcixerolls	4vh/A ₁ -E ₀ IIst	1353	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.2%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
13	Deh Rash (Garghabi)	34°36'31" N 46°38'29" E	Vertic Calcixerolls	4h/B ₂ -E ₀ IIIst	1338	Mesic Xeric	Poor	Graminae/ legume	Wheat	2	2.5%	E ₀	Medium	No	4 (slow) 0.1- 2.0 cm/h
14	Jehan Abad	34°37'57" N 46°37'13" E	Vertic Haploxerepts	3I/A ₁ -E ₀ IIst	1335	Mesic Xeric	Well drained	Graminae/ legume	Wheat	1	0.7%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
15	Deh Cheragh	34°37'59" N 46°35'02" E	Vertic Calcixerolls	4vh/A ₁ -E ₀ IIst	1338	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
16	Kalaveh Hidarkhan	34°38'49" N 46°35'41" E	Vertic Haploxerolls	4h/A ₁ -E ₀ IIst	1335	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Medium	No	4 (slow) 0.1- 2.0 cm/h
17	Kare Galeh sefid	34°39'09" N 46°31'59" E	Vertic Calcixerepts	4vh/B ₁ -E ₁ IIIst	1338	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	3.0%	E ₀	Slow	No	4 (slow) 0.1- 2.0 cm/h
18	Nahrabi	34°40'17" N 46°34'17" E	Vertic Haploxerepts	4vh/A ₁ -E ₁ IIst	1355	Mesic Xeric	Poor	Graminae/ legume	Fallow	1	1.0%	E ₀	Slow to Medium	No	4 (slow) 0.1- 2.0 cm/h

Table A7.1.2 Results of Soil Analysis of Samples from the Study Area (1/2)

Profile No.	Depth	pH	EC	S.P	SAR	CaCO ₃	O.C	Total N	P (Ava)	K (Ava)	Fe (Ava)	Zn (Ava)	Cu (Ava)	Mn (Ava)	CEC
(1)	cm		mS/cm	%		%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	me/100 g
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1	0-25	6.95	0.400	60	0.14	9.0	1.06	0.11	9.6	510	7.3	0.80	2.40	8.6	29.0
	25-46	7.00	0.420	59	0.16	16.8	0.56	0.06	3.2	300	6.6	0.60	2.04	8.2	-
	46-75	7.25	0.430	56	0.13	13.8	0.59	0.06	3.0	290	7.8	0.52	1.94	8.4	-
	75-130	7.20	0.420	65	0.19	13.5	0.50	0.05	-	-	-	-	-	-	-
2	0-25	7.10	0.700	76	0.23	28.8	2.28	0.03	15.2	550	18.2	0.78	2.30	13.4	20.0
	25-45	7.25	0.500	68	0.40	52.2	1.04	0.10	9.0	210	18.0	0.38	2.06	8.6	-
	45-65	7.00	0.450	59	0.42	61.0	0.75	0.08	8.8	100	13.6	0.42	2.26	8.2	-
	65-90	7.25	0.450	53	0.47	60.0	0.54	0.05	-	-	-	-	-	-	-
	90-140	7.00	0.350	56	0.35	46.8	0.36	0.04	-	-	-	-	-	-	-
3	0-23	7.45	0.700	72	0.26	18.8	1.61	0.16	21.8	720	13.8	1.42	6.14	10.4	34.0
	23-48	7.45	0.430	64	0.38	20.8	0.63	0.06	7.6	390	11.6	0.52	2.68	4.7	-
	48-78	7.15	0.430	58	0.38	20.8	0.39	0.04	3.2	320	10.6	0.36	1.98	4.7	-
	78-135	7.20	0.460	67	0.40	22.0	0.59	0.06	-	-	-	-	-	-	-
4	0-23	7.50	0.500	65	0.14	9.2	1.29	0.13	4.4	450	12.6	0.38	2.28	12.4	26.0
	23-48	7.15	0.350	61	0.13	12.8	0.72	0.07	3.2	330	12.4	0.34	2.56	10.0	-
	48-75	7.15	0.450	61	0.15	13.2	0.63	0.06	2.8	310	12.2	0.34	2.32	9.8	-
	75-135	7.20	0.950	59	0.15	17.2	0.53	0.05	-	-	-	-	-	-	-
5	0-25	7.20	0.350	58	0.17	7.5	0.81	0.08	6.6	470	8.2	0.38	2.00	8.6	25.0
	25-50	7.20	0.350	60	0.15	10.2	0.63	0.06	4.8	410	8.8	0.44	2.20	8.4	-
	50-75	7.20	0.350	60	0.18	11.8	0.63	0.06	3.8	370	9.6	0.38	2.08	7.6	-
	75-130	7.15	0.350	61	0.17	12.0	0.48	0.05	-	-	-	-	-	-	-
6	0-30	7.05	0.550	62	0.12	17.5	1.58	0.18	5.2	350	11.4	0.90	2.16	13.6	25.0
	30-60	7.00	0.430	60	0.16	23.2	0.84	0.08	2.0	290	12.1	0.46	2.70	10.0	-
	60-90	7.10	0.400	47	0.17	33.5	0.72	0.07	2.0	220	12.0	0.76	2.80	8.6	-
	90-120	7.35	0.360	45	0.24	38.8	0.54	0.05	-	-	-	-	-	-	-
7	0-27	7.00	0.800	70	0.13	11.0	1.54	0.15	15.2	340	13.8	0.64	2.22	18.4	14.0
	27-47	6.80	0.420	66	0.15	11.5	0.72	0.07	2.0	270	12.1	0.34	2.10	9.0	-
	47-70	7.00	0.350	63	0.19	12.2	0.63	0.06	1.6	280	12.7	0.48	2.38	9.2	-
	70-125	7.05	0.350	66	0.22	14.5	0.47	0.05	-	-	-	-	-	-	-
8	0-22	7.25	0.700	70	0.17	27.2	1.94	0.20	8.2	260	13.8	0.60	2.18	11.4	25.4
	22-50	7.00	0.500	63	0.16	30.5	1.02	0.10	2.8	170	11.1	0.36	2.18	4.6	-
	50-75	7.10	0.350	66	0.21	23.2	0.64	0.06	1.6	220	11.0	0.40	2.06	3.8	-
	75-105	7.00	0.350	63	0.24	18.5	0.54	0.05	-	-	-	-	-	-	-
9	0-18	7.00	1.000	65	0.33	17.5	1.07	0.11	2.6	390	12.0	0.44	3.20	8.2	14.0
	18-40	7.07	0.500	71	0.88	25.8	1.25	0.13	3.6	390	7.8	0.68	3.00	7.4	-
	40-65	7.00	0.950	63	2.11	21.5	0.95	0.09	1.6	260	11.4	0.40	2.94	6.4	-
	65-125	7.05	3.600	54	3.28	41.0	0.45	0.04	-	-	-	-	-	-	-
10	0-18	7.30	0.440	57	0.27	20.0	1.31	0.13	2.8	330	9.8	0.34	2.12	4.4	20.0
	18-40	7.15	0.340	64	0.18	18.0	1.07	0.11	1.8	240	10.8	0.30	2.38	5.6	-
	40-60	7.26	0.390	59	1.08	38.0	0.90	0.09	1.0	100	6.0	0.22	1.20	3.8	-
	60-120	7.20	0.370	58	0.32	25.8	0.50	0.05	-	-	-	-	-	-	-
11	0-18	7.25	0.470	67	0.15	19.0	1.81	0.18	6.6	590	11.2	0.58	2.36	7.6	32.0
	18-40	7.18	0.360	74	0.20	13.5	2.25	0.23	5.8	690	5.0	0.82	2.42	5.8	-
	40-70	7.10	0.580	73	0.34	12.5	1.74	0.17	5.8	540	6.6	0.54	2.82	6.4	-
	70-130	7.15	0.600	74	0.76	17.2	0.80	0.08	-	-	-	-	-	-	-
12	0-20	7.50	0.500	66	0.29	20.8	1.28	0.13	1.1	730	7.6	0.68	2.60	10.2	24.0
	20-43	7.30	0.650	66	0.73	15.2	1.36	0.14	10.6	700	7.4	0.64	2.82	6.8	-
	43-73	7.30	0.600	67	2.06	13.0	1.11	0.11	7.0	640	7.4	0.52	2.66	7.2	-
	73-95	7.40	1.000	49	0.58	33.2	0.66	0.06	-	-	-	-	-	-	-
	95-140	7.40	0.700	79	3.54	23.0	0.78	0.08	-	-	-	-	-	-	-
13	0-30	7.57	0.700	59	0.15	17.0	1.34	0.13	8.2	630	7.6	0.54	2.40	20.8	21.0
	30-60	7.53	0.600	55	0.26	18.5	1.05	0.11	5.6	500	7.8	0.61	2.84	14.4	-
	60-90	7.50	0.500	55	0.17	25.5	0.71	0.07	3.4	290	9.0	0.40	2.50	11.2	-
	90-140	7.50	0.500	46	0.28	31.0	0.32	0.03	-	-	-	-	-	-	-
14	0-28	7.40	0.600	44	0.14	24.0	1.09	0.11	4.6	230	10.6	0.80	2.06	19.8	18.0
	28-60	7.70	0.400	38	0.18	25.5	0.61	0.06	4.2	120	10.0	0.46	2.12	12.4	-
	60-93	7.70	0.500	38	0.32	28.0	0.51	0.05	4.0	100	13.2	0.56	2.16	12.4	-
	93-130	7.60	0.500	46	0.32	30.5	0.51	0.05	-	-	-	-	-	-	-
15	0-24	7.50	0.500	62	0.11	4.5	1.09	0.11	7.0	500	10.2	0.50	3.48	12.4	32.0
	24-52	7.70	0.400	58	0.16	25.5	0.44	0.04	3.0	240	11.4	0.38	2.38	12.6	-
	52-85	7.70	0.400	49	0.15	33.2	0.30	0.03	2.4	140	8.4	0.38	1.42	8.2	-
	85-140	7.90	0.400	59	0.33	22.0	0.23	0.02	-	-	-	-	-	-	-
16	0-17	7.50	0.700	43	0.13	0.5	2.04	0.20	62.0	760	14.6	2.18	2.22	high	21.0
	17-60	7.70	0.500	53	0.20	1.2	0.51	0.05	56.0	790	12.8	0.80	3.72	34.6	-
	60-85	7.90	0.400	34	0.16	10.0	0.32	0.03	4.0	440	10.6	1.30	2.92	14.6	-
	85-140	7.90	0.300	53	0.12	16.2	0.19	0.02	-	-	-	-	-	-	-
17	0-20	7.60	0.350	61	0.12	14.8	0.99	0.10	10.2	480	5.6	0.52	1.84	13.6	36.0
	20-42	7.60	0.400	58	0.11	20.0	0.80	0.08	2.6	310	5.8	0.44	1.84	10.6	-
	42-70	7.60	0.400	61	0.11	23.5	0.51	0.05	1.6	230	7.6	0.32	1.56	9.4	-
	70-130	7.60	0.350	59	0.20	42.2	0.34	0.03	-	-	-	-	-	-	-
18	0-18	7.55	0.500	64	0.13	0.2	0.99	0.10	9.2	500	7.6	0.58	2.62	23.4	25.0
	18-40	7.65	0.350	59	0.12	3.2	0.63	0.06	3.6	290	6.2	0.46	2.58	13.0	-
	40-70	7.60	0.400	65	0.16	7.7	0.57	0.06	3.2	270	8.8	0.54	2.78	11.6	-
	70-130	7.45	0.300	66	0.16	12.2	0.38	0.04	-	-	-	-	-	-	-

Table A7.1.2 Results of Soil Analysis of Samples from the Study Area (2/2)

Profile No.	Depth, cm	Cations and Anions, milliequivalents per liter							B.D g/cc	PWP w/w %	FC w/w %	% Sand	% Silt	% Clay	Classification
		Na ⁺	Ca ⁺⁺ Mg ⁺⁺	Sum Cations	Cl ⁻	SO ₄ ⁻	HCO ₃ ⁻	Sum Anions							
(1)	(2)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
1	0-30	0.20	4.0	4.20	0.45	0.00	3.75	4.20	1.34	16	33	1	52	47	Si-C
	30-60	0.24	4.4	4.64	0.71	0.00	3.75	4.46	1.34	16	33	1	45	54	Si-C
	60-90	0.24	6.6	6.84	1.00	2.34	3.50	6.84	1.34	16	33	1	49	50	Si-C
	90-120	0.30	5.0	5.30	0.80	0.00	4.50	5.30	-	-	-	3	47	50	Si-C
2	0-25	0.50	9.6	10.10	1.75	0.35	8.00	10.10	1.30	17	35	5	39	56	C
	25-45	0.70	6.0	6.70	1.75	0.95	4.00	6.70	1.30	17	35	5	33	62	C
	45-65	0.65	4.8	5.45	0.75	1.20	3.50	5.45	1.30	17	35	9	33	58	C
	65-90	0.75	5.0	5.75	1.75	0.50	3.50	5.75	-	-	-	13	27	60	C
	90-140	0.50	4.2	4.70	1.00	0.45	3.25	4.70	-	-	-	5	35	60	C
3	0-30	0.52	8.0	8.52	1.00	0.00	7.50	8.50	1.35	16	33	1	41	58	Si-C
	30-60	0.65	5.8	6.45	1.75	1.70	3.00	6.45	1.30	17	35	9	30	61	C
	60-90	0.60	5.0	5.60	1.00	1.35	3.25	5.60	1.30	17	35	3	38	59	C
	90-120	0.65	5.4	6.05	1.75	0.80	3.50	6.05	-	-	-	5	35	60	C
4	0-30	0.26	7.0	7.26	1.75	0.26	5.25	7.26	1.35	16	33	3	47	50	Si-C
	30-60	0.21	5.2	5.41	1.00	0.41	4.00	5.41	1.35	16	33	1	43	56	Si-C
	60-90	0.25	5.8	6.05	1.00	1.05	4.00	6.05	1.35	16	33	4	41	55	Si-C
	90-120	0.25	5.6	5.85	1.25	1.35	3.25	5.85	-	-	-	8	36	56	C
5	0-30	0.25	4.4	4.65	0.40	0.00	4.25	4.65	1.36	16	33	5	47	48	Si-C
	30-60	0.23	4.8	5.03	1.00	0.53	3.50	5.03	1.36	16	33	4	46	50	Si-C
	60-90	0.26	4.0	4.26	0.76	0.00	3.50	4.26	1.36	16	33	7	41	52	Si-C
	90-120	0.24	4.2	4.44	1.25	0.44	2.75	4.44	-	-	-	9	41	50	Si-C
6	0-30	0.25	8.2	8.45	1.25	0.95	6.25	8.45	1.35	15	31	9	47	44	Si-CL to Si-C
	30-60	0.27	5.4	5.67	0.67	0.00	5.00	5.67	1.36	15	31	9	44	47	Si-C
	60-90	0.27	4.8	5.07	0.32	0.00	3.75	4.07	1.30	17	35	39	30	31	C
	90-120	0.35	4.4	4.75	0.75	0.00	4.00	4.75	-	-	-	35	29	36	C-L
7	0-27	0.33	13.6	13.93	0.50	3.45	10.00	13.95	1.35	15	31	11	45	44	Si-C
	27-47	0.26	6.4	6.66	1.00	0.65	5.00	6.65	1.35	15	31	5	41	54	Si-C
	47-70	0.30	4.8	5.10	1.00	0.00	4.10	5.10	1.30	17	35	8	38	54	C
	70-125	0.35	5.2	5.55	1.25	0.05	4.25	5.55	-	-	-	9	39	52	C
8	0-22	0.40	10.8	11.20	1.00	0.70	9.50	11.20	1.35	16	33	4	54	42	Si-C
	22-50	0.30	7.2	7.50	1.00	0.50	6.00	7.50	1.35	16	33	5	49	46	Si-C
	50-75	0.31	4.4	4.71	0.75	0.00	3.96	4.71	1.32	17	35	5	40	55	Si-C to C
	75-105	0.35	4.4	4.75	0.75	0.50	3.50	4.75	-	-	-	3	39	58	C
9	0-18	0.95	17.0	17.95	0.75	13.45	3.75	17.95	1.35	16	33	1	53	46	Si-C
	18-40	1.55	6.2	7.75	1.50	1.95	4.25	7.70	1.35	16	33	1	49	50	Si-C
	40-65	5.00	11.2	16.20	1.00	12.20	3.00	16.20	1.35	16	33	1	47	52	Si-C
	65-125	17.50	56.8	74.30	2.00	68.80	3.50	74.30	-	-	-	2	54	44	Si-C
10	0-18	0.50	7.0	7.50	1.00	2.75	3.75	7.50	1.37	15	31	5	49	46	Si-C
	18-40	0.31	6.2	6.51	0.75	1.51	3.25	5.51	1.30	17	35	3	39	58	C
	40-60	1.80	5.6	7.40	0.75	2.65	4.00	7.40	1.37	15	31	3	41	56	Si-C
	60-120	0.55	6.0	6.55	0.75	1.55	4.25	6.55	-	-	-	5	37	58	C
11	0-18	0.28	7.2	7.48	1.00	3.75	2.75	7.50	1.33	17	35	10	40	50	C to Si-C
	18-40	0.35	6.4	6.75	0.50	0.25	6.00	6.75	1.35	15	31	11	53	36	Si-C
	40-70	0.70	8.4	9.10	1.00	0.41	4.00	5.41	1.35	15	31	7	41	52	Si-C
	70-130	1.45	7.2	8.65	1.25	3.15	4.25	8.65	-	-	-	7	39	54	C
12	0-20	0.55	7.2	7.75	1.25	3.00	3.50	7.75	1.37	15	31	9	45	46	Si-C
	20-43	1.46	8.0	9.46	1.00	0.90	7.50	9.40	1.37	15	31	7	48	45	Si-C
	43-73	3.80	6.8	10.60	1.25	6.35	3.00	10.60	1.37	15	31	5	48	47	Si-C
	73-95	1.00	6.0	7.00	0.50	0.00	6.50	7.00	-	-	-	5	34	61	C
	95-140	5.00	4.0	9.00	1.50	1.00	6.50	9.00	-	-	-	3	42	55	Si-C
13	0-30	0.35	11.2	11.55	1.00	0.55	10.00	11.55	1.39	15	31	9	54	37	Si-C-L
	30-60	0.52	7.8	8.32	1.00	0.82	6.50	8.32	1.35	15	31	7	50	43	Si-C
	60-90	0.35	8.2	8.55	1.25	0.80	6.50	8.55	1.35	15	31	9	45	46	Si-C
	90-140	0.50	6.4	6.90	1.25	1.15	4.50	6.90	-	-	-	23	40	37	S-C-L
14	0-28	0.30	9.8	10.10	1.25	0.00	8.85	10.10	1.40	12	25	39	36	25	L
	28-60	0.32	6.2	6.52	0.50	0.52	0.50	1.52	1.40	12	25	49	24	27	L
	60-93	0.60	7.2	7.80	1.00	2.02	4.75	7.77	1.40	12	25	47	28	25	L
	93-130	0.60	7.2	7.80	1.25	1.55	5.00	7.80	-	-	-	37	32	31	C-L
15	0-24	0.24	9.2	9.44	1.75	1.19	6.50	9.44	1.36	16	33	5	50	45	Si-C
	24-52	0.30	6.8	7.10	1.00	0.85	5.25	7.10	1.36	16	33	8	43	49	Si-C
	52-85	0.26	5.8	6.06	0.75	0.81	4.50	6.06	1.36	16	33	7	46	47	Si-C
	85-140	0.55	5.4	5.95	1.00	2.20	2.75	5.95	-	-	-	9	42	49	Si-C
16	0-17	0.31	11.2	11.51	1.00	0.01	10.50	11.51	1.40	13	27	37	36	27	C-L to L
	17-60	0.34	6.0	6.34	0.75	0.59	5.00	6.34	1.30	17	35	37	14	49	C
	60-85	0.25	4.6	4.85	0.75	0.00	4.10	4.85	1.40	12	25	57	18	25	L
	85-140	0.25	8.8	9.05	1.00	3.80	4.25	9.05	-	-	-	19	42	39	Si-C-L
17	0-20	0.20	6.0	6.20	1.00	0.00	5.20	6.20	1.37	16	33	5	50	45	Si-C
	20-42	0.18	5.6	5.78	1.25	0.00	4.53	5.78	1.37	16	33	3	42	55	Si-C
	42-70	0.20	6.6	6.80	0.75	0.80	5.25	6.80	1.30	17	35	7	36	57	C
	70-130	0.30	4.6	4.90	1.25	1.90	1.75	4.90	-	-	-	1	46	53	Si-C
18	0-18	0.25	7.4	7.65	1.00	0.00	6.65	7.65	1.35	16	33	5	50	45	Si-C
	18-40	0.20	5.6	5.80	0.75	0.55	4.50	5.80	1.35	16	33	5	46	49	Si-C
	40-70	0.30	6.8	7.10	0.50	2.35	4.25	7.10	1.35	16	33	9	40	51	Si-C
	70-130	0.25	5.2	5.45	0.75	0.05	4.00	4.80	-	-	-	3	46	51	Si-C

Table A7.1.3 Interpretation of Soil Analysis in Kermanshah Province

Critical Limits of Macronutrients

Level	O.C, %	Total N, %	P (Ava), ppm	K (Ava), ppm
Low	0-1	<0.05	0-5	<120
Medium	1-1.5	0.1-0.150	5-10	120-200
High	1.5-2.0	>0.2	10-20	>200

Critical Limits of Micronutrients

Limit	Micronutrients, ppm				
	Fe	Mn	Zn	Cu	B
Critical	<5	5	<1	0.2	<0.5
Average	10	9	2	0.5	1
High	>25	30	6	>2	>2

Table A7.1.4 Basic Infiltration Rate (cm/hr)

Location	Average Infiltration Rate (cm/hr)
Profile No. 1	2.30
Profile No. 6 (unploughed)	0.30
Profile No. 8	2.64
Profile No. 10	1.80
Profile No. 12	2.20
Profile No. 17	3.00
Profile No. 18	2.10

Infiltration Category

Class	Infiltration Category	I, cm/hr	I, cm/hr	Suitability for Surface Irrigation
1	Very slow (non-irrigable)	<0.1	<0.1	Unsuitable (too slow), but suitable for rice
2	Slow	0.1-0.5	0.1-0.3	Marginally suitable
3	Moderately Slow	0.5-2.0	0.3-0.7	Suitable; unsuitable for rice
4	Moderate	2.0-6.0	0.7-3.5	Optimum
5	Moderately Rapid	6.0-12.15	3.5-6.5	Suitable
6	Rapid	12.5-25.0	6.5-12.5	Marginally suitable (too rapid)
7	Very Rapid	>25.0	12.5-25.0	Suitable under special conditions, small basins required

Table A7.1.5 Soil Profile Characteristics

Profile No. 1 - Tapeh Lori

Horizon	Depth,cm	Profile Description
Ap Ochric	0-25	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; clody (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B1 Cambic	25-46	Strong brown (7.5YR 5/6) when dry and brown (7.5YR 5/4); silty clay; weak fine weak angular blocky; common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B2 Cambic	46-75	Brown (7.5YR 5/4) when moist and dark brown (7.5YR 4/4) when moist; silty clay; weak medium angular blocky (p) and weak fine angular blocky (s); few fine pores; hard when dry and firm when moist; gradual and smooth boundary
B3 Cambic	75-130	Brown (7.5YR 5/4) when dry and dark brown (7.5YR 4/4) when moist; silty clay; weak medium angular blocky (p) and weak coarse angular blocky (s); few fine pores; hard when dry and firm when moist

Profile No. 2 - Goraz Abad

Horizon	Depth,cm	Profile Description
Ap Ochric	0-25	Light gray (10YR 6/1) when dry and dark brown (10YR 3/3) when moist; silty clay; clody (primary); single grained (secondary); common fine pores; hard when dry and firm when moist; gradual and smooth boundary
B1k Calcic	25-45	Gray (10YR 5/1) when dry and brown (10YR 4/3); silty clay; weak medium prismatic (p) and weak fine angular blocky (s); common fine pores; hard when dry and firm when moist; clear and smooth boundary
B2k Calcic	45-65	Light gray (10YR 8/1) when moist and brown (10YR 5/3) when moist; clay; moderate medium angular blocky (p) and weak fine angular blocky (s); many fine pores; soft when dry and friable when moist; clear and smooth boundary
B3k Calcic	65-90	Light gray (10YR 8/2) when dry and pale brown (10YR 6/3) when moist; silty clay; moderate medium angular blocky (p) and weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; clear and smooth boundary
B3k Calcic	90-140	Light gray (10YR 8/1) when dry and pale brown (10YR 6/3) when moist; silty clay; massive; few very fine pores; very hard when dry and very firm when moist

Profile No. 3 - Tapeh Quick

Horizon	Depth,cm	Profile Description
Ap Ochric	0-23	Yellowish brown (10YR 5/4) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay; clody (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B1 Cambic	23-48	Yellowish brown (10YR 5/4) when dry and brown (10YR 5/3) when moist; clay; weak fine weak angular blocky; few fine pores; hard when dry and friable when moist; clear and smooth boundary
B2 Cambic	48-78	Yellowish brown (10YR 5/4) when dry and brown (10YR 5/3) when moist; clay; moderate fine angular blocky (p) and weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B3 Cambic	78-135	Yellowish brown (10YR 5/4) when dry and brown (10YR 5/3) when moist; weak medium angular blocky; few fine pores; hard when dry and firm when moist

Profile No. 4 - Tapeh Rash

Horizon	Depth,cm	Profile Description
Ap Ochric	0-23	Dark brown (7.5YR 4/3) when dry and dark brown (7.5YR 4/2) when moist; silty clay; clody (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B1 Cambic	23-48	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; weak fine weak angular blocky; common fine pores; hard when dry and friable when moist; clear and smooth boundary
B2 Cambic	48-78	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; weak fine angular blocky (p) and weak fine angular blocky (s); few fine pores; very hard when dry and firm when moist; gradual and smooth boundary
B3 Cambic	78-135	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; clay; weak medium angular blocky (p) and weak fine angular blocky (s); few fine pores; hard when dry and firm when moist

Profile No. 5 - Hassan Abad

Horizon	Depth,cm	Profile Description
Ap Ochric	0-25	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; clody (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B1 Cambic	25-50	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; weak fine angular blocky; common fine pores; hard when dry and friable when moist; clear and smooth boundary
B2 Cambic	50-75	Dark brown (7.5YR 5/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; weak medium angular blocky (p) and weak fine angular blocky (s); many fine pores; hard when dry and friable when moist; gradual and smooth boundary
B3 Cambic	75-130	Dark brown (7.5YR 5/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; weak medium angular blocky (p) and weak fine angular blocky (s); common fine pores; hard when dry and friable when moist

Profile No. 6 - Deh Sadeh

Horizon	Depth,cm	Profile Description
Ap Ochric	0-30	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay loam to silty clay; clody (primary); massive (secondary); common fine pores; hard when moist and friable when wet; clear and smooth boundary
B1 Calcic	30-60	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; silty clay; weak fine prismatic; common fine pores; hard when dry and friable when moist; Gradual and smooth boundary
B2 Calcic	60-90	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; clay; moderate fine prismatic and weak fine angular blocky (s); common fine pores; very hard when dry and firm when moist; clear and smooth boundary
B3 Calcic	90-120	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; clay loam; weak medium prismatic (p) and weak fine prismatic (s); few fine pores; very hard when dry and firm when moist

Profile No. 7 - Khoram Abad

Horizon	Depth,cm	Profile Description
Ap Ochric	0-27	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 4/2) when moist; silty clay; clody (primary); single grained (secondary); many fine pores; hard when dry and friable when moist; clear and smooth boundary
B1 Cambic	27-47	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; silty clay; weak fine prismatic; common fine pores; hard when dry and firm when moist; Gradual and smooth boundary
B2 Cambic	47-70	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; clay; moderate fine prismatic and weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; clear and smooth boundary
B3 Cambic	70-125	Dark brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; clay; weak medium prismatic (p) and weak fine prismatic (s); few fine pores; slightly hard when dry and very friable when moist

Profile No. 8 - Kolah Kabood

Horizon	Depth,cm	Profile Description
Ap Ochric	0-22	Yellowish brown (10YR 5/4) when dry and dark yellowish brown (10YR 3/4) when moist; silty clay; clody (primary); single grained (secondary); few fine pores; hard when dry and firm when moist; gradual and smooth boundary
B1 Cambic	22-50	Brown (10YR 5/3) when dry and brown (10YR 4/3) when moist; silty clay; weak fine prismatic (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; clear and smooth boundary
B2 Cambic	50-75	Yellowish brown (10YR 5/4) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay to clay; moderate fine prismatic (p) and moderate fine angular blocky (s); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
B3 Cambic	75-105	Dark yellowish brown brown (10YR 4/6) when dry and yellowish brown (10YR 5/4) when moist; clay; weak fine prismatic (p) and weak fine angular blocky (s); few fine pores; very hard when dry and very firm when moist

Profile No. 9 - Siah Siah

Horizon	Depth,cm	Profile Description
Ap Mollic	0-18	Yellowish brown (10YR 4/2) when dry and dark yellowish brown (10YR 3/3) when moist; silty clay; clody (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
Bk1 Mollic	18-40	Brown (10YR 4/2) when dry and brown (10YR 3/3) when moist; silty clay; moderate fine angular blocky (p); weak fine angular blocky (s); common fine pores; hard when dry and firm when moist; gradual and smooth boundary
Bk2 Calcic	40-65	Yellowish brown (10YR 5/4) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay; weak fine blocky (p) and weak fine blocky (s); common very fine pores; hard when dry and firm when moist; clear and smooth boundary
Bk3 Calcic	65-125	Dark yellowish brown (10YR 6/6) when dry and yellowish brown (10YR 5/6) when moist; silty clay; moderate medium blocky (p) and weak fine blocky (s); few fine and coarse pores; hard when dry and friable when moist

