Chapter 6	**Feasibility Study on Priority Projects and Programs**

CHAPTER 6

FEASIBILITY STUDY ON PRIORITY PROJECTS AND PROGRAMS

6.1 Integrated Agricultural Development Plan

6.1.1 Outline of Agriculture Development Plan

The agricultural development plan of Ravansar plain (Site 1) and Sanjabi plain (Site 2) was planned aiming at the sustainable agriculture of the region together with stabilizing of farming of each farmer through increasing of farmer's revenue. The development plan for the sustainable agriculture of the region was prepared for short term (3 years), medium term (5 years) and long term (10 years) plans, and accordingly the administrative development targets were set up for these three terms. Besides, the plans of agriculture in the Kermanshah Province are also taken into consideration as much as possible. The outline of the integrated agricultural development plan is as follows.

(1) Promotion of Integrated Farming

The agricultural development plan is made based on integrated farming of agriculture, livestock, apiculture, horticulture, inland fishery, and mechanization. Especially, in the integrated farming with livestock, introducing five Holstein dairy cows for 20% of farmers after three years, 50% of farmers after five years and 70% of farmers after ten years in the Study Area will be considered as the basis of development plan to perform integrated farming with agriculture. The advantages of integrated farming with livestock are as follows.

1) One of the purposes of the integrated farming is the effective use of land, water, and organic matter and to perform agriculture which maintains the natural circulatory system, so that it is easy to carry out sustainable farming i.e.; the integrated farming of livestock and agriculture should include the natural circulatory system within its farming. In case of non-integrated management, the organic matter needs to be secured by circulation from other farming practices. For example, in some countries like U.S.A, which has large-scale farms with an area of more than 100 ha, they manage to produce single crops in order to attain high efficiency and they carry out an extensive application of chemical fertilizers or agricultural chemicals. However, in the Study Area, farm scale is 10 to 30 ha in general, which is the most suitable farm scale for integrated farming. In the development plan, all the straw, of which 80% is incinerated now, will be collected from the field. The straw is used as roughage and bed material in stall which absorbs feces and urine and is returned to the field as compost after decomposition and fermentation for two months. If the compost application is made regularly, it can be considered as an agricultural revolution from the present deprived agriculture status in Iran.

2) The other purpose of integrated farming is the stability and improvement of farming. It is more safety in farmer’s economy to combine agriculture and other practices so to avoid the uncertainty of single practice in the region, where there is little rainfall and drought occurring frequently. Moreover, the farmer can earn income everyday from the milk of the livestock, where as it is only one time of income per year by the crop cultivation. If these practices are combined, then it will become easier for the farming.

(2) Effective Use of Irrigation Water

In the agricultural development plan of Site 1, it is irrigated by three irrigation methods including irrigation by canal with Ravansar spring and Jaberi spring as the water source, irrigation by pumping from Gharasu River, and irrigation by the well. In regard to the irrigation from the spring water source, there are some restrictions of irrigated area, since the amount of water in summer is not enough. However, the irrigation in the spring season from April to May brings more stability of production and increase of income for wheat and chick pea as much as several times than the production in dry lands. Therefore, the irrigation canal is planned to be extended as much as possible, and the plan was made so that spring irrigation with more amount of water of the spring can be performed. In the present time, the agricultural development plan is made under assumption that the area of dry land is about 45%, the irrigation area in the spring is about 24% and the irrigation area which can be irrigated in all season is about 31%.

In Site 2, since the prospect on construction of proposed dams is not visible at this time and therefore only well irrigation is considered. Consequently, the dry land area becomes 67%, and the well irrigated area is 33%.

In addition, the integrated farming with inland fishery is planned for the effective use of irrigation water of well. The farmer, who uses the well with a discharge rate of more than 10 liters/sec, shall make a pool in between the well and the field and shall perform the 'trout' fish culture. In Site 1 and Site 2, it is planned to produce 5 tons of trout fish after three years, 6.5 tons after five years and 17 tons after ten years. Moreover, in Site 2, many small-scale springs are located on the slope of hilly area, and it was planned to use that water for irrigation after performing the trout fish culture in a small-scale. As a result, it will be possible to produce 1.3 tons of trout after three years, 6.5 tons after five years and 13 tons after ten years.

The annual gross income from the spring irrigated farmland and the all season irrigated farmland are different. To carry out equitably advantageous all season irrigation for each farmer as much as possible, the block of spring irrigated farmland switches around with the block of all season irrigated farm land in every 4 years. That is, a farmer cultivates crops with rotation system of spring irrigated farmland for 4 years, and cultivates crops with rotation system of all season irrigated farm land for next 4 years.

(3) Establishment of Crop Rotation System

In sustainable farming, it is aimed at increasing of organic matter in the soil by application of compost and it is necessary to establish crop rotation by combining of different types of crops as much as possible. In the lands which are irrigated in all season, the crop rotation was planned with 6 crops including alfalfa (8 years), wheat, rapeseeds, maize for silage, maize for grain, and sugar beet. For small scale farmer with irrigated area of less than 5 ha, it is planned to introduce summer vegetables instead of sugar beet. In the dry land area, it is possible to cultivate wheat, chick pea, and barley. Besides, melon and cucumber, which is planted in April and harvested in July, can also be cultivated in dry land. In the lands which are irrigated in only spring season, the crop rotation, composing of wheat, chick pea and vegetables such as coriander, is planned.

(4) Plan for the Weak and Small Scale Farmers and Farmers using Drylands

In general, implementation of all new projects of an agricultural development plan is carried out by financing. It is necessary to secure self-financing for receiving loan and it is required that the repayment of the principal and interest should usually be performed in five years. The conditions of these loans are very severe for the weak farmers. In order to prevent the stratum differentiation to the extremes of large scale farmers and small scale farmers in the rural area, the following measures are planned for the weak farmers.

1) Purchase of Holstein dairy cow, construction of stall and compost barn etc. shall be supported by the government with relaxed loan conditions.
2) It was planned to introduce rose for perfume or Chinese medicine (crops for herbal medicine) for the farmers who have less than 5ha of irrigated farm in all season. In each Site, it was planned to cultivate an area of 10ha after 3 years, 25ha after 5 years and 50ha after 10 years. In either case, rose or Chinese medicine shall be introduced in 1 ha area for each farm household.
3) It was planned to introduce beekeeping of 40 boxes per one farm household having only dry land on the sloppy area. In the plan, 200 boxes are introduced in each Zone after 3 years of development plan implementation, except the prosperous Zone 2, because beekeeping has restrictions of flowers. Also, 200 boxes will be added to all Zones after 5 years, and 200 more boxes will be added to five Zones after 10 years.
4) In regard to vegetables of spring and summer, it is planned to cultivate in the area which is irrigated only in spring or in all season, by small scale farmers who own irrigated land of less than 5 ha, as already mentioned in the crop rotation system.

(5) Introduction of Plastic Green House

In consideration of marketing of vegetables, it was planned that green houses of 2000 m^2 are set up in Site1 and Site 2 after 3 years of implementation of developing plan. Also, green houses shall be set up at 3 places after 5 years and at 5 places after 10 years in each Site.

(6) Measures of Agricultural Mechanization

The heavy tractor is indispensable in both of Site 1 and Site 2 because of heavy textured soil. Many farm machines are not available in the Study Area including such tractors. Therefore, mechanization has been carried out under very inferior work accuracy. It was planned that the supply of many agricultural machinery and activities of mechanization work shall be carried out by private Mechanization Service Company and large scale farmers or private specialists of mechanization in the rate of 40% and 60%, respectively. Since supply of farm machinery is urgent, it is planned such that 50% of needed machinery shall be provided after 3 years, 70% after 5 years and 100% shall be provided after 10 years in the development plan. That is, it can be achieved only with the support of the government and easing of the financial system. Also, it is necessary to construct repair factories for agricultural machinery and it is desirable to carry out this function under RPC with the governmental support.

(7) Promotion of the Processing Industry

It is planned to construct the coriander processing factory, chick pea packing factory, sorting and shipping facilities for the vegetables, and cleaning and storage facilities for the wheat

seeds, which shall be built in the newly established RPC union in Site 1 and Site 2.

(8) Maintaining the Food Safety

The extension activities will be promoted to abolish the toxic remains of the agricultural chemicals, especially those sprayed on the vegetables. Also, when shipping is made to a market, the toxic residues should be checked, and if any illegal spraying of agricultural chemicals is found out, then the wholesaler should not buy the vegetables.

(9) Governmental Support for Carrying out the Agricultural Development Plan

It is necessary to provide governmental budget and improved loan conditions for the mechanization of agriculture by private mechanization service companies and individuals, and for various facilities to be included in the new RPC, and for the support to the weak farmers.

6.1.2 Agricultural Development Plan

(1) Policy of Agricultural Development Plan

1) The agricultural development plan is the center of all sections including livestock, inland fishery, beekeeping, fruit tree cultivation and mechanization and finally the sections will be integrated with agriculture.

2) The most important subject of the agricultural development plan is improving soil fertility and establishing sustainable farming. Agriculture in Iran is popular for thoroughly extracting all the organic matter from the soil and sustainable farming can not be established under such situation. Improvement of soil fertility starts from returning the organic matter back to the soil. It is one of the methods of integrating farming with livestock and returning the excrements of livestock as compost to the farmland. For this method, they have to use a part of wheat straw as the compost materials (it is the material of beds for livestock and absorbs the excrements). In the Kermanshah province, 20% of wheat straw is circulated as feed and it is said that 80% of wheat straw is incinerated in the fields. It should be grievous situation for global warming and also wasting of precious organic resources. Although somebody recommends mixing the residues directly into soil, it is not considered as the correct method.

   In both of the integrated farming and the specialized livestock farming, residues such as straw of wheat and barley are precious resource as feed and also as litter resource. As long as such farming exists, composting through cattle and returning to farmland are following a principle of coexistence in the community. Moreover, fermented and stabilized organic matter is better for crops than residues like fresh organic materials since compost does not have injury effect on crops and fermentation kills weed seeds and protect spreading of weed seeds. Enough governmental subsidy and technical follow up are necessary for this agricultural technique as well as introduction of crop rotation system, which shall be considered as the revolution of the agricultural technique in Iran.

3) If wheat straw is used as litter in cattle beds and applying compost is impossible because of Iranian long custom and character, then another way is incorporating crops, which

leave a lot of roots residues in soil. This is the introduction of Ryegrass as one of the main crops in the crops rotation system. However, it is the discretion of those who will implement the development plan to select the suitable method.

4) Organic matter in the soil is useful to improve the physical condition of heavy clay. Especially, it is effective to improve the water holding capacity of the soil in the dry land.

5) Another important subject on basic policy of development plan is to establish the crop rotation system. The crop rotation system will be constituted by different crops as much as possible. It is effective for conditions such as reduction of crop yields and diseases which are caused by continuous cropping and also it is useful to reduce agrochemicals. In addition, forage crops will need to be introduced into crop rotation system because of integrated management with livestock.

6) Measures for dry land farming are extension of soil water holding techniques by mechanization and promotion of beekeeping as well as increasing the income through integrated farming with dairy cattle. Measures needed for small scale farmers, who have less than 5 ha of irrigated land, are integrated farming with dairy cattle. Especially, cultivation of spring and summer vegetables shall be introduced in crop rotation of irrigated land.

7) Important Considerations for the Implementation of the Development Plan

   i) Many crops introduced in the crop rotation system cause more divisions in the farm area and decreases efficiency of machinery work. Especially, spraying of agrochemicals will need some cautions such as avoiding harvest time of feed crop like alfalfa. The group cultivation by forming RPC and increasing the area of farmland for each crop is one of the suitable measures. Also in case of beekeeping, close communication and cautions will be needed between agricultural farmers and beekeepers because of large scale damage by agrochemicals.

   ii) If income of each crop in the crop rotation system will be at the same level by improving a technique, then it will not be needed to cultivate each crop every year for annual constant income. In this case, the crops which are following the crop rotation system can be cultivated in the order every year in one farmland. As a result, the efficiency of machinery work will be improved and avoiding damage by agrochemicals will be easier than the case 1) mentioned above.

(2) Contents of Development Plan

1) Presumptions to establish Crop Rotation System

   i) Site 1 is classified into three areas such as rainfed area, area that can be irrigated from winter to May (irrigated in spring season) and area that can be irrigated in all season. In case of the two classes that can be irrigated, vegetable cultivation shall be introduced in crop rotation for small scale farmers who have less than 5 ha of irrigated land. For Site 2, it is assumed that wells are the only irrigation source at present, because prospect of irrigation by dams is not clear. Cultivation of vegetables for small scale farmers is not introduced, because it is assumed that there is no small

scale farmer who have a well and farmland of less than 5 ha. However, in some cases, the farmers who have less than 5 ha of farm area may be included to the farmers who carry out irrigation by well, because the irrigation wells may be constructed cooperatively. Although it is not planned, it is free to cultivate vegetables. From the above viewpoint, 5 crop rotation systems for Site 1 and 2 crop rotation systems for Site 2 are planned.

ii) The areas of rainfed area and 2 irrigated area, spring irrigated and all season irrigated area, are shown in following table. In Site 1, the rainfed area is 45 %, spring irrigated area is 24 %, and all season irrigated area is 31%. In Site 1, water supply for irrigation is through canal and Gharasu River for spring season irrigation and canal, wells and Gharasu river for irrigation in all season. As a result, the rainfed area is 3,445 ha, spring irrigated area is 1,302 ha and year round irrigated area is 1,937 ha.

iii) Though areas of each crop rotation system of field crops are calculated, the area where rose cultivation for perfume was omitted from area of crop cultivation, since it is included in the horticulture development plan. The area of rose cultivation will be 10 ha in the 3rd year, 25 ha in the 5th year and 50 ha in the 10th year.

Acreage of Irrigated and Dry Land in Survey Area

Site	Farm scale in irrigated land	Dry land or type of irrigation	Sources of irrigation water	Area (ha)	Sum (ha)	%	%
Site 1	All	Dry land	–	3,445		51.5	
	< 5 ha	Irrigation in spring only	Canal	454	646	9.7	19.5
			River	192			
	> 5 ha		Canal	209	656	9.8	
			River	447			
	< 5 ha	Irrigation at all seasons	Canal	415	534	8.0	29.0
			Well	0			
			River	119			
	> 5 ha		Canal	142	1,403	21.0	
			Well	983			
			River	278			
	Total			**6,684**		100.0	100.0
Site 2	All	Dry land		6,609		67.3	
	All	Irrigation at all seasons	Well	3,218		32.7	
	Total			**9,827**		100.0	
Total				**16,511**			

2) Crop Rotation System in Site 1

As shown in Fig. 6.1.1, it was classified into the following five systems. This figure illustrates the time of sowing, transplanting, irrigation and harvest.

i) Crop rotation in the rain-fed area: The basic system will be “wheat - chick pea – barley – chick pea”. On the other hand, cucumber, melon etc. can be sown in April instead of chick pea and can be harvested in July. These vegetables are cultivated without agrochemicals and fertilizers, and are popular due to their strong sweet taste. The cultivation area in the Province is 2,000 ha.

ii) Crop rotation in the spring irrigated area of small scale farms (less than 5 ha of irrigated land): The crop rotation system will be “wheat - vegetable - chick pea”. Although coriander which has short growth period was selected as vegetable, it can be changed to other vegetables which have higher profitability.

iii) For farmers who have more than 5 ha of the spring season irrigated area: Only the usual “wheat – chick pea” system is planned because of restriction of irrigation until May. However, the yields will become remarkably high.

iv) Crop rotation in the year round irrigated area of small scale (less than 5 ha of irrigated

land): The crop rotation system will include 7 crops, “wheat – rape-maize for silage - vegetables (potato, tomato and onion) - maize for grain – alfalfa”. Alfalfa will be cultivated for 8 years, although other crops will be rotated. The farmers who will not raise dairy cow will exclude alfalfa cultivation. 3 kinds of vegetables will be cultivated in 1/3rd of the area according to the crop rotation. It is considered that double cropping in a year couldn’t succeed in the Study Area. However, it can succeed by combination of rape and maize for silage. Therefore, rape - maize for silage is one unit on the crop rotation system and will be continuously cultivated in a same area.

v) Crop rotation in year round irrigated area of more than 5 ha of irrigated land: Crop rotation will include 6 crops (the crop rotation system in farmland is 5 units), “wheat – rape maize for silage - sugar beet - maize for grain – alfalfa”. Alfalfa will be managed same as case 4) as mentioned above.

vi) To carry out equitably advantageous all season irrigation for each farmer as much as possible, the block of spring irrigated area is shifted around with the block of all season irrigated farm land in every 4 years. In this case, switching from crops in the spring season irrigated land to crops in the all season irrigated land is carried out in following method.

from spring irrigation to all season irrigation		from all season irrigation to spring irrigation	
Crops in 4th year in spring irrigation	Crops in 1st year in all season irrigation	Crops in 4th year in all season irrigation	Crops in 1st year in spring irrigation
Chick pea	Wheat or Rapeseed	Summer vegetables or Sugar beet	Wheat
Wheat	Rapeseed, Summer vegetables or Sugar beet	Wheat	Chick pea or Summer vegetables
		Maize for silage	Chick pea or Summer vegetables
		Maize for grain	Wheat

In regard to alfalfa cultivation, it is required to cultivate in the special blocks of all season irrigated farmland during 8 years. Therefore, the special blocks for alfalfa cultivation should be changed to other blocks in the 9th year.

3) Crop Rotation System in Site 2

There are only two classifications, which are rain-fed and the year round irrigated area using wells. The cases i) and v) in Site 1 as mentioned above shall be applied. Though there may be farmers who have less than 5 ha of the year round irrigated area using by wells, they were not included in this plan as mentioned above.

(3) Profitability of Each Crop

Yield, farm gate price, gross income, net income and cost per ha in 2002 for the crops which are included in the crop rotation system, are shown in Table 6.1.1. Although a part of the data is collected from the statistical data, most parts of the data were collected from the staff of the Agronomy Department of KJAO, since they can explain more correctly on the present condition. The prices of chick pea, vegetables and alfalfa change by season based on the demand. That effect of spring season irrigation is very high as shown in the Table. It means that the net income in 6 ha of spring season irrigated area of more than 5 ha farm area is about Rls. 25 million which is 3 times of net income in 6 ha of rainfed area, Rls. 8 million. Also, there is some effect on introduction of vegetables to small scale farmers. In year round

irrigated area, the crop rotation system will produce about Rls. 31million in 5 ha, Rls. 60million in 10 ha and Rls. 89 million in 15 ha.

(4) Annual Plan of Crop Production

The staff of the Agronomy Department of KJAO predicted the increase of each crop yield on crop rotation system in 3rd year, 5th year and 10th year of the development plan by improvement machinery work accuracy, application of 20ton compost per ha, use of certified seeds (Only 30 % of farmers are using certified seeds at present and others get seeds from farmers) and extension of advanced improved cultivation technology. According to the calculation, the total production and amounts using the present unit price in each Site were calculated (Table 6.1.2). The present production and amounts are estimated because of no exact data. According to these tables, the amounts estimated are Rls. 27,132 million at present. And the amounts will be Rls. 40,677 Million after 3 years, Rls. 46,771 Million after 5 years and Rls. 58,482 Million after 10 years, respectively. So, the amounts will become about 2.1 times in Site 1.

The amounts of crop production after 10 years from the implementation of the plan will be higher as follows; Rls. 16,666 million of wheat, Rls. 9,518 million of chick pea, 6,610 million of sugar beet, Rls. 5,662 million of alfalfa, Rls. 5,251 million of maize for grain, Rls. 4,719 million of rapeseed, and Rls. 3,397 million of maize for silage, respectively. Besides, the amounts after 10 years will also be 1.9 times in Site 2 than the present level.

(5) Supply System of Seeds and Seedlings

In case of wheat, the variety is improved, after introduction from foreign country and by breeding in Iran. The Agriculture Research Center of the Province improves the varieties, multiply them (elite seeds), consign the cultivation to selected farmers and supply them as certified seeds to Agriculture Support Service Center if the result is good. The elite seeds are supplied from Agriculture Research Center every year and multiplied by the seeds production farmers.

There are 3 varieties for rainfed area including Sardari, which is the main variety. There are varieties such as Zarrin, Marrdasht, Shahriar etc. for irrigated area. However, the farmers have problems with the varieties; for example, a variety suitable for rainfed area was supplied for irrigated area and various varieties were mixed together. Agriculture Department reports that the certified seeds don’t have such problems. The problem is that the certified seeds are supplied to only 30 % of the farmers and 70% of the seeds were traded among individual farmers and 30 - 40 wheat sellers in the Province sell seeds that were supposed to be used for food purpose. Extension of certified seeds is important in the future. Cleaning, storage and sale of wheat seed can be done by RPC. And, proper storage and seed managements are required.

(6) Maintaining of Food Safety

The residual toxicity of agrochemicals is a major problem in the cultivation of vegetables, fruits and other crops. The appropriate guidance for each agrochemical is clearly mentioned and if the farmers strictly follow the guidance, then the residues of agrochemicals are not supposed to remain in the field. Although the farmers are advised to apply agrochemicals

which have low residual toxicity, some farmers apply strong agrochemicals that has toxic long term residual period because of occurrence of pests and diseases which require urgent agrochemical application before harvest. Although there is environmental monitoring by the Kermanshah Environmental Organization, the inspection of residual agrochemicals is carried out mainly through water sampling and there is no legal regulation and control by the government. In general, the residual toxicity is a problem on vegetables and fruits, and but not a serious problem on common crops. In regard to the problem of residual toxicity of agrochemicals, extension activity of correct application technique, spot check in the wholesale market where farmers bring their produce and the refusal of buying the vegetables and fruits that were detected with residual toxicity are the most effective methods. Immediate introduction of such system is necessary.

(7) Plastic Green House

Cultivation in the plastic green house culture needs higher cultivation techniques and therefore, it has been introduced to village graduates. The plastic green house cultivation has been started in some places in the Study Area. Although a lot of plastic green houses cultivation has been tried in the Province until now, many cases have failed. At present, there are 14 ha of plastic green houses in the whole Province.

It is said that the cultivation in small scale plastic green house does not succeed because irrigation by well is expensive. And, there will not be any profit, if it is produced on less than 2,000m^2 scale. Investment of 2,000m^2 plastic green house of the first year is as follows:

Specification	Cost (Million Rls.)
Purchase of land	20.0
Land leveling	6.0
Construction of house	139.0
Building	24.0
Facilities	95.0
Salary of persons	31.8
Equipment	18.3
Farming inputs	4.14
Transportation means	42.0
Total	380.24

The extension staff of KJAO needs to go around and give periodic instructions to avoid failure of green house cultivation.

Also, the introducing plan of plastic green house is made in order to take care of the vegetable market and to avoid its disturbance as much as possible After implementation of the development plan, the green houses shall be established both in Site 1 and 2 at 1 place each in the 3rd year, 2 more places each in the 5th year and another 2 more places each in the 10th year, totaling 5 places in each Site at the end of 10th year.

6.1.3 Horticulture Development Plan

(1) Outline of Horticulture Development Plan

Fruit Cultivation is not suitable in the Ravansar plain, because of its cool climate in autumn. Presently there is nursery for 21 ha of rainfed and 8 ha of irrigated orchard in Site1. However, there are some areas locally able to cultivate fruits but still have economic problem. Site 2, Sanjabi plain is also not suitable for fruits. Therefore, it is planned to cultivate rose for perfumes. Outline of cultivation of rose for perfumes is as follows:

1) In Site 1 and Site 2, the cultivation will be carried out by the farmers who have irrigation area of less than 5 ha as a rule. And one family shall cultivate 1ha in consideration of labor in a family.
2) The harvest will be done when the flower opens for one month from the beginning of May. Those flowers have to harvest from 6 to 9 o'clock in the morning. Amount of harvest per day is 12kg.
3) The rose flowers for rose water as perfumes will be sold to factory for 6,000 Rls./Kg. These flowers put into water and perfume will be extracted after distilling. On the other hand, after drying of flowers export as the materials of perfume to France, Russia and other European countries. The dried rose flowers will be sold to the distributors for 25,000 - 30,000 Rls./kg.
4) Planting is carried out with a spacing of 2 - 3m of intervals between rows and 1m of intervals between plants. The planting rate is 4,000 - 4,500 plants/ha.
5) Irrigation will be carried out in the furrow on every two weeks, because a rose is a plant with drought resistance.
6) It is usually not pruned in rose cultivation. Since the amount of flower products decreases, it will be rejuvenated by cutting by 10 cm in every ten years and the cutting can be sold.
7) It will be able to make 10 tons of rose water from 5 tons of fresh flower.
8) By the joint management of 4 pharmacists, a part of the factory of rose water started its operation in Ravansar. Now, they are waiting to import some machines from Germany. In Gareben village of Harsin District, rose is cultivated in an area of 50 ha.
9) The land suitable to cultivate is high ground and it needs to be irrigated one time in every 2 weeks from May to Middle of October.
10) Rose can also be cultivated in heavy textured soil.

(2) Contents of Horticulture Development Plan

1) In Site 1 and Site 2, it will be cultivated by the farmers who have an irrigated area of less than 5 ha as a rule. And one family cultivates 1ha.
2) The amount of production of rose flower is as follows.

Year	Yield (ton/ha)	
	Fresh Flower	Dry Flower
1st	0	0
2nd	1	0.10
3rd	2	0.25 ~ 0.30
4th	3.5 ~ 4	0.25 ~ 0.30
5 ~ 10th	4	0.25 ~ 0.30

3) Investment and Running cost in first year

Items	Unit price (Rls)	Quantity	Cost (Rls./ha)	Remarks
Soil analysis			200,000	
Tillage & harrowing			200,000	
Manure		20 tons	800,000	
Ridging			100,000	
Hole digging & fertilization			1,000,000	
Sapling	400	4,500	1,600,000	
Transplanting			1,000,000	In March
Weed control			1,000,000	
Total cost in 1st year			**5,900,000**	
Manure			400,000	One time in every 2 years
Phosphate	450	200 kg	90,000	In autumn
Nitrogen	350	300 kg	105,000	In spring at first irrigation
Irrigation			500,000	
Pests control			200,000	
Total (annual running cost)			**1,295,000**	

4) Income and cost after 2nd year

Year	Yield (ton/ha)	Unit price (Rls./kg)	Gross income (Million Rls./ha)	Running cost (MillionRls./ha)	Net income (Million Rls./ha)
2nd	1.0	6,000	6.0	1.3	4.7
3rd	2.0	6,000	12.0	1.3	10.7
4th	3.5~4.0	6,000	22.2	1.3	20.9
5th	4.0	6,000	24.0	1.3	22.7

As shown in the table, there will be enough net income, and repayment to the bank can be made and it is likely to manage without worrying about the influence of no harvest of the first year.

5) Annual plan

Regarding rose flowers for perfume, provincial government supplies the seeding. This year the seedlings were supplied for 444 ha. Regarding market, there is no problem, because factory is built in Ravansar and customers come to buy from factories of rose water in the State or from Kashan.

Site	3rd year	5th year	10th year
1	10 ha	25 ha	50 ha
2	10 ha	25 ha	50 ha

6) Other crops

In this area, it is promising to cultivate not only roses of perfume but also *Valeriana officinalis*, *Thymus serpyllum, Mentha piperata, Melissa officinalis* for Chinese medicine. Those crops are supplied to two factories in Iran. This cultivation is carried out by the contract cultivation with factories and it is cultivated in 44 ha in Iran at present.

6.1.4 Farm Mechanization Development Plan

(1) Present Situation and Problems of Agricultural Mechanization in the Study Area

The number of present agricultural machinery in Study Area is shown in Table 6.1.3. The number of tractors in Site 1 is about 115 and the area is 6,684 ha, which means that an average of 58 ha area is allocated to one tractor. In Site 2, 157 tractors work on 9,827 ha, which means that an average of 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 output. The suitable allocated area for one set (two tractors), which consists of one heavy tractor and one light tractor, is about 100 ha.

Although the soils in the Study Area are heavy clay, there are no heavy tractors to operate in it. As a result, both the tractor operators and the farmers who pay for the tractors have a high level of dissatisfaction with each other, because the tractor operators do not improve their work precision since they are afraid of breakdown of machinery in the heavy clay soil.

(2) Agricultural Mechanization Development Plan

The plan was prepared after discussion with managers, counterparts and staff of the KJAO.

1) Presumptions for Planning

The following assumptions are made for the planning.

Supply plan of machinery was made such that all the crop cultivation can be carried out according to the crop rotation mentioned in the agricultural development plan.

i) Crop cultivation area in the crop rotation system for each irrigation class in Site 1

   a) Crop rotation system in the irrigated area in all season is assumed to be Alfalfa (8 years, and wheat in the 9th year) – Wheat – Rape, Maize for silage – Maize for grain – Sugar beet (farmers with less than 5 ha of irrigated land cultivate summer vegetables). Therefore, each crop shall be cultivated in 1/5 of the area.
   b) Crop rotation system in spring irrigated area is assumed to be Wheat - Chick pea (farmers with less than 5 ha of farm area cultivate spring vegetables). Each crop shall be cultivated in 1/2 of the area.
   c) Crop rotation system in rain-fed area is assumed to be “Wheat – Chick pea – Barley – Chick pea” and each crop shall be cultivated in 1/4 of the area.

ii) It was assumed for Site 2 where the total area is 9,827 ha, that the irrigated area by wells (irrigated in summer and winter) is 33% (3,218 ha) and rainfed area is 67% (6,609 ha).

iii) Crop cultivation area of crop rotation system in each irrigation class in Site 2.

   a) Crop rotation system in irrigated area by wells (irrigated in all season) is assumed to be “Alfalfa (for 8 years, wheat in 9th year) – Wheat – Rape, Maize for silage – Maize for grain – Sugar beet” (farmers less than 5 ha of irrigated land cultivate summer vegetable). Each crop is to be cultivated in 1/5 of the area.
   b) Crop rotation system in rain-fed area is assumed to be “Wheat – Chick pea – Barley– Chick pea”. Each crop is to be cultivated in 1/4 of the area.

2) Principle of Machinery Work

Improvement of agriculture in this area is carried out under very low operating accuracy of farm works: in principle one set (two tractors), which consists of one heavy tractor and one light tractor, covers 100 ha in farm work.

3) Supply Allotment of Needed Machinery

Private mechanization service company and individuals supply needed agricultural machinery and to perform machinery work activities. It is planned that the share of supply of agricultural machinery by mechanization service company and individual farmers will be 40% and 60% respectively.

i) Mechanization Service Company; One company will be established for about 2,500 ha. Thus, three companies will be established in Site 1 and four companies will be established in Site 2. Each company will not only procure machinery but also be able to receive share of agricultural inputs for their area, for about 2,500 ha. Extension offices will select and persuade the capable people and establish the company in the area. The ideal number of members will be 10 members.
   Loan conditions at present involve an annual interest rate of 14% for a tractor and 8 – 20% for a tractor attachment; and the equity capital is 20%.
ii) Private (farmers etc.); Farmers who have more than 20 to 30 ha irrigated farmland or more than 30 ha rain-fed farmland, and special operators who don't have farmland will be in charge of work for 100 ha.

4) Annual Plan of Machinery Supply

Site 1 and 2 have serious shortage of machinery and require quick supply of new machinery. Thus 50% of needed machinery will be supplied in the 3rd year from the starting point of the development plan, and 70% and 100% will be supplied in 5th year and in 10th year. The number of machinery was estimated by Mechanization Department of KJAO.

5) Contents of Machinery Supply Plan

The number of each kind of needed machinery, the unit prices, number of machinery which will be supplied in first, middle and late stage, share of the company and privates in Site 1 and 2 are shown in Table 6.1.4. Total machinery purchase amount in 10 years is estimated as Rls. 31,364 Million (US$ 3.82 million) for Site 1 and Rls. 47,116 Million (US$ 5.3 million) for Site 2. The number of needed tractors and combines are 25 heavy tractors (140 PS), 25 heavy tractors (4WD, 110 PS), 26 heavy tractors (2WD, 110 PS), 127 light tractors (75 PS), and 12 Combines in Site 1, respectively. On the other hand, in Site 2, the number of needed tractors and combines are 38 heavy tractors (140 PS), 38 heavy tractors (4WD, 110 PS), 38 heavy tractors (2WD, 110 PS), 190 light tractors (75 PS), and 18 Combines in Site 1, respectively.

6) Work Charge

Maximum and minimum charges of machinery work for each type of work in Kermanshah Province in 2002 are published. Work charge of the company will not be discounted more than this charge. Instead of the discount, the work accuracy will be improved as explained above. As a result, it is expected that crop yield in the Study Area will be much improved.

7) System of Agricultural Machinery Maintenance and Repair

If RPC will be in charge of machinery and inputs, it is highly preferable that a maintenance and repair workshop for the machinery shall be established in RPC. A maintenance and repair workshop shall be established by subsidy in each Site 1 and 2. If it is impossible, a private maintenance and repair workshop agent should be invited to each Site.

8) Necessity of Government Subsidy

In the agricultural development plan, mechanization service company and private individuals are proposed as suppliers of farm machinery, expecting vitality of private companies. The government should supply the machinery to these companies and private individuals with urgent priority and arrange preferential treatment for the loan and also agricultural inputs.

6.1.5 Livestock Raising Development Plan

(1) Five Dairy Cows Plan of KJAO

KJAO has been promoting the project of raising 5 dairy cows per farm household since 2002. The contents of the project are mentioned below.

1) The Livestock Raising and Breeding Department of KJAO is promoting an extension plan for raising of 5 heads of Holstein or hybrid cows per farm household from 2002. This plan includes government support and low interest loans. Farmers who have raised local livestock variety can introduce 5 heads of Holstein or hybrid dairy cows after rehabilitation of a stall.
2) The Provincial government adopted the raising of 5 heads of Holstein or hybrid cows instead of the 10 heads to reduce the burden to farmers and the government. But the farmers can breed to 10 heads by themselves in 3 – 4 years after getting raising experience on the first few heads. So the target is a plan of raising 10 heads starting with the 5 heads plan.

(2) Livestock Raising Development plan

1) Components of the Development Plan

This plan follows the 5 heads Holstein or hybrid plan of the Province and was prepared through discussion with manager, counterpart and staff of the livestock department. Development plan of livestock raising is planned for only dairy cattle (Holstein). The number of dairy cattle in each village at present is shown by local, hybrid and Holstein variety in Table 6.1.5. Local variety is a majority in all the zones at present. About 160 heads of hybrid variety were already introduced to each zone (Zone1 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, and the extension to other villages is poor.

2) Development Concept

The development concept of the plan is as follows:

At first, milk production is very high and stable in Holstein. On the other hand, hybrid variety,

by breeding local variety with Holstein, has advantages both of the local variety (suitable for the environment in the area) and Holstein (high milk yield). However, hybrid variety has a defect in marketing of variety, because the stage of crossing with Holstein is not identified. Besides, the integrated farming with livestock raising makes soil organic matter increase by composts using excrement of the livestock and this physical recycling is intended for sustainable agriculture.

3) 5 Heads Milk Cow Plan

The reason of 5 heads is to get enough experience on a few heads, to avoid management risk and to reduce investment cost and the loan.

i) Purchasing 5 heads of milking cows (Holstein) at 15 million Rls. per head.
ii) A stall consists of 40 m^2 for milking cows, 30 m^2 for feed storage, 12 m^2 for pregnant cows and calves and 120 m^2 for paddock.
iii) One portable milking machine as a equipment
iv) One method of management for using excrement of dairy cattle at the least cost is that the excrement is absorbed to wheat straw, the mixtures of excrement with straw are piled and fermented for about two months to make compost, and then applied to farmlands.
v) Amount of excrement of 5 heads of dairy cattle and 4 heads of calves is assumed to be 240 kg/day, i.e.86.4 t/year, which consists of 13 tons of dry matter and 73 tons of moisture. 22 tons of wheat straw, which includes 10% of moisture, is required to adjust moisture content of the excrement which includes 85% of moisture for best condition of the fermentation, and the moisture of the mixture is 70%. Wheat straw is a valuable resource as feed in Iran and it is expensive (200 Rls./kg). Wheat straw of 3 million Rls. needs to be purchased as feed and compost materials every year. The compost is returned to the farmlands.
vi) 7 ~ 8 kg/day/head of alfalfa hay, 12 kg of corn silage, 5 kg of wheat straw, 3 kg of bran, 5 kg of formula concentrate and others (sugar beet dross, cotton seed meal, etc.) are given as feed. In the calculation, it is assumed that all are purchased.
vii) Amount of milk is 4.8 t/year/head on average of 5 heads.
viii) The loan for Holstein in the Province has maximum limit of 80 million Rls. There is difference of the annual interest rate, from 7 to 14%, for the loan among different funds. In case of RDC (Rural Development Cooperative) in Mira Abad, the repayment conditions are unredeemable for one year, term of 5 years and annual interest rate of 13%, which is returned at 8% of interest by subsidy, etc.

(3) Production of Compost and Facilities

The mixtures of straw and excrements in the 5 cows plan are carried out from stall, and piled up at barnyard by each farmer. After about one month, the mixtures become partially fermented compost of about 9 tons, about 12 m^3 in volume (2 m in height, 2.5 m in width and length). The partially fermented compost are piled again at adjacent place during about 1.5 ~ 2 months, so that all parts of pile are completely fermented by piling the not fermented parts, such as surface of pile, newly put mixtures, etc. in center of pile. And then, the completely fermented compost is scattered to farmlands with manure spreader. That is, the 3 piling places of composts (each place is 2.5 m in length and width, and 1 place is an occasional place) are

required in paddock near stall.

To avoid the over investment, it is not considered in the plan to construct the building for compost production. Therefore, the investment in animal husbandry in the plan does not include the building of compost production. Each farmer piles the mixture on land surface and covers every day the top surface of pile with plastic film to avoid rain and snow in rainy season and dryness in dry season. The sides of pile are not covered with film for aeration to promote fermentation.

It is necessary to examine, establish and demonstrate the suitable method of compost production for climate of the Study Area by trails in the demonstration farms in collaboration with research center, extension service center and contact farmers.

(4) Annual Development Plan

It is assumed that 30% of all the farmers in the Study Area will not raise dairy cattle and that it will be extended to 20% of farmers in first 3 years of the development plan, 50% in middle stage, from 3rd year to 5th year and 70% in late stage, from 5th year to 10th year. The plan of milk production amount, required establishment of facilities and collecting system of milk in each Zone will include farmers who already raise hybrid variety or Holstein.

(5) Target of the Plan and the Support of Government

Target of extension is 70% of all farmers in the Study Area, including small scale farmers and those who only have rain-fed farmland (excluding 30% farmers who don't want to raise cows). Therefore, Government support is required to change the conditions of the loan for small-scale farmers and rain-fed farmland farmers, because they don't have enough accumulated capital and funds on hand for the loan.

(6) Contents of the Plan

The following table shows the amount of investment, contents of the facilities, fixed cost, running cost, repayment plan of the loan, gross income and net income for the 5 heads plan, respectively.

No.	Items	Price Million Rls.	Remarks
Investment	1) Building 2) Facilities 3) Purchase of 5 heads cows	20.0 5.0 75.0	 Holstein in condition of last month pregnancy
	Total	100.0	
Annual running cost	Annual cost (running cost + depreciation)	24.0 25.0	Alfalfa hay; 18 t, corn-silage; 38 t, Straw hay; 2 t, barn; 4 t, concentrate; 4 t etc.
Annual gross income	1) Milk production 2) Sale of 2 heads of bull	38.4 10.0	4.8 tons x 5 heads x 1,600 Rls./kg 200kg x 2 heads (one year old)
	Total	48.0	Gross income in the 1st year
Balance	Cash income Annual cost	38.4 25.0	
	Net income	13.4	From 1st ~ 3rd year
	Net income	21.4	After 4th year

(Cash flow and balance sheets are shown in section 6.7.3 (4) on page 6 – 89.)

2 mother cows are renewed with calves, which are able to produce milk, from 4th year and sold. Income of 8 million Rls. every year are obtained. Therefore, balance in the 2nd to 4th year is red (negative), and it is required to apply for a short term loan. After repayment, the net income will be about Rls.21.4 million, including amounts of sale of mother cows.

(7) Milk and Compost Production for each Zone

It is assumed that existing hybrid variety is raised as 5 heads on average, and then the number of farmers, who intend to introduce 5 hybrid cows newly, is calculated so that the cow raising farmers are 70% of the total farmers in the Survey Area at the final stage of the development plan. Then the number of matured cows, total milk production in a year, maximum daily production, average daily production of Holstein in the annual plan for each Zone were calculated (Table 6.1.5). Amount of compost production by Site in the plan is as follows.

Site	3rd year Farm households: 20%	5th year Farm households: 50%	10th year Farm households: 70%
Site 1	9,856 ton/year	24,640 ton/year	34,496 ton/year
Site 2	15,648 ton/year	39,120 ton/year	54,768 ton/year

(8) Plan of workers and facilities for artificial insemination

Artificial insemination is not implemented in an official government organization. All are carried out by private sector. So private sector needs to be requested to increase the number of workers and facilities to the study area as the number of dairy cows increase.

(9) Plan of system and facilities for livestock hygiene

KJAO is in charge of medical inspection only for special and important infectious diseases such as *Tuberculosis* and *Brucella abortus*. However, private veterinarians examine and treat other diseases. So private sector needs to be requested to increase the number of veterinarians and clinics to the Study Area as the number of dairy cows increase.

(10) Plan and necessary facilities for milk collection system

Each farmer ships milk to a fixed place in a village by aluminum milk collection bottle twice in a day, morning and evening. The morning batch is carried directly to the processing center (2 centers in Biston, 75 km from Kuzaran, and Eslam Abad, 60km from Kuzaran) by the private milk collection company's cars. The evening batch is kept in a nearby collection center of private companies and then collection cars of the private milk collection companies transport it to the processing center the next morning. There is a plate cooler of 5 tons capacity in the milk collection center. The place for milk collection center should be the central for livestock farmers, milk amount, etc. One milk center in each of Zone 1, 2, 3 and 4 and two milk centers in Zone 5 will need to be established at an early stage. 2 milk centers in Zone 1, 2, 3 and 4 and 4 milk centers in Zone 5 will need to be established in the middle stage. Further in long-term plan, 2 – 3 milk centers in Zone 1, 2, 3 and 4 and 6 milk centers in Zone 5 will need to be established. In regard to the system of collection, storage and transportation of milk, as the private companies carry out actively in both Sites, it is not necessary that RPC participates to these systems.

(11) Production area of roughage by farmers' themselves (Alfalfa hay, corn silage)

In this livestock development plan, it is assumed for calculation of revenue and expenditure that all roughage and concentrate feed will be purchased. If the roughage will be self-produced, the calculation is shown below. Alfalfa hay is to be given in the amount of 7 kg/day/head as roughage. Required hay for 5 heads plan including calves is 18 tons per year. Yield of Alfalfa hay is about 10 t/ha, so alfalfa needs to be cultivated on 2 ha. Then 38 t of corn silage is required for one year. Yield of corn for whole crop silage is about 50 t/ha in ripening stage, and hence enough corn silage for one year is produced on 1 ha.

(12) Place of a stall and environmental development plan

Workshops were held in each village in five Zones of the study area. One of the biggest problems which the villagers mentioned was the bad smell of excrement and unhygienic conditions. In this 5 heads plan, not only it will be difficult to construct a barn in each farmer's narrow site but also mounds of manure will be created everywhere if excrement management will not be improved. To solve these problems, it is suggested that stalls should be constructed on the periphery of a village. As the result, it will solve the environmental problem in a village as well as making tractor work easy for turning manure over (2 to 3 times to make completely fermented compost).

6.1.6 Beekeeping Development Plan

(1) Development Concept

The present situation of beekeeping in each Zone is shown in Table 6.1.6. There is no traditional beekeeping box in any of the Zones. Modern beekeeping is concentrated in Zone 2. Especially, there are a lot of beekeeping boxes in Hassan Abad village. The number of beekeeping boxes in the village is about 200. Also, there are about 20 beekeeping boxes in Deh Bagh village. In other Zones, there are a few boxes but there is no box in Zone 4 and 5.

Concept of the development plan is to increase farmers' income in rain-fed farmland area where agricultural productivity is low, especially on mountainous sides. 40 beekeeping boxes can produce the same net income as irrigated wheat on 1 ha.

One farm household can keep maximum 100 to150 boxes and 1 or 2 laborers are required to manage so many boxes. The reasons of 40 boxes plan, which are adopted as the development plan is that it will not require any labor for beekeeping and repayment of the loan is not a big burden.

(2) Ecology of bees

Bee is activated from early March. The bees should be given sugar in this season because there are no flowers. Bees start collecting honey from late March to end of summer. In autumn, bees are given sugar for two weeks. The bee honey is harvested in autumn, and if half of the bee honey is left in a beehive, the sugar need not be given. In case that 20% of bee honey is left, sugar of 10 kg/box is given. To be economical, 20% of bee honey should be left. Bees do not work in winter till March. Moreover, sugar should be given to bees in case of shortage of flowers because of drought.

(3) Annual plan

200 boxes will be introduced to Zone 1, 3, 4, 5 in early stage, first 3 years of the development plan. Additional 200 boxes will be introduced to all the Zones in middle stage, from 3rd to 5th year. Then additional 200 boxes will be introduced to all the Zones again in late from 3rd to 5th year, and final stage, from 6th to 10th year, respectively. Zone 2 cannot keep more than 200 boxes at present because of shortage of flowers. The beekeeping is related with cropping system and demands lots of kinds of flowers under crop rotation system such as alfalfa, clover, soy been and maize, etc. Implementation of agricultural crop rotation system plan will make beekeeping production increase. Especially pasture of alfalfa and fruit trees which are not treated with agrochemicals are better

(4) Target of the Plan

Targets of this beekeeping plan are farmers in rain-fed farmland area especially farmers on mountainous side where agrochemicals are not applied.

(5) Required Government Support

The biggest problem for beekeeping is dying of bees because of agrochemical application. To avoid this problem, beekeepers in Hassan Abad carry beekeeping boxes to Shahu Mountain, 40 km far, from late March to late June. Employees stay at the site and beekeepers go the site 2 – 3 times and supervise them. If crops which do not apply agrochemicals will increase, beekeepers don't need to move their boxes and can keep the boxes in one place for the whole year. Furthermore, the government support for the rain-fed farmland farmers is required, because these farmers have little accumulated capital and don't have funds on hand for loans. Besides, beekeepers could not get compensation (70,000 Rls/box/year) even when they paid insurance (2,500 Rls/box/year) in drought year, and the application to extend loan repayment period was not accepted. Improvement of these issues should be prerequisite for the plan. Moreover beekeepers strongly request support for sugar to be given from April to June in case of drought, and establishment of the beekeeping research center in the Province.

(6) Contents of the development plan

Contents of the development plan including investment, running cost, gross income and net income are shown in the following table.

Plan of Beekeeping of 40 Beehives

No.	Items	Price Million Rls.	Remarks
Investment	1) Hive	10.0	Rls 0.25 million. x 40 hives
	2) Nest	1.8	1.5 kg x 30,000 Rls. x 40 hives
	3) Guard dress	0.1	
	4) Smoke machine	0.04	
	5) Steel nest	0.1	2kg
	6) Supplementary hives	1.4	Rls. 0.035 million. x 40 hives
	7) Machine to make nest	0.01	
	8) Tool to open hive	0.01	
	9) Supplementary hives	0.14	For increased bees after 3 months
	10) Machine for separating honey from nest	0.6	
	11) Others	1.0	Wages for employees, etc.
	Total	15.2	

No.	Items	Price Million Rls.	Remarks
Annual running cost	Sugar	1.6	in spring: 10 kg x Rls. 4,000 x 40 hives
	Sugar	1.6	
	Nest materials	1.8	in autumn: 10 kg x Rls. 4,000 x 40 hives
	Medicine	0.8	
	Insurance	0.1	1.5 kg x Rls. 30,000 x 40 hives
			2,500 Rls. x 40 hives
	Total	5.9	
Annual gross income		12.0	15 kg x Rls 20,000 x 40 hives
Balance	Cash income	12.0	
	Annual cost	5.9	
	Net income	6.1	
Repayment of loan	1st year	3.90	upper limit: Rls. 10 million
	2nd year	3.55	interest annual rate: 14%
	3rd year	3.20	equity capital: Rls. 5.2 million
	4th year	2.85	
	5th year	0	

(7) Number of beehives and honey production in annual plan for each Zone

The number of beehives and honey production in each Zone are shown in Table 6.1.9. It is estimated to produce 15 tons/year until the first 3 years, 30 tons/year until the 5th year and 45 tons/year at the end of the 10 year plan period.