Profile No. 10 - Kochegineh

Horizon	Depth,cm	Profile Description
Ap Mollic	0-18	Dark grayish brown (10YR 4/2) when dry and very dark grayish brown (10YR 3/2) when moist; silty clay; cloddy (primary); single grained (secondary); common fine pores; slightly hard when dry and friable when moist; gradual and smooth boundary
Bk1 Mollic	18-40	Dark grayish brown (10YR 4/2) when dry and very dark grayish brown (10YR 3/2) when moist; clay; weak fine angular blocky (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
Bk2 Calcic	40-60	Light yellowish brown (10YR 6/4) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay; moderate fine angular blocky (p) and weak fine blocky (s); few fine pores; hard when dry and friable when moist; clear and smooth boundary
Bk3 Calcic	60-120	Dark yellowish brown (10YR 4/4) when dry and yellowish brown (10YR 5/6) when moist; clay; moderate medium angular blocky (p) and weak fine angular blocky (s); few fine pores; hard when dry and firm when moist

Profile No. 11 - Ghale Khoda Morat Khan

Horizon	Depth,cm	Profile Description
Ap Mollic	0-18	Dark grayish brown (10YR 4/2) when dry and dark brown (10YR 3/3) when moist; clay to silty clay; moderate medium angular blocky (primary); medium fine angular blocky (secondary); many fine pores; slightly hard when dry and friable when moist; gradual and smooth boundary
Bk1 Mollic	18-40	Dark grayish brown (10YR 4/2) when dry and very dark grayish brown (10YR 3/2) when moist; silty clay; moderate medium angular blocky (p); medium fine angular blocky (s); many fine pores; slightly hard when dry and friable when moist; gradual and smooth boundary
Bk2 Calcic	40-70	Dark grayish brown (10YR 4/2) when dry and very dark grayish brown (10YR 3/2) when moist; silty clay; moderate medium angular blocky (p); medium fine angular blocky (s); many fine pores; slightly hard when dry and friable when moist; clear and smooth boundary
Bk3 Calcic	70-130	Brown (10YR 5/3) when dry and dark yellowish brown (10YR 4/4) when moist; clay; weak medium angular blocky (p) and weak fine angular blocky (s); common fine pores; hard when dry and firm when moist

Profile No. 12 - Shaleh

Horizon	Depth,cm	Profile Description
Ap Mollic	0-20	Grayish brown (10YR 5/2) when dry and dark brown (10YR 3/3) when moist; silty clay; cloddy (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; some roots ; gradual and smooth boundary;
Bk1 Mollic	20-43	Dark grayish brown (10YR 4/2) when dry and dark brown (10YR 3/3) when moist; silty clay; medium fine angular blocky (p); medium fine angular blocky (s); many fine pores; hard when dry and friable when moist; many roots; gradual and smooth boundary
Bk2 Calcic	43-73	Dark grayish brown (10YR 4/2) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay; moderate fine angular blocky (p); weak fine angular blocky (s); common fine pores; very hard when dry and friable when moist; many coarse roots; clear and smooth boundary
Bk3 Calcic	73-95	Yellowish brown (10YR 5/4) when dry and dark yellowish brown (10YR 4/4) when moist; clay; weak fine prismatic (p) and weak fine angular blocky (s); common fine pores; very hard when dry and firm when moist; gradual and smooth boundary
Bk4 Calcic	95-140	Light brownish gray (10YR 6/2) when dry and Grayish brown (10YR 5/2) when moist; silty clay; weak fine prismatic (p) and weak fine angular blocky (s); common fine pores; very hard when dry and firm when moist

Profile No. 13 - Deh Rash (Garghabi)

Horizon	Depth,cm	Profile Description
Ap Mollic	0-30	Brown (10YR 5/3) when dry and dark brown (10YR 3/3) when moist; silty clay loam; cloddy (primary); single grained (secondary); many fine pores; slightly hard when dry and friable when moist; many roots ; gradual and smooth boundary;
Bk1 Calcic	30-60	Brown (10YR 5/3) when dry and dark yellowish brown (10YR 3/4) when moist; silty clay; weak fine angular blocky (p); weak fine angular blocky (s); many fine pores; hard when dry and friable when moist; many roots; clear and smooth boundary
Bk2 Calcic	60-90	Brown (10YR 5/3) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay; moderate medium prismatic (p); moderate fine prismatic (s); many fine pores; hard when dry and friable when moist; clear and smooth boundary
Bk3 Calcic	90-140	Yellowish brown (10YR 5/4) when dry and dark yellowish brown (10YR 4/4) when moist; silty clay loam; moderate fine prismatic (p) and weak fine prismatic (s); many fine and very fine pores; hard when dry and firm when moist

Profile No. 14 - Jehan Abad

Horizon	Depth,cm	Profile Description
Ap Ochric	0-28	Brown (10YR 5/3) when dry and dark yellowish brown (10YR 4/4) when moist; loam; cloddy (primary); single grained (secondary); many fine pores; slightly hard when dry and friable when moist; many roots ; gradual and smooth boundary;
B1 Cambic	28-60	Brown (10YR 5/3) when dry and dark yellowish brown (10YR 4/4) when moist; loam; moderate fine prismatic (p); weak fine prismatic (s); common fine pores; slightly hard when dry and friable when moist; many roots; gradual and smooth boundary
B2 Cambic	60-93	Light yellowish Brown (10YR 6/4) when dry and dark yellowish brown (10YR 4/6) when moist; loam; moderate fine prismatic (p); weak fine prismatic (s); few fine pores; hard when dry and friable when moist; gradual and smooth boundary
B3 Cambic	93-130	Brown (10YR 5/3) when dry and brown (10YR 4/3) when moist; clay loam; moderate fine prismatic (p) and moderate fine prismatic (s); few fine pores; slightly hard when dry and very firm when moist

Profile No. 15 - Deh Cheragh

Horizon	Depth,cm	Profile Description
Ap Mollic	0-24	Grayish brown (10YR 5/2) when dry and dark brown (10YR 3/3) when moist; silty clay; cloddy (primary); single grained (secondary); few very fine pores; slightly hard when dry and friable when moist; clear and smooth boundary;
Bk1 Calcic	24-52	Yellowish brown (10YR 5/6) when dry and dark yellowish brown (10YR 4/6) when moist; silty clay; moderate medium angular blocky (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
Bk2 Calcic	52-85	Brownish yellow (10YR 6/6) when dry and yellowish brown (10YR 5/6) when moist; silty clay; moderate medium angular blocky (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; gradual and smooth boundary
Bk3 Calcic	85-140	Brownish yellow (10YR 6/6) when dry and yellowish brown (10YR 5/6) when moist; silty clay; weak fine angular blocky (p) and weak fine angular blocky (s); many fine pores; very hard when dry and firm when moist

Profile No. 16 - Kalaveh Hidarkhan

Horizon	Depth,cm	Profile Description
Ap Mollic	0-17	Brown (10YR 4/3) when dry and dark brown (10YR 3/3) when moist; clay loam to loam; cloddy (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; clear and smooth boundary;
Bk1 Calcic	17-60	Yellowish brown (10YR 5/6) when dry and dark yellowish brown (10YR 4/6) when moist; clay; weak fine prismatic (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; about 6-7% fine gravel; clear and smooth boundary
Bk2 Calcic	60-85	Yellowish brown (10YR 5/6) when dry and dark yellowish brown (10YR 4/6) when moist; loam; weak fine angular blocky (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; about 40% fine gravel; clear and smooth boundary
Bk3 Calcic	85-140	Brownish yellow (10YR 6/6) when dry and yellowish brown (10YR 5/6) when moist; silty clay loam; massive; few fine pores; very hard when dry and firm when moist

Profile No. 17 - Kareh Ghaleh Sefid

Horizon	Depth,cm	Profile Description
Ap Ochric	0-20	Brown (7.5YR 5/4) when dry and brown (7.5YR 4/4) when moist; silty clay; cloddy (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; many fine roots; gradual and smooth boundary;
Bk1 Calcic	20-42	Brown (7.5YR 4/4) when dry and strong brown (7.5YR 4/6) when moist; silty clay; weak moderate prismatic (p); weak moderate angular blocky (s); common fine pores; hard when dry and friable when moist; common very fine roots; gradual and smooth boundary
Bk2 Calcic	42-70	Brown (7.5YR 5/4) when dry and strong brown (7.5YR 4/6) when moist; clay; medium moderate angular blocky (p); weak fine angular blocky (s); many very fine pores; hard when dry and friable when moist; lime – pp+ many very fine roots; clear and smooth boundary
Bk3 Calcic	70-130	Reddish yellow (7.5YR 6/6) when dry and strong brown (7.5YR 5/6) when moist; silty clay; medium moderate angular blocky (p); weak fine angular blocky (s); common fine pores; lime – pp+++ ; very hard when dry and firm when moist

Profile No. 18 - Nahrabi

Horizon	Depth,cm	Profile Description
Ap Ochric	0-18	Brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/2) when moist; silty clay; cloddy (primary); single grained (secondary); common fine pores; hard when dry and friable when moist; gradual and smooth boundary;
Bk1 Calcic	18-40	Brown (7.5YR 4/4) when dry and dark brown (7.5YR 3/4) when moist; silty clay; weak fine angular blocky (p); weak fine angular blocky (s); common fine pores; hard when dry and friable when moist; many roots; gradual and smooth boundary
Bk2 Calcic	40-70	Strong brown (7.5YR 4/6) when dry and dark brown (7.5YR 3/4) when moist; clay; weak moderate prismatic (p); weak fine prismatic (s); many fine pores; hard when dry and friable when moist; many roots; gradual and smooth boundary
Bk3 Calcic	70-130	Brown (7.5YR 5/4) when dry and dark brown (7.5YR 4/4) when moist; silty clay; medium moderate prismatic (p); weak fine prismatic (s); many fine pores; many roots than the above two horizons; very hard when dry and firm when moist

Table A7.2.1 Results of Water Quality Survey in the Study Area (1st Field Survey, Jan-Feb 2003)

Sample No.	Source	pH	EC	SAR	SSP	Classification (**)	Cations and Anions, milliequivalents per liter								TDS	DO	Temp
			mS/cm				Na ⁺	Ca ⁺⁺ +Mg ⁺⁺	Sum Cations	Cl	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	Sum Anions	mg/l		Deg C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
W1	Main Spring in Ravansar	7.50	0.250	0.04	1.56%	C1S1	0.06	3.80	3.86	0.35	0.00	0.00	3.50	3.85	160	10.81	14.4
W2	Spring Jaberri near Ravansar	7.65	0.245	0.04	1.29%	C1S1	0.05	3.80	3.85	0.35	0.00	0.00	3.50	3.85	157	7.00	15.9
W3	River Near Khorram Abad	8.75	0.245	0.05	1.72%	C1S1	0.07	4.00	4.07	0.25	0.00	0.80	3.00	4.05	157	-	-
W4	Well near Tam Tam	7.95	0.320	0.17	5.26%	C2S1	0.25	4.50	4.75	0.50	0.00	0.30	4.00	4.80	205	-	-
W5	River Near Karim Abad	8.00	0.280	0.04	2.22%	C2S1	0.10	4.40	4.50	0.35	0.15	0.00	4.00	4.50	179	8.10	9.6
W6	Canal Tapeh Rask	8.83	0.275	0.11	3.84%	C2S1	0.15	3.75	3.90	0.40	0.00	0.55	2.95	3.90	176	19.00	4.0
W7	Canal at Tapeh Kuik	7.00	0.380	0.14	4.45%	C2S1	0.22	4.8	4.97	0.50	0.00	0.00	4.47	4.97	243	9.41	2.9
W8	Gharasu River near Tapeh Lori	8.42	0.300	0.10	3.10%	C2S1	0.15	4.70	4.85	0.40	0.25	0.50	3.70	4.85	192	10.05	7.0
W9	River at Goraz Abad	7.95	0.320	0.10	3.10%	C2S1	0.15	4.8	4.90	0.35	0.15	0.00	4.40	4.90	205		
W10	Gharab River	8.35	0.340	0.17	5.26%	C2S1	0.25	4.50	4.75	0.50	0.00	0.45	3.80	4.75	218	14.10	10.0
W11	Spring near Kareh Galeh Sefid	8.00	0.330	0.15	4.48%	C2S1	0.23	4.90	5.13	0.40	0.00	0.30	4.40	5.10	211	-	-
W12	Kilanbar River	8.10	0.285	0.15	5.00%	C2S1	0.20	3.80	4.00	0.50	0.00	0.15	3.30	3.95	182	13.65	4.0
W13	River near Kolah Kabood	7.95	0.290	0.71	2.44%	C2S1	0.10	4.0	4.10	0.35	0.15	0.00	3.60	4.10	186	4.35	12.8
W14	Well near Shaleh	7.60	0.350	0.18	5.35%	C2S1	0.28	4.95	5.23	0.70	0.00	0.00	4.50	5.20	224	-	-
W15	River at Kalave Haiderkhan	7.60	0.315	0.17	5.49%	C2S1	0.25	4.3	4.55	0.30	0.30	0.00	4.55	5.15	202		
W16	Well near Siah Siah	7.50	0.290	0.20	6.86%	C2S1	0.28	3.8	4.08	0.50	0.00	0.00	3.58	4.08	186	6.00	14.5
W17	Spring at Chagha Gazan	8.25	0.320	0.09	2.96%	C2S1	0.11	3.6	3.71	0.40	0.00	0.30	3.00	3.70	205	16.00	6.0
W18	Well near Khaibar	6.80	3.030	2.40	19.48%	C4S2	12.00	49.6	61.60	24.60	27.00	0.00	10.00	61.60	1,939		

**Table A7.2.2 Results of Gharasu River Water Quality Survey Made by
Kermanshah Environmental Research Center**

Sample No.	pH	EC mS/cm	Turbidity ntu	DO mg/l	BOD mg/l	COD mg/l	TSS mg/l	TDS mg/l	Sample No.	pH	EC mS/cm	Turbidity ntu	DO mg/l	BOD mg/l	COD mg/l	TSS mg/l	TDS mg/l
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
May-97									Aug-97								
1	8.20	0.327	3	9.8	Trace	Trace	8.0	226	1	7.80	0.306	2	9.6	8	16	3.1	200
2	8.40	0.315	4	9.6	10	12	24.3	204	2	7.50	0.375	2	9.0	16	30	4.0	254
3	8.10	0.371	91	7.8	10	10	116.0	238	3	7.80	0.382	14	7.6	10	22	6.0	243
4	8.40	0.842	47	7.2	8	20	36.0	598	4	7.60	0.426	29	8.9	14	28	2.4	279
5	8.30	0.402	98	6.8	10	8	102.1	264	5	7.70	0.496	32	7.4	18	32	4.0	352
6	8.30	0.458	127	7.1	Trace	8	114.3	321	6	8.30	0.439	30	6.9	21	40	3.6	273
7	8.20	0.325	20	9.4	Trace	10	22.7	215	7	7.40	0.857	44	4.6	36	62	10.7	532
8	8.50	0.392	103	8.9	8	10	63.3	267	8	7.20	0.798	13	7.1	24	28	5.6	557
9	8.70	0.309	77	8.4	10	10	58.1	223	9	7.50	0.737	16	8.4	8	15	3.4	510
10	8.80	0.383	60	6.4	20	24	54.7	265	Nov-97								
11	8.70	0.385	72	7.2	Trace	15	39.3	249	1	7.60	0.339	6	9.2	16	20	3.4	212
12	8.60	0.381	68	8.2	Trace	8	21.6	271	2	8.10	0.358	19	9.1	16	26	12.6	232
Jun-97									3	8.30	0.482	51	7.9	16	28	64.1	334
1	7.90	0.325	3	9.8	8	10	16.5	231	4	8.50	0.738	21	7.3	14	24	19.5	453
2	7.50	0.505	4	9.8	13	20	21.7	346	5	8.20	0.539	45	6.9	20	30	28.5	337
3	7.50	0.581	39	8.1	8	14	64.6	442	6	8.40	0.587	43	7.3	26	30	36.2	369
4	7.90	0.584	62	6.2	16	24	108.4	402	7	7.60	0.377	143	6.4	28	48	91.0	231
5	8.10	0.839	37	8.2	18	30	74	513	8	8.40	0.475	116	6.6	26	48	76.2	315
6	8.00	0.397	49	8.6	16	28	52.1	293	9	8.10	0.497	39	5.0	42	60	24.6	336
7	8.20	0.554	27	7.1	20	32	36.2	405	10	7.80	0.563	32	4.0	56	88	33.5	403
8	8.10	0.572	28	7.2	20	32	24.5	397	11	8.20	0.576	21	7.2	28	34	24.7	389
9	7.70	0.625	14	6.2	34	44	39.8	459	12	8.30	0.581	16	8.0	12	22	17.3	394
10	7.60	0.644	6	7.4	10	20	17.0	467									
11	8.90	0.584	3	8.4	6	10	8.4	424									

Table A7.2.3 Results of Gharasu River Water Quality Survey Made by Water Organization

Date	pH	EC	SAR	%Na	Classification (**)	Cations and Anions, milliequivalents per liter										TDS mg/l	Discharge m ³
		MicroS/cm				Na ⁺	Ca ⁺⁺	Mg ⁺⁺	Sum Cations	Cl ⁻	SO ₄ ⁻	CO ₃ ⁻	HCO ₃ ⁻	Sum Anions			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
1991/1/26	8.0	0.398	0.08	2.78		0.11	2.70	1.15	3.96	0.15	0.71		3.05	3.91	255	1.453	
1991/3/2	8.3	0.313	0.06	2.55		0.08	2.40	0.65	3.13	0.17		0.4	2.5	3.07	200		
1992/7/20	7.7	0.39	0.12	4.12		0.16	2.86	0.86	3.88	0.28	0.27		3.3	3.85	249	1.03	
1992/9/29	8.3	0.384	0.1	3.66	C2S1	0.14	2.84	0.84	3.82	0.25	0.15	0.5	2.9	3.8	245	20/s	
1992/1/30	7.5	0.364	0.06	2.22	C2S1	0.08	2.84	0.68	3.6	0.2	0.1		3.3	3.6	233	2.129	
1993/4/2	7.7	0.396	0.05	1.78	C2S1	0.07	2.54	1.42	3.93	0.2	0.3		3.4	3.9	253	4.856	
1993/11/3	7.5	0.398	0.12	4.04		0.16	2.80	1.00	3.96	0.3	0.27		3.35	3.92	254	1.806	
1993/1/25	7.1	0.368	0.06	2.2		0.08	3.10	0.46	3.64	0.2	0.53		2.85	3.58	235	4.307	
1993/2/28	7.9	0.379	0.09	3.19		0.12	3.28	0.36	3.76	0.22	0.3		3.2	3.72	242	4.544	
1994/4/11	7.4	0.371	0.04	1.62		0.06	3.00	0.64	3.7	0.17	0.43		3.05	3.65	237	7.006	
1994/7/31	8.2	0.391	0.1	3.61		0.14	3.00	0.74	3.88	0.2	0.15		3.4	3.85	250	0.03	
1994/11/9	7.1	0.365	0.07	2.76		0.1	2.90	0.62	3.62	0.2	0.25		3.5	3.6	233	5.403	
1994/11/29	8.0	0.342	0.06	2.38		0.08	2.80	0.48	3.36	0.15	0.24		2.9	3.29	218	6.938	
1994/12/28	8.1	0.378	0.09	3.24		0.12	3.00	0.58	3.7	0.25	0.25		3.15	3.65	242	3.376	
1994/1/26	8.3	0.271	0.16	6.71		0.18	1.74	0.76	2.68	0.15	0.3	0.6	1.6	2.65	173	4.365	
1995/5/4	7.9	0.296	0.17	6.89		0.2	1.95	0.75	2.9	0.27	0.27		2.3	2.84	189	7.222	
1995/11/5	7.9	0.32	0.14	5.39		0.17	1.90	1.08	3.15	0.18	0.21		2.7	3.09		0.644	
1995/12/17	7.6	0.408	0.11	3.74		0.15	2.82	1.04	1-Apr	0.25	0.2		3.5	3.95		0.356	
1995/1/15	7.6	0.375	0.15	5.4		0.2	2.10	1.40	3.7	0.2	0.18		3.25	3.63		0.392	
1995/2/10	7.4	0.378	0.17	5.91		0.22	2.17	1.33	3.72	0.28	0.18		3.2	3.66		1.843	
1995/3/1	7.7	0.361	0.21	7.6		0.27	2.40	0.88	3.55	0.3	0.23		2.95	3.48		3.231	
1996/4/8	7.2	0.364	0.13	4.73		0.17	2.60	0.82	3.59	0.19	0.23		3.1	3.52		6.026	
1996/4/23	7.2	0.422	0.13	4.55		0.19	2.78	1.20	4.17	0.23	0.2		3.7	4.13		8.322	
1996/6/6	7.3	0.36	0.14	5.1		0.18	2.35	1.00	3.53	0.25	0.11		3.1	3.46		2.548	
1996/7/14	7.6	0.335	0.1	3.93		0.13	2.20	0.97	3.3	0.19	0.13		2.9	3.22		0.413	
1996/8/18	7.4	0.329	0.12	4.63		0.15	2.27	0.82	3.24	0.17	0.2		2.8	3.17		0.376	
1996/10/22	7.9	0.473	0.14	4.406		0.21	3.10	1.40	4.71	0.25	0.4		4	4.65	302	0.35	
1996/12/15	7.3	0.429	0.1	3.28		0.14	2.68	1.44	4.26	0.2	0.2		3.5	4.2	274	0.823	
1996/1/13	7.5	0.375	0.09	3.22		0.12	2.75	0.85	3.72	0.25	0.13		3.3	3.68	240		
1997/11/17	7.3	0.337	0.14	5.37		0.18	2.54	0.63	3.35	0.17	0.1		3.05	3.32	215	1.475	
1997/1/17	7.5	0.326	0.12	4.62		0.15	2.70	0.39	3.24	0.15	0.09		2.95	3.19	208	2.196	
1997/2/14	7.7	0.311	0.1	3.98		0.12	2.48	0.48	3.08	0.12	0.1		2.8	3.02	199	5.058	
1998/4/15	7.3	0.333	0.086	3.32		0.11	2.71	0.49	3.31	0.14			3.15	3.29	213	6.918	
1998/5/19	7.8	0.341	0.15	5.63		0.19	2.76	0.42	3.37	0.17	0.07		3.1	3.34	218	3.559	
2002/11/21	7.5	0.342	0.24	8.87	C2S1	0.3	2.00	1.08	3.38	0.35	0.2		2.8	3.35	219	0.11	

Table A7.2.4 Iran Water Quality Standard for Discharge Water (1/2)

Item	Pollutants	Discharged to surface water , mg/l	Dicharged to wells, mg/l	Used in Agriculture and Irrigation, mg/l
1	Silver (Ag)	1	0.1	0.1
2	Aluminium (Al)	5	5	5
3	Arsenic (As)	0.1	0.1	0.1
4	Boron (B)	2	1	1
5	Barium (Br)	5	1	1
6	Beryllium (Be)	0.1	1	0.5
7	Calcium (Ca)	75	-	-
8	Cadmium (Cd)	0.1	0.1	0.05
9	Chloride (free)	1	1	0.2
10	Chloride (Cl-)	600 (note 1)	600 (note 2)	600
11	Cyanide (Cn)	0.5	0.1	0.1
12	Cobalt (Co)	1	1	0.05
13	Chromium (Cr+6)	0.5	1	1
14	Cr+3	2	2	2
15	Copper (Cu)	1	1	0.2
16	Flouride (F)	2.5	2	2
17	Iron (Fe)	3	3	3
18	Mercury (Hg)	very low	very low	very low
19	Magnesium (Mg)	100	100	100
20	Manganese (Mn)	1	1	1
21	Molybdenum (Mo)	0.01	0.01	0.01
22	Nickel (Ni)	2	2	2
23	Ammon. Nitrogen (NH4-N)	2.5	1	-
24	Nitrite Nitrogen (NO2-N)	10	10	-
25	Nitrate Nitrogen (NO3-N)	50	10	-
26	Phosphate (based on Phosphur)	1	1	
27	Lead (Pb)	1	1	1
28	Selenium (Se)	1	0.1	0.1
29	Sulphide (SO3-)	1	1	1
30	Sulphate (SO4-)	400	400(note2)	500

Table A7.2.4 Iran Water Quality Standard for Discharge Water (2/2)

Item	Pollutants	Discharged to surface water , mg/l	Dicharged to wells, mg/l	Used in Agriculture and Irrigation, mg/l
31	Vanadium (V)	0.1	0.1	0.1
32	Zinc (Zn)	2	2	2
33	Greasy and oily matters	10	10	10
34	Detergent (ABS)	1.5	0.5	0.5
35	Biological Oxygen Demand (BOD5)	50	50	100
36	Chemical Oxygen Demand (COD)	100	100	200
37	Dissolved Oxygen (DO)	2	-	2
38	Total Dissoloved Solids (TDS)	note 1	note 2	-
39	Total Suspended Solids (TSS)	40	-	100
40	pH	6.5-8.5	5 to 9	6-8.5
41	Turbidity (NTU)	50	-	50
42	Colour (PTC)	75 clour units	75 clour units	75 clour units
43	E-Coli (Nos. in 100 ml)	400	400	400
44	MPN (Nos. in 100 ml)	1000	1000	100
45	Parasitic worm eggs (nematode)	1/ 1000 ml	1/ 1000 ml	1/ 1000 ml

Note 1: Discharge with concentration level in excess of the level specified in the table shall be permissible, if the discharge does not increase the chloride sulfate and dissoloved substances of the receiving body at a 200m diameter, in excess of 10%.

Note 2: Discharge with concentration level in excess of the level specified in the table shall be permissible, if the increase induced by dishcharge of the choloride sulphate and dissolved substances in the consumed water does not exceed 10%.

Ref : The Executive Bylaws for Paragraph (C) of Article 104 and Article 134, DOE (2001)

Table A7.2.5 Guideline for Interpretations of Water Quality for Irrigation

Potential Irrigation Problem	Degree of Restriction on Use		
	None	Slight to Moderate	Severe
Salinity			
EC, mS/cm	<0.7	0.7 – 3.0	>3
Total Dissolved Solids, TDS, mg/l	<450	450-2000	>2000
Specific Ion Toxicity (affects sensitive crops)			
Sodium (Na+) (adj. SAR)			
Surface irrigation	<3	3-9	>9
Sprinkler Irrigation	<3	>3	>9
Chloride (Cl-), meq./lit			
Surface irrigation	<4	4-10	>10
Sprinkler Irrigation	<3	>3	>10
Miscellaneous Effect (Affects susceptible crops)			
Nitrate – N (NO ₃ -N), mg/l	<5	5-30	>30
Bicarbonate (HCO ₃), me/l (Overhead sprinkling)	<1.5	1.5-8.5	>8.5
pH	Normal range 6.5 – 8.4		

(Source : Water Quality for Agriculture, FAO Irrigation and Drainage Paper No.29)

Recommended Maximum Concentrations of Trace Elements in Irrigation Water

Element	Recommended Max. Con. (mg/l)	Remarks
Copper (Cu)	0.20	Toxic to a number of plants at 0.1 to 1.0 mg/l in nutrient solutions
Zinc (Zn)	2.0	Toxic to many plants at widely varying concentrations
Manganese (Mn)	5.0	Toxic to a number of crops at a few-tenths to a few mg/l, but usually only in acid soils
Iron (Fe)	5.0	Not toxic to plants in aerated soils, but can contribute to soil acidification and loss of availability of essential phosphorus and molybdenum. Overhead sprinkling may results in deposits on plants and equipment.

(Source : Water Quality for Agriculture, FAO Irrigation and Drainage Paper No.29)

Annex 8

Farm Economy and Marketing Survey

ANNEX 8

FARM ECONOMY AND MARKETING SURVEY

A8.1 Household Economy

To grasp the actual conditions of farm household economy by Zone in the Survey Area, the farm household economic survey was carried out for 54 households and the farm households were selected in the 5 villages as shown below.

Farm households Selected for the Farmers' Economy Survey

Deh	0 - 5 ha	5 - 10 ha	10 - 15 ha	15 - 20 ha	> 20 ha	Sum
Khoram Abad-e-Olya	3	6	2	7	2	20
Shali Abad	4	3	0	0	0	7
Reis	2	2	2	1	0	7
Kalaveh Haidar Khan	0	5	2	0	0	7
Hossein Abad Shaleh	0	3	4	0	0	7
Nouroleh Oliya	0	2	3	0	1	6
Total	9	21	13	8	3	54

The sample questionnaire used for the survey is attached at the end of this chapter. On the basis of the survey, the present conditions of farm household economy in the Survey Area are summarized below. Table A8.1.1 shows the results of the survey on the farm economy of 54 farm households in the Study Area. Basically, the benefit should cover the production cost for the next year besides production cost and living expenses in this year; otherwise, the farmers could not reproduce. The results of this survey show that the 39 farmers (72%) of the total surveyed farmers of 54 farm households do not have the surplus for reproduction in the next year. The results of the farm households' survey are described below.

(1) Gross income index

In general, the farm size is used as the barometer of potential of gross income in individual farming. In the Survey Area, however, the potential of each farmer's gross income could not be simply described with farm size, because the farmer's gross income in the Survey Area depends on the area of farm with various irrigation types, such as dryland area, irrigated area in only spring, irrigated area in all seasons, etc. Therefore, to analyze the individual farmer's economy, Gross Income Index is used as an index of potential of gross income in individual farming, which is calculated by the following formula;

Gross Income Index

Irrigation type	Crops	Yield ton/ha	Unit price Rls./ha	Gross income million Rls./ha	Gross income million Rls./2 ha	Gross income Index
Dry land	Wheat	1.3	1,450	1.89	2.89	1.0
	Chick pea	0.4	2,500	1.00		
Irrigated in spring	Wheat	5.5	1,450	7.98	12.00	4.2
	Chick pea	1.6	2,500	4.00		
Irrigated at all season	Wheat	5.5	1,450	7.98	17.61	6.1
	Maize	9.0	1,070	9.63		

Gross Income Index = area of dry land in the farm household \times (a) + Irrigated area in spring only in the farm household \times (b) + Irrigated area in all season in the farm household \times (c)
(Constants: (a) = 1, (b) = 4.2, and (c) = 6.1)

The index is not only used in the analysis of farmer's economy, but also is used in the definition of "the weakness" in the Government support on implementation of agricultural development plan.

(2) Farm Household Economy

Table A8.1.2 shows the surveyed farmers' economic data, in which the individual farmer's data is arranged according to size of each Gross Income Index. Based on the table, the farmers' economy in the Survey Area can be concluded as follows;

- 1) The area of each farmer's land in both Sites, which includes own land and rent land, ranges from 1.5 ha to 46 ha.
- 2) The Gross Income Index of each farmer's land in both Sites ranges from 2 to 207.
- 3) The annual gross income in farming of each farm household, which includes agriculture, animal husbandry and trust of farm works with own machinery, ranges from 3 million Rls. to 282 million Rls.
- 4) In regard to animal husbandry in the surveyed farmers, there are two farm households of the single farming of livestock. And there are two farm households, which obtain over 50% of total gross income in integrated farming by animal husbandry, and nine farm households, which obtain 30% to 50% of total gross income by animal husbandry. On the other hand, the farm households, which do not raise livestock, are 23 households, 43% of total surveyed farm households of 54.
- 5) The households whose annual gross income in farming including agriculture, animal husbandry and trust of farm works with own machinery in red (negative), are five. The Gross Income Indexes of these five households are less than 14. Almost all of these farmers have only dry lands of less than 14 ha.
- 6) Percentage of components of running costs in the surveyed farmers' farming, which includes agriculture and animal husbandry, is 27% of repayment of debt, 17% of inputs, 10% of mechanization cost, 9% of feed of livestock, 8% of labor cost, respectively.
- 7) About half of the surveyed farmers have non-agricultural jobs, which are laborer, driver, animal trader, teacher, trader or shop keeper, etc. The non-agricultural incomes of the surveyed farmers range from 0.36 million Rls. a year to 33 million Rls., and are 9.5 million Rls. in average.
- 8) Balances in economies of the surveyed farm households, which subtract the farming cost and living cost from the total gross income of household, are red in 25 farm households of 54 total surveyed households. Especially, in the case of the farm households, of which the Gross Income Indexes are less than 30, almost of households' economy are red. The land of less 30 of the Gross Income Index correspond to 30 ha of dry land, 7 ha of irrigated land in spring only or 5 ha of irrigated land in all season.
- 9) 40 farm households (74%) of the total surveyed farm households have some debts. In the case of over 40 of the Gross Income Index and red in household economy, the reasons of red are construction of house, purchase of farm machinery, construction of well for irrigation. On the other hand, in the case of less 40 of the Gross Income Index, farmers borrow money to purchase of farm materials and mechanization charge in general, even though a few farm household has also debt due to construction of house and construction of well for irrigation.

(3) Living Expenses

Table A8.1.2 shows the living expenses in the surveyed farm households. The annual living expense per capita was very low and 4.6 million Rls. in average, except that the five farm households needed a lot of expense for construction of house or education. Annual living expenses of the 54 surveyed farm households range from Rls. 8.8 million to Rls. 84 million, Rls. 27 million, respectively.

Furthermore, the percentages of components of living expenses are 51% of food, 14% of clothing, 10% of education, 8% of housing, 6% of medical and transportation in average of 54 farm households, respectively.

(4) Debt

74% of the surveyed farm households in the Survey Area have debts as shown in Table A8.1.3. Creditors are banks, cooperatives, wholesalers, consignment loan lenders, relatives, and money lenders.

If the repayment situation is classified into 4 stages: normal, reschedule, overdue and requiring of legal instance, the repayment situations of some farmers to banks are overdue or requiring of legal instance. This means the debt is not paid off and they are in severe condition. The repayment situations of some farmers to cooperatives, consignment loan lenders, and money lenders are also overdue and requiring of legal instance.

From economical point of view, as mentioned above, it is considered that the farm households, of which Gross income Index are less 40 at least, are classified as the weeks. When the development plan will be implemented, the Government should support the weeks by subsidy and deregulation of loan's conditions.

A8.2 Agriculture and Animal Husbandry

A8.2.1 Agriculture

(1) Crop Production

1) General

According to the farm household economic survey (Table A8.2.1), the surveyed farmers have cultivated wheat, barley and chick pea as winter and spring crops, and maize for grain as summer crop. Besides, alfalfa and clover as forage crops are also cultivated by many farmers. Rapeseed was cultivated only by one farmer in 54 surveyed farmers.

2) Yield of crops

Yield of irrigated wheat is 4 to 5.5 tons/ha in average of each Zone, and the range of yields in 54 surveyed farmers is from 2.2 to 9 tons/ha. Yield of wheat in dry land is 1.2 to 2 tons/ha in average of each Zone, and the range of yields in 54 surveyed farmers is from 0.5 to 3 tons/ha.

Yield of barley and chick pea, which are cultivated only in dry land, is 1.2 to 1.7 tons/ha of barley and 0.23 to 0.36 tons/ha of chick pea in average of each Zone, respectively.

Yield of maize for grain, which is cultivated only in irrigated land, is 7.6 to 8.4 tons/ha in average of each Zone, and the range of yields in 54 surveyed farmers is from 4.7 to 12 tons/ha.

Technical index, which shows numbers of used 7 scientific techniques such as organic matter, chemical fertilizer, certified seeds, irrigation, herbicide, insecticide and fungicide, is 3 to 7 in irrigated wheat, 2 to 5 in wheat of dry land, 5 to 7 in maize, respectively. It is seemed that the higher yields are correlative with technical index, 5 to 7 of technical index at least.

3) Amounts of crop production

In regard to annual amounts of crop production in each farm household is about Rls. 18 million/year/household in average at the class of less 30 in Gross Income Index, about Rls. 41 million in average at the class of 30 to 40 in Gross Income Index, and about Rls. 75 million in average at the class of over 40 in Gross Income Index.

4) Rented land

In the Survey Area, crop cultivation is carried out in own land and rented land. 13 farm households (24%) of 54 surveyed farm households are carried out crop cultivation in both lands. 9 households rent the irrigated lands, in which wheat and maize for grain are cultivated, and 3 households rent the dry lands and 2 households rent the irrigated lands and dry lands. In general, most of rented lands are irrigated lands (Table A8.2.2). Land rent is in the range from Rls. 1 million to 3.2 million of irrigated lands and from Rls. 0.4 million to 0.8 million/year.

(2) Present Conditions of Farm Machinery Owners

The number of tractors in Site 1 is about 115 and the area is 6,684 ha, which means that average 58 ha area is allocated to one tractor. In Site 2, 157 tractors work on 9,827 ha, which means that average 63 ha is also allocated to one tractor. Actually, tractors can work only in half of the allocated area, because most of them are light and have low HP. In regard to combine, the number is 14 in Site 1 and 18 in Site2. There are 955 of attachments in the Survey Area.

According to the farm household economic survey, 40% of the total surveyed farmers own tractors and 4% of farmers own combine. With regard to tractors, farmers owned tractors use about 400 hrs a year in average, ranged from 100 to 1,000 hrs, and used periods are 11 years in average, ranged from one to 22 years. 30% of total tractors are purchased during last 5 years. On the other hand, most of combines are purchased within a few years, and works 750 hrs a year on average.

Contracted farmers, which carry out farm works of other farmers with own machinery under contract, is 7 (13% of total surveyed farmers), and contracted area of a tractor is 291 ha in average, ranged from 40 to 900 ha. Annual gross income and net income of a contracted farmer are Rls. 27 million in average, ranged from 6 to Rls.75 million and Rls. 21 million in average, ranged from 6 to Rls. 53 million, respectively.

(3) Present Conditions of Soil Erosion and Soil Analysis of Farm's Land

Most of the surveyed farmers face soil erosion problem in their fields, 80% of the farmers in Khoram Abad, 43% in Shali Abad, 100% of Reis, 57% in Kalaveh Heidarkhan, 29% in Hassan Abad Shaleh and 100% in Noruley Olyia, respectively (Table A8.2.2).

Percentage (%) of farmers, which have ever done soil analysis in their fields, is 14% in Zone 2 and 3, respectively. However, that is 30 to 43% of total surveyed farmers in other Sites, of which half of farmers practiced soil analysis carry out every seeding time and others do every two years or more.

(4) Present Conditions of Use Manure

Dry excrements of cows and chicken, which do not ferment, are used for wheat, barley, maize and alfalfa by 9 (17% of total surveyed farmers), 4, 6, and 4 farmers, respectively. There is no effect on wheat, but the effect of use of manure is shown in increase of yield of about one ton/ha in maize production (Table A8.2.3).

A8.2.2 Animal Husbandry

(1) Dairy cows

At present, local variety is a majority in all zones. About 160 heads of hybrid variety were already introduced to each zone (Zone 1 and 2) of Site 1. Extension of hybrid variety to Zone 3 is less and to Zalou Ab village in Zone 4 and Tapeh Ghol village in Zone 5 is promoted, though extension to other villages is poor.

According to the farm household economic survey (Table A8.2.4), 31 farmers (57% of total surveyed farmers) raise two milking cows in average. Quantity of milk production in each farm household is 2.8 tons an year in average, and annual gross income of milk production is Rls. 2.7 million/household in average. Besides, other gross incomes earned are Rls. 2.9 million in average by sale of cows as beef in 10 farm households, Rls. 3.3 million in average by sale of calves in 17 farm households.

(2) Sheep

Number of sheep in 4 districts, which include Site 1 and Site 2, is about 50,000 heads. Sheep in site 1 and site 2 is mostly Sanjabi breed. This breed is bred in the Sanjabi plain for improvement of meat and wool. The speed of growth is very fast and wool with a cream color is used to carpet industry as the high quality wool. Sheep is raised by farmers in the survey area with traditional method. Male lambs of 30 to 35 kg in weight are often sold at age of 6 months. Feed of sheep is wheat straw, own produced barley, alfalfa and natural pasture in summer.

According to the farm household economic survey, 16 farmers (30% of total surveyed farmers) raise sheep, and each farmer raises 63 heads in average which compose of 28 heads of sheep and 35 heads of young sheep. 11 farmers raise dairy cows and sheep. Annual gross incomes by sheep production are Rls. 14.7 million in average by sale of young sheep, Rls. 5.4 million in average by sale of sheep, Rls. 0.7 million in average by sale of oil produced from milk and Rls. 0.2 million in average by sale of wool. The farmers, who sold milk, are 27 households (50% of total surveyed households), and annual amounts of sale are Rls. 5.9 million in average per household. On the other hand, the farmers, which sold products of sheep, are 16 households (30%), and annual amounts of sale are Rls. 14.3 million in average per household.

A8.2.3 Farmers Intentions on Agricultural Development

Farmers' evaluation on present production factors and farmers' expectations in future were surveyed and the surveyed results are summarized below. The results are reflected directly or indirectly in the agricultural development plan.

(1) Farmers' Evaluation on Present Production Factors

The production factors, which are mentioned as problems in farmers' evaluation are farm gate price of products, input prices, access to rural credit, interest rate of loan, technology of dry farming and mechanization cost, respectively. On the other hand, the factor, which is no problem to farmers, is distance to commercialization (Table A8.2.5).

The evaluation on the factor "getting of irrigation water" is different among zones, that is, most of the farmers in Zone 1, which is near the Ravansar spring, and Zone 4 and 5, which have many irrigation wells, evaluate the factor as medium problem. However, most of the farmers in Zone 2 and 3 evaluate it as a big problem. Besides, the farmers' evaluation on the factor "access to technology" is a "medium problem" in Zone 1 and 3 and "very problem" in other zones, and that on the factor "appropriate technology" is "very problem" in Zone 2 and 3. The problems on technology imply the importance of technical extension activities of ESC. It is necessary to improve the extension system and activities.

(2) Farmers' Expectation in Future

The targets of annual gross income, which farmers expect in the near future, have many differences in range from Rls. 25 million to Rls. 240 million by farm scale. To rearrange the intricate data of farmers' target of annual gross income, Gross Income Index (GII) is used (Table A8.2.6), which is the index of potential of gross income in individual farming instead of farm scale. As a result, the targets of annual gross income are Rls. 50 million in average in households of less 30 of GII, Rls. 87 million in average in households of range from 30 to 40 of GII, and Rls. 108 million in average in households of over 40 of GII. Most of the farmers intended to continue farming. The intentions of farmers on improvement of farming are summarized as follows. Around 91% of the surveyed farmers intend to introduce animal husbandry, dairy cow in 52% of the farmers and sheep in 57% of the farmers. Besides, the percentage of the farmers for the total surveyed farmers, which intend to introduce beekeeping, inland fish culture and horticulture, is 43%, 48% and 80%, respectively. The farmers intend to introduce dairy cows of 2 to 50 heads, 12 heads in average.

(3) Reference to Farmers' Intentions in the Development Plan

Farmers' evaluation on present production factors and farmers' expectations in future are taken into consideration in planning of the agricultural development plan as follows.

Problems in production factors	Items in the Agricultural development Plan
Low and unstable price of products	Farmers organization development plan (RPC)
High price and untimely supply of inputs	Farmers organization development plan (RPC)
Severe conditions and difficult access of credits	Recommendation on improvement of loan conditions, especially, for the weaker people.
High cost of mechanization	Farm mechanization plan
Difficult in getting of irrigation water	Irrigation plan
Difficult to access to technologies	Extension system improvement plan
Farmers expectations in future	Items in the Agricultural development Plan
Targets of annual gross income	All items in the plan
Integrated farming (cow, sheep, beekeeping, inland fishery, horticulture)	All items in the plan

A8.2.4 Marketing of Agricultural Products

(1) General

At present, mainly the grains and pulse including wheat, barley, and chickpea are cultivated in the Study Area in the both rain fed and irrigated field and maize is cultivated in the irrigated field only. Milk is also produced in the area.

The Agricultural Development Plan propose the introduction of the following crops aimed at the markets mainly local, but long distance when and wherever possible within ten years time: they are; alfalfa, rape seed, maize for silage, sugar beet to be grown in an area of around one thousand hectares each; and three vegetables, potato, tomato, and onion, in an area of 40 ha each. Coriander growing is planned in an area of 140 ha looking forward to entering into a niche of the international commodities. Rose growing in an area of 100 ha is also planned in response to the Provincial Government recommendation for the international perfume industry. In the animal husbandry sector, besides diary farming, both beekeeping and trout-raising are proposed for the local market.

The planned production volume of each crop and produce at the tenth year after the Project initiation, the existing processing plants in/around the Study Area and the existing market networks are shown in Table A8.2.7.

The aim of the farm household economic survey is to see if each produce selected in the Agricultural Development Plan whose volume will reach the level estimated in the study in ten years time would find their market.

All the improvement in mechanization of agriculture, in quality control aiming at higher safety standard, and in collection and forwarding facilities implies higher costs, requires winning of the market approval of corresponding higher prices, which is implicitly understood. Development of collection and forwarding facilities are proposed in our plan for the development of RPC.

The government offers a guaranteed price to the producers of wheat and the selected strategic crops, including maize grains and rapeseeds. Wheat, as the staple food, against cheaper imported ones; for the other non-strategic crops it will intervene when market becomes volatile.

A draft of the fourth five year economic development plan which is due to start next year has recently been officially announced. It is understood that the fourth plan succeeds the principles set by the third plan. So, one of the focus of the policies will continue to be given to self-sufficiency in agriculture and therefore, the guaranteed producer price for the strategic crops will be maintained.

Increase of consciousness on the safety standard of food, either in the form of reduction of chemical residues in produce or to the direction of organic farming, is quite tangible in both producers and processing industries throughout the Study Area and its surroundings; as they are in the same boat where safety of consumers is concerned.

Though the plan has taken into account of the current market situation as a whole, some of the crop development plans look ambitious if we compare with the present cropping areas in the Province, and hence this survey will look into the situations a little further for those crops (Alfalfa, rapeseed, and sugar beet).

(2) Present Situation of Agricultural Market

1) Crops within the Scope of Plan

i) Major Grains

Three crops, wheat, maize grain and rape seed, are included in the group of strategic crops. Wheat is the one of the staple diet of the people. Around 8 million tons were produced domestically and 6.6 million tons were imported in 2000. The Government has been giving subsidy to absorb negative commission on its sale at a regulated price. So wheat growers sell all their harvest to the government, and buy their flour requirement from retailers such as RCOs using ration coupons.

The Province produced above 250 thousand tons in 2000/01, which covers around 20 % of the local demand. The rest is covered by the produce from Provinces of Khorasan (50%), Fars and others. In a lean year, the gap was filled by the import. In 2001/02, it came from Russia through Bandar-e-Anzali. Most of them went to the Government silo at the price of Rls. 1,568/kg, but some lesser quality wheat went to egg/ broiler industry for feed at the price of Rls. 1,300-to 1,350. A cereal wholesale market is located at the west end of the city, in the south-west of the Freedom Roundabout. Flour mills are found in the vicinity. A silo complex of about 15,000 m³ capacity is located along the Silo Street, adjacent to the fruit/vegetable wholesale market, in the north-east of the centrally situated Freedom Roundabout. The wheat bran goes to the feed industry.

Barley, ninety percent of maize grain and alfalfa go to the feed industry. In the Study Area, a maize drying facility is found in both of Zālū Āb and Ravansar, and a feed plant in Deh Bagh.

ii) Alfalfa

In the urban area of Kermanshah, alfalfa hay is sold at a feed wholesale market adjacent to the cereal market. A public veterinary center is found in the market place. 20 per cent of alfalfa comes from the suburbs like Taq-e-Bostan, Kuzaran etc., and the rest from Hamadan Province (Ghorveh, Asadabad etc). The suburban producers have recently found it more lucrative to grow alfalfa than wheat, and hence it has become a vogue for the last two years. The wholesalers here go to pick up hay directly to the producer's field with the call from him, and farmers in industry of animal husbandry themselves come to the wholesalers. It is not generally thought that the quality of fodder of Kermanshah is good, but recently a new market found in Kuwait has raised the price from Rls. 150 to 500/kg.

'Ravansar, Livestock, Chicken and Fish Feeding Company' is located in Deh Bagh. It is financed by the Agricultural Bank. At the moment it runs at the operational rate of 50 to 75 % to a 30,000 ton/year capacity because of the lack of market and short supply of two major ingredients, barley and wheat bran. It is sold directly to the medium to small scale buyers, as bigger ones mix their own feed by themselves. Its market area beyond Kermanshah Province covers five western Provinces and one eastern Province, Khorasan. It welcomes the increased barley production in the Study Area and the future scope of selling its five kinds of fish feed for the trout culture.

iii) Chickpea

Chick pea is a sub-staple food. In Kermanshah Province the volume of production reached around 105 thousand tons from 231 thousand ha in 2001/02, which is sufficient for the local demand. It grew mostly on the rain fed field. In Kermanshah city, it is sold at the cereal market. About half of the produce comes from Gahvareh and Kuhdasht, and the other half

from Mahidasht, Sarab Nilufar and others. 85 % of the commodity is brought by producers themselves on their pick-ups, and the rest by middlemen. The commodity is cleaned, graded according to quality and size, and packed at two plants in Daulat Abad, west to the Isal Roundabout.

At the time of the survey, Maize grain was being harvested everywhere in the Study Area and it arrived at the RCO of major village centers; after drying, some will directly be shipped to as far as Qazbin and Mahabad in North-Western Iran.

iv) Rape

Rape seed is another strategic crop (whose producer price is guaranteed by the government) for the edible oil industry. The producers sell it to the state oilseed cultivation organization, from which the industry buys. Though the target area of cultivation plan will reach 20 per cent of the present provincial crop area of the oil seeds, it consists of only 2.6 per cent of the total country. An edible oil mill is located in each of Mahidasht, and Kermanshah city. Rape seed meal is costlier than other meals, and it goes directly to dairy farms, than to feed mixing plants.

The edible oil mill in Mahidasht produces 300 tons of oil a day, in which the share of rapeseed oil is ten per cent. It has the capacity of 1,200 tons a day, and has a plan to double the capacity before long. One ton of rapeseed turns into 400 to 420 kg of oil. In the present situation, therefore, production of rapeseed oil at the rate of 30 tons per day requires around 27 thousand tons of rapeseed a year as raw material, whereas the target annual production of the agriculture development plan in the Study Area is five thousand tons.

v) Sugar beet

A beet sugar mill is found in each of Bīsotūn and Eslam-abad. Production contracts have been bound between the mills and the producers to remove the problem of imbalances between supply and demand as well as to supervise the QC of the produce. The target area of cultivation will reach seven per cent of the present provincial crop area. However, it only consists of 7.5 per cent of the total country. In Iran, only the climate in Khuzestan Province is suitable for sugarcane growing, and cubed beet sugar has been connected with the habit of drinking tea in Iran, and hence its market is domestically established. The beet-sugar mill in Bisotun processes 1,800 tons of sugar beet a day, and turns them into about 200 tons of beet sugar. It has a plan to increase the processing capacity to 2,500 ton by next year. Its present processing capacity of about 660 thousand tons a year is about 1.6 times more than the total production of the beet in Kermanshah Province in 2000/01. The target volume of production in ten year's time is around ten per cent of its present processing capacity. The factory gives away input in kind to the contracted farmers to collect at the time of harvest. So the market will offer good potential for the sales of the produce.

vi) Coriander

Coriander seed growing is meant for export. Cilantro, fresh leaves of coriander, is daily used in cooking as a herb, found plenty in the vegetable market places all the year round. They grow in the suburbs of the city, up the Gharasu basin, and up and downstream of the Study Area, such as the areas of Mohidasht, Sarab Nilufar, Kahriz, and Dorud Faraman. Vegetable growers themselves or middlemen are bringing them to the market on their pick-ups every morning with other vegetables.

The seed, as a spice, has international markets, as well as domestic markets. At present domestic production is concentrated in the eastern region of the Province. And Kangavar city

which is located near the border to Hamadan Province is the center. Producers live on the highland between Sahneh to the west to the city and Nahavand to the south-east, along the Central Zagros ranges, and bring the commodity to the center, which ships it to as far as Teheran market. In Kermanshah city, the commodity is dealt by the traders in the Islami Market, where all kind of spices are sold. A shop with a frontage of three meters buys 10 tones of the seed yearly from a wholesaler in Kangavar city. The selling price is around Rls.7,000 per kilogram, and at some shops, it is out of stock this time of the year. The seed is one of the spices that enhance the culinary delights of the home cooking. Besides, the powdered coriander is mixed with a bleaching agent when the hair is dyed. Apparently the local market itself would have space to accommodate the produce from the Study Area for some time. However, the target area of cultivation will reach three per cent of the present provincial crop area, which is the specialty producer of the country. So expected competition in the established marketing channel will lead the new comer to the export market whether it likes it or not.

vii) Rose

Rose' essence is used in perfume and pharmaceutical industries. Confectionery industry uses it to give flavor to their products, for example, chewing gum.

Mahallat in Markazi Province, Qamsar and the suburbs of Esfahan, both in Esfahan Province, all situated on dry highlands between the eastern flanks of the East Zagros and the Central Zagros ranges, are three representative areas that grow rose in Iran. The Kermanshah provincial government has been providing the prospective growers with free rose cuttings for encouragement. Rose flowers both fresh and dried are meant for export. Golpar-e-Paveh (Marjoram of Paveh), a laboratory intending to extract the essential oil from herbal and medicinal plants, including Marjoram of Paveh of course, is being built in the Ravansar industrial Estate. It has also a plan to extract rose essential oil, and have the rose saplings grow on 100 hectares of land in the highland of Dinehvar area. With their planned capacity at present they can process the volume of pedals collected from the area of 300 hectares.

Fresh flowers would be supplied by contracted growers with whom the laboratory will supervise their operation to maintain the standard of quality of the material. Dry flowers are also sought after, and buyers have been coming from as far as the garden city of Kāshān.

viii) Plastic house

Along with the generic way of vegetable growing, some market gardens in the form of plastic houses are found in the Study Area. The graduates majored in agriculture are the sources of entrepreneurship. As vegetables grown in plastic houses that can regulate the use of chemicals hold an attraction for consumers, buyers come directly to the houses so that the growers can sell their produce without going into the existing agro-marketing channel that consists of middlemen, wholesalers and retailers.

Successful horticulturists are eager to get rid of soil and use water by switching their system to that of the hydroponics, as soon as the amortization period of the present loan is over.

ix) Milk and diary produce

A processing plant each is located in Bīsotūn and Eslām Ābād. Each has been sending tank trucks to collect milk every morning to the project site. 'Ravansar Animal Husbandry Company' in Bīsotūn is 15 years old. It has enough capacity to buy the increased milk production from the Study Area. It has an agreement with a processing plant in Eslām Ābād in terms of marketing volume and area. It gets 70 % of the market, but the other has market

monopoly in Districts of Eslām Ābād and Kerend.

x) Honey

In the Study Area, beekeeping is concentrated in Hassan Ābād, where 200 beehives are found. Sales are done through family networks. A tiny shop each in Ravansar and Kermanshah functions as a liaison to consumers at large. With the increase of flowering plants in the planned cropping patterns and diversification of crops, honeybee will have more space and time to collect honey.

xi) Fish

Fishmongers in the city do not form a market place. One or two individual shops with a signboard of jumping fish on a blue background are found here and there in the broader areas south of the central roundabout. Fish and poultry are sold side by side in some shops also. They sell mainly sea fish with minuscule amount of freshwater fish. With a unit price of Rls. 25,000/kg, trout as a commodity forms a high-end niche for connoisseurs even in a smaller fish market. The catch of some half a ton of trout from the breeding ponds are brought up daily from the area of the Seymareh River in Lorestan Province, downstream of the Gharasu River. Some shops sell grilled trout along with the fresh ones. Natural freshwater fish, the families of carp, catfish, and landlocked salmon are also found in the market, but in less quantity.

2) Some commodities out of scope of the agricultural development plan

Other herbs such as *Valeriana officinalis*, *Thymus serpyllum*, *Mentha piperatand* *Melissa officinalis* have potential in the international marketplace. They are grown in an area of 44 ha in the province under contract to the two processing plants that are also located in the province.

Wool has demand in weaving industry. The two manufacturing centers of the Kurdish carpets and rugs are Sanandaj and Bījār in the neighboring Kurdestān. Buyers there are coming down to the project sites to buy wool from the producers including the nomads who are on passage through the Study Area.

(3) Concluding remarks

This cursory survey finds an entrepreneurial flair on the part of the planner of the IADP of the Study in choosing the commodity crops, envisaging the future market in the competitive conditions. All the commodities could find their market, nevertheless. Needless to say that the producers of crops with guaranteed price will require incessant efforts to increase its efficiency level anticipating to cope up with the situation of future market change.

This is an example of a marketing principle that diversification will pay. The principle will not only make the supply pressure of the generic crops off its market capacity, but also reduces the natural risks caused by mono-culture that give the heavy burden on the environment.

Table A8.1.1 Farmer's Economy in the Survey Area (farmers' Economic Survey, 2003)

Code No.	Deh	Own land			Rent land			Total ha	Gross* income index	Production				Gross income in agriculture	Adult cow	Bull	Calves	Sheep & goat		Gross income of animal husbandry	Gross income by trust of farm works	Total gross income in farming	Total cost in farming	Total net income in farming	Gross income in other jobs	Total gross income in household	Total household expenses	Balance in household	Total debts	Reason of debts			
		Irrg ha	Dry ha	Sum ha	Irrg ha	Dry ha	Sum ha			Wheat ton	Barley ton	Maize (grain) ton	Chicken					Adult	Lamb												heads	heads	heads
28	Reis	0.0	2.0	2.0	0.0	0.0	0.0	2.0	2.0	2.0	1.8																						
1	Khoram Abad Oliyia	0.5	1.0	1.5	0.0	0.0	0.0	1.5	3.1	2.2	1.5																						
21	Shali Abad	0.5	1.0	1.5	0.0	0.0	0.0	1.5	3.1	2.2	1.3																						
49	Noroleh Oliyia	0.0	4.0	4.0	0.0	0.0	0.0	4.0	4.0			1.3																					
24	Shali Abad	0.0	4.5	4.5	0.0	0.0	0.0	4.5	4.5		10.5																						
42	Hassan Abad Shaleh	0.0	6.0	6.0	0.0	0.0	0.0	6.0	6.0				6.0																				
50	Noroleh Oliyia	0.0	6.0	6.0	0.0	0.0	0.0	6.0	6.0																								
27	Shali Abad	0.0	8.0	8.0	0.0	0.0	0.0	8.0	8.0	0.3	1.2																						
30	Reis	0.0	8.0	8.0	0.0	0.0	0.0	8.0	8.0	4.6																							
25	Shali Abad	2.5	1.5	4.0	0.0	0.0	0.0	4.0	12.0	13.5	1.7																						
32	Reis	0.0	12.0	12.0	0.0	0.0	0.0	12.0	12.0	12.0	1.2																						
52	Noroleh Oliyia	0.0	12.0	12.0	0.0	0.0	0.0	12.0	12.0			4.2																					
2	Khoram Abad Oliyia	2.5	2.0	4.5	0.0	0.0	0.0	4.5	12.5	5.5	2.4																						
22	Shali Abad	1.0	0.0	1.0	2.0	0.0	0.0	2.0	3.0	12.6	4.2																						
53	Noroleh Oliyia	0.0	14.0	14.0	0.0	0.0	0.0	14.0	14.0	8.0	6.0																						
33	Reis	0.0	15.0	15.0	0.0	0.0	0.0	15.0	15.0	14.4	1.8																						
31	Reis	2.0	8.5	10.5	0.0	0.0	0.0	10.5	16.9	13.0	0.5																						
37	Kalaveh Heidarshan	3.0	0.0	3.0	0.0	0.0	0.0	3.0	20.2	9.0		18.0																					
3	Khoram Abad Oliyia	4.0	4.0	8.0	0.0	0.0	0.0	8.0	20.8	12.0	4.5																						
4	Khoram Abad Oliyia	4.0	4.0	8.0	0.0	0.0	0.0	8.0	20.8	14.0	12.0																						
5	Khoram Abad Oliyia	4.0	4.0	8.0	0.0	0.0	0.0	8.0	20.8	7.7	1.2																						
29	Reis	0.0	6.0	6.0	0.0	17.0	17.0	23.0	23.0	36.8		1.4																					
26	Shali Abad	4.0	4.0	8.0	0.0	4.5	4.5	12.5	25.3	46.5	21.0																						
36	Kalaveh Heidarshan	4.0	3.0	7.0	0.0	0.0	0.0	7.0	27.4	14.2		18.0																					
6	Khoram Abad Oliyia	4.5	4.0	8.5	0.0	0.0	0.0	8.5	28.6	10.5	6.6	18.0	0.4																				
25	Shali Abad	6.5	1.5	8.0	0.0	0.0	0.0	8.0	28.8	22.0	1.3																						
35	Kalaveh Heidarshan	5.0	1.0	6.0	0.0	0.0	0.0	6.0	31.5	15.9		50.0																					
19	Khoram Abad Oliyia	2.0	23.0	25.0	0.0	0.0	0.0	25.0	33.3	9.2	15.0	2.0																					
9	Khoram Abad Oliyia	4.5	6.0	10.5	0.0	3.0	3.0	13.5	33.6	17.5	10.6																						
43	Hassan Abad Shaleh	4.0	2.0	6.0	0.0	0.0	0.0	6.0	34.0	3.0																							
7	Khoram Abad Oliyia	5.0	4.0	9.0	0.0	0.0	0.0	9.0	34.5	13.2	6.0																						
11	Khoram Abad Oliyia	5.0	7.0	12.0	0.0	0.0	0.0	12.0	35.6	19.0	8.8	20.0	0.3																				
16	Khoram Abad Oliyia	3.0	16.0	19.0	0.0	0.0	0.0	19.0	36.2	12.0	14.0	10.5	0.5																				
47	Hassan Abad Shaleh	5.0	7.0	12.0	0.0	0.0	0.0	12.0	37.5	33.9		19.0	0.2																				
44	Hassan Abad Shaleh	6.0	1.0	7.0	0.0	0.0	0.0	7.0	37.6	16.5		16.5																					
17	Khoram Abad Oliyia	4.0	16.0	20.0	0.0	0.0	0.0	20.0	40.4	9.5	57.6	18.0																					
38	Kalaveh Heidarshan	7.0	0.0	7.0	0.0	0.0	0.0	7.0	42.7	14.0		23.0																					
15	Khoram Abad Oliyia	6.0	12.0	18.0	0.0	0.0	0.0	18.0	44.8	21.5	13.0	22.0	0.8																				
10	Khoram Abad Oliyia	5.0	7.0	12.0	1.0	12.0	13.0	25.0	51.8	11.0	15.3	18.0	1.8																				
8	Khoram Abad Oliyia	6.0	4.0	10.0	0.0	0.0	0.0	10.0	52.0			30.0	0.3																				
34	Reis	10.0	10.0	20.0	0.0	0.0	0.0	20.0	52.0	19.2	16.8																						
14	Khoram Abad Oliyia	7.0	9.5	16.5	0.0	0.0	0.0	16.5	54.1	34.7		18.7																					
41	Kalaveh Heidarshan	8.0	6.0	14.0	0.0	0.0	0.0	14.0	54.8	20.0		34.0	0.6																				
18	Khoram Abad Oliyia	10.0	10.0	20.0	0.0	0.0	0.0	20.0	63.4	32.9	18.7	25.5																					
40	Kalaveh Heidarshan	10.0	0.0	10.0	0.0	0.0	0.0	10.0	64.8	22.8		45.0																					
13	Khoram Abad Oliyia	3.0	13.0	16.0	9.0	0.0	9.0	25.0	67.2	5.7	8.0	10.8	0.9																				
45	Hassan Abad Shaleh	10.0	2.0	12.0	0.0	8.0	8.0	20.0	71.0	37.5		50.0	1.4																				
39	Kalaveh Heidarshan	4.0	4.5	8.5	12.0	1.0	13.0	21.5	72.7	16.0	3.6	36.0	1.2																				
51	Noroleh Oliyia	6.0	6.0	12.0	10.0	0.0	10.0	22.0	84.6	30.0		33.6	0.6																				
20	Khoram Abad Oliyia	3.0	27.0	30.0	9.0	0.0	9.0	39.0	88.8	29.0	20.0	40.3	2.0																				
46	Hassan Abad Shaleh	13.0	0.0	13.0	0.0	6.0	6.0	19.0	91.0	18.0	3.6	32.0																					
48	Hassan Abad Shaleh	16.0	1.5	17.5	0.0	0.0	0.0	17.5	91.5	45.5	1.9	48.																					