6.1.7 Inland Fishery Development Plan

After establishment of the Kermanshah Fishery Organization in 1996, the amount of fish consumption per capita has increased from 250 g to 3 kg in 2003 in the Province. The target is to increase it to 5 kg per capita. So, the development of inland fishery was included in the agriculture development plan for the Study Area.

The Fishery Department of KJAO is preparing a development plan for every water source. Water sources of irrigation system from springs, rivers, wells are used in fish culture. Moreover, as high technological fish culture, there is recirculation system fish culture (with biological filter and physical filter), which demands only a small water supply, and three farms of this system are constructed in the Province. In the integrated agricultural plan for the Study Area, the suitable fish culture systems will be introduced and annual plan is prepared.

(1) Target of the Inland Fishery Development Plan

1) Targets of fish culture are farmers who use irrigation wells of more than 10 liters/sec of discharge (Table 6.1.3).
2) The target of trout fish culture using springs as water source are the farmers who have spring water rights.
3) Carp fish culture using irrigation water is not included in the water use plan, because it is expected that such fish culture uses too much water as same as the paddy field. This plan was made under the condition that the plan will be implemented if consensus is reached among Water Board, WUC, farmers of WUC and farmers around farmlands where farmers want fish culture.

4) For promotion of extension of inland fish culture, carp and duck culture for self-use was planned. Although this culture will use water source of wells, springs, canals etc., it is assumed that the culture is not included in water use plan because of its small scale.

(2) Trout Culture by Irrigation Wells

1) Trout Culture by Irrigation Wells

In case of fish culture using wells which have more than 10 liters/sec of discharge, concrete pools for fish culture will be constructed around the well. After using water in the pool for fish culture, the over flowed water will be used for crop irrigation. This means irrigation water will not be influenced and the farmers will be able to get income from the trout culture as a side business. And also, the income will be able to be allotted to repayment of the loan for the well construction.

Number of irrigation wells with above 10 l/sec is shown in Table 6.1.3. The number of wells in Zone 5 is the highest and then Zone 2 and 3. More than 10 liter/sec discharge wells is a major type in all the Zones. It shows that the well water will be able to be used for fish culture before irrigation.

2) Annual development plan

As shown in the table below, one well in Site 1 and four wells in Site 2 will be used for trout culture in early stage in the first 3 years of the development plan. In the middle stage from 3rd year to 5th year, three wells in Site 1 and eight wells in Site 2 will be used for fish culture. In the late stage from 5th year to 10th year, four wells in Site 1 and 13 wells in Site 2 will be used for fish culture.

Number of agricultural wells used as both fish culture and irrigation

Zone	No. of wells > 10 liter/sec	Cumulative number of wells		
		3rd year	5th year	10th year
1	3	0	1	1
2	26	1	2	3
3	13	1	2	2
4	31	1	2	4
5	60	2	4	7
Total	133	5	11	17

3) Yield

The production of each fish culture farm is about 1 ton (60 m^2 pool) after 6 months cultivation of purchased fingerlings.

4) Contents of the development plan

Investment cost, contents of facilities, running cost, loan repayment plan, gross income, and net income of the trout production plan of one ton are shown in the following table. The balance will be red (negative) for 4 years in 5 years repayment terms because of loan repayment. The net income will be Rls. 6 million from 6th year, after end of repayment.

No.	Items	Price Million Rls.	Remarks
Investment	1) Ground leveling	0.640	40 m^3
	2) Foundation work of pool	2.970	33 m^3
	3) ditto	1.380	Concrete
	4) Main irrigation canal	0.306	17m
	5) First line of pool	2.700	22.5m^2
	6) 2nd line of pool	2.475	22.5 m^2
	7) Injector canal from 1st to 2nd pool	0.484	4.4 m^2
	8) Fishing pool	0.330	3.0 m^2
	9) Entry gate of pool	0.240	2
	10) Exit gate of pool	0.920	4
	11) Aeration facility	1.900	1
	12) Pump	2.500	2.5 inch, gasoline
	13) Fishing and biometric equipment	0.650	
	Total	17.495	
Annual running cost	1) Fry	2.948	4,400 fishes, unit price 670 Rls./fish
	2) FFT feed	0.240	
	3) GFT1	1.927	kg
	4) GFT2	3.375	kg
	5) Medicine and cure	0.100	kg
	6) Labor	0	
	7) Others	0.4295	
	Total	9.020	
Total costs included investment and running cost		26.5	
Annual gross income		15.00	15,000 Rls./kg
Balance	Cash income	15.0	
	Annual cost	9.0	
	Net income	6.0	
Repayment of loan	1st year	8.23	Loan: 90% of total cost (24.21 Million Rls.)
	2nd year	7.55	
	3rd year	6.88	Interest annual rate: 16%
	4th year	6.20	Equity capital: 10% of total cost (Rls. 2.65 million)
	5th year	5.52	
	6th year	0	

5) Annual production of trout by Zone in the plan

Number of wells used for trout culture in each Zone and annual production of trout in each development stage are shown in the following table.

Number of agricultural wells used as both fish culture and irrigated farming and trout production

(unit of trout production; tons)

Zone	No. of wells > 10 lit./sec	3rd year		5th year		10th year	
		No. of wells	Production	No. of wells	Production	No. of wells	Production
1	3	0	0 tons	1	1 ton	1	1 ton
2	26	1	1	2	2	3	3
3	13	1	1	2	2	2	2
4	31	1	1	2	2	4	4
5	60	2	2	4	4	7	7
Total	133	5	5	11	11	17	17

6) Distribution of trout

Producers sell trout to middlemen and the producers will not have problems on distribution because of the high demand.

(3) Trout Culture by Springs

1) Present Condition and Development Potential

In case of trout culture by springs which mainly exist on mountainous sides in Zone 2, the water is used for irrigation after trout culture. The springs should have more than 5 liter/sec water discharge as a condition of this system. In many cases, individuals have spring water rights. So farmers who have spring water rights can cultivate trout before using the water for irrigation purpose. If a circular pool is installed for this culture, the establishment cost will be cheaper. The cost for 80 m^2 pool (circular of 5 m in diameter) is Rls. 3 million.

2) Annual plan

The plan mainly was made for Site 2. Fish culture was planned in three springs in Site 2 in early stage of the development plan, in 3 years. Fish culture will be newly started in two springs in Site 2 in middle stage, from 3rd year to 5th year, so fish will be cultivated in a total of five springs. New fish culture farms will be started in five springs in Site 2 in late stage, 5th year to 10th year, so in total 10 fish culture farms which use springs will work.

3) Investment

The running cost and production of this fish culture system is 1.3 times more than the trout fish culture using well water which is explained above. The investment cost, running cost, loan repayment plan, gross income and net income are shown in the following table.

No.	Items	Price (Million Rls.)	Remarks
1	Investment	3.0	
2	Annual running cost	11.7	
3	Annual gross income	19.5	Yield: 1.3 tons
4	Balance	7.8	
5	Repayment of loan		
	1st year	4.77	Loan: 90% of total cost
	2nd year	4.34	(13.23 Million Rls.)
	3rd year	3.92	Interest annual rate: 16%
	4th year	3.49	Equity capital: 10% of total
	5th year	3.07	cost (Rls. 1.47 million)
	6th year	0.00	

This table shows that trout culture using springs will earn net income of Rls. 3 million in the 1st year, Rls. 3.5 million in the 2nd year, Rls. 3.9 million in the 3rd year, Rls. 4.3 million in the 4th year and Rls. 4.7 million in the 5th year even in loan repayment period. Net income of about Rls. 8 million is expected after end of the loan repayment terms, from 6th year.

4) Annual production of trout

In Site 2, trout of 1.3 tons each in three springs, totaling about 4 tons in the 3rd year of the plan, 6.5 tons in five springs in the 5th year and 13 tons in the 10th year will be produced.

(4) Annual Total Production of Trout

Total production of trout by two production methods which are explained above is shown in the following table.

(Unit: tons)

Site	3rd year	5th year	10th year
1	1	3	4
2	8	14.5	26
Total	9	17.5	30

(5) Warm Water Fish Culture

Two types of warm water fish culture which are explained below are not included in water use plan of canal irrigation system. It was planned under a condition that this plan would be implemented if consensus can be reached among Water Board, WUA, farmers who are member of WUA and farms around farmland where farmers want to cultivate fish, etc..

1) Warm Water Fish Culture in 1 ha Irrigation Farmland in Summer

i) Cultivation method

- Surface of 1 ha farmland is dug 10 cm deep and then about 2 m high bank which have 1:3 slope inside and 1:2 slope outside is constructed as a fish pond. Inside of the pond is not lined.
- In April, fingerlings of warm water fish shall be released in this 1 ha pond and cultivated for 6 months and 2.5 tons of fish shall be shipped.
- In rainy season when there is enough water, water is poured into the pond and in summer, the same amount of water as loss is added from the canal. In August, considering the daily evaporation of 14.4 mm and the percolation of 10 mm, the required water depth is 24.4 mm. And, irrigation water requirement is estimated as 13.4 mm/day. Therefore, the water amount supplied to a pond is almost as same as that of 1.82 ha farmland. This means that 1.82 ha farmland will not be irrigated in summer for the fish culture pond. This is the reason that this plan was not included to the canal water use plan.

2) Costs

Investment cost, running cost, gross income and net income of this plan are shown in the following table. Although the balance will show a deficit for two years, it will have a surplus in 3 years in the late terms of loan repayment and 1 ha pond will produce a net income of about Rls. 9 million after end of repayment, from 6th year.

Items	Price (million Rls.)	Remarks
Investment	40	
Annual running cost	10	
Annual gross income	19	Yield; 2.5 tons, unit price; 7,500 Rls./kg
Balance	9	
Repayment of loan		
1st year	10.1	Loan: 70% of investment (28 Million Rls.)
2nd year	9.2	
3rd year	8.3	Interest annual rate: 16%
4th year	7.4	Equity capital: 30% of total cost (12 million Rls.)
5th year	6.5	
6th year	0	

In whole Study Area of Sites 1 and 2, the number of the ponds will be two in 3rd year of development plan, totaling four, including new 2 ponds in 5th year and totaling 8 including new 4 ponds in 10th year.

3) Extension Plan of Warm Water Fish Culture

For extension of warm water fish culture, the plan is that each farmer will construct 100 m^2 pond and cultivate warm water fish and ducks. The products will be for self use and surplus will be sold. The investment cost will be about Rls. 2 million. The running cost will be about Rls. 1 million. The production will be about 0.2 ton. If it will be sold, the gross income will be Rls. 1.5 million and net income will be Rls. 0.5 million.

In the annual plan, the culture will be extended to five farmers in the 3rd year, 15 farmers in the 5th year and 30 farmers in the 10th year in each Site 1 and 2.

6.1.8 Effect of Integrated Farming and Governmental Support

(1) Effect of Integrated Farming

The objectives of integrated farming are effective use of land, water, organic matter, etc. and to perform agriculture which maintains the natural circulation system for sustainable farming. The circulation is easily made inside of the farmers own management in case of integrated farming, e.g. organic matter etc. In case of more than a few hundred ha farmland farming (which are seen in U.S.A etc.), only one crop is cultivated and a lot of chemical fertilizers and agrochemicals are applied for improving the efficiency. However farmland scale in the study area is less than dozens of ha and this scale is suitable for integrated farming.

Another objective is stability and improvement of farm management. Combining some sectors is safe to avoid management risk in an area where there is less rain and several times of drought. Moreover, livestock produces income everyday from milk whereas crop cultivation produces it only once a year. So if both of them will be combined, the management will be easer.

In this agricultural development plan, the rational land use, such as establishment of crop rotation, introduction of roses for perfumes, is introduced. Besides, dairy cows raising will be integrated with agriculture, and compost, which are made from excrement and wheat straw, will be returned to the farmland. As a result, soil organic matter will increase, soil physical condition of heavy textured soil in the Site will be improved, and the water holding capacity of soil will be increased and resistance of crops for drought, pests and diseases will be improved. So with increasing yield, use of chemical fertilizers and agrochemicals will be decreased gradually.

Agriculture and beekeeping will be naturally integrated in farming because establishment of crop rotation will also supply a lot of flowers and increase capacity of beekeeping.

Inland fishery and agriculture also have a close relationship. In case of well irrigation, the construction cost is high and the loan repayment is difficult. So integration of inland fishery and agriculture was planned so that water flow of wells and springs is used for trout culture and then the flow is used for irrigation.

Net incomes of various integrated farming are shown in Table 6.1.7. It is assumed for the net income that small scale farmers have 3 ha as integrated farming, and other farmers have 10 ha which is the average in the study area, and there will be net income after completion of the loan repayment.

The table shows that integrated farming has high efficiency considering the net income. For example, a net income of only Rls. 13 million per year is attained from a 10 ha of rain-fed farmland where wheat, chick pea and barley are cultivated as crop rotation in Site 1. However, the integrated farming with 5 dairy cows will produce three times of the net income.

And also in the case of 10 ha of whole year irrigated farmland, in which farmers gain the net income of Rls. 61 million, will be increased to Rls. 105 million by the integrated farming with dairy cows and rose cultivation.

(2) Government Support on Implementation of Agricultural Development Plan

It is not confirmed whether the development plan explained above is feasible. This whole development plan will be implemented by individual farmer loans or private company's funds for agricultural machinery and the farmer's plan of loan repayment is mentioned in each section. However, if the governmental support is small and the present condition of loans of the Agriculture Bank is not loosened, loan repayment will be difficult for rain-fed farmland farmers and small scale farmers, who do not have much equity capital. Especially, there are two major problems as follows.

1) 5 Dairy Cows Plan

On first plan of livestock, the 5 dairy cows plan targeted farmers who have 15 – 20 ha irrigated farmlands. In this plan, irrigated farmland farmers who have more than 15 ha is 6% and the area is just 12% in Site 1 and Site 2 as shown in the following table.

Site	0 ~ 5 ha		5 ~ 10 ha		10 ~ 15 ha		> 15 ha		Total	
	No. of farm household	Area (ha)	No. of farm household	Area (ha)	No. of farm household	Area (ha)	No. of farm household	Area (ha)	No. of farm household	Area (ha)
Site 1	117	421	218	1,640	162	2,040	119	2,583	616	6,684
	19 %	6%	35%	25%	26%	31%	19%	39%	100%	100%
Site 2	135	423	445	3,200	241	2,678	127	3,528	978	9,827
	14%	4%	45%	33%	25%	27%	13%	36%	100%	100%

Note: The rate of irrigation at all season in Site 1 is about 30%, and in Site 2 is about 33%.

Integrated farming of dairy cow raising and agriculture is the basic policy of this development plan. Two objectives of the plan are: (1) establishment of sustainable farming through making compost from excrement of dairy cows and wheat straw and returning it to farmland, and (2) economical stability and improvement of rain-fed farmland farmers and small scale farmers. Hence, target of introduction of dairy cows in this plan is 70% of total farmers. To make this plan feasible, it is required that government directly provides the budget (subsidy) and the loan conditions of the Agriculture Bank are loosened. For the loan, although it is for a stall of livestock, the repayment terms of 5 years is unreasonable. In case of Japan, its period is 20 years because a stall has a 25-year depreciation period. Required amounts of equity capital need to be reduced and the repayment conditions of the Bank's loans need to be loosened. If there is no such support, this development plan will be only for rich farmers and the stratum differentiation to the extremes of large scale farmers and the small scale farmers will be

advanced in the rural area.

2) Supply of Agricultural Machinery

A lot of crops are included in the crop rotation system and large increase of yield is expected after 10 years of the plan. It involves principles of improving machinery work accuracy like plowing 20 cm in rain-fed farmland and 40 cm in irrigated farmland, applying compost, etc. At present, however, there are only a few heavy tractors and even light tractors and attachments are in very short in the Study Area. Considering such a situation, it is planned that 50% of needed machinery will be supplied by the 3rd year from implementation of the development plan. However it is not sure that private companies and private individuals as suppliers of a lot of machinery will be able to supply such a large amount of machinery. The investment costs may impossible for private companies and private individuals under present loan system. Therefore, use of government budget and a loosening of loan repayment conditions of the Bank are required.

Solving these two problems is the fundamental matter to successfully implement the development plan.

6.2 Farmers' Organization Development Plan

6.2.1 Present Conditions of Farmers Organization

(1) Present Conditions and Major Issues

There are two types of farmers organizations under MOA: Rural Cooperative Organization (RCO) under Central Organization for Rural Cooperative of Iran (CORC) and Rural Production Cooperative (RPC) under the Utilization System of MOJA. Besides, there are producers cooperatives functioning under the Ministry of Cooperatives. The major issues of these organizations are discussed below.

1) Issues of the RCO as a Farmers' organization

i) Cannot provide agricultural inputs timely

One of the high-priority problems of the farmers in the study area was the timely access to the agricultural inputs which is mainly distributed by the RCOs. It is partly due to the delay of supply of inputs from the Agriculture Support Company (ASC). Another reason is the size of RCO. The RCOs are normally located in the center of Sub-district or the center of highly populated villages and one organization provides services for more than 1,000 members. Furthermore, agricultural inputs are distributed also to the non-members. It is difficult for the RCOs to provide inputs to all farmers concerned in an appropriate timing.

ii) Farmer's participation is limited

The RCOs have been there for so many years and long been known as providing services for distributing agricultural inputs, coupon products and etc rather than as a cooperative. Apart from the Board Members, the participation of farmers in decision makings or conducting activities is very limited.

iii) Influence of the Government Policy

While RCOs are financially independent, the most of the activities are related to the governmental work, such as distribution of inputs and coupon products and buying guaranteed products. The income sources of the RCOs are mostly from these activities, too. The current government emphasis on the involvement of private sectors may reduce the role of RCOs in future.

2) Issues of the Rural Production Cooperative (RPC)

i) Government takes the leading roles in RPCs

In all 18 RPCs in Kermanshah, the Managing directors of the RPCs are dispatched from and paid by the Utilization System of MOJA. According to the regulation of the RPC, the assignment period of a managing director is generally for 3 to 5 years and the Board committee is to assign a new director by self-finance. In reality, however, none of the RPCs have managed to find a new manager. The reasons are 1) RPC rented a loan to purchase machinery etc. However, farmers can not correspond to gain the procedure of the loan, because procedure of the loan is so complicated, 2) it is difficult to find capable personnel to do the management of the RPC, 3) No financial capacity of the RPCs to pay the salary of the director.

ii) Lack of Leadership and Participation by the Farmers

According to the Bylaw of RPCs, the board of directors, the representatives of the member farmers, have the actually authority of the RPCs such as approving RPC's membership application, decision-making on shares transferring among the members, preparing programs, projects, budget and other proposals and presenting them to the general meeting for making necessary decisions. In reality, however, the Government take the initiatives in the said activities. The lack of leadership is partly caused by the perception of the RPCs. The farmers believe that if the initiatives are taken by the farmers themselves the financial and technical supports of the government will be reduced. This is one of the reasons why the RPCs are not willing to pay the salary of the Managing Director after 3 to 5 years of assignment. It should also be noted that the RPC members are limited to the land owning farmers and the young sons or daughter are out of the criteria of membership despite their potentials in leaderships and new knowledge.

iii) Limitation in the Subsidies of the Government

In the beginning of the 1990s, the Government encourages the establishment of RPC by providing subsidies with favorable conditions compared with now. As already mentioned, the land consolidation was done totally by the Government in the past and 30 % contribution by farmers at present. In the case of agricultural machineries, some of the old RPC received tractors and combines by the Government at its establishment. No promise of such provisions is given presently apart from the priority for distribution. In general, RPCs have problems in accessing bank’s loan. The problem of purchasing wheat seeds from farmers, for example, is the unavailability of access to the bank’s loan in advance. The RPCs needs considerable capital to purchase wheat seeds from farmers. The difficulty in the access to loans is limited the expansion of activities of RPCs. It is considered that the government prepared a lot of programs of subsidies to promote RPC at beginning. However, the government can not provide any service because of lack of budget. Contents of governmental subsidy at beginning and at present are summarized in following table;

	At beginning（the first half of 1990th）	At present（2003）
Condition of establishment	It is possible to establish as small scale organization which number is around 50 persons. Small scale farmer have a priority.	Number of member is not limited, however, its covered farm land area should be more than 2000 ha Area that potentials of water resource and soil are high, have priority to establish.
Admission fee	Rls. 1,000~3000/member	Rainfed：Rls. 100 thousand to 200 thousand/ha Irrigated：Rls. 200 thousand to 300 thousand/ha
Office and Storage	To be advanced by MOJA at beginning	To be advanced by MOJA at beginning（If there is not enough storage, the government will rent）
Agricultural Machinery	Two tractors and one combine will be provided by the government without any payment at beginning（Other machinery will be advanced based on the situation）	It can be gave priority to buy, however, subsidy is only low interest.
Land Consolidation	The government prepare the map, land re-plotting, farm road, digging well and irrigation network etc.	The government share 60-70% of the project and farmer have to pay the rest.

iv) No Original Law

There is no law/ministerial ordinance originally formulated for the RPCs. The current RPC's law is that of RCO. The Agriculture Company had its own bylaw but it was abolished after the Revolution. For this reason, the general assembly of the RPC has to be held with the attendance of a RCO representative. The draft RPC Law is waiting the final approval by supreme council at present.

3) Issues of Cooperatives

i) Several organizations are involved in management

While the registration of the Cooperative is pursued by the Ministry of Cooperatives, there are other official stakeholders in the formulation and implementation of the Cooperative activities. In the case of Water User's Association (WUA), both the MOJA and MOE are involved in the support of the activities. For this reason, the representatives and members of the cooperatives confuse to find out where the responsibility lies.

ii) Difficulties in accumulating the capital for loan

The most of the successful cooperatives are those obtained the required amount of the loan from the Bank with a sufficient amount of own capital. In order to start any activities, the Cooperative members have to prepare the first capital which is 10 to 40 % of the total amount. While the normal interest rate by the Agriculture Bank is 14 %. But if the special note is applied, the interest rate can be reduced to 7%. While the banks principally offer these special provisions to the Cooperatives, the application of the notes depend on the availability of subsides mentioned in the budget law. Thus it is more advantageous for the cooperatives with the rich farmers who could buy many shares of the Cooperative's capital. In many cases, the managing directors are not necessary the farmers in the target villages, but the investors from the urban area.

	First capital	Interest rate for agri. loan
Cooperatives / RPC(with special notes)	10-40%	7-14%
private	20-40%	14%

(2) Comparison of Farmers' Organization Systems

Farmers Organizations in Kermanshah take many forms and their activities often overlap with one another. The table below summarizes the strengths and weaknesses of each organization:

RCO	RPC	Cooperatives
Strength: 1. Existed for a long time and people have trusts. (creditworthy) 2. Officials (banks and input distributors) trust on the RCO and rely on their services 3. Stable service provisions	Strength: 1. Possibilities of wide range of agricultural activities 2. Potentials in improving efficiency of land and production 3. Technical assistance by MOJA 4. Reflection of Government policy	Strength: 1. Better coordination among the members because of the small size 2. Manager director is selected from non-officials 3. Common interest/ goal of the farmers can be met
Weakness: 1. Cannot provide agricultural inputs timely 2. Regarded by farmers as a service provider rather than as cooperative 3. Government control in activities	Weakness: 1. Government take initiatives 2. Limitation in farmer's participation & reliance on Gov 3. Limitation in subsidies 4. No established trust by Officials (banks and input distributors)	Weakness: 1. Several Organizations are involved in management 2. Difficulty in accumulating capital and access to loan

The comparison of each organization was made by using the evaluation indicators as follows:

- Self management by farmers: leadership, participation and extension opportunities
- Efficiency in production: timely access to agriculture inputs, purchase of products from farmers,
- Efficient use of land and water: by means of land consolidation, applying machineries water optimum consumption
- Financial capacity: government subsidies, financial capacity, access to external loans, profit

	RCO	**RPC**	**Cooperative**
1. Farmers' Leadership and Participation			
1.1 Leadership of the farmers	1	1	2
1.2 Participation of farmers	1	1	1
1.3 Training opportunities	0	1	2
Sub-Total	2	3	**4**
2. Performance on Agricultural Production			
2.1 Selling agricultural inputs	2	2	0
2.2 Purchasing guaranteed products from farmers	2	1	0
2.3 Purchasing & selling non-guaranteed products from farmers	1	1	2
2.4 Development of agro-industries and processing	1	1	2
Sub-Total	**6**	5	4
3. Efficiency in Use of Land and Water			
3.1 Irrigation infrastructure	0	1	1
3.2 Water Management	0	1	1
3.3 Land consolidation	0	1	0
3.4 Mechanization	1	2	2
Sub-Total	1	**5**	4
4. Financial Management			
4.1 Government subsidies	2	2	1
4.2 Financial capacity of organization	2	1	1
4.3 Access to external loans	2	1	1
4.4 Profits to shareholders	1	1	2
Sub-Total	**7**	5	5
Total	14	**18**	17

Notes: 0=poor or non, 1=normal, 2=good

(3) RPC as the Farmers Organization to be proposed in the Study Area

Based on the comparison of the organization made in the table in previous sub-section, it is possible to say that RPC is considered to be the starting point of the farmers' cooperative activities. Unlike other organizations, RPCs are expected to receive adequate technical and administrative support by the staff of Utilization System at MOJA. It is advantageous for the farmers who have less experience in the joint activities or farmers with less capital to receive such technical support by the Government. Furthermore, as mentioned earlier, the promotion of RPCs is the direct reflection of both national and provincial policy on agriculture. Importance of RPC for strengthening the local water management is highlighted in the Third Socio-Economic and Cultural Development Plan. At the Provincial level, Kermanshah is undergoing the restructuring of the agricultural centers at sub-district level, transferring some of the functions to the existing and newly formulated RPCs.

RPC is the most suitable Farmers' organization to be introduced in the Study Area, however, studying the actual operations of the RPCs, some concrete changes in the structure and activities should be proposed for creating new RPCs in the Study Area. It is misunderstood by farmers to be same as previous Rural Producers Company (*aherkat-esahmi-ye zera'i*) which farmers lands changed to shares of the company and farmers lost their land after the white revolution. But the present RPC is based on the individual farmers and their land since 1990. The system itself aims to establish self-reliance farmers' organization. RPC has potentials in land and water use but is weak in self-reliance of farmers.

(4) RCO as national-wide Rural Cooperatives

RCO has a long history and contributed to the life of rural area for the distributor of government subsidies. RCO is a nation wide cooperative. It is member of International Agricultural Cooperative Alliance (ICA) – Central Organization for Rural Cooperative of Iran. Based on its scale merit RCO has potentials in better production performance and get a financial trust by the Agricultural Service Center (ASC) and Agricultural Bank (BK). But RCO is weak in the farmer's involvement. These evidences support to say that RCOs can be an independent organization separated from the Government in the future. It can extend activities by its organization keeping the farmer-centered institute with national network.

(5) Cooperatives to Promote Rural Entrepreneurs in the Study Area

Cooperatives under the Ministry of Cooperatives (MOC) are established based on the farmer's intention to investigate their specific field activities such as poultry farming and greenhouse cultivation. Therefore cooperatives have high potentials in farmers' participations. Even through they are registered to MOC, technical and financial evaluation are confirmed relevant government institutions such as agriculture, water affair organizations at the inception stage of cooperative activities. As the role of MOC support the small to medium scale enterprise enhancement, the cooperatives are expected to extend their activities as private company. Rather than establishing two separate Farmers' organizations like the RPC and Cooperative in one area, it should be coordinated with one another so that the management will be more efficient. In the Study Area, the formation of cooperatives should be promoted particularly for the young people and women who have priority for the government subsidies. Such cooperative activities by young men and women entrepreneurs can also be the part of RPC which covers the wider area.

6.2.2 Basic Strategy of Farmers' Organization

Farmers on their individual strengths cannot solve all of the agricultural problems they presently face. The problems include; 1) the lack of timely and adequate supply of agricultural inputs, 2) the lack of financial sources for investing on agriculture, 3) inability of finding suitable market revenues i.e., the lack of market information, warehousing, value addition and 4) the lack of agricultural infrastructure such as irrigation, storage, processing facilities, etc. It is, therefore, expected that the cooperatives, in the form of Rural Production Cooperative (RPC) enables to develop and provide such services to the farmers for sustainable agriculture.

RPCs before the Revolution in 1980 was aiming to the increase the land efficiency through land consolidation, water management and the application of the cropping pattern. RPC as a company took all the initiatives in the management of farmer's land and production. It was successful as far as the efficiency of production is concerned, but it neglected the ownership and participation of farmers who was supposed to be central to the agricultural operation.

RPCs which is to be promoted at present and in the future should very different from the one before the Revolution or even after the Revolution because the aim is to fulfill farmer's economic and social needs through the farmer's initiatives in the management and practice of agriculture. In order to promote sustainable Farmers' organization, the following four principals should be taken into account.

(1) Establishing a Farmer-Centered RPC

The formation of RPCs should be based on the willingness of the farmers to participate and accordingly the aim of the organization is to reflect the farmer's needs on agricultural services. The proposed RPC should be only organized by the Farmers themselves, by selecting a Managing Director from the member farmers who is familiar with the people, social and cultural relationship and agricultural conditions in the local context.

(2) Involvement of the Government Staff as Advisors

For the operation of RPC, the experts of KJAO Utilizations System take an important role as an Advisor of RPC. Standing outside the RPC, the role of a RPC expert as an advisor is to give necessary technical assistances to the RPCs he/she is in charge. A RPC expert from the Utilization System of KJAO should be stationed at each Extension Service Center (ESC) at the Dehestan Level. Particularly, the RPC expert needs to give advices on the financial management of the RPC for getting loans from the bank, checking the bookkeeping for the income and expense accrued from agricultural inputs and sales of products. The involvement of RPC expert may be intensive in the beginning, but gradually withdraw from the RPC's activities.

(3) Flexibility of the Conditions and Regulation at the Beginning

At the beginning of the formation, the conditions and rules of RPC should be kept open. Rather than adjusting the members with the ready made regulations, the farmers' organization should be formulated according to the expectations and the needs of the members themselves. The rules and regulation of RPC should be prepared with the participation of the member farmers. In particular, involvement of the young people without the registration of land, women groups should be considered.

(4) Emphasis on Making Profits

One of the most important motives of the farmers to join the cooperatives is to make profits. At present, the main functions of RPCs largely remain confined to the supply of agricultural inputs and mechanization which solve the problem of accessibility but not bring about much economic benefit. Newly formed PRCs in the Study Area should focus more on the economic advantages of forming a cooperative and encourage the business operation by introducing joint sales of farmer's products, marketing and agro-processing. Provision of packaging, grading, storing and market information is the key areas to develop the value-addition of the products.

6.2.3 Group Activities by Farmers' Organization

To determine the scopes of activities by a farmers' organization like RPC, there are two important aspects to be taken into account. First, the RPC is to provide the basic services that farmers expect. Second, as mentioned earlier, Farmers' organization is to promote the economic benefits of the farmers. Through joint sales and production including agro-processing, the members of RPC gain the bargaining power for negotiation and competition in the agricultural market. In addition to these two aspects, water and land utilization is another main activity of the RPCs for increasing the land efficiency through the land consolidation and irrigation water management. The activities of the RPCs in the Study Area will be undertaken by the following 7 sectors:

Type	Activity	Level	Implementation
Service Provisions	1. Inputs Distribution	RPC	First year
	2. Mechanization	RPC	
	3. Extension and Training	RPC, RPC Unit	
Economic Activities	4. Joint sales and Marketing Plan	RPC	
	5. Rural Credit Fund		
	6. Agro-Processing and Agro-Industry	RPC Union	From 6th year
Water and Land Utilization:	7. Water management and land consolidation		Collaboration with WUC

The detail plans of each activity are described in the following section.

6.2.4 Farmers' Organization Development Plan

(1) System of Farmers' Organization

Estimated Number of RPC, RPC Union members in Study Area

	villages	family	culitivated land	3year 50%	5th year 70%	10year 100%
RPC Union Ravansar						
RPC1 (Ravansar + Dowlat Abad	12	460	5383	230	322	460
RPC2 (Hassan Abd)	10	334	2292	167	233.8	334
RPC Union(Ravansar)	22	794	7675	397	555.8	794
RPC Union Kuzaran						
RPC1 (Kuzaran)	11	400	3868	200	280	400
RPC2 (Zalu Ab)	11	400	3868	200	280	400
RPC Union(Kuzaran)	22	800	7736	400	560	800

It is proposed that 2 RPC Unions will be formed in the Study Area: Site 1 and Site 2. As shown in the Organization chart below, the RPCs are consisted of 3 tiers: RPC units, RPC (RPC 1 and 2) and RPC Union is each Site. Due to the administrative boundaries, the number of the villages and area to be covered by each RPC would vary. The villages in the Dowlat Abad Dehestan in site 2 may join the RPC in Site 1 because it belongs

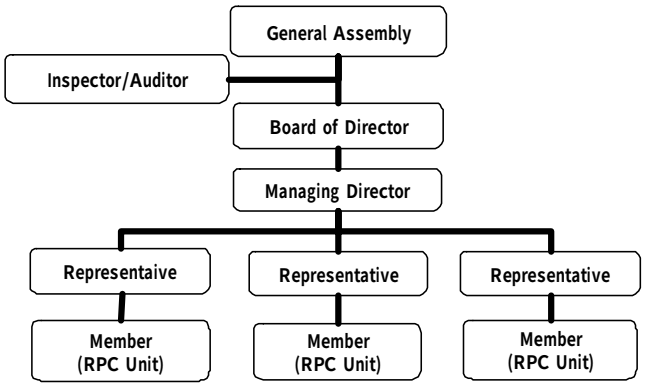
to the Ravansar Baksh like the rest of the villages in the Site 1. The group formation starts from the RPC unit level where the people in one villages or adjacent villages which have similar geographic, cultural, social and economic specification, can establish one RPC Unit.

The activities at the primary level of the RPC Unit would be to make coordination with the adjacent villages to exchange information, take collective actions for transporting agricultural products and inputs between the RPC and villages. The RPC Units The second level, that is, RPC 1 and RPC 2 will undertake the main activities such as the supply of agricultural inputs, extension services and the joint sales of agricultural products. Each RPC will have an office and storage for preserving agricultural inputs or products. It is proposed that the activities which are larger, collective and more costly including agricultural processing, mechanization and mechanic workshop, rural credit, and water management for irrigation be operated at the Union Level which will be implemented from the 5th year. The activities at the primary level of the RPC Unit would be to make coordination with the adjacent villages to exchange information, take collective actions for transporting agricultural products and inputs between the RPC and villages.

	Location and Covering Area		Responsible personnel	Function
	Site 1	Site 2		
RPC Unit	One to five 5 villages/dehs (Adjacent villages with similar geographic, social and economic conditions can form one RPC Unit)		One coordinator from each village	Coordination and information exchange between members • Extension and training • Land consolidation
RPC 1	Ravansar Dowlat Abad	Zalu Ab (3 units)	One Managing director Min. 5 Board members	• Inputs distribution • Joint sale of products • Extension and training • Mechanization
RPC 2	Hassan Abad	Kuzaran	1 Managing director Min. 5 Board members	
Union of RPC	RPC 1 + 2 Total 7,675 ha, 794farmers	RPC 1 + 2 Total 7,993 ha 800 farmers	1 Union Manager (directing manger of RPC 1 or 2) Coordination Committee (Board members of RPC 1 and 2)	• Agro-processing • Rural credit Fund • Water management and land consolidation

(2) Organizational Structure of RPCs

The responsible personals and the functions of each level of RPC are shown in the table above.



Proposed RPC Organization

Managing Director

Each RPC will have a managing director selected by and from the member farmers without the involvement of the government officials. Since the success of the RPC is in the hand of the managing director, he / she should be carefully selected with the consent of member farmers. Some of the important criteria for the managing director are as shown in the box (above).

Board of directors

The Board of Directors consists of a chairperson, a vice-chairperson, a secretary and the board members will be elected at the first general meeting of each RPC. Board of directors is the decision-maker and the legal representative of the RPC. Duties, authorities and responsibilities of the board of directors should be determined by the board meetings with the reference to the experiences of excising PRCs in Kermanshah Province.

Village representatives

A coordinator of the RPC should be selected from each village whose responsibilities are to coordinate activities between the RPC and village members, among the adjacent villages, and to take collective actions for transporting agricultural products and inputs between the RPC and villages. Thus a coordinator should be an active person who is familiar with the local culture and agriculture situation. One of the candidates for a coordinator is the contact farmers selected by the extension service centers.

Membership

Membership of the RPC should not be restricted to the farmers with the possession of land but be kept open to everyone who is 1) residing the Study Area and 2) ready to pay the admission fee of the RPC and the annual membership fee decided at the general meeting. This includes young generations or women without land registration.

Auditor

The role of an auditor are monitoring of articles of the cooperative, by-law, decision of the general meeting and to audit the financial affairs especially annual balance sheet and budget proposed by the board of directors and giving opinion about them 20 days before the annual general meeting.

Role of the government officials

A RPC expert from the Utilization System of KJAO should be stationed at each Extension Service Center (ESC) at the Dehestan Level. Particularly, the RPC expert needs to give advices on the financial management of the RPC for getting loans from the bank, checking the book record for the income and expense accrued from agricultural inputs and sales of products.

(3) Contents of RPC Development Plan

The RPCs as an Agricultural Service Provider undertake the following seven activities: Inputs Distribution, Mechanization and Extension and Training:

1) Inputs distribution plan

Currently the main agricultural problem of the farmers is the lack of timely and adequate supply of agricultural inputs. Thus, if this activity is executed at the level of RPC, by the scale smaller than the present volume of distribution by RCO or private companies, farmers will be obtained agricultural inputs with better timing and amount. RPCs takes loan from a bank for purchasing agricultural inputs and pays back within one year by collecting money from all the members. The following conditions will be applied to access to loan. As a distributor, the RPCs receive the government subsidies, the commission money will be accumulated in the RPC account to be used for other activities.

This activity will be conducted at each RPC, that is RPC (Hassan Abad) and RPC 2 (Dowlat Abad and Ravansar) in Site 1, and RPC in Zalu Ab and Kuzaran. To start a RPC, the inputs distribution will be the key service to be provided to the member framers.

Volume of Fertilizer to be distributed (ton)								
	RPC Union Site 1				RPC Union Site 1			
Year	Total	RPC-1-1	RPC-1-2	Member	Total	RPC-1-1	RPC-1-2	Member
Present	2,339	584.8	584.8	50%	2464	616.0	616.0	50%
3rd Year	3,195	798.8	798.8	70%	2,826	706.5	706.5	70%
5th Year	3,188	1,115.8	1,115.8	70%	2,764	967.4	967.4	70%
10th Year	3,188	1,594.0	1,594.0	100%	2,796	1398.0	1398.0	100%

The annual gross income, the joint inputs distribution commissions from Agriculture Supporting Company (ASC), can be estimated as follows in case of RPC1 in RPC Union Ravansar:

Year	Fertilizer (mill. Rls)	Chemical (mill. Rls)	Seeds (wheat) (mill. Rls)	Total Cost (mill. Rls)	Gross Income (mill. Rls.)
Commission Rate	6%	10%	3%	-	-
Present	234	188	41	462	34.1
3rd year	321	251	31	602	45.2
5th year	448	350	43.4	841	63.2
10th year	636	497.5	61.5	1,195	89.8

2) Mechanization

Access to agricultural machineries is one of the main agricultural problems of the Study Area not only because it is expensive, but also the supply is limited. In the Agricultural Development Plan, it is proposed that mechanization service company will be established in every 2,500 ha, i.e., 3 companies in Site 1 and 4 companies in Site 2. Share of newly supplied agricultural machinery for these companies will be 40 %, while the rest of 60 % will be supplied by individual farmers. In addition, RPCs can also supplement the supply of machineries to the members with the difficulty of access to machineries. One unit of 10 main machineries listed above table will be possessed by RPC. The Government should supply the machinery to the RPCs with the highest priority by allocating a large amount of subsidies. Total investment cost for this activity will be of machineries will be Rls. 308 million including the cost of the machineries for Rls. 198 million.

Machinery	Million Rls.
Heavy tractor	95.00
Light plow	3.65
Fertilizer sprayer	2.50
Seeder	35.21
Chemical sprayer	5.30
Thresher	1.35
Mower	6.50
Baler	45.50
Rake	2.85
Total	197.86

3) Extension and Training Plan

A RPC expert from KJAO Utilization System shall be stationed at each ESC at the dehestan level as an advisor of RPC. The RPC experts will be helpful to give advices on the financial management for getting loans from the bank, checking the bookkeeping of the RPC and agricultural technical advices. The involvement of RPC expert may be intensive in the beginning, but gradually withdraw from the RPC's activities. The agricultural training for the farmers and necessary technical advice, outside the specialty of expert, should be provided by the extension service center at the Dehestan. All the members of the RPC 1 and RPC 2 belong to the Union of RPC. The next three activities are related to the economic activities of RPCs,

namely, Joint Sales Plan, Agro-processing Plan and Rural Credit:

4) Joint Sales and Marketing Plan

In Study Area, farmers face the problems of selling their agricultural products timely and with a fair price. The guaranteed prices for maize and chickpea are set low and the market condition is so unfavorable to the farmers. In order to solve this problem, each RPC needs to act jointly to increasing their bargaining power. To initiate this activity, RPCs need to have a warehouse facility with simple facilities such as a sensor, damper and a fan to store the products of farmers to sell them when the market price is more advantageous. Joint sales of products will also decrease the cost of transportation. The handling charge of the sales of product should be accumulated in the RPC's account.

After a few years of operation, the joint sales of agriculture may be linked with the planned agricultural production. Researching of the market needs, the members of RPC buy a particular crop seeds jointly, cultivate the same product at the same season so that they can sell their products together at the most suitable time in the market.

5) Agro-Processing and Industry Plan

Activities at the Union Level

After the 5 years of operation, when each RPC complete the repayment of bank's loan for the machineries and storages. In order to gain more profits, the joint sales of agriculture would be linked to the agro-processing functions such as for (i) chickpea packing, (ii) wheat seed cleaning and storage facility and (iii) vegetable sorting (potato and onion).

i) Chickpea packing factory

With the increase of chickpea production with the implementation of chickpea production in the Development Study, there is a potential in the Study area to expand the chickpea processing industry. Given that the retailing prices of chickpea is Rls. 500/kg higher than the wholesale's price, the processing will be the benefit as the income is estimated below. To initiate this activity, the government has to give subsidies to the RPC Union with the favorable loan conditions with less primary capital and the longer repayment period. The initial capital is estimated to be Rls. 1,390 million for a 1,000 ton capacity of the chickpea and other pulse products packing facilities.

ii) Storage and cleaning facilities for wheat seeds

Since this year, cleaning, storage and sales of wheat seed can be handled by the RPCs. This will enable PRC's to

Chickpea Packing Factory (1,000 ton capacity)

Items	Price Million Rls.
Investment	
1)Machinereies	700
2) Building	300
3) Campus	50
4) land	10
5) Infrastructure (water, electricity etc)	150
6)Track	100
7)Facilities for research	30
8)office equipement	50
Total	1390
Annual running cost	
1) O&M cost (machine fix, fuel,	80
2)Manpower (manage, packing loading)	70.0
Total	150.0
Annual gross income	
1)Chickpea packing (1000 ton)	410
Total	410
Balance	
Cash income	410
Annual cost	150
Net income	260

Wheat seed cleaning and storage (2000m^2 land, 700m^2)

Items	Price Million Rls.
Investment	
1)Land	20
2) Storage building	210
3) Scale	80
4) Cleaning & disinfection facilities	370
5) Laboratory & seed control facilities	40
6) Laboratory building & Keepers' room	80
Total	800
Annual running cost	
1) O & M cost	40
2) Manpower (manage, packing loading, driver)	58
Total	98.0
Annual gross income	
1000 ton /year	150
Total	150
Balance	
Cash income	150
Annual cost	98.0
Net income	52

have access to better quality seeds for cultivation and also to increase the PRC's finance, As shown in the cost estimates below, the investment of the facilities cost more that 1,000 million and the annual running cost will be Rls. 82 million.

iii) Vegetable (potato and onion) grading and sorting facilities

With the increased production of potato and onion in the Site 1 since the 3rd year onwards, the vegetable grading and sorting facility will be benefit the farmers to sell their products directory to the retailers and not through the wholesalers. By installing the drying and cleaning facilities for the vegetable, it will be prevent the loss when selling to the retailers. Sorting and grading work will be done by the people, particularly selecting from the members without a permanent job.

Potato & Onion Grading Factory (1,000 ton capacity)

Items	Price Million Rls.
Investment	
1)Machinereies,building, land	600
2) Infrastructure (water, electricity etc)	40
Total	640
Annual running cost	
1) O&M cost (machine fix, fuel, electricity etc)	64
2)Manpower (management, packing loading)	86.0
Total	150.0
Annual gross income	
Vegetable Sorting	168
Total	168
Balance	
Cash income	168
Annual cost	150.0
Net income	18.0

6) Rural Credit Fund Plan

The basic function of rural credit fund is to make available the credit loans to the RPC members who have limited economic capacity and access to the formal loan schemes like that of Agricultural Bank. For the credit program, money is collected by the members at first and deposited in the Union's Fund. Then the collected money is used as the RPC's capital, made available to the member farmers with low interest rates. The ceiling amount of loan and the rate of interest should be decided by the Union. If there is any surplus amount in the fund (deposit exceed the saving), it can be used by the RPCs for investing on the new activities. Rural credit program is to be operated through the RPC Union. In case, it is difficult for the farmers to give the primary capital, needs to find the creditors to start the activities- for example, taking loan from a bank with the minimum interests and use as the revolving fund of the RPC. Rural credit should be made available particularly to the small farmers with the problems of purchasing agricultural inputs without loan.

Example of Rural Credit Scheme

Primary capital for credit	Total Amount of credit for Union	Interest rate	Ceiling amount for loan	Purpose of loan
Qursolhasane (3.5% interest)	Rls. 100 million	7 to 10 %	Rls. 5 million	Access to agricultural inputs, mechanization cost etc

7) Water Management and Land Consolidation Plan

The advantages of the land consolidation through the RPC are: (i) the area of consolidation can be larger regardless of the border of villages, (ii) the application and process of the land consolidation could be more efficient by a group of large number of farmers, rather than by not individuals, and (iii) better access to financial supports for undertaking land consolidation by the RPC. The Government subsidizes 70% of the total cost of land consolidation including the construction of canals, land leveling, and construction of farm road at on-farm level, also drilling wells for rainfed land and defining the cropping pattern. When the land consolidation is requested through RPCs, the members do not need to pay any primary capital when taking loan from the bank. With almost the same reasons, irrigation water management, namely, the use of irrigation canal, wells and river could be more efficient through the formulation of the

RPCs. The farmers of the left bank canal is expected to establish a Water Users Cooperative (WUC). Since the villages covered by the WUC and RPC belong to the same area, the collaboration should be made on the agricultural activities, particularly adjusting the cropping patterns for irrigated land.

(4) Promotion of RPCs by Farmers' Initiatives

In order to promote farmers' initiatives, the representatives of farmers, such as the members of Islamic Council and the contact farmers should be involved in the formation of RPC units from the very initial stage. The role of the Government staff is crucial in disseminating information on RPCs and encouraging village people to join the RPCs at the beginning. Not only the staff of KJAO Utilization System, but also the staff of extension service center and the District office of KJAO should actively take part in the promotion of the PRCs. All important decisions of the RPCs, including the selection of a managing director, should be made by the farmers themselves since it is the farmer-centered organization.