Table A8.1.2 Annual Farm Household Expenses in the Survey Area (Farmers' Economic Survey, 2003)

	Deh	Own land			No. of Total Family			Annual Household Expenses (Family)										Annual expenses per capita	
		Irrg. ha	Dry ha	Sum ha	male	female	Sum	Food	Housing	Clothing	Energy	Medical	Transport	Communication	Education	Taxes	Others		Total
								Million Rls.	Million Rls.	Million Rls.	Million Rls.	Million Rls.	Million Rls.	Million Rls.	Million Rls.	Million Rls.	Million Rls.		Million Rls.
S1	Khoram Abad Oliya	0.5	1.0	1.5	2	3	5	7.20	0.45	0.52	0.30	1.75	1.00	0.30	0.00	0.00	0.30	11.82	2.36
S2	Khoram Abad Oliya	2.5	2.0	4.5	3	4	7	10.80	0.00	0.21	0.20	1.00	0.60	0.03	2.50	0.00	0.30	15.64	2.23
S3	Khoram Abad Oliya	4.0	4.0	8.0	1	3	4	15.60	1.80	7.20	0.21	0.40	2.00	0.24	1.80	0.00	0.50	29.75	7.44
S4	Khoram Abad Oliya	4.0	4.0	8.0	2	3	5	16.50	1.20	4.60	0.24	1.20	4.00	0.05	0.90	0.00	0.60	29.29	5.86
S5	Khoram Abad Oliya	4.0	4.0	8.0	2	2	4	6.20	0.10	1.50	0.18	0.50	2.50	0.18	0.20	0.00	0.35	11.71	2.93
S6	Khoram Abad Oliya	4.5	4.0	8.5	4	3	7	12.00	1.50	4.00	0.22	1.00	0.50	0.40	0.00	0.00	0.50	20.12	2.87
S7	Khoram Abad Oliya	5.0	4.0	9.0	1	2	3	19.00	1.20	4.50	0.24	1.50	4.00	0.15	6.60	0.00	0.50	37.69	12.56
S8	Khoram Abad Oliya	6.0	4.0	10.0	4	4	8	18.00	1.00	5.00	0.20	3.00	1.00	0.20	2.00	0.00	2.00	32.40	4.05
S9	Khoram Abad Oliya	4.5	6.0	10.5	2	2	4	14.50	1.20	4.60	0.24	3.00	3.50	0.10	1.20	0.00	0.50	28.84	7.21
S10	Khoram Abad Oliya	5.0	7.0	12.0	2	3	5	8.00	1.00	4.20	0.48	1.50	0.30	0.10	0.20	0.00	0.10	15.88	3.18
S11	Khoram Abad Oliya	5.0	7.0	12.0	2	2	4	7.80	1.25	3.00	0.25	2.00	1.00	0.15	2.76	0.00	0.42	18.63	4.66
S12	Khoram Abad Oliya	10.0	5.0	15.0	4	4	8	30.00	0.00	7.50	0.25	1.00	4.70	0.50	2.50	0.00	1.50	47.95	5.99
S13	Khoram Abad Oliya	3.0	13.0	16.0	2	3	5	8.00	0.80	3.00	0.21	0.70	1.00	0.15	0.80	0.00	0.20	14.86	2.97
S14	Khoram Abad Oliya	7.0	9.5	16.5	4	3	7	21.60	21.50	8.50	0.20	1.00	2.40	0.24	1.90	0.00	0.50	57.84	8.26
S15	Khoram Abad Oliya	6.0	12.0	18.0	2	2	4	7.00	1.20	3.00	0.21	3.00	0.40	0.10	9.00	0.00	0.00	23.91	5.98
S16	Khoram Abad Oliya	3.0	16.0	19.0	3	5	8	22.00	1.50	6.00	0.30	2.50	4.50	0.10	1.05	0.00	0.80	38.75	4.84
S17	Khoram Abad Oliya	4.0	16.0	20.0	2	2	4	9.60	0.50	3.50	0.35	2.00	0.80	0.12	1.80	0.00	1.00	19.67	4.92
S18	Khoram Abad Oliya	10.0	10.0	20.0	1	2	3	6.50	1.20	3.00	0.74	0.85	0.86	0.10	7.20	0.00	0.58	21.03	7.01
S19	Khoram Abad Oliya	2.0	23.0	25.0	3	2	5	15.00	0.00	3.50	0.25	1.00	1.50	0.12	1.00	0.00	0.30	22.67	4.53
S20	Khoram Abad Oliya	3.0	27.0	30.0	4	6	10	25.92	2.22	5.20	0.72	5.00	0.95	1.00	1.85	0.00	0.45	43.31	4.33
S21	Shali Abad	0.5	1.0	1.5	4	2	6	11.00	0.30	3.00	0.42	3.00	1.00	0.05	0.00	0.00	0.30	19.07	3.18
S22	Shali Abad	1.0	0.0	1.0	2	1	3	4.00	2.50	1.00	0.21	0.50	0.80	0.10	0.40	0.00	0.00	9.51	3.17
S23	Shali Abad	2.5	1.5	4.0	2	1	3	5.00	0.60	2.50	0.22	0.30	0.50	0.20	0.25	0.00	0.00	9.57	3.19
S24	Shali Abad	0.0	4.5	4.5	4	1	5	10.95	0.50	4.00	0.40	0.30	0.30	0.40	12.50	0.00	0.00	29.35	5.87
S25	Shali Abad	6.5	1.5	8.0	2	4	6	12.00	0.20	6.80	0.36	0.50	1.80	0.32	0.90	0.00	0.65	23.53	3.92
S26	Shali Abad	4.0	4.0	8.0	3	2	5	18.00	3.20	5.00	0.24	2.50	5.00	0.15	1.50	0.00	0.70	36.29	7.26
S27	Shali Abad	0.0	8.0	8.0	1	2	3	10.80	0.00	3.50	0.02	1.00	0.20	0.20	1.00	0.00	0.30	17.02	5.67
S28	Reis	0.0	2.0	2.0	3	3	6	16.00	0.20	7.50	0.27	0.25	3.00	0.24	0.00	0.00	0.50	27.96	4.66
S29	Reis	0.0	6.0	6.0	3	4	7	10.00	0.40	2.00	0.22	1.00	0.15	0.15	0.30	0.00	0.00	14.22	2.03
S30	Reis	0.0	8.0	8.0	3	1	4	6.00	0.40	1.50	0.25	0.15	0.60	0.05	0.00	0.00	0.00	8.95	2.24
S31	Reis	2.0	8.5	10.5	2	3	5	5.40	0.30	1.20	0.25	0.95	0.20	0.50	0.00	0.00	0.00	8.80	1.76
S32	Reis	0.0	12.0	12.0	4	4	8	12.60	0.00	4.00	0.36	0.80	3.00	0.20	9.65	0.00	0.30	30.91	3.86
S33	Reis	0.0	15.0	15.0	2	3	5	11.00	0.60	3.90	0.34	0.70	1.10	0.03	0.80	0.00	0.00	18.47	3.69
S34	Reis	10.0	10.0	20.0	3	2	5	11.00	1.00	5.50	0.96	1.50	0.45	0.16	1.00	0.00	0.45	22.02	4.40
S35	Kalaveh Heidarkhan	5.0	1.0	6.0	3	1	4	9.60	0.60	4.00	0.30	2.50	0.90	0.60	0.00	0.00	5.00	23.50	5.88
S36	Kalaveh Heidarkhan	4.0	3.0	7.0	4	3	7	5.00	1.50	2.50	0.45	3.00	0.80	0.12	3.00	0.00	0.30	16.67	2.38
S37	Kalaveh Heidarkhan	3.0	0.0	3.0	2	1	3	18.00	0.30	4.30	0.36	2.00	2.30	0.24	2.10	0.00	0.35	29.95	9.98
S38	Kalaveh Heidarkhan	7.0	0.0	7.0	1	1	2	11.80	0.00	3.00	0.30	1.00	2.60	0.02	8.40	0.00	0.30	27.42	13.71
S39	Kalaveh Heidarkhan	4.0	4.5	8.5	1	2	3	15.00	14.00	3.00	0.36	1.50	2.00	0.05	1.80	0.00	0.75	38.46	12.82
S40	Kalaveh Heidarkhan	10.0	0.0	10.0	6	2	8	19.00	1.00	4.60	0.36	1.20	0.50	0.15	0.30	0.00	0.45	27.56	3.45
S41	Kalaveh Heidarkhan	8.0	6.0	14.0	2	4	6	7.20	0.75	3.45	0.38	0.60	1.00	0.08	1.80	0.00	0.37	15.63	2.61
S42	Hassan Abad Shaleh	0.0	6.0	6.0	3	3	6	6.00	1.00	3.00	0.24	0.84	1.20	0.10	1.80	0.00	0.00	14.18	2.36
S43	Hassan Abad Shaleh	4.0	2.0	6.0	3	3	6	6.80	0.50	1.50	0.42	2.00	2.00	0.30	0.90	0.00	0.90	15.32	2.55
S44	Hassan Abad Shaleh	6.0	1.0	7.0	4	2	6	8.40	0.80	3.00	0.36	5.60	1.80	0.18	1.50	0.00	0.00	21.64	3.61
S45	Hassan Abad Shaleh	10.0	2.0	12.0	4	1	5	7.20	2.20	3.60	1.50	1.00	1.20	0.35	0.95	0.00	0.00	18.00	3.60
S46	Hassan Abad Shaleh	13.0	0.0	13.0	1	3	4	18.00	1.00	8.00	0.13	1.50	4.00	0.05	16.80	0.00	0.50	49.98	12.50
S47	Hassan Abad Shaleh	5.0	7.0	12.0	4	4	8	28.50	21.00	6.00	1.35	5.00	1.20	1.10	7.20	0.00	0.60	71.95	8.99
S48	Hassan Abad Shaleh	16.0	1.5	17.5	3	3	6	30.00	1.00	9.00	0.80	1.00	3.60	1.00	18.00	0.00	0.00	64.40	10.73
S49	Noroleh Oliya	0.0	4.0	4.0	1	1	2	5.80	0.00	3.00	0.48	1.20	0.60	0.22	3.75	0.00	0.78	15.83	7.92
S50	Noroleh Oliya	0.0	6.0	6.0	3	2	5	10.00	0.50	3.00	0.18	2.00	2.20	0.03	0.00	0.00	0.00	17.91	3.58
S51	Noroleh Oliya	6.0	6.0	12.0	2	4	6	7.00	0.60	1.00	0.24	2.10	1.00	0.07	0.90	0.00	0.00	12.91	2.15
S52	Noroleh Oliya	0.0	12.0	12.0	3	4	7	18.00	5.00	2.50	0.45	6.00	1.20	0.36	1.50	0.00	0.00	35.01	5.00
S53	Noroleh Oliya	0.0	14.0	14.0	7	5	12	54.00	0.00	3.00	0.36	4.00	3.60	0.25	0.00	0.00	0.30	65.51	5.46
S54	Noroleh Oliya	20.0	10.0	30.0	3	1	4	50.00	15.00	4.00	1.20	1.00	0.50	10.80	1.30	0.00	0.00	83.80	20.95
Average (Million Rls./year)								14.08	2.16	3.88	0.38	1.71	1.66	0.43	2.70	0.00	0.47	27.46	4.63
%								51.3	7.9	14.1	1.4	6.2	6.1	1.6	9.8	0.0	1.7	100.0	

Note: Average of annual expense per capita is calculated with exception of the farmers (S7, S38, S39, S46, and S54), who needed particularly high expenses in education and housing in 2002.

Table A8.1.3 Farmer's Debts in the Survey Area (farmers' Economic Survey, 2003)

Code No.	Deh	Own land			Rent land			Total ha	Bank (1)			Bank (2)			Bank (3)			Relative			Others Lender	Situation Condition Amount			Total debts Million Rls	Reason of debts		
		Irrg. ha	Dry ha	Sum ha	Irrg. ha	Dry ha	Sum ha		Situation	Condition	Amount Million Rls	Situation	Condition	Amount Million Rls	Situation	Condition	Amount Million Rls	Situation	Condition	Amount Million Rls								
S1	Khoram Abad Oliya	0.5	1.0	1.5	0.0	0.0	0.0	1.5	2	0	4.00	0	2	0.35	0	2	1.50								5.85			
S2	Khoram Abad Oliya	2.5	2.0	4.5	0.0	0.0	0.0	4.5	0	1	3.00										Money lender	2	2	4.00	7.00	Inputs		
S3	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0																8.00	Input and mechanization cost			
S4	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0																13.00	Tractor			
S5	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0																				
S6	Khoram Abad Oliya	4.5	4.0	8.5	0.0	0.0	0.0	8.5	0	1	4.00														7.00	Tractor		
S7	Khoram Abad Oliya	5.0	4.0	9.0	0.0	0.0	0.0	9.0																				
S8	Khoram Abad Oliya	6.0	4.0	10.0	0.0	0.0	0.0	10.0																				
S9	Khoram Abad Oliya	4.5	6.0	10.5	0.0	3.0	3.0	13.5													Whole seller	0	2	0.90	1.90	Inputs		
S10	Khoram Abad Oliya	5.0	7.0	12.0	1.0	12.0	13.0	25.0																				
S11	Khoram Abad Oliya	5.0	7.0	12.0	0.0	0.0	0.0	12.0	1	1	2.00														2.00	Inputs		
S12	Khoram Abad Oliya	10.0	5.0	15.0	12.0	0.0	12.0	27.0																				
S13	Khoram Abad Oliya	3.0	13.0	16.0	9.0	0.0	9.0	25.0																				
S14	Khoram Abad Oliya	7.0	9.5	16.5	0.0	0.0	0.0	16.5																				
S15	Khoram Abad Oliya	6.0	12.0	18.0	0.0	0.0	0.0	18.0	3	1	3.00	1	1	3.00											6.00	Inputs		
S16	Khoram Abad Oliya	3.0	16.0	19.0	0.0	0.0	0.0	19.0																				
S17	Khoram Abad Oliya	4.0	16.0	20.0	0.0	0.0	0.0	20.0	1	0	20.00																	
S18	Khoram Abad Oliya	10.0	10.0	20.0	0.0	0.0	0.0	20.0	3	1	30.00	0	0	15.00							Whole seller	0	0	1.00	26.00	Input and mechanization cost		
S19	Khoram Abad Oliya	2.0	23.0	25.0	0.0	0.0	0.0	25.0																		46.00	Machinery, input and living expenses	
S20	Khoram Abad Oliya	3.0	27.0	30.0	9.0	0.0	9.0	39.0	3	0	18.50	3	0	2.50												21.00	Machinery	
S21	Shali Abad	0.5	1.0	1.5	0.0	0.0	0.0	1.5	0	1	11.60															14.60	Construction of house	
S22	Shali Abad	1.0	0.0	1.0	2.0	0.0	2.0	3.0	3	1	20.00	1	0	4.00							Cooperatives, & money lender	3	2	1.27	25.27	Inputs and cows		
S23	Shali Abad	2.5	1.5	4.0	0.0	0.0	0.0	4.0	3	1	5.00	3	0	5.00												10.00		
S24	Shali Abad	0.0	4.5	4.5	0.0	0.0	0.0	4.5	1	1	1.00	0	2	1.50							Cooperatives, & whole seller	0	1	1.80	4.80	Living expenses, especially for education		
S25	Shali Abad	6.5	1.5	8.0	0.0	0.0	0.0	8.0	0	1	7.96	3	1	6.00	3	0	3.00									20.96	Irrigation facilities and inputs	
S26	Shali Abad	4.0	4.0	8.0	0.0	4.5	4.5	12.5	1	0	40.80	0	2	34.00	0	2	8.60				Cooperatives, & whole seller	0	2	22.40	112.80			
S27	Shali Abad	0.0	8.0	8.0	0.0	0.0	0.0	8.0																		3.00	Input and mechanization cost	
S28	Reis	0.0	2.0	2.0	0.0	0.0	0.0	2.0	2	0	10.00										Whole seller	0	1	2.40	16.40	Input and mechanization cost		
S29	Reis	0.0	6.0	6.0	0.0	17.0	17.0	23.0													Cooperatives	0	2	1.00	1.00	Input and mechanization cost		
S30	Reis	0.0	8.0	8.0	0.0	0.0	0.0	8.0													Cooperatives	0	1	0.35	0.35	Input and mechanization cost		
S31	Reis	2.0	8.5	10.5	0.0	0.0	0.0	10.5																		0.65	Construction of house	
S32	Reis	0.0	12.0	12.0	0.0	0.0	0.0	12.0																		8.30	Input and mechanization cost	
S33	Reis	0.0	15.0	15.0	0.0	0.0	0.0	15.0																				
S34	Reis	10.0	10.0	20.0	0.0	0.0	0.0	20.0	3	0	93.86										Cooperatives, & money lender	3	0	13.50	124.36	Machinery and child's employment		
S35	Kalaveh Heidarkhan	5.0	1.0	6.0	0.0	0.0	0.0	6.0	0	0	21.00	0	0	15.00												0.00	Construction of well for irrigation	
S36	Kalaveh Heidarkhan	4.0	3.0	7.0	0.0	0.0	0.0	7.0	3	1	2.00	3	2	14.00	0	0	6.00									22.00	Production cost and living expenses	
S37	Kalaveh Heidarkhan	3.0	0.0	3.0	0.0	0.0	0.0	3.0	0	1	9.00															13.00	Construction of well and irrigation facilit	
S38	Kalaveh Heidarkhan	7.0	0.0	7.0	0.0	0.0	0.0	7.0																				
S39	Kalaveh Heidarkhan	4.0	4.5	8.5	12.0	1.0	13.0	21.5	0	1	5.00															20.00	Input and mechanization cost	
S40	Kalaveh Heidarkhan	10.0	0.0	10.0	0.0	0.0	0.0	10.0	3	0	67.50	3	0	3.20												80.70	Input and mechanization cost	
S41	Kalaveh Heidarkhan	8.0	6.0	14.0	0.0	0.0	0.0	14.0																				
S42	Hassan Abad Shaleh	0.0	6.0	6.0	0.0	0.0	0.0	6.0	3	1	5.00										Whole seller	0	0	15.00	20.00	Production cost and living expenses		
S43	Hassan Abad Shaleh	4.0	2.0	6.0	0.0	0.0	0.0	6.0																				
S44	Hassan Abad Shaleh	6.0	1.0	7.0	0.0	0.0	0.0	7.0	1	0	0.25	0	0	0.30												4.55	Inputs	
S45	Hassan Abad Shaleh	10.0	2.0	12.0	0.0	8.0	8.0	20.0	3	0	60.00	1	0	10.00							Whole seller	0	0	20.00	90.00	Construction of well for irrigation and in		
S46	Hassan Abad Shaleh	13.0	0.0	13.0	0.0	6.0	6.0	19.0	0	0	95.00	0	0	105.00	0	0	37.50									240.10	Construction of well for irrigation and in	
S47	Hassan Abad Shaleh	5.0	7.0	12.0	0.0	0.0	0.0	12.0	3	0	30.86																30.86	Construction of well and irrigation facilit
S48	Hassan Abad Shaleh	16.0	1.5	17.5	0.0	0.0	0.0	17.5																				
S49	Noroleh Oliya	0.0	4.0	4.0	0.0	0.0	0.0	4.0													Green soybean	0	0	2.50	2.50			
S50	Noroleh Oliya	0.0	6.0	6.0	0.0	0.0	0.0	6.0																		10.00	Input and mechanization cost	
S51	Noroleh Oliya	6.0	6.0	12.0	10.0	0.0	10.0	22.0	3	1	29.30	3	2	110.00												139.30	Input and mechanization cost	
S52	Noroleh Oliya	0.0	12.0	12.0	0.0	0.0	0.0	12.0	2	0	16.66																31.66	Less income in agriculture
S53	Noroleh Oliya	0.0	14.0	14.0	0.0	0.0	0.0	14.0																				
S54	Noroleh Oliya	20.0	10.0	30.0	16.0	0.0	16.0	46.0	3	2	160.00	3	1	135.00	3	1	35.00									350.00	Construction of well and irrigation facilit	

Note 1) Situation of debt - normal: 0, rescheduled: 1, overdue: 2, legal instance: 3

Note 3) 14 farm households (26%) of 54 households byave no debt.

2) Conditions of debt - too expense: 0, medium cost: 1, favorable: 2

Table A8.2.1 Farmers' production in the Survey Area (farmers' Economic Survey, 2003)

Code No.	Deh	Own land			Rent land			Total	Yield (wheat)				Barley		Chick pea		Maize		(Alfalfa)		Condition of land rent	Kind of rent land	
		Irrg. ha	Dry ha	Sum ha	Irrg. ha	Dry ha	Sum ha		ton/ha	Tech. index	Tech. index	Rented land Irrg. ha	Rented land Dry land ha	Own land Dry land ton/ha	Rented land Dry land ton/ha	Own land Dry land ton/ha	Rented land Dry land ton/ha	Tech. index	Rented land Irrg. ha	Own land Irrg. ha			
S1	Khoram Abad Oliya	0.5	1.0	1.5	0.0	0.0	0.0	1.5	4.4	5				1.5									
S2	Khoram Abad Oliya	2.5	2.0	4.5	0.0	0.0	0.0	4.5	2.2	5				2.5									
S3	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0	3.0	5				1.1									
S4	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0	3.5	5				3.0									
S5	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0	2.6	4				1.2		0.22							
S6	Khoram Abad Oliya	4.5	4.0	8.5	0.0	0.0	0.0	8.5	3.5	3				2.2		0.39	12.0	5					
S7	Khoram Abad Oliya	5.0	4.0	9.0	0.0	0.0	0.0	9.0	6.6	7				2.4		0.36	8.0	6					
S8	Khoram Abad Oliya	6.0	4.0	10.0	0.0	0.0	0.0	10.0								0.08	5.0	5					
S9	Khoram Abad Oliya	4.5	6.0	10.5	3.0	0.0	3.0	13.5	5.4	6		3.8	1.4	1.6	0.14	8.0	7		9.3	1.5 Million Rls./ha/year, terms of rent: 8 years	irrig. Land		
S10	Khoram Abad Oliya	5.0	7.0	12.0	1.0	12.0	13.0	25.0	5.5	4			2.0	1.8	0.15	9.0	6		5.0	2.5 Million Rls./ha/year, terms of rent: 2 years	irrig. & dry land		
S11	Khoram Abad Oliya	5.0	7.0	12.0				12.0	5.0	7		3.0	2.2		0.10	10.0	6		10.0	0.83 Million Rls./ha/year			
S12	Khoram Abad Oliya	10.0	5.0	15.0	12.0	0.0	12.0	27.0	6.0	5			1.2					5.0		5.0	2.0 Million Rls./ha/year	irrig. Land	
S13	Khoram Abad Oliya	3.0	13.0	16.0	9.0	0.0	9.0	25.0	2.5	6	0.8		2.0		0.18	6.0	7	4.8	7.0	1.0 Million Rls./ha/year, terms of rent: 3 years	irrig. Land		
S14	Khoram Abad Oliya	7.0	9.5	16.5	0.0	0.0	0.0	16.5	4.8	5	2.1					4.7	5						
S15	Khoram Abad Oliya	6.0	12.0	18.0	0.0	0.0	0.0	18.0	4.3	6	1.5		2.2		0.25	11.0	6						
S16	Khoram Abad Oliya	3.0	16.0	19.0				19.0		4		6.0	2.0		0.13	5.3	5		10.0	1.8 Million Rls./ha/year	irrig. Land		
S17	Khoram Abad Oliya	4.0	16.0	20.0	0.0	0.0	0.0	20.0	4.7	6			3.6			9.0	6						
S18	Khoram Abad Oliya	10.0	10.0	20.0	0.0	0.0	0.0	20.0	4.5	5	0.5		2.3			8.5	7						
S19	Khoram Abad Oliya	2.0	23.0	25.0	0.0	0.0	0.0	25.0	4.0	7	1.3		1.5		0.22	12.0	7		10.0				
S20	Khoram Abad Oliya	3.0	27.0	30.0	9.0	0.0	9.0	39.0	7	2	2.0	5.7	2.0		0.18	9.3	7	6.8		1.1 Million Rls./ha/year	irrig. Land		
Average Range								4.3 2.2-6.6	5 0.5-2.1			4.6 3.0-6.0	2.0 1.1-3.6	1.7 1.6-1.8	0.20 0.08-0.39	0.23	8.4 4.7-12.0	6 5.0-6.8	8.6 5.0-10.0				
S21	Shali Abad	0.5	1.0	1.5	0.0	0.0	0.0	1.5					1.3								4.0	partnership (going halves with owner)	irrig. Land
S22	Shali Abad	1.0	0.0	1.0	2.0	0.0	2.0	3.0	4.2	5													
S23	Shali Abad	2.5	1.5	4.0	0.0	0.0	0.0	4.0	5.4	6													
S24	Shali Abad	0.0	4.5	4.5	0.0	0.0	0.0	4.5							0.75								
S25	Shali Abad	6.5	1.5	8.0	0.0	0.0	0.0	8.0	3.4	6													
S26	Shali Abad	4.0	4.0	8.0	4.5	0.0	4.5	12.5	6.0	6		5.0	3.8	1.3							1.6 Million Rls./ha/year	irrig. Land	
S27	Shali Abad	0.0	8.0	8.0	0.0	0.0	0.0	8.0			2		0.1		0.03								
Average Range								4.7 2.2-6.6	6 0.5-2.1			5.0 3.0-6.0	1.7 1.7-3.8	1.3 1.3	0.39 0.03-0.75					4.0			
S28	Reis	0.0	2.0	2.0	0.0	0.0	0.0	2.0			2.0	5		1.8								0.82 Million Rls./ha/year	dry land
S29	Reis	0.0	6.0	6.0	0.0	17.0	17.0	23.0			1.3	5		1.7									
S30	Reis	0.0	8.0	8.0	0.0	0.0	0.0	8.0			1.2	4			0.35								
S31	Reis	2.0	8.5	10.5	0.0	0.0	0.0	10.5	4.5	5			1.1		0.21								
S32	Reis	0.0	12.0	12.0	0.0	0.0	0.0	12.0			2.0	4		1.2	0.36								
S33	Reis	0.0	15.0	15.0	0.0	0.0	0.0	15.0			1.8	4		1.8	0.19								
S34	Reis	10.0	10.0	20.0	0.0	0.0	0.0	20.0	3.2	4					0.47								
Average Range								3.9 3.2-4.5	5 1.2-2.0			1.7	1.5 1.1-1.8		0.32 0.19-0.47								
S35	Kalaveh Heidarkhan	5.0	1.0	6.0	0.0	0.0	0.0	6.0	6.0	6	0.9					10.0	6						
S36	Kalaveh Heidarkhan	4.0	3.0	7.0	0.0	0.0	0.0	7.0	4.5	6	1.4					9.0	6						
S37	Kalaveh Heidarkhan	3.0	0.0	3.0	0.0	0.0	0.0	3.0	9.0	6						9.0	5						
S38	Kalaveh Heidarkhan	7.0	0.0	7.0	0.0	0.0	0.0	7.0	4.0	4						6.5	5						
S39	Kalaveh Heidarkhan	4.0	4.5	8.5	12.0	1.0	13.0	21.5	4.0	4			2.4	1.2	0.33			9.0		3.2 Million Rls./ha/year	irrig. Land		
S40	Kalaveh Heidarkhan	10.0	0.0	10.0	0.0	0.0	0.0	10.0	5.7	4						6.9	5						
S41	Kalaveh Heidarkhan	8.0	6.0	14.0	0.0	0.0	0.0	14.0	5.0	4					0.10	8.5	6						
Average Range								5.5 4.0-9.0	5 0.9-1.4				2.4	1.2	0.22 0.1-0.33	8.3 6.5-10.0	6 9.0						
S42	Hassan Abad Shaleh	0.0	6.0	6.0	0.0	0.0	0.0	6.0			1.2	2			0.30								
S43	Hassan Abad Shaleh	4.0	2.0	6.0	0.0	0.0	0.0	6.0			1.5												
S44	Hassan Abad Shaleh	6.0	1.0	7.0	0.0	0.0	0.0	7.0	4.5	4	3.0					5.5	5						
S45	Hassan Abad Shaleh	10.0	2.0	12.0	0.0	8.0	8.0	20.0	6.3	7	3.0					10.0	7			going halves with owner	dry land		
S46	Hassan Abad Shaleh	13.0	0.0	13.0	0.0	6.0	6.0	19.0	3.0	6		1.0		1.2		4.0	5			0.42 Million Rls./ha/year, terms of rent: 3 years	dry land		
S47	Hassan Abad Shaleh	5.0	7.0	12.0	0.0	0.0	0.0	12.0	4.8	4	1.5				0.18	7.6	6						
S48	Hassan Abad Shaleh	16.0	1.5	17.5	0.0	0.0	0.0	17.5	4.5	4			1.3			8.0	5						
Average Range								4.6 3.0-6.3	5 1.2-3.0			1.0	1.3	1.2	0.24 0.18-0.30	0.36 4.0-10.5	6 9.0						
S49	Noroleh Oliya	0.0	4.0	4.0	0.0	0.0	0.0	4.0							0.32								
S50	Noroleh Oliya	0.0	6.0	6.0	0.0	0.0	0.0	6.0			2.0	4			0.30								
S51	Noroleh Oliya	6.0	6.0	12.0	10.0	0.0	10.0	22.0	5.5	5	1.1	3.0			0.30		5.6	6	5.6		1/3 of products	irrig. Land	
S52	Noroleh Oliya	0.0	12.0	12.0	0.0	0.0	0.0	12.0							0.35								
S53	Noroleh Oliya	0.0	14.0	14.0	0.0	0.0	0.0	14.0					1.2		0.38								
S54	Noroleh Oliya	20.0	10.0	30.0	16.0	0.0	16.0	46.0	5.0	5	1.2		5.0			10.0	6	10.0		partnership (going halves with owner)	irrig. Land		
Average Range								5.3 5.0-5.5	5 1.1-2.0			3.0	3.1 1.2-5.0		0.33 0.30-0.38	7.8 5.6-10.0	6 5.6-10.0						

Note 1) Technological index: Numbers of used technologies from 7 technologies, i.e. organic matter, chemical fertilizer, certified seeds, irrigation, herbicide, insecticide, fungicide.