The Table below indicates the procedure of the PRC formation as well as the stakeholders to be involved in the formation. The following step-by-step procedure is proposed for the formation of RPCs in the Study Area:

Step	Activities	Main Actor	Participants
STEP 1 Introduction of RPC	**Step 1-1** Introductory Workshop on RPC at the Dehestan level	Utilizations system, District KJAO, Extension Center (ESC)	Representative farmers (e.g.) Islamic council, contact farmers
	Step 1-2 Village meeting on advantages and procedure on RPC formation	Representative farmers	farmers in each village Utilizations system ESC of the target area
1 -2nd month	**Step1-3** Hold several village meetings to decide whether to apply for RPC and what are the priority activities for RPC	Representative farmers	farmers in each village
STEP 2 Application for RPC	**Step 2-1** Application for RPCs by villages by selecting minimum 3 persons as a founder of the team.	Village representatives	Farmers -
	Step 2-2 Examination of the application (+study villages)	Utilization System District KJAO, ESC	-
	Step 2-3 Study visit to advanced RPCs by selected candidates	Utilization System District KJAO, ESC	Farmers interested in site study visit
	Step 2-4 Selection of Managing Director	Village representatives	-
3-4th month	**Step 2-5** Establishment of RPC at Dehestan level and Allocate RPC expert by KJAO	Utilization System District KJAO, ESC	village representatives
	Step2-6 Training for RPC Manager and RPC Expert	Private institutes (on management)	Managing Director RPC Expert
STEP 3 Formation of RPC	**Step3-1** First General Assembly to elect Board members	Managing director	RPC members RPC Expert (s)
5th month	**Step3-2** Formulation of Rules and Regulation. Collection of admission fee.	Managing director Board members	RPC members RPC Expert (s)
STEP 4 Registration	**Step4-1** Application to the district registration office	Managing director Board members	
6-7th month	**Step4-1** Publication in newspapers, Advertisement of the RPC establishment, introduction for the cooperative stamp	District Registration office	Managing director Board members

Start of the RPC Activities

(5) Annual Plan of Actives

When the registration of the RPCs will be completed after 6 to 7 months of preparation, the organization and its functions will be developed every one and then. The activities at the RPC Union will start from the 6th year. By this time, each RPC will have enough experiences on the cooperative activities. With the completion of repayment of the loan, the RPC will also become financially more viable and be ready to undertake Union's activities.

(6) Financial Operation of the RPC and PRC Union

1) Project Cost

The initial investment of an RPC in site 1 is Rls.1,397 Million and that of RPC union in the 6th year is Rls. 3,915 Million. The initial investment of an RPC in site 1 is Rls.1,397 Million and that of RPC union in the 6th year is Rls. 2,965 Million. Total Project cost of the Site 1 and Site 2 will be Rls. 20,905 million.

2) Financial Operation of RPCs

Each 4 RPCs in the Site 1 and Site 2 will start the operation with the (1) Inputs Distribution, (2) Mechanization, (3) Extension and Training, and (4) joint sales of products. In order to initiate this activity at the RPC level, the total investment cost will be 1,029 million. This excludes the cost of office equipment and the storage for the agricultural inputs which would be supplied by Government. Given the conditions by the Agriculture Bank (13.5% interest rate, 5 years repayment and 10% minimum primary capital), the members of a RPC has to prepare at least Rls.103 million. Assuming that about 200 families will join the RPC at the beginning, each member's share will be approximately Rls. 515,000. The balance of the RPC account is expected to be surplus from the sixth year when it completes the repayment of the loan. From the 6th year onwards, assuming that the activities of the RPC remain constant, the RPC will have Rls.88.5 million net income every year. With this income there would be a possibility for each RPC to expand activities on the joint sales, increasing machineries and as it is proposed, start agro-processing projects.

3) Financial Operation of RPC Unions

As for the RPC Union's activities from the 6th years onwards, the total cost of 3 facilities: (1) chickpea processing factory, (2) wheat seed cleaning and storage facility and (3) vegetable sorting facilities. The total investment and the operation and maintenance cost of the activities is shown in section 6.6.2 (1) later:

While the number of PRC Union is expected to be more than 550 persons in the 6th year of operation, the initial cost per member is indicated in the table below depending on the rate of interests:

Primary capital	Amount of primary capital	Per member (500 members)
10%	319	Rls. 0.58 million
20%	638	Rls.1.16 million
30%*	957	Rls. 1.91 million

* The normal condition for the rural industry project

In order to include the Agro-processing in the activities of RPC Union, the member farmers have to share , 0.58 million to 1.19 million as the primary cost of starting the agro-industry Depending on the banks' conditions. Installation of 30% of the total cost as a primary capital with 13.5-14% interest rate is the basic conditions to start a agro-processing industries. However, since the activity is conducted by the RPC, a better loan conditions should be provided by the government subsidies. If the member's capital alone cannot be sufficient for starting the activities, the financial support of the government or even the joint venture with the private investors should be encouraged. As in the existing case in Kangawar, the RPCs can collaborate with the private companies, investors and cooperatives to initiate a agro industrial project. RPCs will be the main supplier of the materials (i.e., agricultural products) to the factory on the contract basis and receive the discounted processing charge. The benefit is to be divided according to the share of the stocks by the RPC and the Investor.

(7) Relationship with other organizations

As there are several farmers' organizations exist in the Study Area apart from RPCs, the formation and promotion of proposed RPCs should be executed with taking the advantages of other Farmers' organizations exist in the Study Area including the existing RCOs, Cooperatives and possibly RDCs in the future. The table below indicates the relationship and involvement of the Farmers' organizations in the Study Area. The main roles of other Farmers' organizations in the Study Area are shown in the following table :

RCO:	Supplier of the basic services to farmers not only agricultural inputs but also living necessities. The majority of farmers in the study area belong to the existing RCOs. RCO's role on the distribution of inputs can be partly transferred to the RPCs in the Study Area.
RPC :	The main Farmers' organization to be promoted
Cooperatives:	Existing productive cooperatives can be linked with the activities of RPCs. Young men's and women's associations should be promoted as a lower branch of RPC.
RDC:	Functions of RDC is similar to that of RPC as both are the multi-purpose cooperatives aiming to achieve development of agriculture and rural livelihood. The main difference is that RDCs is registered under the Ministry of Cooperative and RPCs by the MOJA. Thus, instead of having two different cooperatives in on region, the proposed RPCs should cover the functions of RDCs with the focus on agriculture as well as rural development works such as rural infrastructure.

6.3 Agricultural Extension System Improvement Plan

6.3.1 Improvement of Agricultural Extension System

In order to strengthen the current agricultural extension system further by solving the problems faced by the extension service centers in the Study Area, the following suggestions should be taken into account.

(1) Increase Number of Extension Officials

1) Necessity of Strengthening of Human Resources, Facilities and Equipments

Given the workload of the staff of ESC, and the accessibility from ESC to the villages, the most ideal number to cover by one ESC would be around 40 villages. In case of Kuzaran, it covers 134 villages by only one ESC and the capacity of ESC has not at all been sufficient in

terms of human and physical resources. As it has been proposed by Kuzaran ESC to the KJAO, the extension services in Kuzaran Sub-district should be extended to 3 centers: Kuzaran, Zalu Ab and Haft Ashian, covering around 40 villages by each center. As far the Study Area is concerned, the proposed ESC in Zalu Ab will take the responsibility of the activities.

There are two centers in Ravansar Sub-district and the number of the villages covered is 60 villages for Ravansar and 37 villages for Hassan Abad. While the number of the villages covered is different, two centers are managing it by sharing the human and physical resources together. Thus, there is no need of having a new center. The proposed capacity of the ESCs will be as follows:

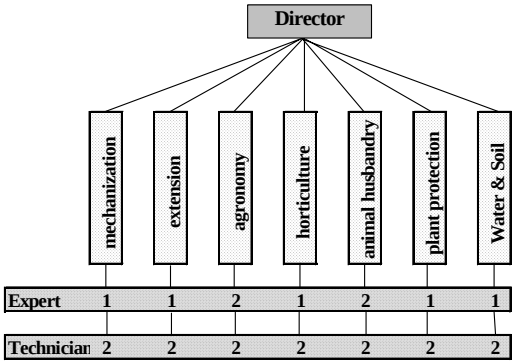
Proposed Capacity of Extension Service Center

Sub-district (Bakhsh)	Extension Service Center	Covering Dehestan	No. of villages covered	No. of villages in Study Area
Ravansar	Ravansar	Ravansar, Badr	60	11
	Hassan Abad	Hassan Abad	37	21
Kuzaran	*Zalu Ab	Sanjabi	40 +	25
	Kuzaran	Sanjabi /Haft Ashian	40 +	0
	*Haft Ashian	Haft Ashian	40 +	0

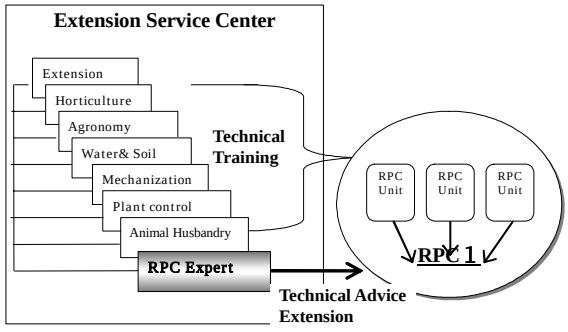
*proposed new centers

2) Allocation of Experts and Technicians in 7 Sectors

The basic condition of ESCs would be to have at least 7 main agricultural sectors with the allocation of experts in the related field. 7 Sectors include, mechanization, extension, agronomy, horticulture, animal husbandry, plant protection and soil & water. At present, due to the shortage of experts, one expert has to look after more than one sector even without enough knowledge. Among 7 sectors, 2 experts are needed for agronomy and animal husbandry. These two sectors need the most extensive extension compared with the rests.



Allocation of women experts is also necessary for the improved extension system. Within the proposed system of human resources, at least two female staff should be allocated to conduct training and extension especially for women farmers. Female extension workers should be women staffs as they are the area where the extension and training activities are the most needed. Furthermore, under each sector one technician should be allocated to assist the activities of the experts both in the office and in the filed.



In addition, as proposed in the Farmers' Organization Plan, one RPC expert dispatched

from the Utilization System of KJAO will be stationed in each ESC to monitor the activities at the RPC site. RPC expert is also responsible for the site inspection of members' farm activities, giving necessary technical advices and instructions. Particularly, the RPC expert needs to give support to RPC for getting loans from the bank, checking the accounting record for incomes and expenses accrued from the economic activities of the RPCs.

(2) Improvement of Facilities, Equipment and Materials

1) Required Facilities, Equipment and Materials

There are no sufficient facilities and equipments available in any of ESC in the Study Area. The following table summarizes the facilities, equipment and materials to be supplied in each ESC based on the discussion with the staff in the existing ESCs:

Facilities, Equipments and Materials required for each ESC

	Facilities, Equipment, Materials	Purpose
Facilities	1 training room	As a training, library and audio visual room
Equipments	1 overhead projector	For presentation
	2 Computers (1desktop, 1 laptop)	To access to internet For playing DVD, VCD, PowerPoint
	1 Digital camera	Recording of events and preparation of extension materials by computer
	1.Video camera	Recording of events, making extension film
	1 Projector	For presentation
	1 Photocopy machine	Photocopy extension materials to distribute to farmers
Materials	Monthly magazines (for all contact farmers)	At least one magazine for one contact farmer
	Technical books and instruction of agriculture	Books on the various types cropping, irrigation techniques, pesticides etc to be made available for staff and farmers

Both the staff of ESCs and the farmers in the Study Area will directly be benefited with the supply of above functions. For example, when there is no training, the training room can be utilized as the audio-visual-cum-study room and open to all the farmers covered by the ESC. Farmers will be able to freely visit the extension office to obtain new information through the extension-video, CD, or from the written materials.

2) Supply of Transportation

Lack of an appropriate means of transportation has been preventing the staff of ESCs from conducting extension activities in the villages timely and sufficiently. Based on the proposed ESCs with allocating experts and technicians in 7 Sections, at least one vehicle (4WD) should be supplied per one or two sections.

(3) Demarcation of the Works of ESC

1) Outsourcing of Agricultural Input Distribution Administration

As shown in the activity calendar of the ESC in the section 6.1, the staff of ESC spends 5 to 6 months of the year issuing permits for the agricultural inputs. These 5 to 6 months are the busiest time for the ESCs because it is the farming season and staffs have to go to the villages for extension works. Without removing this work from their duty, the staff cannot concentrate on the extension and training activities.

According to the staffs of ESCs, since the supply of agricultural inputs is limited, the

government needs to strictly control the issuance of permits for each farmer. For them, it is thus not as simple as to transfer this work to the private sector. In the study area, it is proposed that 4 RPCs (2 RPC Unions) to be formulated in Site 1 and Site 2 and they will handle not only distribution of inputs but also the issuance of permits. RPC experts should be responsible for asking the director of Extension Service Center to collectively issue the permission of inputs the RPC members can obtain. Transfer of this function from the ESCs to RPCs benefits both the staff ESCs and the farmers who will be able to receive their necessary inputs more timely.

The supply side has been improved from last year, as for instance the supply of fertilizer alone increased 60 % more: 77,000 ton in 2001 to 140,000 ton in 2002. Thus, the current tension of the government to strictly control the issuance will be more relaxed in the future.

2) Expansion of the Roles of Contact Farmers

A contact farmer can play a role not only as a coordinator between the government and farmers in the village, but also as a pioneer in the agricultural practices. At present, one contact farmer is assigned per village. In the proposed extension plan, two contact farmers are assigned and their farmlands are used as the demonstration farms. The contact farmers cultivate crops according to the given crop rotation under the management plan and conduct of collaboration with the experts of ESC, researchers of Research Center and staff of KJAO.

More active involvement of the female contact farmers should be considered. For this, one female farmer should be selected as a female contact farmer from each village. Since there are only a limited number of women's groups in the study area, the female contact farmers could be a focal point to disseminate information on agricultural extension to the women in the villages.

6.3.2 Agricultural Extension Plan and Training Programs of Farming

(1) Intentions of Extension Workers on Improvement of Extension and Curriculums

As results of the survey on activities of extension workers in the Ravansar Extension Service Center, Hassan Abad Extension Service Center and Kuzaran Extension Service Center (ESC), the intensions on improvement of extension activities and training programs for farmers in the Survey Area are summarized as following table.

Items	Additional Curriculum	Extension Method
Farming Technologies	Training on suitable cultivation of new crops and operating methods of new machinery. Setting up extension class on cultivation and facilities. Inviting lecturers from other provinces or states Soil management techniques including use of compost. Training of pulse cultivation.	Visiting to crop rotated farms Visit of contact farmers to successful farms. Exhibition of techniques in two demonstration farms in each Deh.
Hybrid cow Raising	Inviting lecturers from other provinces or states Improving present curriculum (feeding, hygiene, breeding, diseases, malnutrition (alfalfa))	Group training method. Visit of contact farmers to successful farms. Exhibition of techniques in two demonstration farms in each Deh.
Making Compost	Necessity of organic matter in soil Planning of storage, processing of manure to make useful compost, and mechanization	Exhibition of techniques in two demonstration farms in each Deh.
Plastic Greenhouse	Construction of green house and its components, and cultivation method	

Items	Additional Curriculum	Extension Method
RPCs	Establishing training class on RPCs	Visit to advance RPCs. Workshop, and showing films
Relationship of Extension Center with Research Center	Demonstration farms should be set up in each village in collaboration of extension center and Research Center.	

(2) Improvement Plan of Extension Activities of Extension Service Centers

1) Prerequisite Conditions of Improvement Plan

As mentioned above, number of extension staff in the ESCs, extension materials and official vehicles are in short to carry out the sufficient activities of extension at present. Therefore, as mentioned in the section of agricultural extension system improvement plan, it is indispensable to fill a vacancy of staff (specialists) in 7 sections at first, and to allocate two technicians to each section. Furthermore, it is required to allocate two specialists in the agronomy section and animal husbandry section. One specialist in these sections carries out the affaires in the ESC, and another specialist (visiting specialist), who makes his round of farmlands in his responsible area, performs extension activities in field to guide in farming for farmers. Especially, the visiting specialists cover also the demonstration farms during implementation of the Agricultural Development Plan. Besides, the contact farmer, which is one person in each village at present, should increase to 2 persons.

2) Extension Improvement Plan

Main extension improvement plans and their extension methods are as follows.

i) Establishment of demonstration farms

Two demonstration farms of agricultural farming and cow raising should be established in each village.

a) Demonstration farms of agricultural farming

Two contact farmers' farmlands are used as the demonstration farm. The contact farmers cultivate crops according to the given crop rotation under management plan and conduct of collaboration with visiting specialists of ESC, researchers of KARC and staff of KJAO. The demonstration farms are used to technical extension for farmers. Contents of demonstration are crop rotation system, production and use of compost, which makes from straw and cow's excrement, mechanization of various crops introduced in the development plan, post-harvest of these crops, etc.

b) Demonstration farms of livestock farming (cow raising)

Two contact farmers' stalls are used as the demonstration farm. The contact farmers raise cows according to the given methods of cow raising and compost production under management plan and conduct of collaboration with visiting specialists of ESC, researchers of KARC and staff of KJAO. The demonstration farms are used to technical extension for farmers. Contents of demonstration are structure of stall, location in village of stall, raising techniques of cow, hygienic management of stall and cow raising method, handling method of cow's excrement (compost production), production and use of compost, which makes from straw and cow's excrement, mechanized production of maize silage, mechanized hay production of alfalfa, etc.

ii) Extension Activities for Farmers

- Present extension activities should be continued after some improvements on information transfer. At present, farmers in the Study Area have not been received often the extension materials. This situation of information transfer should be improved in collaboration with RC, KJAO and ESC.
- Implementation of the Agricultural Development Plan involves the additional extension activities. Therefore, the visiting specialists of ESCs should lead the contact farmers to succeed farming in the demonstration farms in villages, and have consultations with farmers about various problems in their farming.
- It is important as one of extension methods to visit the advanced farms.
- ESCs will play an important role in process of establishment of new RPCs in the Study Area. Main role of ESCs is to gain the agreement of farmers on the establishment of RPCs and participation to new RPCs. To reach successfully an agreement, ESCs should carry out extension for farmers about advantages of participation to RPC, such as timely supplying of inputs by joint purchase, increase of profit by joint sale of products, joint sale of products in favorable time for sale by marketing research, increase of quality of products and standardization of products, annual planned production of individual farmer according to marketing, increase of values of products by processing, plan and management of irrigation water use, etc. Furthermore, ESCs may participate in organization of RPCs and selecting of suitable persons for executives.

iii) Support of KJAO and NRD

Most of the contents in the agricultural development plan are different from the customs in rural community or traditional farming. It is expected that extension to farmers and performance of the development plan will be very difficult. Therefore, it is necessary to support from every sections of research center, including socio-economic research section. Furthermore, it is desirable to transfer the results of researches and information related to the development plan from KARC to ESCs and farmers as spot news in collaboration with KJAO, in addition to joint trials and exhibition in demonstration farms. The researches are the base of success of the development plan.

iv) Support of foreign experts

Farmers in Iran have not mostly experience on production and use of compost, which composes of straw and animal excrements, and farmers' organization, especially RPC. It is considered that the foreign lecturers are better than Iranian lecturers for effective training for farmers on these subjects. It is recommendable to invite experts as lecturer from foreign countries, which have many results of researches on these subjects and fix in rural community as practices.

(3) Training Plan for Farmers

In addition to the present training classes, it is considered to add newly classes with the following subjects, such as crop rotation and its effectiveness, production and use of compost to improve soil, mechanization methods of various new crops, standardization and improvement of quality of vegetables, construction of plastic green house and cultivation of

vegetables in it, purposes and management of RPC, etc. Added curriculums are as follows.

Items	Curriculum
Farm management	1) Keeping accounts by each farmer
Mechanization	2) Making compost with manure and straws 3) Mechanized scattering method of compost
Farming techniques	4) Crop rotation 5) Use of compost and soil management 6) Suitable cultivation of new crops and operating methods of new machinery
Hybrid and Holstein cows raising	7) Making compost with manure and straws 8) Structure and frame of stall for Hybrid and Holstein cows 9) Location of stalls in village (for easier works with tractor and for public hygiene in village; for preventing environmental pollution by animal excrements)
Horticulture	10) Cultivation methods of rose for perfume 11) Cultivation of herb medicine trees
Plastic green house	12) Construction and components of green house 13) Vegetable cultivation in plastic green house
Training on RPCs	14) Necessity and purposes of RPC 15) Management of RPC 16) Marketing research and joint sale of products 17) Management of facilities in RPC 18) Finance management (included keeping accounts)

6.3.3 Capacity Building Plan in Extension Service Centers

The key factor to develop the extension system is to improve the human resources, namely, the staffs of ESCs. While giving technical supports to the farmers, the extension workers themselves also have to increase their competences and motivations through trainings. Despite a number of training courses available for the staffs of ESCs at national, provincial and district level, they could hardly make use of these opportunities due to the lack of staff at the ESCs and the difficulty to find the time for training. The training opportunities for extension staffs should also be increased with the improved extension system as proposed in the previous section. Based on the agricultural development plan proposed in the Study, the training for the extension staff may be categorized into two types: (1) technical trainings on agriculture and (2) trainings on farmers' organizations.

(1) Technical Trainings on Agriculture

1) Introduction of a New Concept

Since the implementation of the Agricultural Development Plan involves additional extension and training activities, it is the role of the extension workers to give guidance and technical assistance to the farmers. Therefore, the staffs of ESCs should receive adequate training on the new agricultural technologies proposed in the Agricultural Development Plan. The farming methods in the proposed plan are based on the new concepts, which do not exist in the social customs or traditions of the villages in the Study Area. Some of the new concepts include the production and use of composts by mixing straw and animal excrements and also the introduction of farmer-centered RPCs. It is a new concept which brings about the "sustainable farming" in rural areas. Some of these new technologies are not even

experienced by the researcher in KARC. Thus, not only the staffs of ESCs, but also the district, provincial officials and the researchers in KARC may need to take trainings on sustainable development.

2) Involvement of a Foreign Experts

Foreign experts on the short-term basis may be invited to conduct trainings on the farming methods proposed in the Agricultural Development Plan including agriculture, animal husbandry, mechanization, horticulture, bee-keeping and inland fishery. Foreign experts should be invited from a country with experiences of researches on these subjects and its result has been put into practice by rural communities. However, the farming methods and practices of a foreign country cannot be directly applied in the Iranian context. It is the role of the staffs in KJAO, KARC and ESCs to modify the farming methods into the given natural, social and cultural contexts in Iran and, transfer this new knowledge to the staffs of KJAO as well as farmers.

3) Necessity of Training for the Staff of KJAO, KARC and ESCs

For the implementation of Agriculture Development Plan, additional technical trainings to farmers were suggested in the previous section 6.3. These additional trainings should be also provided with staffs of KJAO, KARC and ESCs with necessary modifications. For example, the training for the staff of ESCs should focus not only on the technical aspects but also on the extension skills like communication with farmers. The staffs of KJAO should use these training opportunities to discuss the possible coordination among the different deputies and sections of KJAO towards a common goal of “sustainable agriculture. Finally, through the trainings, the researchers in KARC need to reexamine the relevance of sustainable farming, identify research subjects from the local contexts, collect a wide range of information such as from foreign countries, and the most importantly, improve the communication with farmers, with ESCs and with other sections of KARC. It would help the researchers to formulate a desirable research plan which integrate the voices of different levels of stakeholders involved in agriculture.

(2) Training on Farmers’ Organizations

The field performances of the extension workers depend on the good human relationship with the farmers. In order to build a good rapport with the village people, the staffs have to develop an attitude of learning from farmers rather than just teaching.