Table A8.2.2 Present Condition of Soil Erosion and Farmers' Performing of Soil Analysis

Code No.	Deh	Own land			Rent land			Total ha	Erosion yes/no	Soil analysis	
		Irrg. ha	Dry ha	Sum ha	Irrg. ha	Dry ha	Sum ha			yes/no	Interval
S1	Khoram Abad Oliya	0.5	1.0	1.5	0.0	0.0	0.0	1.5	1		
S2	Khoram Abad Oliya	2.5	2.0	4.5	0.0	0.0	0.0	4.5	1		
S3	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0	1		
S4	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0			
S5	Khoram Abad Oliya	4.0	4.0	8.0	0.0	0.0	0.0	8.0			
S6	Khoram Abad Oliya	4.5	4.0	8.5	0.0	0.0	0.0	8.5			
S7	Khoram Abad Oliya	5.0	4.0	9.0	0.0	0.0	0.0	9.0	1		
S8	Khoram Abad Oliya	6.0	4.0	10.0	0.0	0.0	0.0	10.0	1	1	1
S9	Khoram Abad Oliya	4.5	6.0	10.5	3.0	0.0	3.0	13.5			
S10	Khoram Abad Oliya	5.0	7.0	12.0	1.0	12.0	13.0	25.0	1	1	1
S11	Khoram Abad Oliya	5.0	7.0	12.0				12.0	1	1	2
S12	Khoram Abad Oliya	10.0	5.0	15.0	12.0	0.0	12.0	27.0	1		
S13	Khoram Abad Oliya	3.0	13.0	16.0	9.0	0.0	9.0	25.0	1		
S14	Khoram Abad Oliya	7.0	9.5	16.5	0.0	0.0	0.0	16.5	1		
S15	Khoram Abad Oliya	6.0	12.0	18.0	0.0	0.0	0.0	18.0	1	1	1
S16	Khoram Abad Oliya	3.0	16.0	19.0				19.0	1		
S17	Khoram Abad Oliya	4.0	16.0	20.0	0.0	0.0	0.0	20.0	1	1	1
S18	Khoram Abad Oliya	10.0	10.0	20.0	0.0	0.0	0.0	20.0	1	1	4
S19	Khoram Abad Oliya	2.0	23.0	25.0	0.0	0.0	0.0	25.0	1		
S20	Khoram Abad Oliya	3.0	27.0	30.0	9.0	0.0	9.0	39.0	1	1	1
%									80.0	35.0	
S21	Shali Abad	0.5	1.0	1.5	0.0	0.0	0.0	1.5	1		
S22	Shali Abad	1.0	0.0	1.0	2.0	0.0	2.0	3.0		1	1
S23	Shali Abad	2.5	1.5	4.0	0.0	0.0	0.0	4.0			
S24	Shali Abad	0.0	4.5	4.5	0.0	0.0	0.0	4.5			
S25	Shali Abad	6.5	1.5	8.0	0.0	0.0	0.0	8.0			
S26	Shali Abad	4.0	4.0	8.0	4.5	0.0	4.5	12.5	1		
S27	Shali Abad	0.0	8.0	8.0	0.0	0.0	0.0	8.0	1		
%									42.9	14.3	
S28	Reis	0.0	2.0	2.0	0.0	0.0	0.0	2.0	1		
S29	Reis	0.0	6.0	6.0	0.0	17.0	17.0	23.0	1	1	1
S30	Reis	0.0	8.0	8.0	0.0	0.0	0.0	8.0	1		
S31	Reis	2.0	8.5	10.5	0.0	0.0	0.0	10.5	1		
S32	Reis	0.0	12.0	12.0	0.0	0.0	0.0	12.0	1		
S33	Reis	0.0	15.0	15.0	0.0	0.0	0.0	15.0	1		
S34	Reis	10.0	10.0	20.0	0.0	0.0	0.0	20.0	1		
%									100.0	14.3	
S35	Kalaveh Heidarkhan	5.0	1.0	6.0	0.0	0.0	0.0	6.0		1	2
S36	Kalaveh Heidarkhan	4.0	3.0	7.0	0.0	0.0	0.0	7.0		1	1
S37	Kalaveh Heidarkhan	3.0	0.0	3.0	0.0	0.0	0.0	3.0	1		
S38	Kalaveh Heidarkhan	7.0	0.0	7.0	0.0	0.0	0.0	7.0	1		
S39	Kalaveh Heidarkhan	4.0	4.5	8.5	12.0	1.0	13.0	21.5	1		
S40	Kalaveh Heidarkhan	10.0	0.0	10.0	0.0	0.0	0.0	10.0	1		
S41	Kalaveh Heidarkhan	8.0	6.0	14.0	0.0	0.0	0.0	14.0		1	3
%									57.1	42.9	
S42	Hassan Abad Shaleh	0.0	6.0	6.0	0.0	0.0	0.0	6.0			
S43	Hassan Abad Shaleh	4.0	2.0	6.0	0.0	0.0	0.0	6.0			
S44	Hassan Abad Shaleh	6.0	1.0	7.0	0.0	0.0	0.0	7.0	1		
S45	Hassan Abad Shaleh	10.0	2.0	12.0	0.0	8.0	8.0	20.0		1	3
S46	Hassan Abad Shaleh	13.0	0.0	13.0	0.0	6.0	6.0	19.0			
S47	Hassan Abad Shaleh	5.0	7.0	12.0	0.0	0.0	0.0	12.0	1		
S48	Hassan Abad Shaleh	16.0	1.5	17.5	0.0	0.0	0.0	17.5		1	4
%									28.6	28.6	
S49	Noroleh Oliya	0.0	4.0	4.0	0.0	0.0	0.0	4.0	1		
S50	Noroleh Oliya	0.0	6.0	6.0	0.0	0.0	0.0	6.0	1		
S51	Noroleh Oliya	6.0	6.0	12.0	10.0	0.0	10.0	22.0	1	1	1
S52	Noroleh Oliya	0.0	12.0	12.0	0.0	0.0	0.0	12.0	1		
S53	Noroleh Oliya	0.0	14.0	14.0	0.0	0.0	0.0	14.0	1		
S54	Noroleh Oliya	20.0	10.0	30.0	16.0	0.0	16.0	46.0	1	1	2
%									100.0	33.3	

Note 1) Inteval of soil analysis 1: before each planting, 2:once a year, 3: once each 2 years, 4: longer period

Table A8.2.3 Use of Manure and Crop Yield (Farmers' Economic Survey, 2003)

	Deh	Own land			Yield of wheat(irrig.)		Yield of barley		Yield of maize		Yield of alfalfa	
		Irrg. ha	Dry ha	Sum ha	Manure		Manure		Manure		Manure	
					no use	use	no use	use	no use	use	no use	use
					ton/ha	ton/ha	ton/ha	ton/ha	ton/ha	ton/ha	ton/ha	ton/ha
S1	Khoram Abad Oliya	0.5	1.0	1.5	4.4							
S2	Khoram Abad Oliya	2.5	2.0	4.5	2.2		1.2					
S3	Khoram Abad Oliya	4.0	4.0	8.0	3.0		1.1					
S4	Khoram Abad Oliya	4.0	4.0	8.0	3.5		3.0					
S5	Khoram Abad Oliya	4.0	4.0	8.0	2.6		1.2					
S6	Khoram Abad Oliya	4.5	4.0	8.5	3.5			12.0				
S7	Khoram Abad Oliya	5.0	4.0	9.0		6.6	2.4			8.0		
S8	Khoram Abad Oliya	6.0	4.0	10.0				5.0				
S9	Khoram Abad Oliya	4.5	6.0	10.5		4.4		1.5		8.0		9.3
S10	Khoram Abad Oliya	5.0	7.0	12.0	5.5		1.8		9.0			20.0
S11	Khoram Abad Oliya	5.0	7.0	12.0		5.0	2.2		10.0			10.0
S12	Khoram Abad Oliya	10.0	5.0	15.0	6.0		1.9		5.0			
S13	Khoram Abad Oliya	3.0	13.0	16.0		2.5	2.0			5.4		7.0
S14	Khoram Abad Oliya	7.0	9.5	16.5	4.8				4.7			
S15	Khoram Abad Oliya	6.0	12.0	18.0	4.5		2.1		11.0			
S16	Khoram Abad Oliya	3.0	16.0	19.0	6.0		2.0		5.3			
S17	Khoram Abad Oliya	4.0	16.0	20.0	4.7		3.6		9.0			
S18	Khoram Abad Oliya	10.0	10.0	20.0		4.5		2.3		8.5		
S19	Khoram Abad Oliya	2.0	23.0	25.0		4.0	10.5			12.0		
S20	Khoram Abad Oliya	3.0	27.0	30.0		2.0	2.0			9.3		
S21	Shali Abad	0.5	1.0	1.5			0.0					
S22	Shali Abad	1.0	0.0	1.0	4.2							
S23	Shali Abad	2.5	1.5	4.0	5.4		1.1					
S24	Shali Abad	0.0	4.5	4.5								
S25	Shali Abad	6.5	1.5	8.0	3.4		0.9					
S26	Shali Abad	4.0	4.0	8.0	5.5		2.7					
S27	Shali Abad	0.0	8.0	8.0	2.0		0.6					
S28	Reis	0.0	2.0	2.0				1.8				
S29	Reis	0.0	6.0	6.0								
S30	Reis	0.0	8.0	8.0								
S31	Reis	2.0	8.5	10.5	4.5							
S32	Reis	0.0	12.0	12.0			1.2					
S33	Reis	0.0	15.0	15.0			1.8					
S34	Reis	10.0	10.0	20.0	3.2		4.2					
S35	Kalaveh Heidarkhan	5.0	1.0	6.0	6.0							
S36	Kalaveh Heidarkhan	4.0	3.0	7.0	4.5				9.0			
S37	Kalaveh Heidarkhan	3.0	0.0	3.0	9.0				9.0			
S38	Kalaveh Heidarkhan	7.0	0.0	7.0	4.0				6.6			
S39	Kalaveh Heidarkhan	4.0	4.5	8.5	4.0		2.4		9.0			
S40	Kalaveh Heidarkhan	10.0	0.0	10.0	5.7		0.0		9.0			
S41	Kalaveh Heidarkhan	8.0	6.0	14.0	5.0				8.5			
S42	Hassan Abad Shaleh	0.0	6.0	6.0								
S43	Hassan Abad Shaleh	4.0	2.0	6.0	1.5				10.5			
S44	Hassan Abad Shaleh	6.0	1.0	7.0	4.5				5.5			
S45	Hassan Abad Shaleh	10.0	2.0	12.0		6.3				10.0		
S46	Hassan Abad Shaleh	13.0	0.0	13.0		3.0	1.2		4.0			
S47	Hassan Abad Shaleh	5.0	7.0	12.0	4.8				7.6			
S48	Hassan Abad Shaleh	16.0	1.5	17.5	4.5		1.3		8.0			
S49	Noroleh Oliya	0.0	4.0	4.0								
S50	Noroleh Oliya	0.0	6.0	6.0								
S51	Noroleh Oliya	6.0	6.0	12.0	5.5				5.6			
S52	Noroleh Oliya	0.0	12.0	12.0								
S53	Noroleh Oliya	0.0	14.0	14.0			1.2					
S54	Noroleh Oliya	20.0	10.0	30.0	5.0				10.0			
				Count	32	9	26	4	23	6		4
				Average	4.5	4.3	2.1	1.9	7.9	8.9		11.6

Table A8.2.4 Livestock Production (Farmers' Economic Survey, 2003) (1/2)

	Deh	Own land			Adult cow					Cattle for beef					Calves					Sheep						
		Irrg. ha	Dry ha	Sum ha	heads	Milk production lit./year	Sale of milk lit./year	Unit price milk Rls./lit.	Gross income M. Rls./year	To whom	heads	Sale of cattle	Unit price M. Rls./head	Gross income M. Rls./year	To whom	heads	Sale of calves	Unit price Rls./head	Gross income M. Rls./year	To whom	heads	Young sheep	Milk production Self-consumption lit./year	Sale of oil Quantity kg/year	Unit price of oil Rls./kg	
																										heads
S1	Khoram Abad Oliya	0.5	1.0	1.5																						
S2	Khoram Abad Oliya	2.5	2.0	4.5																						
S3	Khoram Abad Oliya	4.0	4.0	8.0	1	2,100	1,470	1,000	1.47	woshler																
S4	Khoram Abad Oliya	4.0	4.0	8.0	3	4,200	3,360	1,100	3.70	milk factory																
S5	Khoram Abad Oliya	4.0	4.0	8.0											2	2	2.05	4.10	bazar				840			
S6	Khoram Abad Oliya	4.5	4.0	8.5	1	1,440									1	1	1.20	1.20								
S7	Khoram Abad Oliya	5.0	4.0	9.0	2	4,200	3,400	1,100	3.74	broker					2	2	3.00	6.00	bazar	28	31	270				
S8	Khoram Abad Oliya	6.0	4.0	10.0	1	1,440	300	1,100	0.33	broker					1	1	2.60	2.60	bazar							
S9	Khoram Abad Oliya	4.5	6.0	10.5	2	2,300	2,300	1,100	2.53	broker					2	2	2.00	4.00	broker	30	35	360				
S10	Khoram Abad Oliya	5.0	7.0	12.0	2	5,400	4,500	1,000	4.50	bazar	1	1	3.20	3.20	bazar	1					50	50		18	42,000	
S11	Khoram Abad Oliya	5.0	7.0	12.0	2	4,200	4,200	1,000	4.20	bazar					4						30	32	400			
S12	Khoram Abad Oliya	10.0	5.0	15.0	1	2,250									1								100			
S13	Khoram Abad Oliya	3.0	13.0	16.0	2	2,160	1,440	1,100	1.58	bazar	1	1	4.00	4.00	bazar	1					25	18	450	12	40,000	
S14	Khoram Abad Oliya	7.0	9.5	16.5	3	3,000	1,700	1,000	1.70	bazar	2	2	2.00	4.00	broker	2										
S15	Khoram Abad Oliya	6.0	12.0	18.0																	15	20	10			
S16	Khoram Abad Oliya	3.0	16.0	19.0																	40	47	420			
S17	Khoram Abad Oliya	4.0	16.0	20.0																						
S18	Khoram Abad Oliya	10.0	10.0	20.0	4	2,250	1,650	1,000	1.65	bazar					3	2	2.05	4.10	bazar							
S19	Khoram Abad Oliya	2.0	23.0	25.0	2										2						35	25		20	33,000	
S20	Khoram Abad Oliya	3.0	27.0	30.0	3	5,250	3,150	1,000	3.15	bazar					2	2	1.71	3.41	bazar							
S21	Shali Abad	0.5	1.0	1.5																	20	26	360			
S22	Shali Abad	1.0	0.0	1.0	3	3,600	3,000	1,100	3.30	bazar	2	1	3.00	3.00	broker	1								35	29,000	
S23	Shali Abad	2.5	1.5	4.0																						
S24	Shali Abad	0.0	4.5	4.5																						
S25	Shali Abad	6.5	1.5	8.0																						
S26	Shali Abad	4.0	4.0	8.0	2	2,100					1	1	3.00	3.00	bazar	6	2	1.72	3.44	broker						
S27	Shali Abad	0.0	8.0	8.0	5	4,500					4	4	1.50	6.00		4										
S28	Reis	0.0	2.0	2.0	5	5,400	3,600	1,000	3.60	bazar					3	2	1.60	3.20	broker						25	30,000
S29	Reis	0.0	6.0	6.0	1	400									1	1	1.60	1.60	broker							
S30	Reis	0.0	8.0	8.0	3	900					1	1	1.10	1.10												
S31	Reis	2.0	8.5	10.5																						
S32	Reis	0.0	12.0	12.0	4	1,500	800	1,000	0.80	bazar	2	1	1.80	1.80	bazar	3	3	0.90	2.70	bazar	3	3	120			
S33	Reis	0.0	15.0	15.0	1	800									1	1	1.30	1.30	bazar	22	31	250	15	40,000		
S34	Reis	10.0	10.0	20.0																						
S35	Kalaveh Heidarkhan	5.0	1.0	6.0																						
S36	Kalaveh Heidarkhan	4.0	3.0	7.0																						
S37	Kalaveh Heidarkhan	3.0	0.0	3.0																						
S38	Kalaveh Heidarkhan	7.0	0.0	7.0	1	450					1	1	1.00	1.00	bazar	1										
S39	Kalaveh Heidarkhan	4.0	4.5	8.5																						
S40	Kalaveh Heidarkhan	10.0	0.0	10.0																						
S41	Kalaveh Heidarkhan	8.0	6.0	14.0	2	750									1	1	1.80	1.80	broker							
S42	Hassan Abad Shaleh	0.0	6.0	6.0	1	1,470									1	1	1.60	1.60	broker							
S43	Hassan Abad Shaleh	4.0	2.0	6.0	1	2,160																				
S44	Hassan Abad Shaleh	6.0	1.0	7.0	1	1,470																				
S45	Hassan Abad Shaleh	10.0	2.0	12.0	1	4,200	2,100	1,100	2.31	bazar					1	1	5.50	5.50	bazar							
S46	Hassan Abad Shaleh	13.0	0.0	13.0	3	5,670	4,320	1,200	5.18	bazar	1				3	3	2.50	7.50	bazar							
S47	Hassan Abad Shaleh	5.0	7.0	12.0																						
S48	Hassan Abad Shaleh	16.0	1.5	17.5																						
S49	Noroleh Oliya	0.0	4.0	4.0																						
S50	Noroleh Oliya	0.0	6.0	6.0																						
S51	Noroleh Oliya	6.0	6.0	12.0	1	360									1	1	1.20	1.20	bazar	15	15	270				
S52	Noroleh Oliya	0.0	12.0	12.0																						
S53	Noroleh Oliya	0.0	14.0	14.0	2	6,750					1	1	2.00	2.00	bazar	1					48	20	250			
S54	Noroleh Oliya	20.0	10.0	30.0																						
		Sum			66	82,670	41,290	16,900	43.7		17	14	58.60	29.1		52	28	34.33	55.3		361	453	4,000	125	214,000	
		Count			31	30	16	16	16.0		11	10	10.0		27	17	17.0				13	14	12	6		6
		Average			2	2,756	2,581	1,056	2.7		2	1	58.60	2.9		2	2	2.02	3.3		28	32	333	21	35,667	

Table A8.2.4 Livestock Production (Farmers' Economic Survey, 2003) (2/2)

	Deh	Own land			Gross income To whom M. Rls./year	Sales of sheep			Sale of young sheep				Sale of wool				Total gross income of cattle raising Million Rls./year	Total gross income of sheep raising Million Rls./year	Total gross income of livestock raising Million Rls./year		
		Irrg. ha	Dry ha	Sum ha		Quantity	Unit price	Gross income	To whom	Quantity	Unit price	Gross income	To whom	Quantity	Unit price	Gross income				To whom	
																					heads/year
S1	Khoram Abad Oliya	0.5	1.0	1.5																	
S2	Khoram Abad Oliya	2.5	2.0	4.5																	
S3	Khoram Abad Oliya	4.0	4.0	8.0												1.47		1.47			
S4	Khoram Abad Oliya	4.0	4.0	8.0												7.80		7.80			
S5	Khoram Abad Oliya	4.0	4.0	8.0																	
S6	Khoram Abad Oliya	4.5	4.0	8.5												1.20		1.20			
S7	Khoram Abad Oliya	5.0	4.0	9.0					29	400,000	11.60	bazar	51	3,000	0.15	bazar	9.74	11.75	21.49		
S8	Khoram Abad Oliya	6.0	4.0	10.0												2.93		2.93			
S9	Khoram Abad Oliya	4.5	6.0	10.5					32	350,000	11.20	broker	60	3,000	0.18	broker	6.53	11.38	17.91		
S10	Khoram Abad Oliya	5.0	7.0	12.0	0.76	bazar	10	450,000	4.50	wholesaler	40	400,000	16.00	wholesaler	40	3,300	0.13	bazar	4.50	21.39	25.89
S11	Khoram Abad Oliya	5.0	7.0	12.0					27	700,000	18.90	abutchery	60	3,300	0.20	bazar	4.20		19.10	23.30	
S12	Khoram Abad Oliya	10.0	5.0	15.0					90	415,000	37.35	bazar	60	3,300	0.20	bazar			37.55	37.55	
S13	Khoram Abad Oliya	3.0	13.0	16.0	0.48	bazar			15	600,000	9.00	bazar	35	3,300	0.12	bazar	41.58		9.60	51.18	
S14	Khoram Abad Oliya	7.0	9.5	16.5												5.70		5.70		5.70	
S15	Khoram Abad Oliya	6.0	12.0	18.0			4	400,000	1.60	wholesaler	12	500,000	6.00	wholesaler	45	3,300	0.15	bazar		7.75	7.75
S16	Khoram Abad Oliya	3.0	16.0	19.0					112	337,500	37.80	broker	75	3,300	0.25	bazar			38.05	38.05	
S17	Khoram Abad Oliya	4.0	16.0	20.0																	
S18	Khoram Abad Oliya	10.0	10.0	20.0												5.75		5.75		5.75	
S19	Khoram Abad Oliya	2.0	23.0	25.0	0.66	bazar	1,000	10,000	10.00	wholesaler	25	600,000	15.00	broker						25.66	25.66
S20	Khoram Abad Oliya	3.0	27.0	30.0					30	430,000	12.90	broker	30	3,000	0.09	bazar	6.56		12.99	19.55	
S21	Shali Abad	0.5	1.0	1.5					20	500,000	10.00	broker	36	2,000	0.07	bazar			10.07	10.07	
S22	Shali Abad	1.0	0.0	1.0	1.02											6.30		1.02		7.32	
S23	Shali Abad	2.5	1.5	4.0																	
S24	Shali Abad	0.0	4.5	4.5																	
S25	Shali Abad	6.5	1.5	8.0																	
S26	Shali Abad	4.0	4.0	8.0												3.74		3.74		3.74	
S27	Shali Abad	0.0	8.0	8.0												6.00		6.00		6.00	
S28	Reis	0.0	2.0	2.0	0.75	bazar										6.80		0.75		7.55	
S29	Reis	0.0	6.0	6.0												1.60		1.60		1.60	
S30	Reis	0.0	8.0	8.0												1.10		1.10		1.10	
S31	Reis	2.0	8.5	10.5																	
S32	Reis	0.0	12.0	12.0												5.30		5.30		5.30	
S33	Reis	0.0	15.0	15.0	0.60	bazar			26	400,000	10.40	bazar	34	3,300	0.11	broker	1.30		11.11	12.41	
S34	Reis	10.0	10.0	20.0																	
S35	Kalaveh Heidarkhan	5.0	1.0	6.0																	
S36	Kalaveh Heidarkhan	4.0	3.0	7.0																	
S37	Kalaveh Heidarkhan	3.0	0.0	3.0																	
S38	Kalaveh Heidarkhan	7.0	0.0	7.0												1.00		1.00		1.00	
S39	Kalaveh Heidarkhan	4.0	4.5	8.5																	
S40	Kalaveh Heidarkhan	10.0	0.0	10.0																	
S41	Kalaveh Heidarkhan	8.0	6.0	14.0												1.80		1.80		1.80	
S42	Hassan Abad Shaleh	0.0	6.0	6.0												1.60		1.60		1.60	
S43	Hassan Abad Shaleh	4.0	2.0	6.0																	
S44	Hassan Abad Shaleh	6.0	1.0	7.0																	
S45	Hassan Abad Shaleh	10.0	2.0	12.0												7.81		7.81		7.81	
S46	Hassan Abad Shaleh	13.0	0.0	13.0												12.68		12.68		12.68	
S47	Hassan Abad Shaleh	5.0	7.0	12.0																	
S48	Hassan Abad Shaleh	16.0	1.5	17.5																	
S49	Noroleh Oliya	0.0	4.0	4.0																	
S50	Noroleh Oliya	0.0	6.0	6.0																	
S51	Noroleh Oliya	6.0	6.0	12.0					10	300,000	3.00	bazar	8	10,000	0.08	broker	1.20		3.08	4.28	
S52	Noroleh Oliya	0.0	12.0	12.0																	
S53	Noroleh Oliya	0.0	14.0	14.0					15	450,000	6.75	bazar	84	3,350	0.28	broker	2.00		7.03	9.03	
S54	Noroleh Oliya	20.0	10.0	30.0																	
			Sum		4.3		1,014	860,000	16.1		483	6,382,500	205.9		618	47,450	2.0	158.2		228.3	386.5
			Count		6.0		3	3	3.0		14	14	14.0		13	13	13.0	27		16	32
			Average		0.7		338	286,667	5.4		35	455,893	14.7		48	3,650	0.2	5.9		14.3	12.1

Table A8.2.5 Farmers' evaluation on production factors (Farmers' Economic Survey, 2003)

Code No.	Deh	Farm gate price	Input price	Getting of irrigation water	Access to technology	Appropriate technology	Transportation cost	Access to rural credit	Interest rate	Technology of dry farming	Mechanization cost	Distance to commercialization place
S1	Khoram Abad Oliya	2	2	2	2	2	2	2	2	2	2	2
S2	Khoram Abad Oliya	2	2	0	1	2	1	2	2	2	2	1
S3	Khoram Abad Oliya	2	1	1	1	2	2	2	2	2	2	1
S4	Khoram Abad Oliya	2	2	0	1	2	2	2	2	2	2	0
S5	Khoram Abad Oliya	2	2	0	0	1	1	2	2	2	2	1
S6	Khoram Abad Oliya	1	2	0	1	2	2	2	2	2	2	2
S7	Khoram Abad Oliya	2	2	0	2	2	2	2	2	2	2	0
S8	Khoram Abad Oliya	1	2	2	2	2	0	2	1	1	2	2
S9	Khoram Abad Oliya	2	2	0	2	2	2	2	2	2	2	0
S10	Khoram Abad Oliya	2	0	1	1	1	2	2	0	0	2	2
S11	Khoram Abad Oliya	1	2	0	1	1	2	1	1	1	2	1
S12	Khoram Abad Oliya	2	2	1	1	1	2	2	1	2	2	2
S13	Khoram Abad Oliya	0	2	1	2	1	2	2	2	0	2	0
S14	Khoram Abad Oliya	2	2	2	1	1	2	2	1	2	2	2
S15	Khoram Abad Oliya	1	2	1	0	1	2	2	1	1	2	2
S16	Khoram Abad Oliya	2	2	2	2	2	2	2	2	2	1	0
S17	Khoram Abad Oliya	2	2	1	1	1	2	2	1	2	2	1
S18	Khoram Abad Oliya	2	2	2	1	2	2	2	2	1	2	1
S19	Khoram Abad Oliya	1	1	1	1	2	2	2	1	2	2	1
S20	Khoram Abad Oliya	2	2	1	1	0	2	2	1	1	2	0
	Average	1.7	1.8	0.9	1.2	1.5	1.8	2.0	1.5	1.6	2.0	1.1
S21	Shali Abad	2	2	2	2	2	2	2	2	2	2	1
S22	Shali Abad	2	2	1	1	2	1	2	2	1	2	1
S23	Shali Abad	2	0	2	1	2	2	2	2	2	2	0
S24	Shali Abad	1	2	2	2	2	1	2	2	2	2	2
S25	Shali Abad	2	0	2	1	2	2	2	2	2	2	0
S26	Shali Abad	1	2	2	2	2	1	2	2	2	2	2
S27	Shali Abad	2	0	2	2	1	2	2	2	2	2	0
	Average	1.7	1.1	1.9	1.6	1.9	1.6	2.0	2.0	1.9	2.0	0.9
S28	Reis	2	2	2	1	2	2	2	2	2	2	0
S29	Reis	1	2	2	1	2	1	2	2	2	2	1
S30	Reis	2	2	2	2	2	2	2	2	2	2	2
S31	Reis	2	2	2	1	2	1	1	2	1	2	0
S32	Reis	2	2	2	1	2	1	2	2	2	2	1
S33	Reis	2	2	2	1	2	1	2	2	2	2	0
S34	Reis	1	2	0	1	2	1	2	1	1	1	0
	Average	1.7	2.0	1.7	1.1	2.0	1.3	1.9	1.9	1.7	1.9	0.6
S35	Kalaveh Heidarkhan	1	2	0	1	1	2	2	2	1	2	2
S36	Kalaveh Heidarkhan	1	1	2	2	0	1	1	1	1	2	1
S37	Kalaveh Heidarkhan	2	1	0	2	1	2	2	2	2	2	1
S38	Kalaveh Heidarkhan	2	1	1	2	2	1	2	1	2	1	2
S39	Kalaveh Heidarkhan	2	2	2	2	2	1	2	2	2	2	2
S40	Kalaveh Heidarkhan	2	1	0	2	2	0	2	2	2	2	2
S41	Kalaveh Heidarkhan	2	1	2	1	1	2	2	1	1	2	0
	Average	1.7	1.3	1.0	1.7	1.3	1.3	1.9	1.6	1.6	1.9	1.4
S42	Hassan Abad Shaleh	2	2	2	1	1	2	2	2	1	2	0
S43	Hassan Abad Shaleh	1	2	2	2	1	1	2	1	1	1	1
S44	Hassan Abad Shaleh	1	2	0	2	1	1	2	1	2	1	1
S45	Hassan Abad Shaleh	2	2	2	0	1	2	2	2	1	2	0
S46	Hassan Abad Shaleh	2	1	0	1	1	0	0	2	2	1	0
S47	Hassan Abad Shaleh	1	2	0	2	1	2	2	1	2	2	0
S48	Hassan Abad Shaleh	1	1	1	2	1	1	2	2	2	1	1
	Average	1.4	1.7	1.0	1.4	1.0	1.3	1.7	1.6	1.6	1.4	0.4
S49	Noroleh Oliya	2	1	2	2	1	2	0	1	2	1	0
S50	Noroleh Oliya	2	2	0	2	1	1	2	2	2	2	0
S51	Noroleh Oliya	1	2	1	1	1	1	2	0	0	0	0
S52	Noroleh Oliya	1	2	2	2	0	1	2	2	2	1	1
S53	Noroleh Oliya	1	1	2	1	2	1	2	2	2	2	0
S54	Noroleh Oliya	2	2	0	2	2	2	1	2	2	2	1
	Average	1.5	1.7	1.2	1.7	1.2	1.3	1.5	1.5	1.7	1.3	0.3

Note 0: no problem, 1: medium problem, 2: very problem.