In the Farmers’ Organization Development Plan, the formation of farmer-centered RPC is proposed in the Study Area. Since the staffs of ESCs received little knowledge and skills to establish farmers’ organizations and groups, they did not actively create cooperatives in the past. To implement this RPC Plan, the extension workers need to build, develop and increase the farmer’s capacity through cooperation, sharing and working together. Followings are the possible trainings to be added in relation to the human relationship and the promotion of RPCs and Cooperatives:

1) Training on RPCs

There are no training courses for RPCs provided by MOJA. This is one of the reasons why the concept and advantages of RPCs are not well understood by the extension workers in the

Study Area. It is the responsibility of the Utilization System of KJAO to provide trainings or workshops on the RPCs in the Study Area. It should be noted that the concept of RPC proposed in the Development Plan is different from the existing conditions of RPCs in Kermanshah or any other part of Iran, thus the trainer from the Utilization System has to stress on the how different and how advantageous the proposed RPCs is from the existing ones. Particularly, the training should be emphasized on the profit making economic functions, market-oriented agricultural production, participation of the farmers in the decision making and involvement of women and youth in the RPCs. While the Utilization System is responsible for organizing the trainings, lecturers and trainers may be invited from the private sectors including foreign experts in cooperatives, business consultants, university staffs and facilitators from non-governmental organization.

2) Training on Cooperatives and Group Organization

Agricultural cooperatives are registered by the Ministry of Cooperatives (MOC). However, the supervision and training of the cooperatives are conducted both by the staffs of the District Cooperative Office as well as the staff of ESCs. Since the staffs of the ESCs are more familiar with the local people through the agricultural extension, their involvement in training and technical advices are inevitable. In the RPC development plan, it is proposed that the formation of small cooperatives as the lower branch of RPC should be promoted in order to foster the entrepreneurs from young generations or women's groups. In the Site 1, the new Left Bank Irrigation canal is under construction. The proposed RPC union in the Site 1 could be a mother organization if the Water Users Cooperative (WUC) which main functions dose not focusing profit generation, will be formed by the beneficiary farmers in the Site 1.

Followings are the training curriculum for the proposed the promotion of RPCs, cooperatives and group formations in general:

<u>Training on RPCs</u>

1. History of RPC development and the new concept of farmers' organizations
2. Cooperatives in other countries*
3. Visit of advanced RPCs (national, provincial)
4. Identification of leadership and formation of RPC units at the community level*
5. Understanding the structures, by-law, rules of RPCs in the Study Area
6. Marketing research and information*
7. Planning of market-oriented agricultural production*
8. Finance management (included bookkeeping)*
9. Management of facilities in RPC

<u>Training on Cooperatives</u>

1. Role of women and youth in farmers' organizations*
2. Development of Cooperatives and RDCs*
3. Irrigation water management through Water Users Cooperatives (WUC)

<u>Training on Group Organizations (additional curriculum to the existing ones)</u>

1. Skill development in conflict-resolution, negotiation and persuasive communication*
2. Sensitivity analysis on the different social groups (gender, disadvantaged, tribes) *

* To be provided by resource persons outside the MOJA

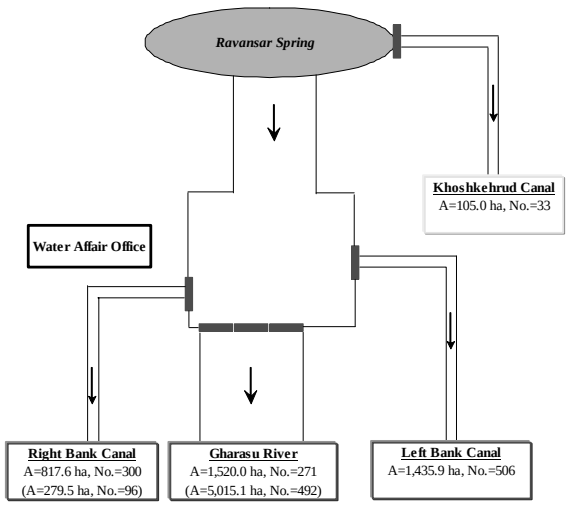
6.4 Improvement Plan of Ravansar Irrigation Canal Management and On-Farm Water Management System

6.4.1 Irrigation System Improvement Plan

(1) Stakeholders of the Ravansar Spring and Its Past Details

Stakeholders of the Ravansar spring can be divided into four areas such as Khoshkehrud irrigation canal which takes the water from the Ravansar spring directly, left bank irrigation canal and right bank irrigation canal which distributes the water from diversion weir, which is located at approximately 1.0 km downstream from the Ravansar spring and an area where the irrigation water is pumped up from the Gharasu River directly. According to the registered list of water right holding area from KWA, the water right holding area of each system is shown in Table 3.5.3. The total registered area of the Khoshkehrud irrigation canal is 105.0 ha, the right bank irrigation canal is 817.6 ha, the registered area of the left bank irrigation canal is 1,435.9 ha. On the other hand, the total registered area of direct intake from the Gharasu River is 5,015.1 ha. Out of the total area, the area depending on the Ravansar diversion weir will be upstream of the point that the Mereg River joins with the Gharasu River at the downstream of Doab village. It is presumed that the area is 1,520.0 ha. On the other hand, the irrigation area of the right bank irrigation canal is registered as 817.6 ha. However, seven villages which are located at the downstream of Tam Tam, could not receive any irrigation water for some year before 1999. Then, these villages have decided to dig deep wells for the purpose of irrigation near their farm land. As a result, these villages have withdrawn from the right bank irrigation canal users in 1999. Therefore, existing irrigation area where the irrigation water depends on the right bank irrigation canal is 279.5 ha according to the report by the right bank WUC.

Irrigation Networks Related to the Ravansar Spring



Remarks:
Area and number of Right bank canal is information on the water right holders in the list of WA.
( ) of Right bank canal is actual information on the water right holders.
Area and number of the Gharasu River is information on the water right holders till Doab village.
( ) of the Gharasu River is information on the water right holders in the list of WA.

These canals were constructed approximately 60 years ago. 10 km of the concrete lining of the right bank irrigation canal out of 14 km has been carried out until 1995 and the left bank irrigation canal is under the implementation. The implementation of the left bank irrigation canal such as concrete lining and intake facilities etc. is going to be finished in 2004. As for the water distribution, big landlords have decided the water distribution rule at beginning. After the land distribution which has been done after the revolution, *Mir-ab* were employed by Water Affairs and *Mir-ab* has managed water distribution at each turnout based on a rule which has been decided by a discussion with farmers. However, this system has been abolished 3 years ago in order to encourage the farmers' participation to the water distribution management because the farmers have left the water management to *Mir-ab* completely and they have not done anything. Although the farmers understand the importance of task of *Mir-ab*, they do not manage the water distribution by themselves at present. Therefore, the water distribution management is not carried out now. The Water Utilization and distribution company has been collecting penalties in case that illegal water use has been found by their study.

Under the condition, unfair situation of excess and illegal water use are carried out at the upstream of the project and the irrigation water can not reach the downstream side. The farmers at downstream side sometimes made efforts to remove the excess water use and the illegal water use asking for police or military's help. However, the situation has not been improved at all. The situation became serious because of leakage caused by lack of management on the canal at present.

(2) Discharge of the Gharasu River at Ravansar Diversion Weir

Discharge of the left and the right bank irrigation canal, releasing volume of the Gharasu River are observed at the Ravansar diversion weir. Unfortunately discharge of the Khoshkerud irrigation canal is not observed. So, total volume that is applicable to agricultural activity can not be clarified out of spring volume of the Ravansar spring. Therefore, following examination will be implemented except the beneficial area of Khoshkerud canal. According to discharge data from 1976 to 1980 and from 1987 to1998, the average discharge which has been taken from each canal and river is 86.1 million cubic meters (MCM). Monthly average of intake volume as shown in the following table:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
(m^3/sec)	59.2	91.9	165.3	183.5	141.3	88.4	66.5	50.4	36.0	30.7	35.8	47.0	996.0
(MCM)	5.1	7.9	14.3	15.9	12.2	7.6	5.7	4.4	3.1	2.7	3.1	4.1	86.1

Source: MOE in Tehran

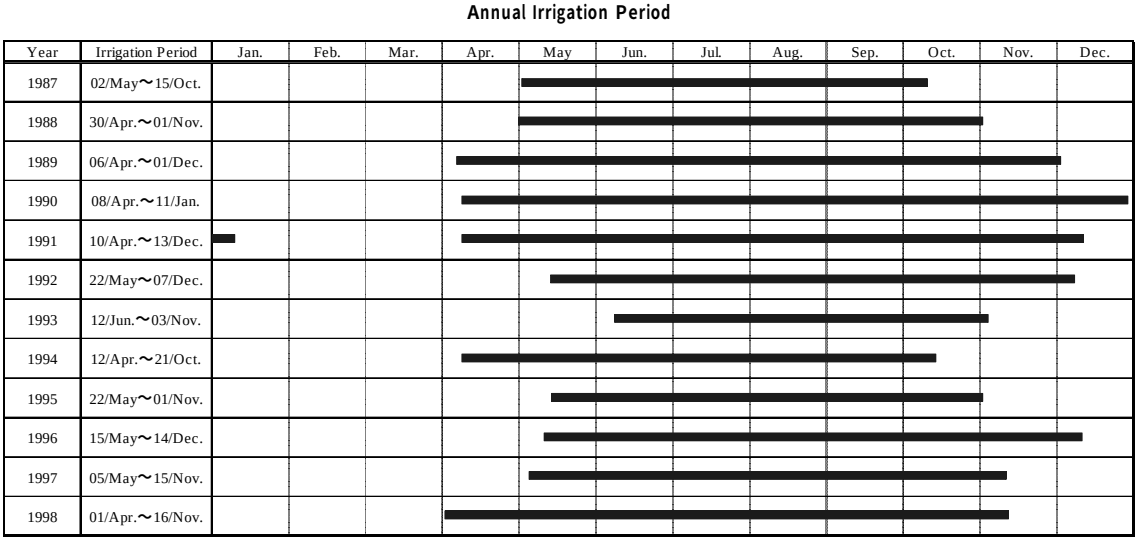
According to the data, total volume from May to October which irrigation is necessary for maize, is 35.7 MCM.

(3) Present Water Distribution to Irrigation Systems

As stated previous section, the water distribution management is not done at present. Especially, there is illegal intake and excess water use by farmers at upstream side. The situation of water distribution management of the Ravansar diversion weir is discussed in this subsection.

1) Irrigation period

Based on the observed intake data of the right bank canal and the left bank canal and also discharge data of the Gharasu River which were provided by the MOE, the irrigation period from 1987 to 1998 were verified. The irrigation period of each year is shown as follows:

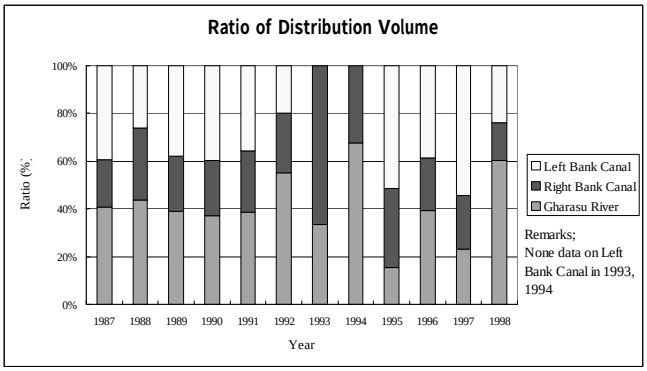


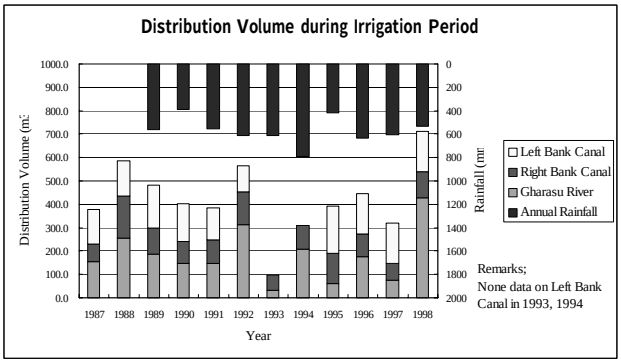
As shown above, the beginning of irrigation period and the end of irrigation period are quite different every year. It seems that a regulation of the irrigation period is not decided yet. On the other hand, relation between rainfall and the irrigation period of each year is arranged to clarify an influence of the rain to the irrigation period at each year. The results are shown in Fig. 6.4.1. At a glance, it seems that the irrigation period was decided by the condition of the rainfall. However, the irrigation was started from the period with rainfall which was more than 50 mm at some year and the irrigation was started from a time which one month passed after end of the rainfall at some year. And the end of irrigation period was also terminated after getting enough water at some year, or the period was terminated without enough rainfall. So, it is very difficult to say that the irrigation period is decided based on a fixed regulation.

According to a person in charge of the gate operation actually, there is no regulation to operate the diversion gate. Based on a request of farmers to open and close the gate, the irrigation period will be started and also finished. The main problem is that the farmer, who requests to start or finish the irrigation, will go to the office of WA without consensus of all farmers concerning the canal. They will request the matter based on the agreement of only one village or with neighbor village only.

2) Diversion Ratio of Each Canal and the Gharasu River

Based on the data stated above, the irrigation water volume and diversion ratio of each canal and the Gharasu River were prepared as shown in the figure.





As shown in the above figure, irrigation water volumes are different every year. It is natural result because the irrigation water volume is influenced by the spring volume of the Ravansar spring. However, the diversion ratio is also so different. (As for the data in 1993 and 1994, there is no data in the left bank canal. So, the figure shows that the diversion ratio of the right bank canal and the Gharasu River.)

Originally, since water fee has been collected from registered farmers as irrigation area of each canal and the Gharasu River, the diversion gate should be operated based on a ratio of registered area of each canal and the Gharasu River. Therefore, diversion volume may change every year but diversion ratio should be almost the same. However, it is very clear that above stated operation has not been carried out according to the above figure.

The gate of the left bank canal has been closed approximately 80 % on the end of July when this verification was carried out. According to a comment of a farmer who walked near the gate, “We need to irrigate the water for maize at present, however, the gate was closed by a staff of WA.” The same matter was asked to a staff of WA. The staff said ‘’We closed the gate

80 % in compliance with the wishes of farmers who are harvesting wheat and they are afraid of overflow the water from the canal to a field where harvesting work is carried out or ready to harvest the wheat."

This is typical example of present situation. The operation of the gate during the irrigation period is decided in compliance with the wishes of farmers like the decision of irrigation period. It is clear that an agreement of all farmers concerned is needed.

From the result of these verifications, the regulation on operation and maintenance of the Ravansar diversion weir should be decided and the regulation should be carried out by the staff of WA before encouraging the optimum water use to farmers.

(4) Basic Concepts of Water Distribution to Irrigation Systems

According to the registered list of water right holding area from provincial WA in Kermanshah, the water right holding area of the right bank canal, the left bank canal and direct intake of the Gharasu River are shown in Table 3.5.3. The total registered area of the right bank canal is 279.5 ha, the registered area of the left bank canal is 1,435.9 ha. On the other hand, the registered area of direct intake of the Gharasu River is 5,015.1 ha as total. Out of the total area, the area depending on the Ravansar diversion weir will be upstream of the point that the Mereg River joins with the Gharasu River at downstream of Doab village. It is presumed that the area is 1,520.0 ha. Based on these areas, it is estimated that the diversion ratio for the right bank canal, the left bank canal and the Gharasu River will be 8.6 %, 44.4 % and 47.0 % respectively. The water distribution to irrigation systems should be carried out based on above stated ratio. As for the irrigation period, the condition of rainfall will be change but the irrigation should be from the end of March to the end of December based on crop water requirements of proposed cropping patterns. However, if all stakeholders can be gathering to discuss and making a decision on the irrigation period and water distribution, and ratios to irrigation systems of each year based on cropping patterns which the farmers selects, this decision can be made after the establishment of WUCs.

(5) Irrigation Water Requirement and Irrigable Area

1) Probable year

Probability of non-exceedance regarding the annual rainfall and probable non-rainy days were calculated. Return period five years is employed to design the proposed project as the drought year. The result of calculation will almost be equivalent to rainfall and non-rainy days in 1995. So, actual data in 1995 is employed to estimate several items on the water balance. Results of calculation on probability of non-exceedance regarding the annual rainfall and probable non-rainy days with return period of five years are as follows;

Observatories	Annual Rainfall (mm)			Non-rainy days (days)		
	Calculated	Adapted		Calculated	Adapted	
		Volume	Year		Volume	Year
Javanrood	492.2	480.0	’94,’99	315		
Bonchale	434.5	455.0	‘01	321		
Ravansar	415.3	414.8	‘95	298	298	‘01
Varmohang	511.0	493.6	‘95	299	300	‘91
Jelogireh	408.4			322	319	‘95
Gahvareh	401.9	389.5	‘01	309	310	‘95

2) Areal rainfall

As stated in the previous section, Thiessen Polygon was delineated and average annual rainfall in the study area has been estimated based on actual data at selected observatories in 1995. The areal rainfalls are as follows;

Unit; mm/month

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
35.0	57.0	73.9	101.2	70.5	10.6	0.0	0.0	0.0	1.9	24.5	8.5	383.1

3) Cropping Pattern

Five cropping patterns are recommended for the project. One is for rainfed area. Two cropping patterns are for the area, which can receive the irrigation water only in spring season taking into account the irrigable land holding area of less than 5 ha and more than 5 ha. Remaining two cropping patterns are for the area where can receive the irrigation water all season taking into account of the irrigable land holding area of less than 5 ha. These cropping patterns are discussed in the section of 'Integrated agricultural development plan.

4) Potential Evapo-transpiration

Potential evapo-transpiration (ETo) in the Study Area is estimated by the Penmen Monteith method using monthly meteorological data of Ravansar meteorological station based on present cropping pattern. The ETo are estimated as follows;

Unit: mm/day

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
0.87	1.26	2.21	3.51	5.33	7.73	9.67	9.16	7.03	4.27	1.84	1.03

Details of the calculation on ETo is shown in Table 3.5.1.

5) Crop Coefficient

Recommended crops in the proposed cropping patterns are maize, maize for silage, sugar beet and vegetables such as potato, tomato, onion as the summer crop and wheat, rape in the winter crop. Coriander and chick pea are recommended for the spring season and alfalfa is selected as a feed crop. Since the crop coefficient varies with kind of crops, planting season and period of crop growth, the crop coefficients of the proposed crops are made referring to "An Estimate of Water Requirement of Main Field Crops and Orchards in Iran" mainly. However, in case of coriander and rape, it can not be found in Iranian standard, and hence data of "Crop Water Requirements, FAO Irrigation and Drainage Paper No. 56" is used.

6) Effective Rainfall

The effective rainfall is estimated on a monthly basis based on the actual data in 1995.

7) Overall Irrigation Efficiency

Overall irrigation efficiency consists of conveyance, canal and field application efficiencies. Conveyance efficiency of the proposed project is assumed as 90 %, because the water distribution management will be carried out satisfactorily, and canal efficiency is assumed as 85 % because irrigation blocks which is more than 20 ha and less than 20 ha, will be mixed and canal will be covered by concrete. Field application efficiency will be 67 % because 80 % of the efficiency will be improved by the implementation of the land consolidation. Overall irrigation efficiency is assumed as 51 % for the development plan.

8) Seasonal Irrigation Water Requirements

Table 6.4.1 shows the seasonal irrigation water requirements of cropping pattern 2, as a sample (details are shown in ANNEX 3). Seasonal irrigation requirements are summarized below:

Unit: mm/day

Cropping pattern	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Pattern2	0.2	0.2	0.5	1.5	6.4	9.1	3.8	0.0	0.0	0.0	0.0	0.5
Pattern3	0.2	0.2	0.5	1.5	6.3	8.4	2.6	0.0	0.0	0.0	0.0	0.5
Pattern4	0.2	0.2	0.5	1.5	5.4	9.6	12.0	13.4	9.9	4.7	2.4	0.5
Pattern5	0.2	0.2	0.5	1.5	5.4	9.3	11.8	13.4	10.3	4.9	2.4	0.5

Ratio of the land owner between less than 5 ha and more than 5 ha, are estimated for each canal and river respectively based on the list of water right holders prepared by KPWA. They are summarized as follows:

	More than 5 ha		Less than 5 ha		Total	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Left bank canal	439.8	30.6	996.1	69.4	1,435.9	100.0
Right bank canal	101.3	36.2	178.2	63.8	279.5	100.0
Gharasu River	1,064.2	70.0	455.8	30.0	1,520.0	100.0

According to the above ratios, irrigation water requirements of irrigation patterns for spring irrigation and all season irrigation on each canal and river are estimated as follows:

Unit: mm/day

Irrig. pattern	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Left bank												
Spring	0.2	0.2	0.5	1.5	6.4	8.9	3.4	0.0	0.0	0.0	0.0	0.5
All season	0.2	0.2	0.5	1.1	5.4	9.5	11.9	13.4	10.0	4.8	2.4	0.5
Right bank												
Spring	0.2	0.2	0.5	1.5	6.4	8.8	3.4	0.0	0.0	0.0	0.0	0.5
All season	0.2	0.2	0.5	1.1	5.4	9.5	11.9	13.4	10.0	4.8	2.4	0.5
Gharasu River												
Spring	0.2	0.2	0.5	1.5	6.3	8.6	3.0	0.0	0.0	0.0	0.0	0.5
All season	0.2	0.2	0.5	1.1	5.4	9.4	11.9	13.4	10.2	4.8	2.4	0.5

9) Irrigable area based on the presumed diversion ratio

An irrigable area is estimated based on the presumed diversion ratio using the observed data from 1987 to 1998 at the Ravansar diversion weir. The cropping pattern consists of a cropping pattern which is necessary to irrigate during spring season only and a cropping pattern which is necessary to irrigate during summer. In the calculation, the irrigable area for the cropping pattern which is necessary to irrigate during summer is decided at first. After that, the irrigable area for the cropping pattern which is necessary to irrigate during spring season only by surplus water, is estimated. On the other hand, the design discharges of each canal were employed as a maximum intake volume of the right bank and the left bank canal such as 1.5 m^3/sec and 2.2 m^3/sec.

Based on the estimation for 10 years with complete data, the registered area could be irrigated in 1992 only for both canal and the Gharasu River. Therefore, it can be said that the registered area is an excess against the possible water resource volume. The farmer pays some amount of water fee for non-irrigable farmland at present. It is so irrational for the farmer. The optimum irrigation area against water resource should be calculated and the irrigable area should be identified in order to correct appropriate water fee.

Results of the calculation are shown in Fig. 6.4.2. According to the average irrigable area for 10 years, the suitable irrigable area against water resource is 181.6 ha for the right bank canal, 933.4 ha for the left bank canal and 1,036.0 ha for direct intake from the Gharasu River. In accordance with the result of estimation, it is necessary to modify the registered water right holding area as follows: In case of the right bank canal, the area is reduced from 279.5 ha to 181.6 ha (-97.9 ha). On the left bank canal, it is reduced from 1,435.9 ha to 933.4 ha (-502.5 ha) and the direct intake from the Gharasu River is reduced from 1,520.0 ha to 1,036.0 ha (-484.0 ha). The return flow to the river is not considered in the calculation, and the area of the direct intake from the Gharasu River may be increase. However, it is very difficult to assume the return flow volume to the river and hence, the return flow is not considered.

On the other hand, according to the average for 10 years, it can be presumed that the ratio between the cropping pattern which is necessary to irrigate during spring season only and the cropping pattern which is necessary to irrigate during summer, will be 60 % and 40 % respectively for the right and left bank canal. In case of the direct intake of the Gharasu River, it will be 62 % and 38 % respectively.

(6) Water Distribution Plan in Normal Years

It can be considered that the proper diversion ratio for the right bank canal, the left bank canal and the Gharasu River will be 8.6 %, 44.4 % and 47.0 % respectively. A diversion facility with double standard of gate with a width of 1.4 m and height of 1.6 m was set up at beginning of the right bank canal and a gate with a width of 2.04 m and height of 1.05 m was set up at beginning of the left bank canal. And for the Gharasu River, a diversion facility with triple standard gate with a width of 2.56 m and height of 2.25m was set up.

The discharge control by such different width of gates might be quite difficult for a person in charge. For example, if gates whose widths are adapted to the diversion ratio can be reset up and gates are opened with same height, water can be flown under the fixed diversion ratio naturally. The operation must be easy for the person in charge.