Table A8.2.6 Perspectives of farmers in Future in Survey Area (farmers' Economic Survey, 2003)

Code No.	Deh	Own land			Gross income index	Farmers' intention for improvement of farming													
		Irrg. ha	Dry ha	Sum ha		Expectation of annual income Million Rls./year	Continuation of farming yes/no	Introducing of animal husbandry				Introducing of new facilities		Bee keep yes/no	Fish yes/no	Fruit tree and vegetables			
								yes/no	Sheep	Cow	Poultry	yes/no	yes/no			yes/no	Vegetable	ha	
28	Reis	0.0	2.0	2.0	2.0	54.0	0	1		10	200	1	Mechanization	0	1	1	strawberry	1.0	
1	Khoram Abad Oliya	0.5	1.0	1.5	3.1	48.0	1	1	50			1	Mechanization - irrigation system	1	0	1			
21	Shali Abad	0.5	1.0	1.5	3.1	30.0	1	1	20			1	Mechanization	0	1	1			
49	Noroleh Oliya	0.0	4.0	4.0	4.0	40.0	1	1		20		1	Well construction	1	1	1			
24	Shali Abad	0.0	4.5	4.5	4.5	60.0	1	1	50	5		1	Mechanization	0	0	0			
42	Hassan Abad Shaleh	0.0	6.0	6.0	6.0	30.0	1	1		5		1	Irrigation system	1	0	1			
50	Noroleh Oliya	0.0	6.0	6.0	6.0	28.0	1	1		3		1	Mechanization	0	0	0			
27	Shali Abad	0.0	8.0	8.0	8.0	70.0	1	1		20		1	Irrigation system	0	0	1			
30	Reis	0.0	8.0	8.0	8.0	25.0	0	1	50			1	Well construction & canal	0	1	1			
23	Shali Abad	2.5	1.5	4.0	12.0	40.0	1	1	30	10		1	Mechanization	0	0	1			
32	Reis	0.0	12.0	12.0	12.0	50.0	1	1	50			1	Mechanization	1	0	1	summery veg.	1.0	
52	Noroleh Oliya	0.0	12.0	12.0	12.0	48.0	1	1		12		1	Sprinkler irrigation	1	1	1	summery veg.	1.0	
2	Khoram Abad Oliya	2.5	2.0	4.5	12.5	30.0	1	1	40	2		1	Irrigation of lands	1	0	1			
22	Shali Abad	1.0	0.0	1.0	12.6	50.0	1	1	100	10		1	Well construction	1	1	1			
53	Noroleh Oliya	0.0	14.0	14.0	14.0	72.0	1	1	150	5		1	Well construction	1	0	1			
33	Reis	0.0	15.0	15.0	15.0	35.0	1	1	150			1	Mechanization	0	0	0			
31	Reis	2.0	8.5	10.5	16.9	30.0	1	0				1	Canal construction & levelling of lands	1	0	1			
37	Kalaveh Heidarkhan	3.0	0.0	3.0	20.2	60.0	1	1	100	5		1	Cooperative mecanization	0	1	1	watermelon	2.0	
3	Khoram Abad Oliya	4.0	4.0	8.0	20.8	54.0	1	1		8		1	Cooperative mecanization	1	1	1			
4	Khoram Abad Oliya	4.0	4.0	8.0	20.8	55.0	1	1	60			1	Mechanization	0	0	1			
5	Khoram Abad Oliya	4.0	4.0	8.0	20.8	24.0	0	0		0		0		0	0	0			
29	Reis	0.0	6.0	6.0	23.0	80.0	1	1	500			0	Well construction & canal	1	0	1	strawberry	2.0	
26	Shali Abad	4.0	4.0	8.0	25.3	110.0	1	1	70			1	Mechanization	1	1	1			
36	Kalaveh Heidarkhan	4.0	3.0	7.0	27.4	50.0	1	0		0		0		0	1	1	cantaloup/tomato	2.0	
6	Khoram Abad Oliya	4.5	4.0	8.5	28.6	70.0	1	1	50			1	Mechanization	0	0	0			
25	Shali Abad	6.5	1.5	8.0	28.8	60.0	1	1		5		1	Well construction & canal	0	1	1	tomato	1.0	
	Average					50.1													
35	Kalaveh Heidarkhan	5.0	1.0	6.0	31.5	90.0	1	1		10	10,000	1	Irrigation system	1	0	1	strawberry	1.0	
19	Khoram Abad Oliya	2.0	23.0	25.0	33.3	96.0	1	1	40	2		1	Cooperative irrigation	1	1	1			
9	Khoram Abad Oliya	4.5	6.0	10.5	33.6	70.0	1	1	60			1	For farm buying	0	0	0			
43	Hassan Abad Shaleh	4.0	2.0	6.0	34.0	80.0	1	1	100			1	Irrigation system	0	0	1			
7	Khoram Abad Oliya	5.0	4.0	9.0	34.5	70.0	1	1		7		1	Land levelling	0	0	1			
11	Khoram Abad Oliya	5.0	7.0	12.0	35.6	70.0	1	1	100			1	Pump	1	1	1			
16	Khoram Abad Oliya	3.0	16.0	19.0	36.2	150.0	1	1	200			1	Well construction	0	0	1			
47	Hassan Abad Shaleh	5.0	7.0	12.0	37.5	100.0	1	0		0		0		0	0	0			
44	Hassan Abad Shaleh	6.0	1.0	7.0	37.6	60.0	1	1		12		1	Irrigation system	1	1	1	patch	1.0	
	Average					87.3													
17	Khoram Abad Oliya	4.0	16.0	20.0	40.4	100.0	1	1				1	Well construction	0	0	0			
38	Kalaveh Heidarkhan	7.0	0.0	7.0	42.7	80.0	1	1	50	4		1	Cooperative mecanization	1	1	1	potato	2.0	
15	Khoram Abad Oliya	6.0	12.0	18.0	44.8	60.0	1	1	40			1	Well construction	0	0	1	strawberry	1.0	
10	Khoram Abad Oliya	5.0	7.0	12.0	51.8	40.0	1	1	100	10		1	Deep well construction	1	0	1			
8	Khoram Abad Oliya	6.0	4.0	10.0	52.0	100.0	1	1		50		1	Mechanization	0	0	0			
34	Reis	10.0	10.0	20.0	52.0	150.0	1	1	200			1	Fish culture & animal husbandvdy	0	1	1			
14	Khoram Abad Oliya	7.0	9.5	16.5	54.1	85.0	1	1		8		1	Cooperative mecanization	0	1	1			
41	Kalaveh Heidarkhan	8.0	6.0	14.0	54.8	100.0	1	1	300			1	Sprinkler irrigation	0	0	1			
18	Khoram Abad Oliya	10.0	10.0	20.0	63.4	100.0	1	1		30		1	Animal husbandry & sprinkler irrigation	1	0	1			
40	Kalaveh Heidarkhan	10.0	0.0	10.0	64.8	100.0	1	1	50			1	Canal construction & mecanization	0	1	0			
13	Khoram Abad Oliya	3.0	13.0	16.0	67.2	30.0	1	1	100	10		1	Well construction	1	1	1			
45	Hassan Abad Shaleh	10.0	2.0	12.0	71.0	200.0	1	1		30		1	Land levelling	1	1	1			
39	Kalaveh Heidarkhan	4.0	4.5	8.5	72.7	110.0	1	1	100			1	Land levelling	0	0	1			
51	Noroleh Oliya	6.0	6.0	12.0	84.6	100.0	1	1	100	6		1	Land levelling	1	1	1			
20	Khoram Abad Oliya	3.0	27.0	30.0	88.8	120.0	1	1	80			1	Well construction	0	1	1			
46	Hassan Abad Shaleh	13.0	0.0	13.0	91.0	30.0	1	1		10		1	Canal construction	0	1	0			
48	Hassan Abad Shaleh	16.0	1.5	17.5	91.5	140.0	1	1		30		1	Land levelling	1	1	1	vegetables	0.5	
12	Khoram Abad Oliya	10.0	5.0	15.0	97.4	160.0	1	1	100			1	Mechanization	0	1	1			
54	Noroleh Oliya	20.0	10.0	30.0	206.8	240.0	1	0				1	Irrigation system & mecaniztion	0	1	1			
	Average					107.6	Total	49	3,190	339	10,200	50			23	26	43		
							Total count		31	28	2								
							Average in total		103	12	5,100								

Table A8.2.7 Planned Production Volume, Existing Processing Plants and Marketing Network

Crop/Products	Wheat	Chick pea	Barley	Maize	maiz	Alfalfa	Rapeseed	Sugar beet	Coriander	Potato	Tomato	Onion	Rose	Milk	Honey	Trout
	gandom	nokhod	jou	zorrat	zorrat	yonjeh	kolza	choghondar -e-ghand	geshniz	sibzamir	gojeh	piyaz	gole sorkh	shir	asal (zanbur-)	mohi-e- qezelala
Area:1000ha	304.3	230.9	108.8	26.2		6.6	5.1	12.9	4.4	1.3	2.0	1.0				
% area	2%	1%	2%	4%		16%	20%	7%	3%	3%	2%	4%				
Production Type	guaranteed			guaranteed			guaranteed	contract					contract			
Market			feed	feed	feed	feed			export				export			
Yield: ton	30,281	4,809	4,030	13,229	62,520	15,313	4,893	68,032	501	1,855	1,855	2,226	600	26,335	45	30
Price: Rls./kg	1,450	2,500	1,000	1,070	150	1,000	2,500	303	2,581	700	500	475	6,000	1,600	20,000	15,000
Area:ha (10year after)	7,450	2,904	1,658	1,042	1,042	1,042	1,042	930	143	37	37	37	100			
Specialty /Producer		RPC Kuzaran							Kanghavar District				Esfahan & Makazi		Hassan Abad	Downstream in Lorestan
Buyer																
Processing Plant		Eslam Abad		Zalu Ab & Ravansar			Mahidasht, Kermanshah	Bisotun & Eslam Abad					Ravansar	Bisotun & Eslam Abad		
			Deh Bagh													
RCO	Ravansar Kareh Zalu Ab Kuzaran			Zalu Ab												
middleman wholesaler retail shop		Y		Y	Y	Y			Kanghavar City	Y	Y	Y	Kashan		Y Ravansar	Y
Remaraks	Bran: to feed industry		50%: Gov.	10% goes to Food Industry		Its powder goes to free industry	Kshah/Iran= 2.6%	Kshah/Iran= 7.5%					+ medicinal plants,		family-run Shops & Networks	

Notes: Y= existing in Kermanshah city

* *Valeriana officinalis*, *Thymus srpyllum*, *Mentha piperata*, *Melissa officinalis* etc.

QUESTIONNAIRE OF ECONOMIC EVALUATION OF FARMARS IN KERMANSHAH

Outline of Field Condition: (Please enter to following items by interviewer)

Geographical and social condition of a location

- 001 Distance from river or new canal or old canal:.....km
- 002 Altitude.....m, Distance from paved road to Deh.....km
- Health center: yes or no, Common well of drinking water: yes or no
- Number of well for irrigation in your Deh
- % of irrigated land for total land in Deh

Irrigation type

- 003 from river or
- 004 by well (owned well or common use of irrigation water by pool of group ofpersons)
- Energy of pumping: oil or electricity

Water use in each season (enough or short)

- 005 Winter: short, enough
- 006 Summer: short, enough

Cropping season and level of yield in common years (except droughty years)

- 007 only in winter, both in winter and summer with irrigation
- 008 Yield of wheat: Kg/ha in irrigated land, Kg/ha in dry land,
- 009 Yield of chick pea: Kg/ha in irrigated land, Kg/ha in dry land,
- Yield of maize: Kg/ha in irrigated land, Kg/ha in dry land,

Soil texture

- 010 heavy textured soil (%), light heavy textured soil (%),
- light textured soil (%)

Level of underground water in each season

- 013 About m in depth from soil surface in winter
- 014 About m in depth from soil surface in summer

Other conditions

- 015 **Ponding of field in winter:** % of total area of farm

016 Severe problems in farm management

- (1)
- (2)
- (3)
- (4)

QUESTIONNAIRE OF ECONOMIC INFORMATION ABOUT FARMERS

QUESTIONNAIRE

Code No.

Date	of		
interview	/	/	/

A Personal Information

A-1	Name		
A-2	Name of Deh:		
A-3	Telephone: ()	A-4 Fax: ()	
A-5	Age:	A-6 Origin: 1) Kurd <input type="checkbox"/> 2) Others	

B Farm Workforces and Employment in 2001/2002

- B-1 Number of total family members 1) Male _____ 2) Female _____ (3) Child in School _____)
- B-2 Number of family members in farming 1) Male _____ 2) Female _____
- B-3 Number of permanent employees _____
- B-4 Number of temporary employees in a year of 2001/2002 _____
- B-5 Number of family members in non-farm activities 1) Male _____ 2) Female _____
- B-6 Type of non-farm activity (choose the number from below)
- (1) Male 1: (1) Service 2) Business 3) Labour 4) handi craft 5) others
- (2) Female 1: (1) Service 2) Business 3) Labour 4) handi craft 5) others
- (3) (1) Service 2) Business 3) Labour 4) handi craft 5) others
- B-7 Number of family members unemployed (1) Male _____ 2) Female _____
- B-8 Age of the unemployed Members of the Family (1) Male _____ 2) Female _____
- B-9 What the unemployed members do?
- (1) Male 1: 1) do nothing 2) help farming 3) job searching in urban 4) others
- (2) Female 1: 1) do nothing 2) help farming 3) job searching in urban 4) others
- (3) : 1) do nothing 2) help farming 3) job searching in urban 4) others

C Field (Land) and Production in 2001/2002

Owned land

Irrigated land

	(1) Name of crop	(2) ha	(3) Month of sowing & harvesting	(4) Yield (ton/ha)	(5) Production (ton)
C-1	Wheat	_____	_____ ~ _____	_____	_____
C-2	Maize	_____	_____ ~ _____	_____	_____
C-3	Others(name)	_____	_____ ~ _____	_____	_____

Rain-fed land

	(1) Name of crop	(2) ha	(3) Month of sowing & harvesting	(4) Yield (ton/ha)	(5) Production (ton)
C-4	Wheat	_____	_____ ~ _____	_____	_____

C-5	Barely	_____	_____ ~ _____	_____	_____
C-6	Cheakpea	_____	_____ ~ _____	_____	_____
C-7	Others(name)	_____	_____ ~ _____	_____	_____

Rented land

Irrigated land

	(1) Name of crop	(2) ha	(3)Month of sowing & harvesting	(4) Yield (ton/ha)	(5) Production (ton)
C-8	Wheat	_____	_____ ~ _____	_____	_____
C-9	Maize	_____	_____ ~ _____	_____	_____
C-10	Others(name)	_____	_____ ~ _____	_____	_____

Rain-fed land

	(1) Name of crop	(2) ha	(3)Month of sowing & harvesting	(4) Yield (ton/ha)	(5) Production (ton)
C-11	Wheat	_____	_____ ~ _____	_____	_____
C-12	Barely	_____	_____ ~ _____	_____	_____
C-13	Cheakpea	_____	_____ ~ _____	_____	_____
C-14	Others(name)	_____	_____ ~ _____	_____	_____

C-15 Condition of rent: _____

D Gross Income from Agriculture in 2001/2002

	(1)Name of crop	(2) Production (ton)	(3)For seeds and self consumption (ton)	(4)Loss (ton)	(5) Sale (ton)	(6) Unit price (Rls./kg)	(7) To whom ?
D-1	Wheat	_____	_____	_____	_____	_____	_____
D-2	Barely	_____	_____	_____	_____	_____	_____
D-3	Maize	_____	_____	_____	_____	_____	_____
D-4	Cheakpea	_____	_____	_____	_____	_____	_____
D-5	Others(name)	_____	_____	_____	_____	_____	_____

E Gross Income from Animal Husbandry and others in 2001/2002

Cattle

	(1)heads	(2)Milk production a year (lit.)	(3)Beef production a year (heads)	(4) quantity of sale/year	(5)unit price Rls/lit. or head	(6) To whom ?
E-1	Adult cow	_____	_____	_____	_____	_____
E-2	Bull	_____	_____	_____	_____	_____
E-3	Calves	_____	_____	_____	_____	_____

Sheep & goat

E-4 Number of raising: 1) Adult _____ heads, 2) Lamb _____

E-5 Produced milk;

(1) Self-consumption 1/ ()

(2) Sale of milk a year 1) _____heads, 2) unit price _____Rls/head, 3) To whom? _____

(3) Sale of oil a year 1) _____heads, 2) unit price _____Rls/head, 3) To whom? _____

E-6 Sale of mutton;

1) Sale a year _____heads, 2) unit price _____Rls/head, 3) To whom? _____

E-7 Sale of lamb:

1) Sale a year _____heads, 2) unit price _____Rls/head, 3) To whom? _____

E-8 Sale of wool:

1) Sale a year _____heads, 2) unit price _____Rls/head, 3) To whom? _____

E-9 Annual gross income from poultry, beekeeping or fish culture in 2001/2002

Other gross income (no-agricultural income) in 2001/2002

	(1) Kind of job	(2) Income a year (Rls.)	(3) Period of job (months)
E-10	_____	_____	_____
E-11	_____	_____	_____
E-12	_____	_____	_____
E-13	_____	_____	_____

F Machinery, Equipment, Vehicles

Type	(1) Quantity (no.)	(2) Average time of use (ha/year)	(3) Period of use (year)
F-1 Tractor			
F-2 Harvester			
F-3 Trucks			
F-4 Vehicles			
F-5 Irrigation Equipment			
F-6 Agricultural Implements			
F-7 Others:			

F-8 If you have machinery, are you given farm work operation with your machinery in trust?

1) Yes 0) No

F-9 If Yes, the total covered area with your machinery in trust, except your farm, is

(1) _____ha/year, and the gross income from the farm work operation charge is

(2) _____ Rls/year with the costs, such as fuel, repair and maintenance of machinery, etc., of (3) _____Rls/year

G Irrigation

G-1 Do you have access to irrigation facilities? 1) Yes 0) No

G-2 If yes, 1) well , 2) pump (for pumping up from river)

G-3 If you have a well, total covered area isha

G-4 Construction cost of well (1) Rls. in (2)

Type of Irrigation	(1) Crops	(2) Area (ha)
G-5 Furrow		
G-6 Drip		
G-7 Basin		
G-8 Others		
G-9 Water Source for Irrigation:	1)River <input type="checkbox"/> 2)Well <input type="checkbox"/> 3)Canal <input type="checkbox"/> 4)Others <input type="checkbox"/> _____	
G-10 Quantity of Water for Irrigation?	1) Enough <input type="checkbox"/> 0)Not Enough <input type="checkbox"/>	
G-11 Quality of Water for Irrigation?	1) Good <input type="checkbox"/> 0)Bad <input type="checkbox"/>	
G-12 Energy for Irrigation	1) Electric <input type="checkbox"/> 2) Diesel <input type="checkbox"/> 3) Other <input type="checkbox"/>	
G-13 (1) Satisfied with the irrigation? 1) Y <input type="checkbox"/> 0) N <input type="checkbox"/>	(2) If NO, why? _____ _____	

Times of irrigation each month (2001/2002)

crop \ month	1	2	3	4	5	6	7	8	9	10	11	12	Total
	G-14 Wheat												
G-15 Maize													
G-16 Others (Name)													
G-17													

H Technology

(1) Crop	(2)Area (ha)	(3) Yield (kg/ha)	(4) Fill out with an X (see below)							
H-1 Wheat			1	2	3	4	5	6	7	
H-2 Bareley			1	2	3	4	5	6	7	
H-3 Maize			1	2	3	4	5	6	7	
H-4 Chickpea			1	2	3	4	5	6	7	
H-5 Others (name)			1	2	3	4	5	6	7	
H-6 Others (name)			1	2	3	4	5	6	7	
Technology: 1 – organic manure 2 – chemical fertilizer 3 – Certified or registered seeds 4 – irrigation 5– herbicide 6 – insecticide 7 – fungicide										
H-7 Are there any erosion problems at your farm?			1) Yes <input type="checkbox"/> 0) No <input type="checkbox"/>							
H-8 Do you perform soil analysis? (1) Yes <input type="checkbox"/> →			1) Before each planting <input type="checkbox"/> 2) Once a year <input type="checkbox"/> 3)Once each 2 year <input type="checkbox"/> 4)Longer period <input type="checkbox"/> (0) No <input type="checkbox"/>							

I Commercialization

I-1 From whom do you buy your **farm materials**?

- (1) Seeds: _____
(2) Fertilizer _____
(3) Herbicide _____
(4) Fungicide _____
(5) Pesticide _____
(6) Feed of livestock
 1) Roughage _____
 2) Concentrates _____

J Experiences of Cooperatives/ Association

J-1 Are you a member of any cooperative or any rural association? 1) Yes 0) No

J-2 If yes, what are the names and activities of cooperative / associations?

- (1) Cooperative _____ Activities _____
(2) Association _____ Activities _____

J-3 If no, do you think that you need a cooperative / associations in your village?

- (1) Yes 1) Type of Cooperative / Association (_____)
 2) Reason (_____)
(0) No 1) Reason (_____)

Are you involved in the groups activities as indicated below?

	(1) By group 1) Yes, 0) No	(2) No. of families participate
J-4 Farming		
J-5 Grazing		
J-6 House building		
J-7 Marriage celemony		
J-8 Cleaning		
J-9 Literacy class		
J-10 Religeous activities		
J-11 Others		

K Evaluation of Production Factors

K-1 Evaluate the Production factors according to the level of influence in your farm

(0) – no problem

(1) – Medium problem

(2) – very problem

K-2 Farm Gate Price	(0) <input type="checkbox"/>	(1) <input type="checkbox"/>	K-7 Transportation Cost	(0) <input type="checkbox"/>	(1) <input type="checkbox"/>
	(2) <input type="checkbox"/>			(2) <input type="checkbox"/>	
K-3 Inputs Price	(0) <input type="checkbox"/>	(1) <input type="checkbox"/>	K-8 Access to Rural Credit	(0) <input type="checkbox"/>	(1) <input type="checkbox"/>
	(2) <input type="checkbox"/>			(2) <input type="checkbox"/>	

K-4 Getting of irrigation water	(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>	K-9 Interest Rate	(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>
K-5 Access to Technology	(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>	K-10 Technology of dry farming	(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>
K-6 Appropriate Technology	(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>	K-11 Mechanization cost	(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>
K-12 Distance to the commercialization place		(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>	
K-13 Others: (1) _____		(2) _____	
		(0) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/>	

L Debts

Financial Agency	(1) Situation	(2) Conditions	(3)
	0) - Normal 1) - Rescheduled 2) - Overdue 3) - Legal Instance	0) - Too Expense 1) - Medium Cost 2) - Favorable	Amount of debt (Rls.)
L-1 Bank _____	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-2 Bank _____	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-3 Bank _____	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-4 Cooperative	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-5 Wholesaler / Seller	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-6 Consignment Loan (Green Soybean)	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-7 Relative	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-8 Money lender	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-9 Others	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	
L-10 Total debt (1) _____ Rls.			
L-11 Main reason of debt:			

M Production Factors

Item	(1) Details	(2) Total Annual Cost (Rls./year)
M-1 Irrigation water charge		
M-2 Mechanization cost (including the charge for operation contractor)		
M-3 Agricultural inputs		
M-4 Roughage and concentrate feed for livestock		
M-5 Maintenance of machinery and equipment		

M-6 Combustible and lubricants		
M-7 Rental		
M-8 Electric energy for production		
M-9 Commercialization (Charge and others)		
M-10 Transportation		
M-11 Labor force		
M-12 Financial expenses (Repayment)		
M-13 Agricultural accident insurance premium (1) For 1)(crops) 2).....ha (2) For 1)(crops) 2).....ha		
M-14 Others:		
M-15 TOTAL		

N Household Expenses (Family)

Item	(1) Annual Cost (Rls./year)	(2) Details
N-1 Food:		
N-2 Housing:		
N-3 Clothing:		
N-4 Energy and Water:		
N-5 Medical Services:		
N-6 Transportation:		
N-7 Communication:		
N-8 Education:		
N-9 Taxes and Obligations:		
N-10 Others:		
N-11 TOTAL		

O Perspectives of Farmer

Present

O-1 What is your expectation of Annual Income? _____ Rls./year

O-2 Do you intend to continue the agricultural activity here? 1) Yes 0) No

Future

O-3 Do you intend to increase the cultivated area in your farm? 1) Yes 0) No (keep as it is)

O-4 Do you intend to introduce high yield varieties? 0) No 1) Yes Which one: _____

O-5 (1) Do you intend to introduce animal husbandry? 1) Yes 0) No

(2) If "Yes", what type of livestock?: 1) _____ heads of 2) _____, 3) _____ heads of
4) _____

O-6 Do you intend to invest in new facilities (e.g. irrigation)? 0) No 1) Yes Which one: _____

- O-7 Do you intend to introduce beekeeping? 1)Yes 2)No
- O-8 Do you intend to introduce fish culture? 1)Yes 2)No
- O-9 (1)Do you intend to introduce fruit trees or vegetables? 1)Yes 2)No
- (2) If Yes, What kinds of fruits and vegetables?
- 1.1)Name.1.2).....ha, 2.1)Name.2.2).....ha, 3.1)Name.3.2).....ha
- O-10 Future planning on the other issues:

P Evaluation of the Organizations Involved in Farming

P-1 Evaluate the organizations involved in your farming according to your point of view:		
0)– Unsatisfactory	1) – Medium	2) – Satisfactory
P-2 Province Government	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	P-4 RCO 0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>
P-3 Banks	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	P-5 Association of 0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>
P-4 Extension activities	0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>	P-6 Feeds or maize dry factories 0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>
P-7 e.g. wholesaler Others: _____		0) <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>

Q

Q-1 Time to fill out the Questionnaire:	Q-2 Telephone of the Interviewer: ()
Q-3 Interviewer:	
Q-4 Address for Mail:	

Annex 9

Project Evaluation

ANNEX 9

PROJECT EVALUATION

A9.1 Cost and Income of the Project

Production costs of adopted crops in the Project are shown in Table A9.1.1 to A9.1.3. Their sources are Kermanshah Jihad-e-Agriculture Organization.

A9.2 Discount Rate for Economic and Financial Evaluation

In the economic appraisal a discount rate of 10 % is used to estimate NPV and B/C, as a socially acceptable discounted rate. In the financial appraisal a discount rate of 17 % is used. It is equivalent to the rate of return on five-year term deposit in 2002/03 period. (See Table 35 Islamic Republic of Iran: rate of return on deposits, Statistical appendix, IMF Country Report NO.03/280.)

Rate of Return on Deposit in Iran (in %/year)

Year	1998/99	1999/2000	2000/01	2001/02	2002/03
Short Term	8.0	8.0	8.0	7.0	7.0
Long Term					
1-year	14.0	14.0	14.0	13.0	13.0
2-year	15.0	15.0	15.0	13 – 17	13 - 17
3-year	16.0	16.0	16.0	13 – 17	13 – 17
4-year	--	--	17.0	13 – 17	13 – 17
5-year	18.5	18.5	18.5	17.0	17.0

Original source: Central Bank of Iran, after IMF data mentioned above.