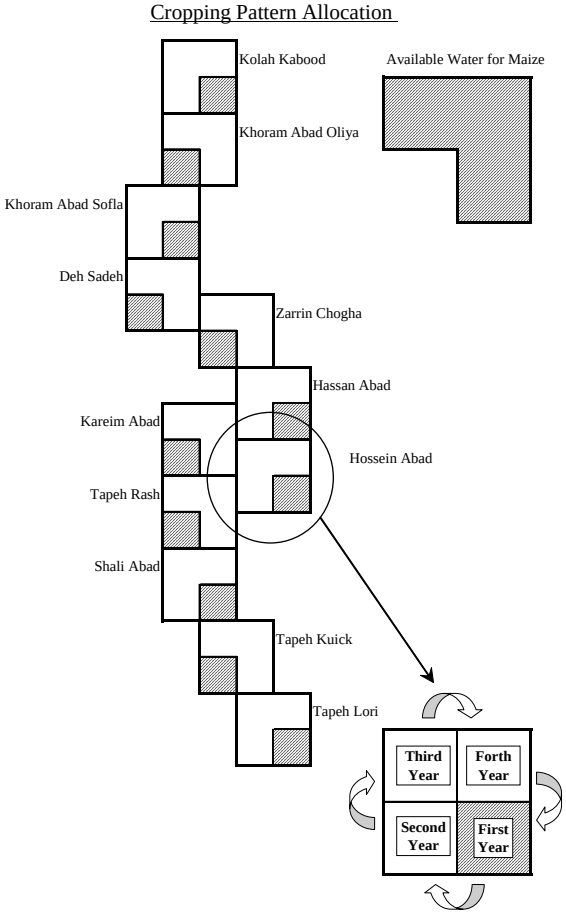
On the other hand, elevations of canal bed at beginning of the right bank canal, the left bank canal and the Gharasu River are EL = 3,040.42 m, EL = 3,040.44 m and EL = 3,039.40 m respectively according to the result of the topographical survey. Elevations of the right bank canal and the left bank canal are almost same. So, open heights of gates for the right bank canal and the left bank canal can be simulated easily. According to above stated irrigable areas, diversion requirements of the right bank canal and the left bank canal are 0.19 m^3/sec. and 0.99 m^3/sec. respectively. And longitudinal slopes of each canal are 1 to 2,500 at the right bank canal and 1 to 1,000 at the left bank canal. Section of the right bank canal is 1.30 m

width, 1.30 m depth and side slope is 1 to 1.5. Section of the left bank canal is 2.00 m width, 1.60 m depth and side slope is vertical. Under the condition, open height of the gate at beginning of the right bank canal and the left bank canal for normal years were estimated as 0.26 m and 0.49 m respectively using the manning formula. Remaining water can be flown into the Gharasu River. However, according to the result of topographical survey, opposite slope was found from beginning to approximately 300m point of the right bank canal. So, this interval should be checked and be modified.

(7) Water Distribution in Drought Year

Several rules can be considered as water distribution rule in drought year. Alternatives are as follows:

1) A priority system of the four cropping patterns shall be selected. The irrigation water shall be delivered to the priority system in first drought year and shall be changed on a rotational basis in the drought years.
2) The irrigation water is delivered to each system based on above stated ratio. Some priority block is selected in each system. The irrigation water shall be delivered to the priority block of each system only. The priority block will be changed on a rotational basis in the drought years.
3) The irrigation water shall be delivered to each system based on above stated ratio. Also, the irrigation water shall be delivered to all blocks in each system. A priority area shall be selected in each block and the irrigation water shall be delivered to the priority area only in the block. The priority area in the village will be changed on a rotational basis in the drought years.



These alternatives were explained in a workshop with representatives of villages which are located in Left Bank Irrigation Scheme area. Some discussion has been held among farmers in the workshop. As a result of discussion, alternative-3) was selected as an acceptable rule for the farmers. After making decision of the rule, all representatives of the villages have felt difficulty of operation and monitoring of the rule. However, these farmers have to establish acceptable way of operation and monitoring of the rule by themselves with help of governmental officers in order to realize proper water distribution under the condition of optimum water use. It will be the main agenda of WUC in future.

According to the 'Study on Chemical and Organic Fertilizers and Recommendations for Sustainable Agriculture of Wheat (2001)' by the Soil and Water Research Organization of MOJA, 50% of the maximum yield (8 t/ha) can be attained in Kermanshah district, by

supplying 20% of the required amount of water use, while the other inputs such as fertilizers are supplied at the optimum level; however, this data should be verified for the Study Area. The irrigation plan mentioned in this report strictly considers the water requirement during the entire growth period for attaining the maximum yield. In case of normal years, irrigation shall be carried out according to the irrigation plan. However, when there is a limited amount of water during drought period, supplemental irrigation shall be considered to distribute the water to more area.

(8) Diversion Weir Operation during Flood

Excess water will flow into the canal from field or mountainous area during the flood. If water supply for the irrigation is carried out continuously during flood, excess water will overflow into fields and serious problem will occur for the crop cultivation. So, the main gates of the right and left bank canal at the diversion weir should be closed and gates of the Gharasu River should be opened completely. Also, all turnouts of secondary canals should be opened, otherwise serious problem may be occur by excess water flow into canal during flood.

6.4.2 Irrigation and Drainage Facilities and Land Consolidation Plan

(1) Ravansar Diversion Weir

The Ravansar diversion weir is located at approximately 1.0 km downstream from the Ravansar spring. A small lake with many grass growth is formed behind the diversion weir. The weir has been made by wet masonry. A diversion facility with double standard of gate with a width of 1.4 m and height of 1.6 m is set up at beginning of the right bank canal and a gate with a width of 2.04 m and height of 1.05 m is set up at beginning of the left bank canal. And for the Gharasu River, a diversion facility with triple standard of gate which width is 2.56 m and height is 2.25m is set up. According to WA, rehabilitation has been carried out this year. However, only painting seems to be carried out actually. Facilities of the diversion weir are not critical situation at present and it is not necessary to rehabilitate immediately. As stated in the previous section, gate operation has been carried out based on farmer’s request without any official rule. So, many problems have occurred under the situation.

The proper water distribution will be carried out in future based on the distribution rule which are stated in the previous section. Some measurement tool should be installed to evaluate or check water distribution volumes for each stakeholder. Some numbers of staff gauges are installed along the right bank and the left bank canal at present. Discharges of the left, right bank canal and the Gharasu River have been observed even once per month, which is not sufficient especially during summer season since the spring volume will reduce day by day. So, observation work should be carried out every day. Additionally, H-Q curve of each canal should be checked by current mater at least once per year. On the other hand, the results of distribution can be found by these observation works. However, the amount of available water volume at diversion weir can not be grasped. A gauging station should be established at the upstream of the diversion weir. There is a suitable place to establish the gauging station located at approximately 130 m to 330 m downstream of the Ravansar Spring. The wet masonry walls are constructed on both the sides of the river, so shape is rectangle. It is easy to estimate the H-Q curve after clean up the river bed.

(2) Main Irrigation Facilities on the Left Bank Canal

1) Peak Water Requirement

As stated in the previous section, the ratio between the cropping pattern which is necessary to irrigate during spring season only and the cropping pattern which is necessary to irrigate during summer, are 60 % and 40 % respectively for the left bank canal. The peak water requirement is estimated based on ratios. The peak water requirement of the left bank canal is 9.14 mm/day on June. Since present irrigation time is 24 hours, 24 hours of irrigation time is proposed. So, unit peak discharge of the canals are 1.06 lit./sec/ha.

2) New Main Irrigation Canal under the Construction

According to the information of KPWA, the total canal length of new main canal is approximately 18.0 km. Wet masonry rectangle canal has been designed from beginning to 3.5 km. Section size of the canal is 2.00 m×1.50 m. Trapezoidal concrete lining canal with 1:2.0 side slope has been selected from 3.5 km to the end. Bed width and height of canals are 0.90 m×1.10 m from 3.5 km to 12.0 km and 0.70 m×0.90 m from 12.0 km to the end. Design discharge of the new main canal is at 2.20m^3/sec including free board at beginning. This volume is equivalent to water requirement volume for approximately 2,560 ha of farm land. However, as stated in the previous section, irrigable area in the average year is only 933.4 ha. It can be said that 2,560 ha can be irrigated by the main canal if water is available.

On the other hand, flood water will flow into the main canal from mountainous area during rainy season. Since the new main canal is set deeply in the excavated elevation, especially, in the area between Khoram Abad Oliya village and Hassan Abad village. And also, this flood water cannot drain till a turnout of secondary canal. It needs to install the drain near the turnout of secondary canal.

3) Newly Proposed Secondary Canal Alignment

Design of proposed secondary canals has been completed already by KPWA of MOE. 23 turnouts of secondary canals were designed previously according to the design plan which was received from consulting company by the Study Team. This consultant is in charge of supervision of the implementation. However, according to final design, the numbers of turnouts are reduced to 10 places. Reasons of the modification could not be clarified by the Study Team during the reporting period, even though the Study Team requested for the meeting with the person in charge of the design in KPWA by an official letter through the Soil and Water Department of KJAO. According to some interview and discussion with farmers, farmers can not understand this modification, and they are not informed any plan of secondary canals to be constructed. On the other hand, the present irrigation network survey on the Left Bank Canal was carried out with former *Mir-ab* during the Study period. Results of survey are shown in Fig. 6.4.3. Proposed irrigation network of new secondary and tertiary canals also could be received through the Soil and Water Department of KJAO. The proposed irrigation network design did not consider the present irrigation network system, border of villages and topographic conditions at some places. There is no irrigation network whose area is located across a boundary of villages in the present irrigation network. Based on the present

design, some irrigation network can not be irrigated as shown in Fig. 6.4.4. Present plan of secondary canal alignment and turnout arrangements shall be informed in the public consultation to the beneficiaries/farmers to avoid the problems during construction. The Study Team recommends the plan of irrigation network for new irrigation system based on the present irrigation network for the modification as shown in Fig. 6.4.5.

Since the land consolidation needs to be carried out for the optimum water use, the areas in the figure are reduced by 3 % as the area for irrigation and drainage canals and farm roads. According to the cadastral map, present water right holding area is 1,305.1 ha in the Left Bank Canal area. This area might be different with area of registered water right list. If this area is correct, as stated in the previous section, 371.7 ha out of 1,305.1 ha can not be irrigated in normal year.

(3) On-farm Irrigation Facilities on the Left Bank Canal

1) Peak Water Requirement

The effective rainfall is not considered in the estimate of the peak water requirement of on-farm irrigation facility. The monthly water requirement except the effective rainfall is shown as follows:

Unit: mm/day

Cropping pattern	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Pattern2	0.8	1.1	1.9	5.1	9.7	9.7	3.8	0.0	0.0	0.0	0.4	0.7
Pattern3	0.8	1.1	2.0	5.0	9.0	9.0	2.6	0.0	0.0	0.0	0.4	0.7
Pattern4	0.6	0.9	1.7	3.4	10.2	10.2	12.0	13.4	9.9	4.8	3.1	0.6
Pattern5	0.6	0.9	1.7	3.4	9.9	9.9	11.8	13.4	10.3	5.0	3.1	0.6

Ratio of the land owner between less than 5 ha and more than 5 ha, are estimated for each canal and river respectively based on the list of water right holder prepared by KPWA. Their areas are estimated as shown in the following table.

	More than 5 ha		Less than 5 ha		Total	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Left bank canal	439.8	30.6	996.1	69.4	1,435.9	100.0

According to above ratios, irrigation water requirements of cropping patterns for spring irrigation and all season irrigation on each canal and river are as follows;

Unit: mm/day

Irrigation pattern	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Left bank												
Spring irrigation	0.8	1.1	1.9	5.1	9.7	9.5	3.4	0.0	0.0	0.0	0.4	0.7
All season irrigation	0.6	0.9	1.7	3.4	8.7	10.1	11.9	13.4	10.0	4.9	3.1	0.6

As stated in the previous section, the ratio between the cropping pattern which is necessary to irrigate during spring season only and the cropping pattern which is necessary to irrigate during summer, are 60 % and 40 % respectively for the left bank canal. The peak water requirement can be estimated based on ratios. However, the cropping pattern which is necessary to irrigate during summer may be allocated for some tertiary or quaternary irrigation block. Therefore, maximum water requirement out of both cropping pattern should be selected to design the on-farm facility. The peak water requirement of the left bank canal is 13.4 mm/day on August. According to the result of soil survey, the average water holding capacity is 6.8 cm at root zone depth of 30 cm. So, irrigation interval will be 5 days. In case of

24 hours irrigation, unit peak discharge of canals are 7.75 lit./sec/ha.

2) Facilities of the Left Bank On-farm Irrigation System

A trapezoidal concrete lining canal with side slope of 1:1.0 is proposed for the tertiary and quaternary irrigation canals. Bed width and height of canals are 0.30 m×0.30 m to 0.80 m× 0.70 m mostly. Total length of on-farm irrigation canals is estimated as approximately 47.4 km. A diversion box will be constructed with control gate at divergence point of tertiary or quaternary irrigation canals. Rotation block consists of 6 standard plots equivalent to 18.0 ha. Irrigation water is delivered to a farm plot thorough an inlet facility with gate. Rotation of irrigation is controlled by the gate. Pipe culvert which can flow the design discharge within 80 % of the pipe section is employed for road crossing or access road crossing culvert of irrigation canals. Total length of pipe culvert is estimated as approximately 2.1 km.

(4) Main Irrigation Facility on the Right Bank Canal

1) Peak Water Requirement

As stated in the previous section, the ratio between the cropping pattern which is necessary to irrigate during spring season only and the cropping pattern which is necessary to irrigate during summer, are 60 % and 40 % respectively for the left bank canal. The peak water requirement is estimated based on ratios. The peak water requirement of the left bank canal is 9.08 mm/day on June. Since present irrigation time is 24 hours, 24 hours of irrigation time is proposed. So, unit peak discharge of canals are 1.05 lit./sec/ha.

2) Rehabilitation of the Right Bank Main Irrigation Canal

According to the information of Western Region WA, rehabilitation of the right bank main irrigation canal will be implemented during this fiscal year. The walk through survey has been carried out to clarify the problem and the situation of the right bank main irrigation canal. As a result of work through survey, problem list and summarized map were prepared. In the rehabilitation plan, the existing problems should be considered based on these materials. Farmers participation is necessary to make rehabilitation plan; otherwise, some facilities which are constructed without farmer’s willingness, will be damaged after the completion of the rehabilitation work.

For the rehabilitation work, proposed irrigation network for the irrigation system based on the present irrigation network is shown in Fig 6.4.6. Since the land consolidation needs to be carried out for the optimum water use, area in the figure are reduced by 3 % as allocation of land reduce. Also, the present irrigation network of the right bank canal is shown in Fig. 6.4.7. According to the cadastral map, present water right holding area is 291.0 ha. This area is different with area of registered water right list. In case that this area is true, as stated in the previous section, 109.4 ha out of 291.0 ha can not be irrigated in an average year.

(5) On-farm Irrigation Facilities on the Right Bank Canal

1) Peak Water Requirement

The effective rainfall is not considered to estimate the peak water requirement of on-farm irrigation facility. The seasonal water requirement except the effective rainfall is as follows:

Unit; mm/day

Cropping pattern	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Pattern2	0.8	1.1	1.9	5.1	9.7	9.7	3.8	0.0	0.0	0.0	0.4	0.7
Pattern3	0.8	1.1	2.0	5.0	9.0	9.0	2.6	0.0	0.0	0.0	0.4	0.7
Pattern4	0.6	0.9	1.7	3.4	10.2	10.2	12.0	13.4	9.9	4.8	3.1	0.6
Pattern5	0.6	0.9	1.7	3.4	9.9	9.9	11.8	13.4	10.3	5.0	3.1	0.6

Ratio of the land owner between less than 5 ha and more than 5 ha, are estimated for each canal and river respectively based on the list of water right holder prepared by WA in Kermanshah. According to the results of estimation, ratio is shown in the following table.

	More than 5 ha		Less than 5 ha		Total	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Right bank canal	101.3	36.2	178.2	63.8	279.5	100.0

According to above ratios, irrigation water requirements of cropping patterns for spring irrigation and all season irrigation on each canal and river are as follows:

Unit: mm/day

Cropping pattern	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Right bank												
Spring	0.8	1.1	1.9	5.1	9.7	9.4	3.4	0.0	0.0	0.0	0.4	0.7
All season	0.6	0.9	1.7	3.4	8.7	10.1	11.9	13.4	10.0	4.9	3.1	0.6

As stated in the previous section, the ratio between the cropping pattern which is necessary to irrigate during spring season only and the cropping pattern which is necessary to irrigate during summer, are 60 % and 40 % respectively for the right bank canal. The peak water requirement can be estimated based on ratios. However, the cropping pattern which is necessary to irrigate during summer may be allocated for some tertiary or quaternary irrigation block. Therefore, maximum water requirement out of both cropping pattern should be selected to design the on-farm facility. The peak water requirement of the left bank canal is 13.4 mm/day on August.

According to the result of soil survey, the average water holding capacity is 6.8 cm at root zone depth of 30 cm. So, irrigation interval will be 5 days. So, in case of 24 hours irrigation, unit peak discharge of canals are 7.75 lit./sec/ha.

2) Facilities of the Right Bank On-farm Irrigation System

A trapezoidal concrete lining canal with side slope of 1:1.0 is proposed for the tertiary and quaternary irrigation canals. Bed width and height of canals are 0.30 m×0.30 m to 0.80 m× 0.60 m mostly. Total length of on-farm irrigation canals is estimated as approximately 10.3 km. A diversion box will be constructed with control gate at divergence point of tertiary or quaternary irrigation canals. Rotation block consists of 6 standard plots equivalent to 18.0 ha. Irrigation water is delivered to a farm plot thorough an inlet facility with gate. Rotation of irrigation is controlled by the gate. Pipe culvert which can flow the design discharge within 80 % of the pipe section is employed for road crossing or access road crossing culvert of irrigation canals. Total length of pipe culvert is estimated as approximately 0.3 km.

(6) Land Consolidation

1) Present Conditions of Land Consolidation in the Study Area

There are two type of land consolidation in Iran. One is land re-plotting without land leveling, or canal and road construction (hereinafter referred to as ‘land re-plotting’). The other is pure

land consolidation with land leveling and agricultural facilities such as farm road, irrigation canal network and drainage canal network. An area of 1,354.5 ha of land re-plotting and 121.5 ha of land consolidation have been implemented in Site 1. 8,031.0 ha of land re-plotting and 228.5 ha of land consolidation have been implemented in Site 2. Also, 1,403.0 ha of land consolidation have been carried out between Site 1 and Site 2. Totally 9,385.5 ha of land re-plotting and 1,403.0 ha of land consolidation have been finished in and around the Study area. Location of the area where the land re-plotting have been carried out and the area where the land consolidation have been carried out, are shown in Fig. 6.4.8.

In case of the land re-plotting, scattered lands were collected to one place and the shape of land is reformed without any facilities and land leveling. So, workability of farmer is improved a little. However, accessibility, irrigation efficiency and drainage effect are not improved because irrigation and drainage canal, farm road and land leveling are not implemented. Therefore, the land consolidation should be completed in order to carry out optimum water use in future.

Some problems concerning land consolidation, have occurred at present. As for the problem of farmer side, some staff of soil and water department has promised to implement land leveling in this year. So, several farmers believed this information and they did not cultivate any crop. However, nothing has happened until now. These farmers can not have income from agricultural activity and also without any compensation due to irresponsible speech of some staff of soil and water department. In case of KJAO, annual budget used to be prepared at beginning of September. The design of projects which programmed for this year will be placed an order after have received annual budget. So, implementation period shall be winter season that is rainy season. So, the management of the progress of work is so difficult. Exact information and on time allocation of annual budget have to be considered to solve these problems.

2) Land Consolidation Plan

Purposes of land consolidation are as follows;

i) Improvement of workability by land re-plotting and shaping the land
ii) Improvement of accessibility by construction of farm road
iii) Improvement of irrigation efficiency and drainage effect by land leveling and construction of irrigation and drainage network

Therefore, the land consolidation is indispensable to carry out optimum water use. As stated in previous section, irrigable area in average year of the left bank canal and the right bank canal area are 933.4 ha and 181.6 ha respectively. Therefore, target area of each system will be above stated areas.

i) Determination of the maximum plot size on the right bank canal

The standard plot size is decided taking average land holding area, interval of drainage canal and irrigation canal based on the condition of soil and irrigation method into account.

According to the information of water right holder by the right bank WUC, the average land holding area of the right bank canal where have water right, is approximately 2.9 ha. However, the average land holding area of each village is little bit different. The average land holding

area of each village is shown in following table.

Village name	Number of farmer	Irrigated area (ha)	Average land holding area (ha)
Ghalancheh	12	42.0	3.50
Meskin Abad Oliya	27	71.0	2.63
Meskin Abad Sofla	34	115.5	3.40
Khoram Abad Sofla	23	51.0	2.21
Total	96	279.5	2.91

At present, furrow irrigation method is followed in the Study Area. The irrigation method will be not changed because initial investment is necessary to change the irrigation method. It is very difficult that farmer pays the initial investment for irrigation method in addition to the land consolidation fee. According to the irrigation and drainage technical report No. 24 of FAO, following table is introduced as standard maximum length of ridges for the surface irrigation method based on the soil type and gradient;

		Length of ridges (m)											
Grading		Rough				Middle				Fine			
Irrigation depth (mm)		75	150	225	300	50	100	150	200	50	75	100	125
Gradient	0.05%	300	400	400	400	120	270	400	400	60	90	150	190
	0.10%	340	440	470	500	180	340	440	470	90	120	190	220
	0.20%	370	470	530	620	220	370	470	530	120	190	250	300
	0.30%	400	500	620	800	280	400	500	600	150	**220**	**280**	400
	0.50%	400	500	560	750	280	370	470	530	120	190	250	300
	1.00%	280	400	500	600	250	300	370	470	90	**150**	**220**	250
	1.50%	250	340	430	500	220	280	340	400	80	120	190	220
	2.00%	220	270	340	400	180	250	300	340	60	90	150	190

Since the soil type of the right bank canal is classified as silty clay or clay, the grading should be fine. The natural slope of the area is approximately 1 %, and irrigation depth will be 75 to 100 mm. In this case, the maximum length of the ridge will be 150 m from irrigation method's point of view. As an assumption, the on-farm ditch which will convey the irrigation water to each ridge may be with approx. 0.30 % of gradient. According to the above table, maximum length of on-farm ditch will be 220 m. In the case of drainage canal, ditch spacing is often in the order of 200 m to 500 m. So, it is not necessary to consider. Under the conditions, since average land holding area of the right bank is approximately 3.0 ha, maximum plot size will be 3.0 ha with 200 m width and 150 m length considering the condition of irrigation method.

ii) Determination of the maximum plot size on the left bank canal

According to the list of registered water right holder in KWA, the average land holding area of the left bank canal, which have water right, is approximately 2.8 ha. However, the average land holding area of each village is a bit different. The average land holding area of each village is shown in the following table.