A9.3 Cash Flows for Financial, Economic Analysis, and Their Sensitivity Analysis

(1) Economic Evaluation

1) Economic B/C Ratio, NPV and IRR

Economic benefit/cost (E.B/C), economic net present value (ENPV) at the discount rate of 10 %, and economic internal rate of return (EIRR) are estimated as shown in Table A9.3.1 to A9.3.3 together with sensibility analysis.

	With Sunk Cost			Without Sunk Costs	
	Site 1	Site 2	Total Project	Site 1	Total Project
Economic IRR	15.41%	15.69%	15.06%	16.93%	16.28%
NPV (10%) in mill. Rls.	72,166	68,682	141,448	106,876	142,528
B/C	1.33	1.26	1.27	1.38	1.31

The Project as a whole is regarded as economically feasible.

2) Sensitivity Analysis

Three alternative cases with some probability of occurrence are examined here. They are cases with 1) increase of costs by 10 %, 2) decrease of benefits by 10 % and 3) the combined case of aforesaid two cases. They are summarized as follows:

Area	Site 1 (with sunk costs)		Site 2		Total Project(with sunk costs)	
	Cost : Base	Cost +10%	Cost : Base	Cost +10%	Cost : Base	Cost +10%
Benefit: Base	15.41%	13.45%	15.69%	13.19%	15.06%	12.96%
Benefit : -10%	13.25%	11.44%	12.95%	10.71%	12.74%	10.80%

(2) Financial Evaluation

1) Financial B/C Ratio, NPV and IRR

Financial internal rate of return (FIRR), net present value (NPV) and benefit and cost ratio (B/C) at a discount rate of 17 % of the Project are estimated as follows (Table A9.3.4 to A9.3.6);

	With sunk costs			Without sunk costs	
	Site 1	Site 2	Total Project	Site 1	Total Project
Financial IRR	15.99%	16.08%	16.03%	19.31%	17.51%
NPV (17%) in mill. Rls.	-7,315	-5,108	-13,291	10,222	5,114
B/C	0.95	0.97	0.96	1.09	1.02

The total Project with sunk costs is regarded as financially feasible by a narrow margin. In case of without sunk costs, it can be said the Project is financially feasible except Site 2 only.

2) Sensitivity Analysis

Three alternative cases with some probability of occurrence are examined here. They are cases with 1) increase of costs by 10 %, 2) decrease of benefits by 10 %, and 3) the combined case of aforesaid two cases. They are summarized as follows:

Area	Site 1(with sunk costs)		Site 2		Total Project (with sunk costs)	
	Cost : Base	Cost +10%	Cost : Base	Cost +10%	Cost : Base	Cost +10%
Benefit: Base	15.99%	14.24%	16.08%	13.53%	16.03%	13.80%
Benefit : -10%	13.86%	12.19%	13.27%	10.99%	13.57%	11.51%

These results show the importance of supports for the investment such as long term and low interest loan conditions to the farmers/implementators.

A9.4 Mechanization

Mechanization is a pillar of the Project, and an ideal set up is discussed in the main report. In the annex, however, we have adopted a more pragmatic approach to the financial problems faced at the initial investing stage.

An example of a small service enterprise with ten set machines run by an RPC is given in Table A9.4.1. A unit income per hectare by a mechanization service is estimated at Rls. 0.68 million (See Table A9.4.2). The annual gross income is estimated at Rls. 88 million as of 2003 price with the service area of 150 ha. Light tractors owned by private farmers are incorporated in the program. They will get Rls. 14 million as a gross income.

Financial analysis has shown that the operation would be so tight that it would require a favorable rate of interest for a necessary long term loan.

A9.5 Other Ancillary Program

A9.5.1 Plastic Green House

A financial analysis of a plastic house, as is given in the table below, shows a very favorable result if its niche market is found. So, the banks have been encouraging the knowledgeable young entrepreneurs to take up this agro-business.

(1) Investment		(3) Cash Flow			
	mil. Rls.	Year	Investme Cost	Gross	Net
Purchase of land	20.0	1	344.3	0.0	(344.3)
Land leveling	6.0	2		180.0	144.1
Construction of house	139.0	3		180.0	144.1
Building	24.0	4		180.0	144.1
Facilities	95.0	5		180.0	144.1
Equipment	18.3	6		180.0	144.1
Transportation means	42.0	7		180.0	144.1
Total	344.3	8		180.0	144.1
(2) Annual cost		9		180.0	144.1
Salary of persons	31.8	10		180.0	144.1
Farming inputs	4.1				
Total	35.9				
Gross Income/Y	180.0				

IRR= 39.8%

A9.5.2 Apiary (Beekeeping)

Apiary does not need big capital initially. A family which keeps 40 hives could earn annually a net income of Rls. 6 million. There are around 80 beekeepers at the tenth project year (See Table A9.5.1).

A9.5.3 Trout Culture

As is shown in Table A9.5.2, this is a financially very promising business, especially the case with the trout culture of spring water pond. The obvious reason is free water resources.

A9.5.4 Rose Garden

As is shown in Table A9.5.3, this is also a financially very promising business for small holders with relatively small amount of investment.

A9.6 Projects to be Carried out by RPC

One of the two business investments planned by RPC as their initial trial, development of mechanization with its financial ramification is analyzed in Table A9.5.6.

A9.6.1 Input Distribution

This is a conservative earning business all right. However, a commission taking business requires frugal way of running it. If RPC can make use of its building itself for its operation, its retained income would become useful for its future business activities that would start after the sixth project year.

A9.6.2 Agro-Processing Industries

Three sample enterprises are exhibited as models of RPC economic activities in the long term strategy of running it. Their financial analysis is refrained from carrying out here, though, as it would be rather a tall order to make a long shot.

Annex 10

Topographic and Cadastral Survey

ANNEX 10

TOPOGRAPHIC AND CADASTRAL SURVEY

A10.1 Outline of the Survey

During the 2nd field work in Iran, topographic and cadastral survey was carried out in the Study Area in an area of approximately 1,730 ha. Besides, survey was carried out along the Gharasu river and canal. The specifications of the survey are shown below.

A10.2 Specifications of the Survey

(1) Mobilization

The site for the new benchmark (BM) was selected utilizing the existing topographic maps and description of the control point, after confirming the existing ground control points and BM.

(2) Establishment of Bench Mark

Concrete stakes of 20× 20 × 50 cm were put up as BM at every 4.0 km basically and at critical locations. All stakes were placed on higher ground so that it can not be easily disturbed. In order to determine the elevation of newly placed BM to be used for succeeding topographic surveying, 2nd order leveling was carried out based on existing BM.

Following tolerances were followed.

- Distance between level and staff : 70 m
- Minimum unit of measuring : 1 mm
- Double running error : 10 mm \sqrt{s} (s = distance in Km)
- Closing error : 10 mm \sqrt{s} (s = distance in Km)

(3) Details of the Survey

The estimated area of the topographic and cadastral survey was approximately 1,730 ha. Specification of the topographic and cadastral maps required for each site is as follows.

Item	Specification
Map scale	1:2,000
Contour interval	1 m (Intermediate)
Contour interval	0.5 m (Supplementary)
Coordinates system	International (UTM) coordinates system

Surveying area was surrounded by traversing route and elevation of traversing points was measured by direct leveling. Based on the traversing points, detailed topographic features on basic intersection of approx. 40m mesh and every changing point of topographic situation were measured by using theodolite, electric distance meter and level. Specifications of the observations are mentioned below.

Instrument to be used

- Theodolite: Minimum reading 1 second
- Electric distance meter: $\pm 10 \text{ mm} \pm 3 \text{ ppm} \times \text{Distance}$

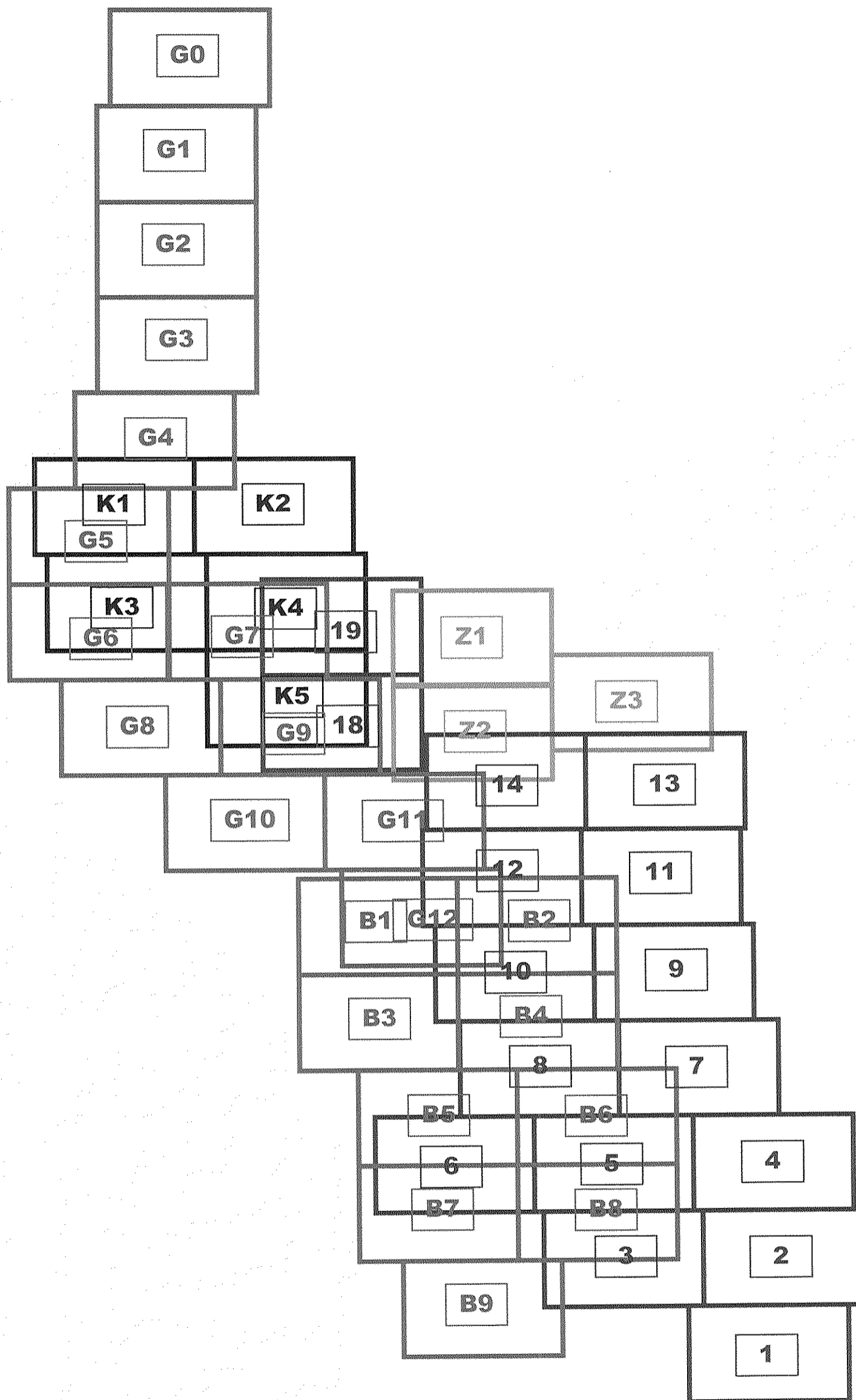
Number of measurement and tolerance

Horizontal Angle	Number of measurement (Graduation)	2 sets (0°90°)
	Difference of observation	10 second
	Double angle difference	20 second
Vertical Angle	Number of measurement	1 set
	Constant of elevation	10 second
Distance	Number of measurement	3 times
	Distance discrepancy	2 cm×S (km)

Accuracy

- Traversing method: Closed traverse
- Closing error of direction angle: 20 second \sqrt{n} (n = N° of angle observation)

The maps were digitalized by using computer software. The results of the survey are enclosed in the following pages.



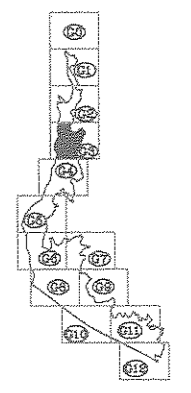
Remarks; • Red color show the index of maps which survey has been carried out during the Study.
 • Other color show the index of maps which survey has been carried out by KJAO before the Study.

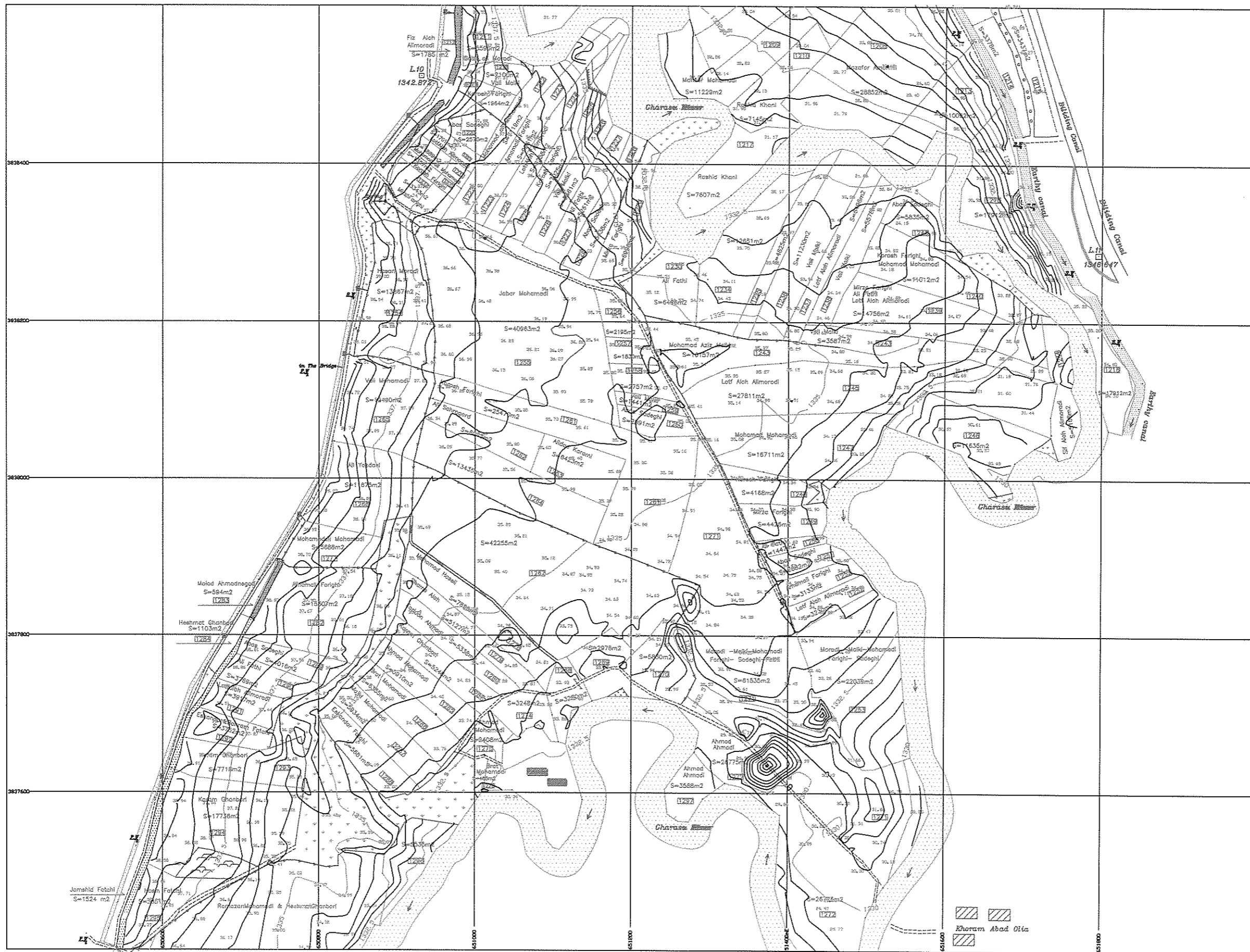
Map Index



- RIVER
- CANAL
- ROAD
- BOUNDARY
- FENCE
- WALL
- PLOT
- BUILDING
- WELL
- POND
- DAM
- BRIDGE
- GATE
- CULVERT
- PIPELINE
- POWER LINE
- TELEPHONE LINE
- ELECTRIC LINE
- ROAD MARKING
- SPOT HEIGHT
- CONTOUR LINE
- GRID LINE

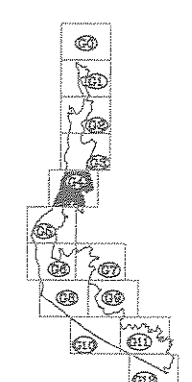
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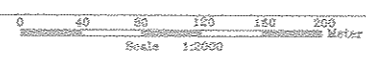
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- ROAD WIDTH
- ROAD CENTERLINE
- ROAD EDGE
- ROAD CUT
- ROAD FILL
- ROAD BRIDGE
- ROAD TUNNEL
- ROAD UNDERPASS
- ROAD OVERPASS
- ROAD CULVERT
- ROAD DRAINAGE
- ROAD ELEVATION
- ROAD GRADE
- ROAD SURFACE
- ROAD MATERIAL
- ROAD TYPE
- ROAD WIDTH
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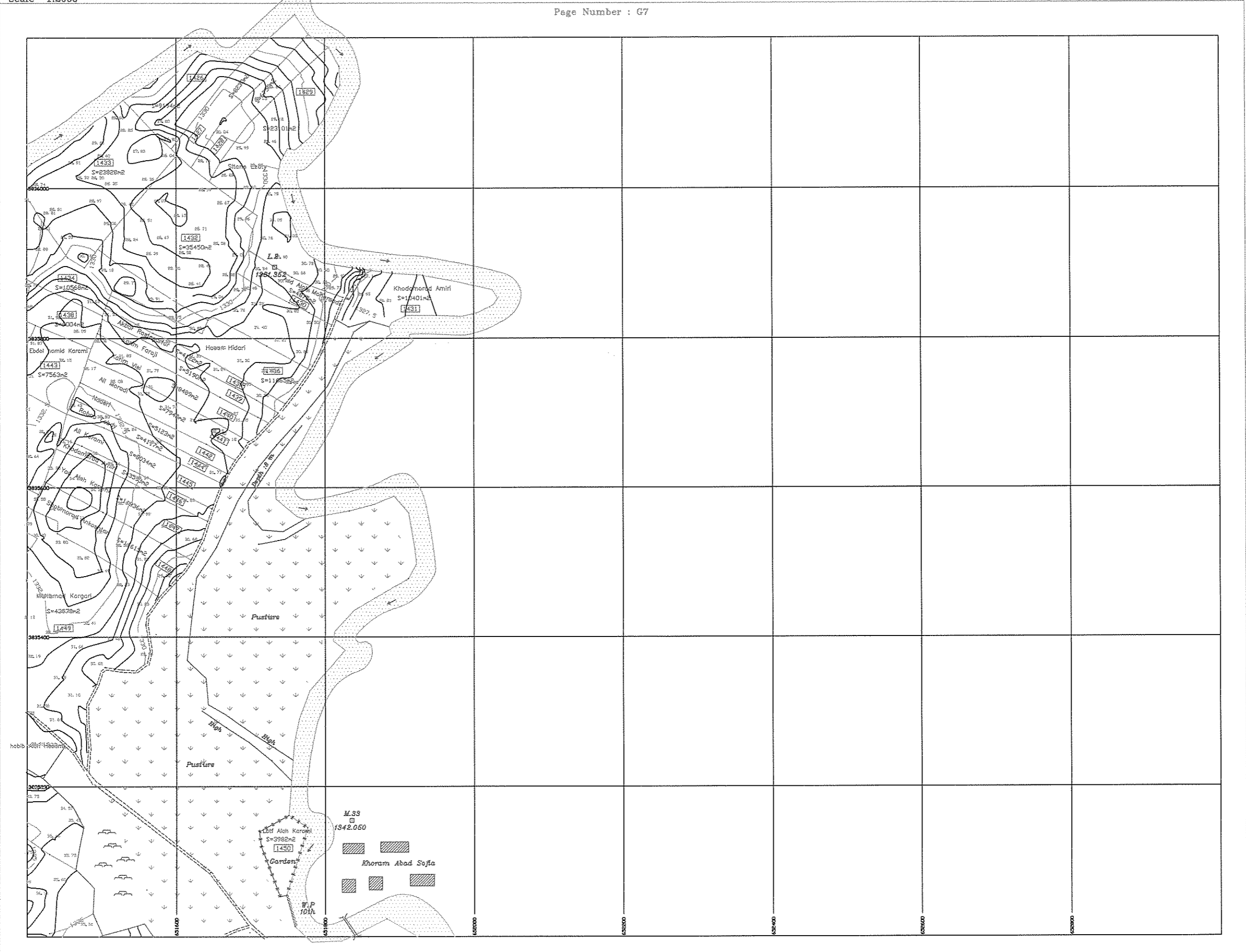


Supply date: summer 2003

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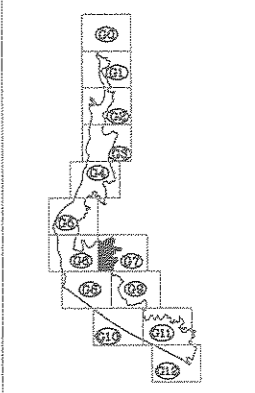


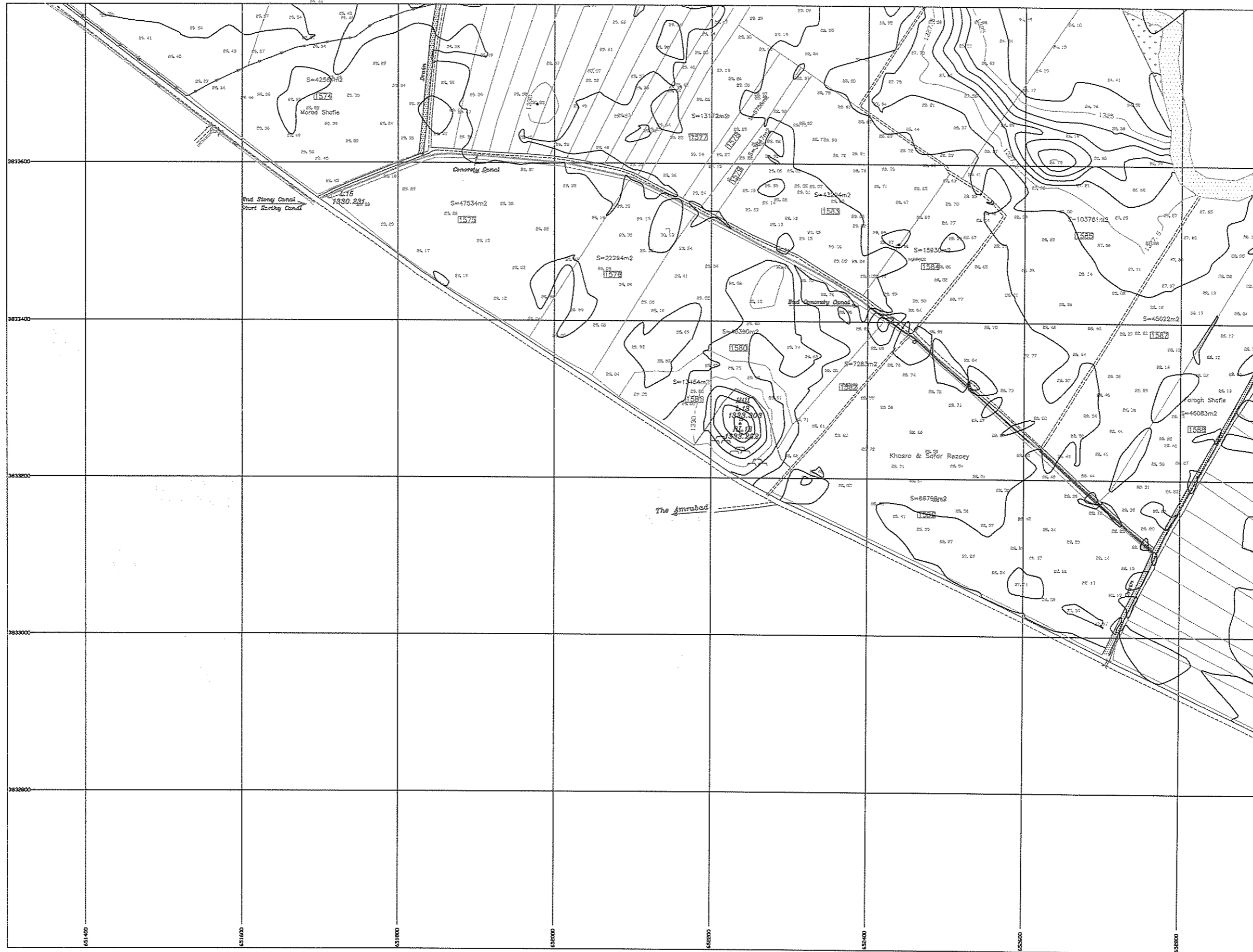
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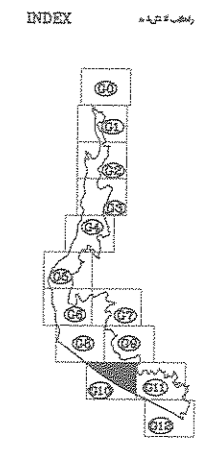
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ROAD		جاده
RAIL		راه آهن
WATER		آب
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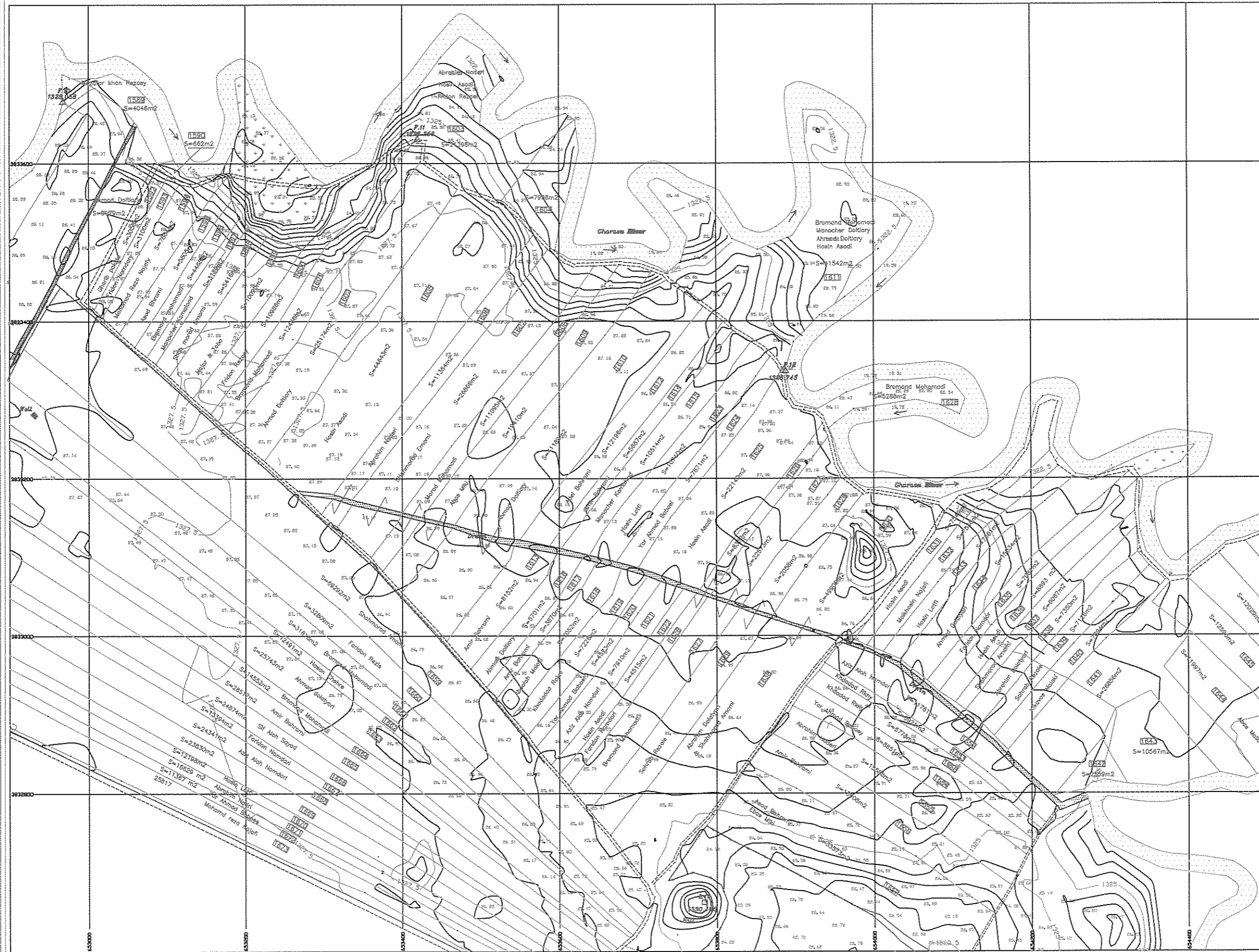
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WATER	[Symbol]	آب
...





INDEX

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[Symbol]	Stream
[Symbol]	Contour Line
[Symbol]	Property Boundary
[Symbol]	Wall
[Symbol]	Gate
[Symbol]	Well
[Symbol]	Electricity
[Symbol]	Telephone
[Symbol]	Highway
[Symbol]	Road
[Symbol]	Path
[Symbol]	Field
[Symbol]	Forest
[Symbol]	Barren Land
[Symbol]	Settlement
[Symbol]	Public Building
[Symbol]	Religious Building
[Symbol]	Industrial Building
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[Symbol]	Archaeological Site
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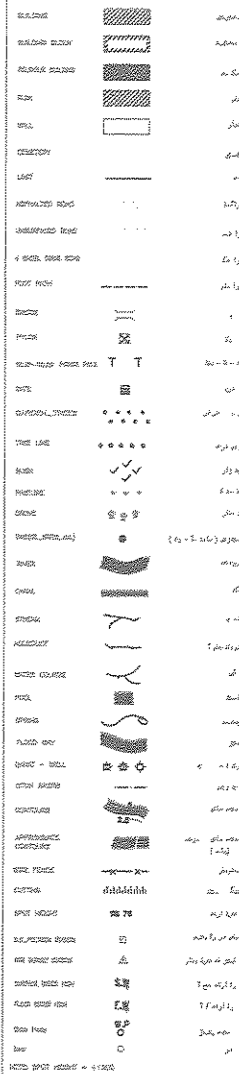
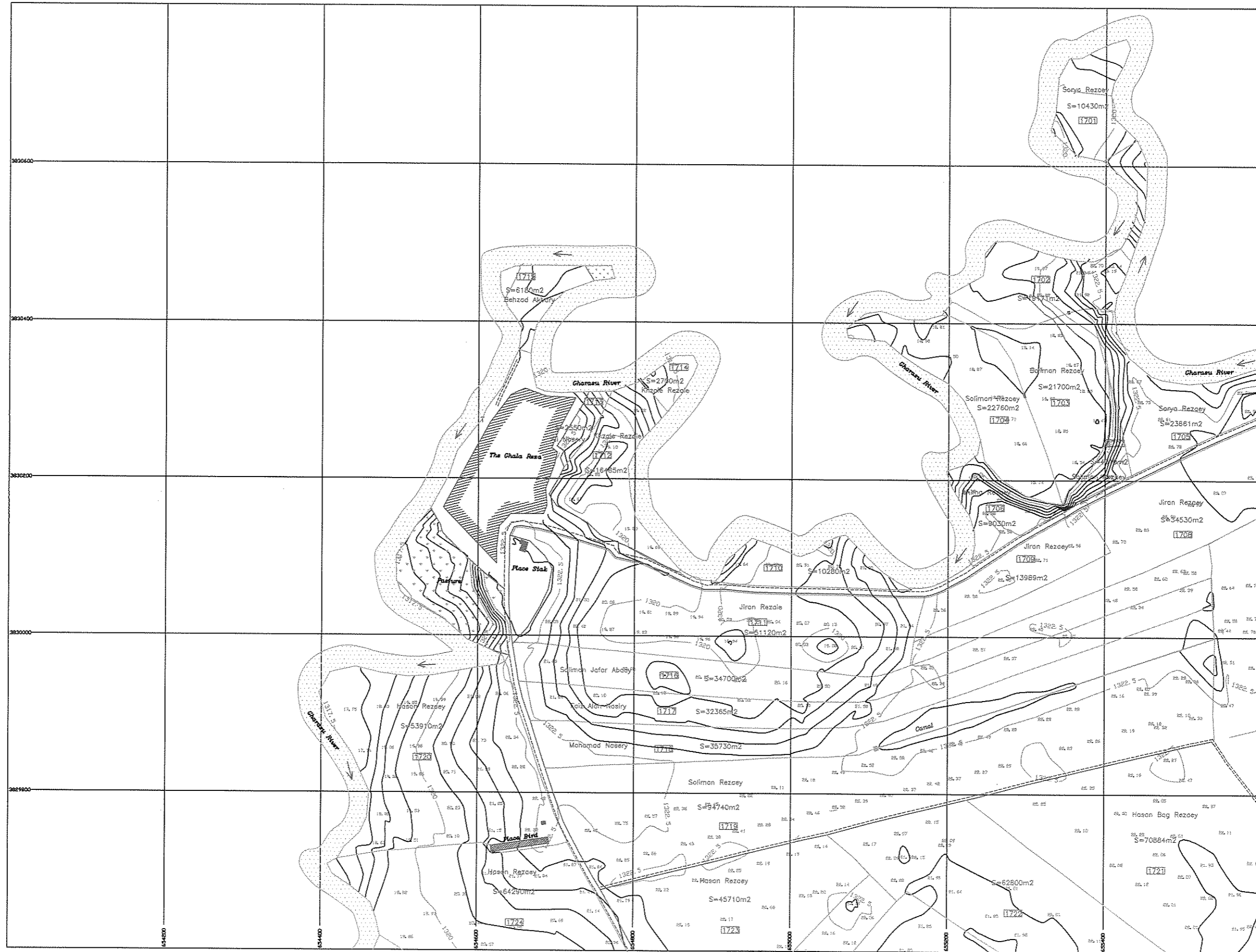
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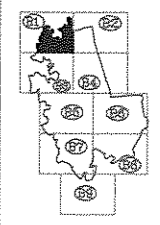
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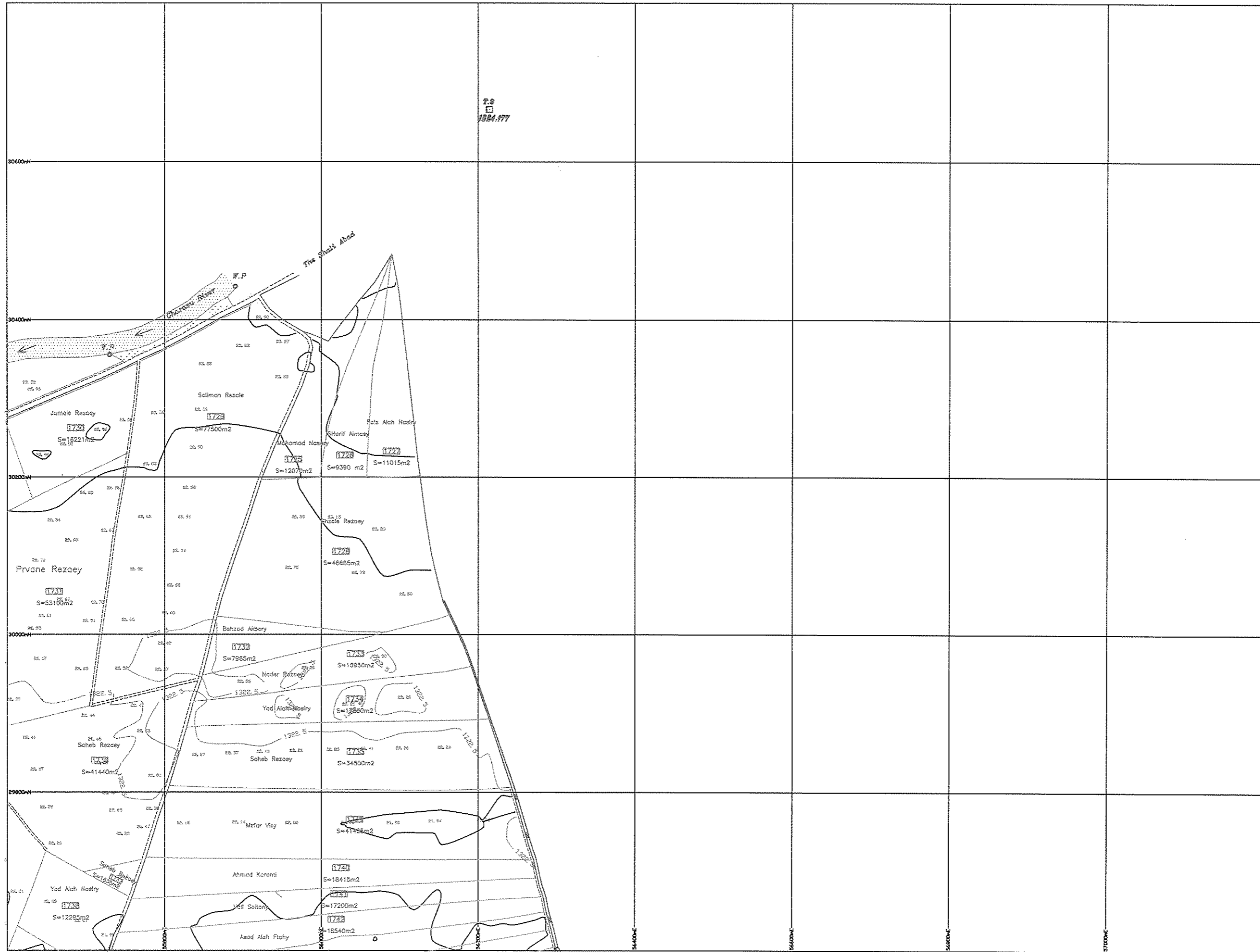
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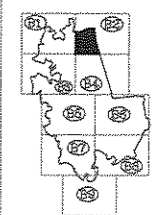


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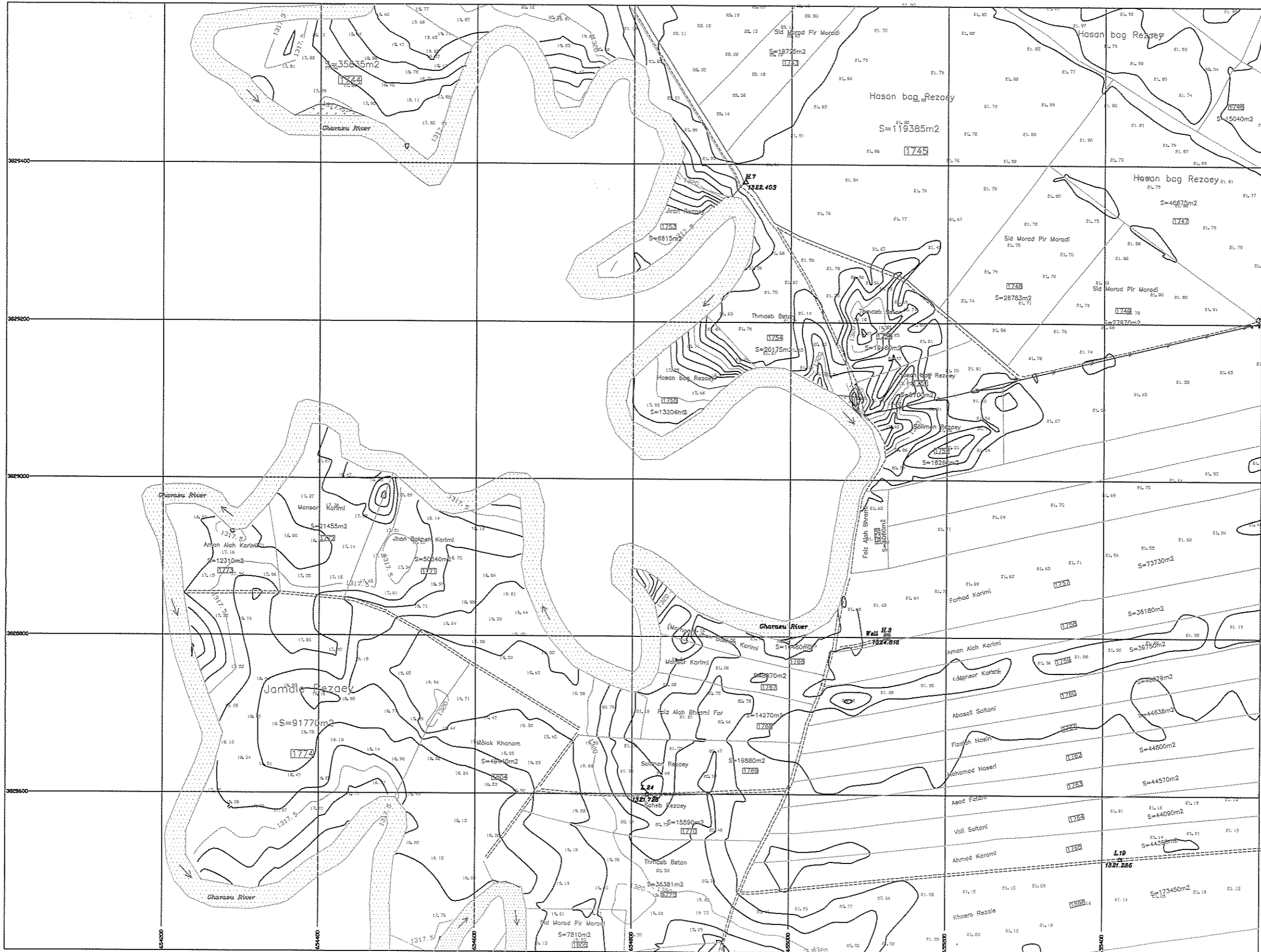


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	خط زلزله
	ساختمان
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	ساختمان
	حصار

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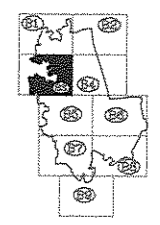


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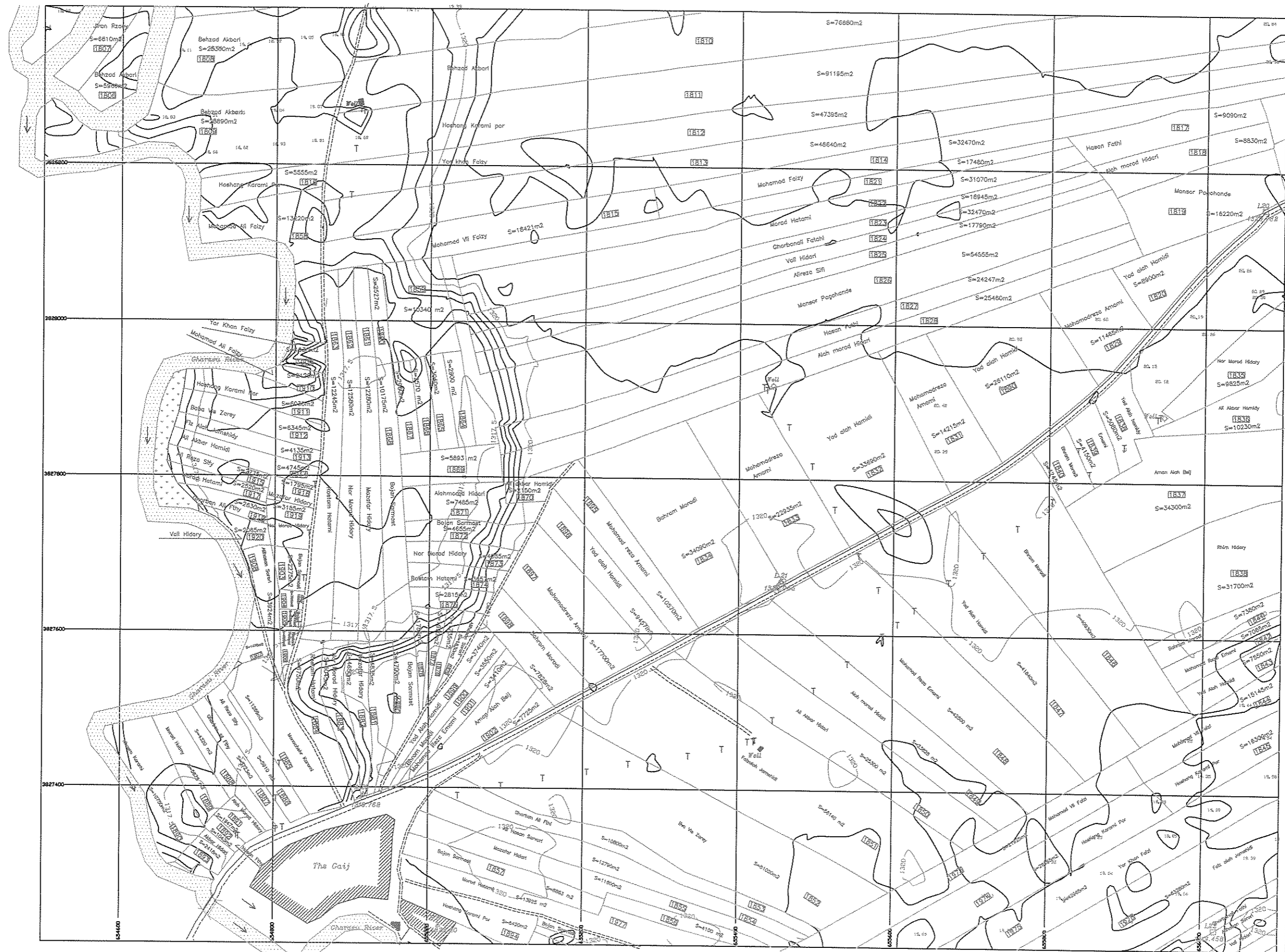


- Contour lines (various thicknesses)
- Water bodies (river, stream)
- Buildings (various symbols)
- Roads (various line styles)
- Power lines
- Other infrastructure symbols

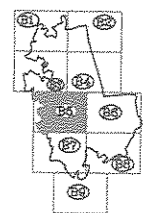
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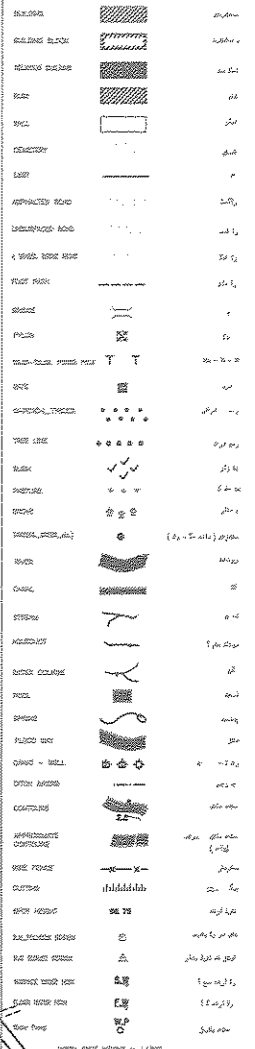


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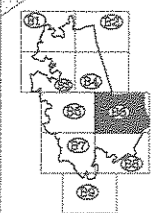


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- Water bodies
- Buildings
- Roads
- Other symbols

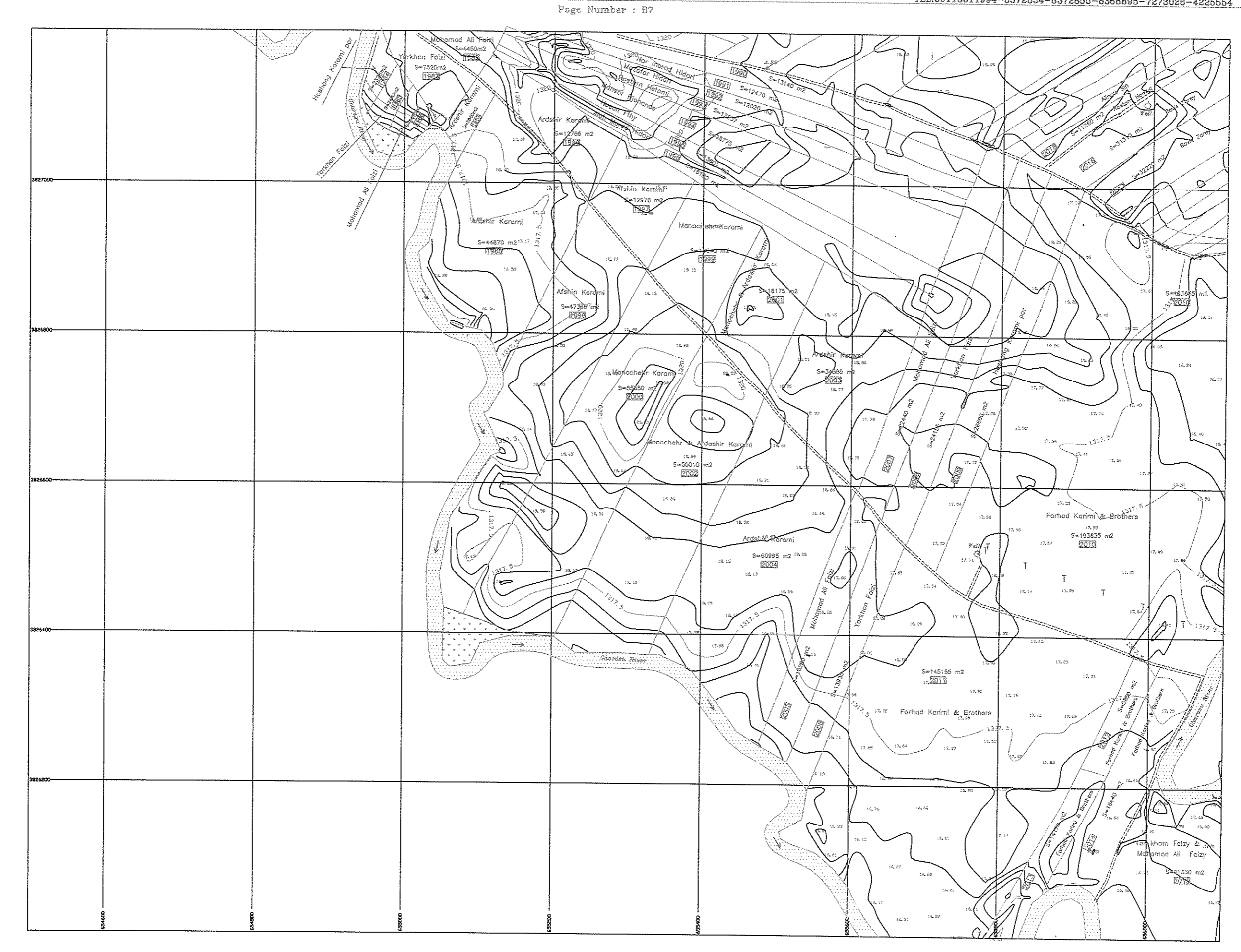




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E-mail: marzpaimeyesh@yahoo.com

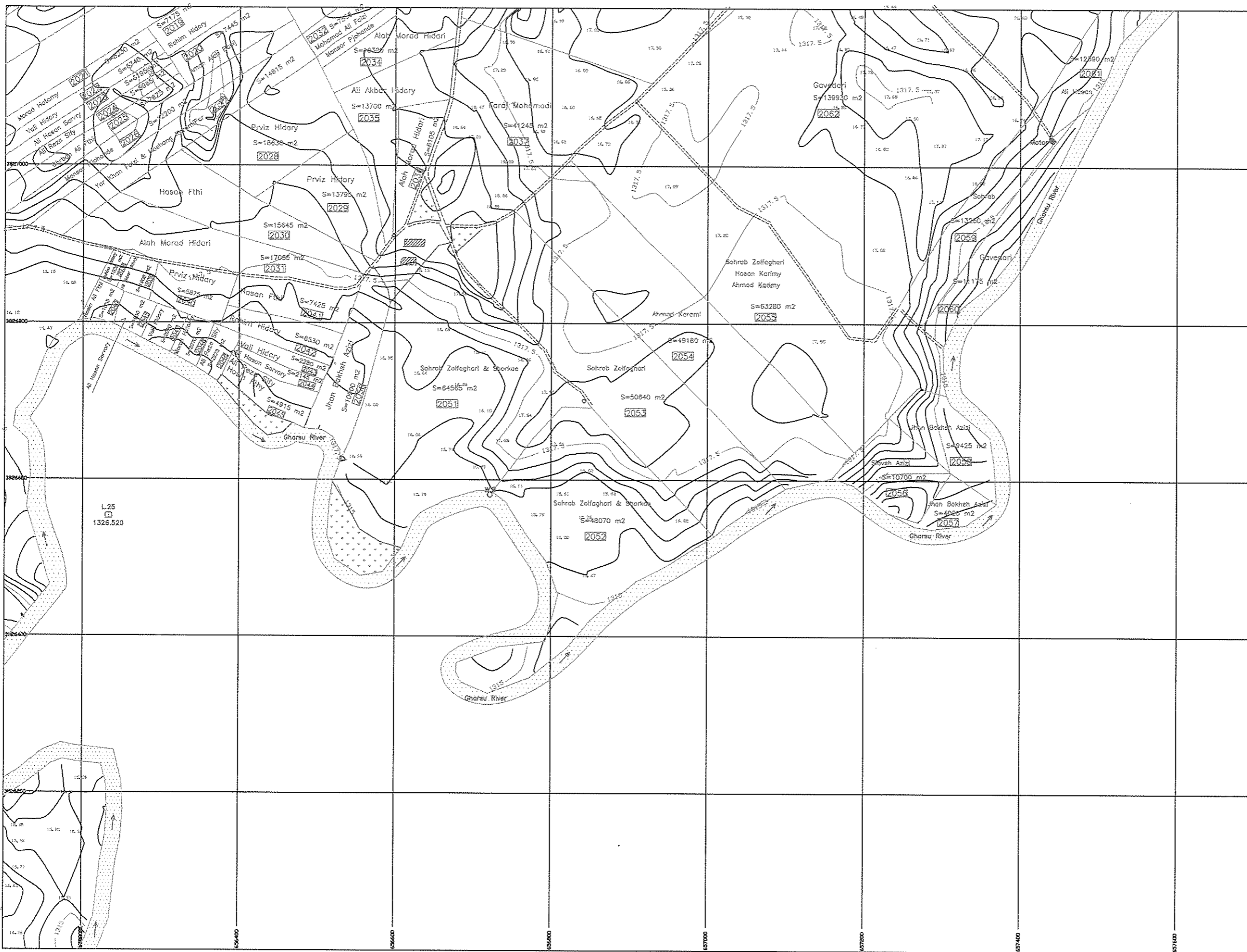


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 - 2. Property boundaries
 - 3. Roads
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 - 6. Buildings
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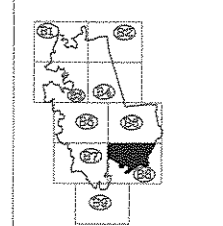
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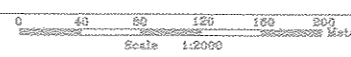


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	راه
	راه آسفالت
	راه گریز
	راه آسفالت
	راه
	خط برق
	خط تلفن
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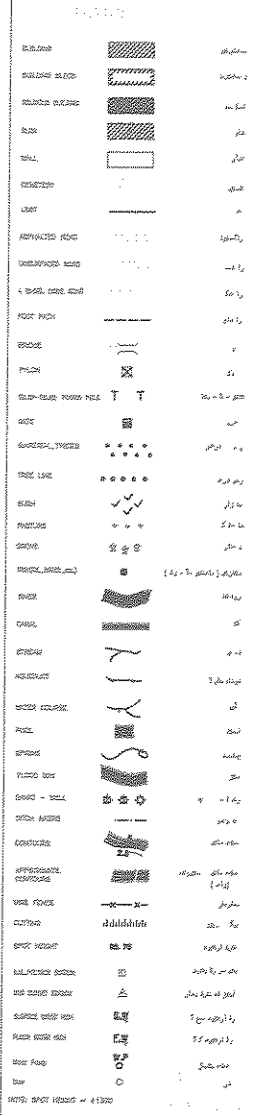
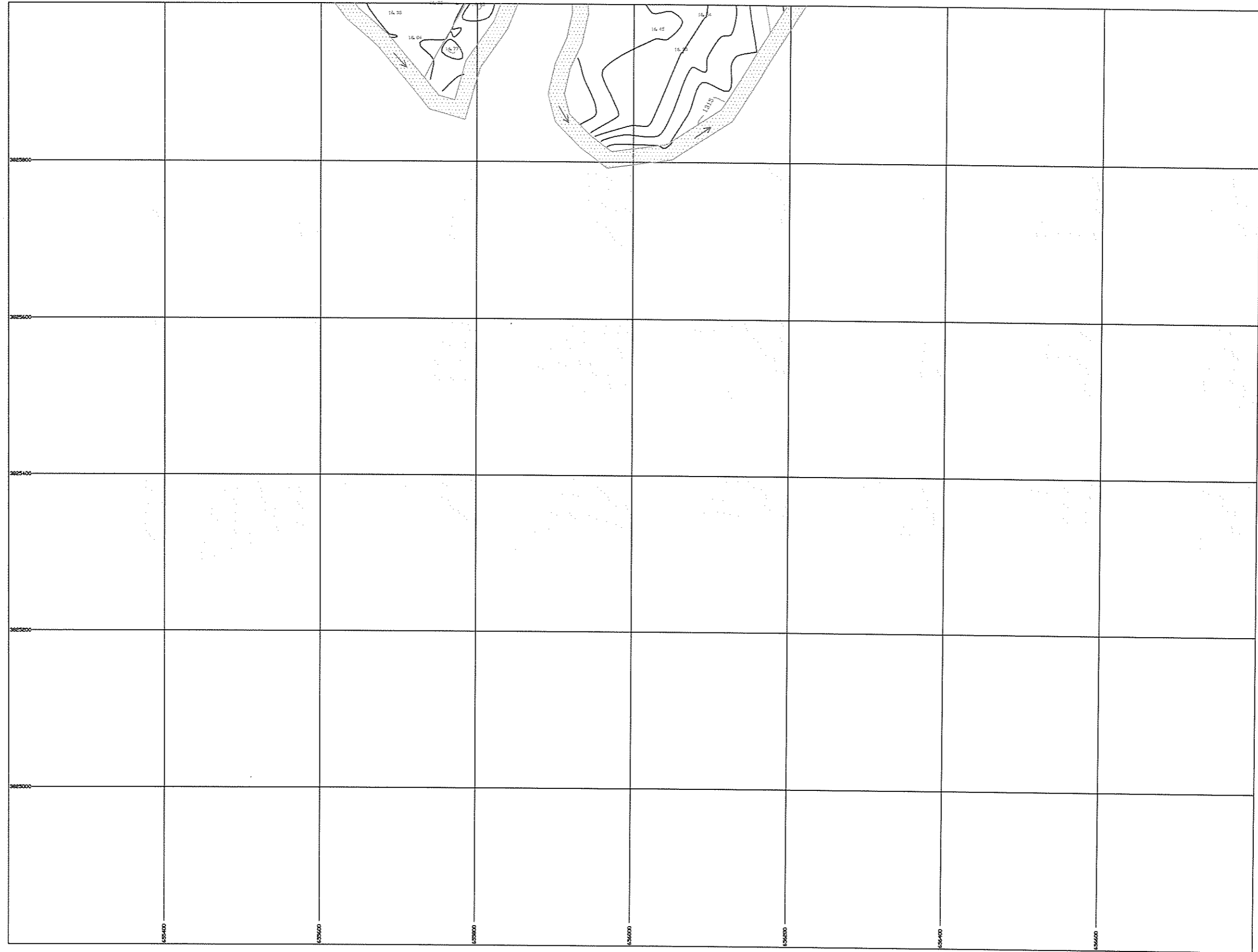
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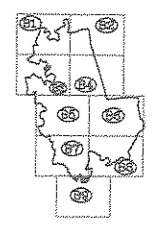
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مشیت : ۱۳۷۴ خرداد - شهریور
کودک : ۱۳۷۴ خرداد - شهریور
تاریخ : ۱۳۷۴ خرداد - شهریور



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