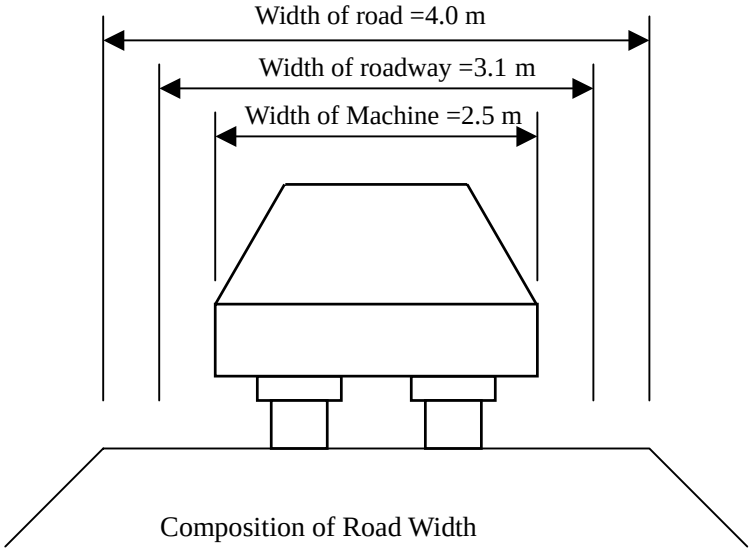
Village name	Number of farmer	Irrigated area (ha)	Average land holding area (ha)
Tapeh Rash	37	141.0	3.81
Tapeh Kuick	36	106.0	2.94
Tapeh Lori	38	130.6	3.44
Hassan Abad	73	165.9	2.27
Hossein Abad	4	24.0	6.00
Khoram Abad Sofla	64	149.2	2.33

Village name	Number of farmer	Irrigated area (ha)	Average land holding area (ha)
Khoram Abad Oliya	66	199.0	3.02
Kolah Kabood	33	38.5	1.17
Zarin Chagha	45	120.3	2.67
Deh Bagh	20	58.3	2.92
Deh Sadeh	33	113.5	3.44
Shali Abad	22	66.3	3.01
Kareim Abad	35	123.3	3.52
Total	506	1,435.9	2.84

Since the soil type of the left bank canal is also classified as silty clay or clay, the grading should be fine. The natural slope of the area is also approximately 1.00 %, and irrigation depth will be 75 to 100 mm. So the condition of the left bank is almost same as the right bank canal. Therefore, maximum plot size will be 3.0 ha with 200 m width and 150 m length taking the condition of irrigation method into account. Standard layout of land consolidation is shown in Fig. 6.4.9.

iii) Farm roads

The width of farm road will be decided based on the size of machineries that will be past on the road. As an example, the width of agricultural machineries in Japan is shown as follows;



Composition of Road Width

The biggest agricultural machineries in the Study area are harvester and big track which might be used during harvesting period. According to the above table, width of the harvester and the big track are 2.5 m. The roadway will be consist of 2.5 m which is width of machinery, and spare spaces which will be 0.3 m at both side. Total roadway is 3.1 m. Total road wide which including shoulder of the road, will be 4.0 m.

The height of farm road should be higher than the crest of irrigation canal which is located along the farm road. If the road is lower than the crest of irrigation canal, the road will be in bad condition to pass due to overflow or leakage of the canal. In case that a culvert has to be installed, enough embankment height should be considered to protect the culvert. The materials for embankment of the road should be prepared in consideration of the suitable grain size distribution. The full compaction of embankment of the road should be implemented. The gravel pavement is recommended to protect the roadway.

iv) Model Plan for Land Consolidation

In the right bank canal area, an area of 144.0 ha in Meskin Abad was selected as the model area and in the left bank canal area, an area of 280.4 ha in Khoram Abad area was selected as

the model area. The model plans of these two areas are shown in Fig.6.4.10 and Fig.6.4.11 respectively.

(7) Drainage Plan

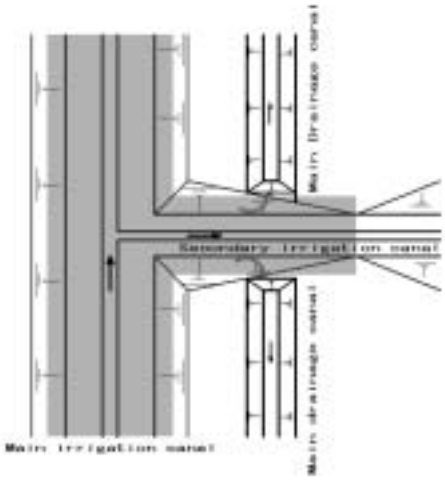
1) Drainage Requirement of Main Drainage Canal

The drainage requirement of main drainage canal which has the basin area outside of the project area, is estimated by using the rational method because the basin areas are mainly less than 50 km^2. The runoff coefficient is assumed as 0.7 considering the topographical conditions of the basin.

2) Drainage Requirement of On-farm Drains

The drainage requirement of on-farm drainage canal for which the basin area is only field, is estimated to drain the surplus rain water for the drainage period of 24 hours by using the probable daily rainfall with the return period of 5 years. The unit drainage discharge is estimated at 6.5 lit./sec./ha.

3) Drainage Facilities



The main and on-farm drainage canals are planned as earthern canal. The earthern canal is a trapezoidal canal type with 1:1.0 side slope because soil type is heavy clay. Maximum velocity should be less than 1.50 m/sec because of earthern canal. The pipe culvert or box culvert is set up for the road crossing structure. The culvert size has been decided as a section which can flow the design discharge smoothly. As for the on-farm drainage canal, the canal depth should be more than 30 cm from design water level at the beginning of the drainage canal for lowering down the groundwater level because high groundwater level may cause root rotting. On the other hand, junction box is designed for the place where some drainage canals join. Also, spill out structure is designed at outlet point of drainage to the Gharasu River in order to protect the erosion dike of the Gharasu River.

As stated in the previous section, the rain water will flow into new left bank main irrigation canal from mountainous area during rainy season. Since the new irrigation canal is too much deeper than the land beside the canal especially from Khoram Abad Oliya village to end of Hassan Abad village. And also, this flood water cannot drain till a turnout of secondary canal. In this case, this flood water will overflow into the field near the place where canal type change from excavation canal to embankment canal, and the water will make problem to agricultural products and field. So, some drainage canal near the turnout should be connected to secondary irrigation canal in order to catch the flood directly from the secondary irrigation canal.

As for the drainage facilities of the left bank canal area, the total length of drainage canal is approximately 42.3 km. Bottom width and height of drainage canal are 0.50 m×0.30 m to 7.00 m×4.50 m. Longitudinal slope is 1/100 to 1/1,600. On the other hand, as for the

drainage facilities of the right bank canal area, total length of drainage canals is approximately 5.4 km. Bottom width and height of drainage canal are 0.50 m×0.40 m to 4.00 m×2.40 m. Longitudinal slope is 1/100 to 1/700.

6.4.3 Irrigation Management Improvement Plan

(1) Understanding on Irrigation Management Aspects

1) Government's Intention and Policy on WUC Program

The Government's intention and policy on WUC Program are summarized below.

i) The reason of enhancing WUC program is to apply the program as a measure to realize "crop production increment by effective water use" based on understanding the water resources limitation of the country.
ii) Such understanding shows the Government's intention to activate the country through social and economical channels. The Government admires the concept of "cost-sharing" enhancement as its concrete measure.
iii) The subject of irrigation management improvement is an approach of the Government to transplant the irrigation enhancement and their own management with self-reliance to the rural area, which is behind to the achievements of economic development in the urban area comparatively.
iv) But, it seems to be better to distinguish the above understanding with other subjects such as how to develop the willingness of policy acceptance and participation by the people, actually farmers, and local officers as policy recipients, after implementation of the policy.
v) Especially, the burden or obligation which the administration is going to owe when they will be in-charge of the subjects to ensure their comprehension and activities and to develop their progressive sprits, will be high similar to enhancing of WUC program.
vi) Specifically, the Law of fair Water Distribution and Utilization (1983) was a quite innovative under the country's critical situation to keep the national constitution at that time. But the administrational environments, as the premises of issuing the laws, have been changing up to today. Hence it is necessary to apply more flexible comprehension, if it would like to keep up the same administrative system

Work Classification On O/M Aspects

Classification / Descriptions		Major	Minor
Operation :	*Works to operate related facilities in proper manners like dam, weir, pump, gates and so on.*	*Works on operation with special techniques or knowledge's for proper conditions.* * Dam operation * Intake wair operation * Large scale pump station	*Works of operation available with ordinary persons like elementary educated farmers.* * Small diversions' operation * Small gate operations * Pump On-Off operation * Small diversions' operation
Maintenance :	*Works to keep facilities in proper condition against life time.*	*Periodical works for large scale / sophisticated facilities to keep in proper conditions, also from view points of avoiding social securities to be occurred by facilities' failure to communities.* * Facility monitoring (Dam body, primary canal, river intakes) * Earth dam surface grass cutting * Large metal gate paintings, oiling * Large metal gate paintings	*Works with ordinary natures in daily activities in field.* * Grass cutting, weed removal * Minor embankment repair * Minor greasing * Trash removal from canal
Repair :	*Works to recover facilities damaged with disaster or serious accidents.*	*Works to repair facilities to avoid functional disorders or harms to be occurred if not conducting the works, which shall be conducted with professional engineering.* * Repair damaged parts of facilities of primary, secondary or tertiary canal. * Repair major permanent facilities like concrete bridge, revetment, intake weir * Repair wide range collapsed canals / embankments	*Works to repair minor breakdowns or defects like exchanging few bolts & nuts, with non or small expenses.* * Changing alignment of Quarterly canals

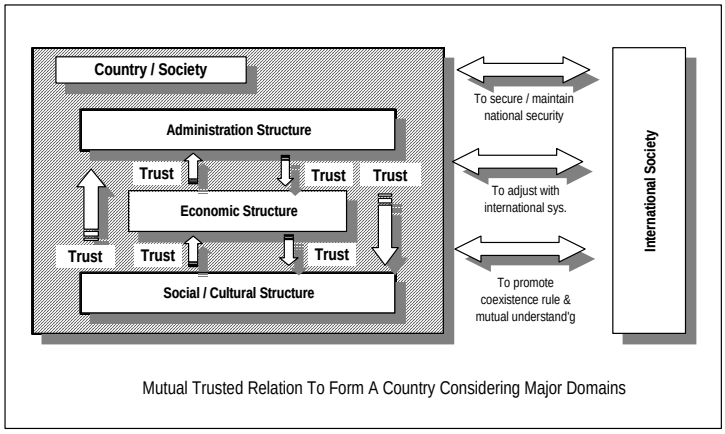
Note :
Classification of "Major" and "Minor" does not indicate physical scale, but magnitude of special or professional knowledge or technology requirement. Also distinguishing with fund requirement. So "Minor" class indicates works which is manageable by ordinary farmers, with small or non-expenses.
Commonly used " Rehabilitation " seems to indicate "Repair " and " Reconstruction" in the above table.

and understanding as the previous era. For instance, regarding the task-allocation between MOE for main facility construction and O&M and MOJA for whole on-farm aspects, an idea of appointing MOJA as consignee to owe whole of construction and O&M by MOE as consigner as status of "Water Supplier", for the irrigation projects smaller than a certain scale, for e.g. less than 5,000ha. It might be effective to restart the stagnated irrigation and drainage schemes. It means to regain the strong trust of the farmers to the administration.

2) Present Situation of the Administration

i) While enhancing the stronger recognition of MOE as 'Water Supplier' in the country, it seems the relation between farmers and MOE will become more ambiguous. In addition, if the Water Utilization and Distribution Company involves in the contract works between them, the relationship becomes weaker, though the casting of the water business scenario might be completed physically. Besides, the trust which is basic premise to establish business condition before making contract, is to be unstable.

ii) Especially, it can not help to inquire MOE how effective the contract is and how beneficial to the end user, farmers, which is the Government body in-charge to form "Water Market". It is hard to fill up the gaps in understanding the tasks of the firm and the actual condition in the field, when comparing the scope of 1) water fee collection and 2) O&M of the water conveyance system. It is explained by the staff of the firm that 20% of the total collected fee is to be paid to the firm as contract fee. Besides, it seems the definition of O&M is not yet completed.



Mutual Trusted Relation To Form A Country Considering Major Domains

iii) It is well known at the decision maker level that WUC program stands on the rural activation concept applying the farmers' entrepreneur policy as applicable method. There are many intervention and involvements of the government agencies such as MOE for water, MOJA for soil and MOC for organization. Even though, there are many foundations related to WUC program, the way of communication with farmers is limited, like extension center in the field. Most of the agencies are facing staff-shortage to have enough communication with farmers.

iv) There might be subjects to let farmers accept and understand role of 'water buyer' in the "water market", which is the Government's strong intention to establish through enhancing irrigation. Before that it is indispensable to let farmers understand the necessary components to realize proper irrigation, who had been continuing rainfed farming until some ten years before. Hence, some measures are necessary to expand the limited pass to communicate with farmers. If not, the WUC enhancement will be uncertain.

v) Land consolidation is indispensable as a tool to realize the policy of increasing crop production utilizing limited water effectively. Actually, some discord conditions to adjust implementation and budget disbursement schedule are found under the joint working

condition between MOE and MOJA. Project stagnation causes distrust of farmers' to the administration performance.

vi) It is predicted that certain time and processes are needed to foment sufficient conditions for the smooth synchronization among relevant agencies. But during the period, the farmers' disappointment towards the administration only grows up. Therefore, the administration should set up measures to generate the first success story as their presentation to the people. Establishing an organization gathering experts from relevant agencies might be an effective alternative as a special task force. If it is possible to obtain the experience and lessons of co-working with other office staffs, it will be a great and concrete step for all the farmers, administration agencies in province and the Central Government which intends to form 'Water Market'.

vii) It is the time to complete logic rationale of water fee again, which shares foundation of WUC program. There should be components like a) water cost, b) cost for maintenance, b) cost for operation, d) cost for development investment, e) management cost, including the aid portion from the Government. If not, it will become more doubtful impression on the farmers' side, while having the discussion with farmers.

3) Situation of Irrigation for Farmers

i) There is no sufficient progresses and rooms on farmers side to understand rights and duties (of both officers and farmers), because irrigation is quite a new subject for them in the Study Area, just introduced some 10 years before. Also, the efforts of the Government side seemed to be insufficient.

ii) There has been no particular organization specialized in water management in their community, while keeping the traditional decision making based on Deh from the previous generations. Decision regarding water management was just one of their daily events in the community. There was no special rule or bylaws for the management. Therefore, establishing a definite rule is one of subjects to overcome on both the farmers' and government's sides.

iii) Enhancement of irrigation among the farmers is seemed as a result of government's efforts, who were aiming "crop production increment" during the last 10 years. Besides, there were some insufficiencies on clarification of water resources availability, and irrigation schedule to meet with crop cultivation in the drought season. So if enough water becomes available, then those stakeholders start to accept the program and the others who do not receive the sufficient level, are not fully satisfied. Under such situations, rapid disappointment of farmers grows causing distrust to the administration. So, some measures are needed in the government side to wipe away such negative mood to strengthen the trust and to make concrete foundation of rural activation.

iv) Water trade-off might be new subjects for farmers among Dehs, in their daily life. To achieve fair distribution, some mutual – courtesy is indispensable which is hard to define with laws and regulation. To propel the above matter, respectable leaders or dominant persons are required to lead community people. Such human resources development can not be handled by one sector, or one government program, but to be handled as a subject for multi-sectors.

As discussed in the above, the WUC enhancement program is a huge subject, and can not be overcome just with physical establishment of 'Water Market'. It exists under a situation of

multi-constraints mixing components not only like present situations of relevant agencies and farmers, capabilities of their trusts among them, but also budgets and regulations / laws. It is a quite smart approach to set subject of 'Rural Activation' as foundation of the discussion.

(2) Ravansar Irrigation System Management Improvement Plan

1) Ravansar Right Bank WUC Strengthening Plan

Ravansar Right Bank Canal WUC was established in February 2003, under the condition of the Government's guidance in haste and upset farmers with such surprising explanation. Some assistance programs are already prepared, mainly by KCO, to support farmers of the WUC, but they are not informed. Considering those situations regarding the WUC, strengthening plan is prepared as mentioned below.

i) Extension of WUC Enhancement Program
- Re-explanation on significance and backgrounds, task-allocation between the Government and farmers, possibilities of WUC activities and scope in the future.
- Participatory discussion on water management, water trade-off, constraints of irrigation
- Explanation of WUC set-up procedure, related laws, scope of agencies and assistances
- Guidance on necessary knowledge for WUC management like decision making, bookkeeping, commercial code, financial support programs and others

ii) Extension on land Consolidation Scheme
- Explanation on significance, necessity, effects, scope of relevant agencies, while stressing merits of WUC.
- Explanation on procedure of the scheme implementation from the commencement to the completion of the construction and contents of maintenance works.
- Explanation of relation between land consolidation and the WUC program
- Explanation on cost allocation of the scheme and financial supports

iii) Guidance of WUC Management
- Farmers' participatory workshop on WUC organization and task allocation
- Farmers' participatory workshop on WUC Article of Association .
- Farmers' participatory workshop on WUC bylaw

2) Ravansar Left Bank WUC establishment plan

KJAO should take the initiative and is obliged to the farmers in the beneficial area of the left bank canal on the aspects of Ravansar Left Bank Canal WUC establishment. KJAO has to apply the lessons learned through the activities of establishing the Right Bank Canal WUC. The significance, background, merits for the farmers, burden of the government, future prosperous alternatives and others are to be discussed with farmers in detail for securing their understanding.

The contents of the establishment plan are almost the same as descried in the previous section for the Right Bank WUC, and hence only the different aspects are discussed below.

i) Guidance of WUC program to farmers

The contents and procedure to apply as the guidance is the same as described in section 4) of the previous clause. In addition, it is better to conduct initial sounding on social and

cultural background to understand their circumstances of community lives. It might be an alternative to be guided by local university specialists or NGO who are familiar with such subjects together with staffs of KJAO.

ii) Registration of the WUC

The government's guidance and supports should continue for the WUC registration and KCO shall be responsible for this activity.

iii) Physical Infrastructure Preparation

Particular physical infrastructure is not proposed with similar understanding of the Right Bank Canal WUC.

iv) WUC organization

Basic contents of the WUC organization is same as the Right Bank WUC. Besides, a consideration might be required since the command area of left bank canal is larger consisting of 12 Dehs along the canal. Hence, it is better to provide sub-groups to make convenient for WUC management under the WUC body. There shall be 3 sub-groups as mentioned below.

Upstream WUC	Kolah Kabood, Khoram Abad Oliya, Khoram Abad Sofla, Deh Sadeh
Middle stream WUC	Zarrin Chogha, Hassan Abad, Hossein Abad, Kareim Abad
Downstream WUC	Tapeh Rash, Shali Abad, Tapeh Kuick, Tapeh Lori

The board members shall be selected from each sub-group. Participation of elder people to certain gathering originates from their tradition and this attitude causes WUC to become inactive. Therefore, younger generation should be encouraged to participate in the WUC activities. The participation of younger generation can be legalized by making a contract between the elder and his son on contract cultivation.

3) Provision of WUC Bylaw

While KJAO is taking initiative to guide farmers to the WUC program, the agency has to introduce bylaws to farmers to generate their own bylaw to meet with their condition, to define the members' right and duties, aiming at the WUC activation. All of WUC related agencies (MOE, MOJA and MOC) have never issued example of WUC bylaw. Hence KJAO, should be responsible to prepare the bylaw example and to finalize the contents while encouraging farmers.

Example of WUC bylaw shown in this report is quoted from production of the National Irrigation Authority, Philippines and revised to meet with the situation of the Study Area and other factors. Considerable aspects applied for the revision are as follows;

i) Introducing duty-sharing among WUC members and providing "committees"

In order to avoid the heavy load to the managing director and enhance the members' participation to the WUC activities, the following committees are proposed.

a. Membership, education and training committee

This committee shall extend rights and duties and activate mutual exchange knowledge and technical advances among members.

Number of literate farmers using new techniques is limited in the rural communities. Ordinary farmers, who are the majority, are easily to have feelings of prejudice in front

of such advanced ones and easily to turn the mood to the negative side. This committee will have function to release such tendency. Also view-point of 'Fare-To-Farmer' concept is applied based on the experience obtained in the Study.

b. Service committee
Service committee shall assist the Board of Directors on management aspects based on the Article of Association and the bylaw. Younger generation shall be involved in the committee.

c. Finance committee；
Finance committee is responsible for finance, accounting, bookkeeping and fund preparation while assisting the BOD. Also, younger generation will be the member of the committee.

d. Audit and inventory Committee
This committee is responsible for auditing, controlling documents and asset management of the WUC.

ii) Association Annual Dues

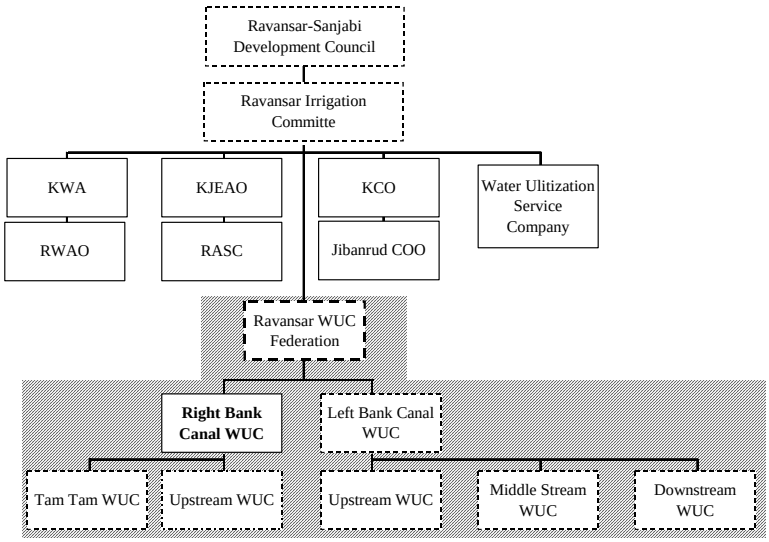
Generally, WUC runs with volunteers' support. But being different from the administration's understanding, farmers are quite keen on time-cost reference, due to the daily works in the field. Hence, the annual due system is introduced to obtain necessary fund to use for compensations and incentives of members of WUC committees.

iii) Introduction of Penalty System

Penalty system is to be adapted to charge penalties to members who delays water fee payment, do not participate in group working for canal maintenance, not attending to farmers' meetings and break internal rules. The collected penalty is to be gathered and used for WUC activities.

4) Establish Ravansar Irrigation Scheme WUC Union.

Presently WUC establishment activities are going on to provide individual WUC on each side. The Union is a body to unite those WUCs which are going to depend on the water source Ravansar Spring. This approach will be applied after completing establishment of individual WUC. Guidance is pretended to KJAO with coordination of KCO. Objectives of the Union are as follows;



WUC Establishments and Comprehensive Water Management Organizatin Structure

i) To define proper water allotment among water users groups from viewpoint of farmers.

ii) To work together with the administration as representatives of farmers

The union will function as a member of "Ravansar Irrigation Committee", which works with the government agencies to enhance proper O&M to keep sound condition of irrigation

activities in the area. Also, it will function as member of "Ravansar-Sanjabi Development Board", which will work as inter-sectoral discussion for regional development

5) Indirect Programs to Support WUC Strengthening and Establishment

WUC enhancement program has been just started. Farmers, recipients of the program, has never been familiar with the program nor understood the government intention. So it is quite hard for MOE and MOJA to owe the burden by themselves only. It is necessary to introduce some supplemental programs to support this important approach. Supplemental programs to reinforce WUC are summarized in the box.

Supplemental Programs To Reinforce WUC and Rural Activation.

A. Farmers Institute Program (Rural Activation Enhancement Program)

Unification Program to make plan, preparation and implementation with cooperation of local universities or vocational schools. In-charge agency is to be KJEAO, Rural Activation Division.

A.1 Agriculture Support Planning Program
To form committee with younger farmers to generate any plans for rural activation with assistances of specialists. All programs under Farmers Institute Program are to be generated and apprized through this program.

A.2 Young Generation Participation Program
This might be one of programs by the above to high-light social participation of younger generation in the rural area. This program covers not only guidance but also events in communities.

A.3 FTF Message Board Program
This might be one of programs by the above to high-light public awareness aiming "Farmer-To-Farmer" activities, introducing new cultivation, success stories of farm management found among farmers.

A.4 Route Finding Program
This might be one of programs by the above to high-light history of communities how the previous generation led development to let deepen mutual understanding of next neighbor Dehs. Available to leave generation of high-school or more younger.

A.5 Regional Agriculture Awarding Program
This might be one of programs by the above to introduce and award farmers who contribute to communities or providing good results of farm management. Just awarding, not use any special budgets.

B. In-Charge Agency for the above;

KJEAO-Rural Activation Div.; In-charge whole set-up, including experts selection, idea extension to farmers and relevant agencies to get cooperation. Also budget.
The admission fee is to be paid by the participants, but should be petty amount. Then leave the collected one to the participants' management.

C. Comprehensive Water Resources Clarification Program

C.1 Hydrological Circulation Study
C.2 Regional Water Balance Study
C.3 Ravansar Spring Water Storage Study
C.4 Water Saving Method Study

D. Irrigation Water Rationalizing Program.

D.1 Participatory Land Consolidation Planning.

D.2 Demonstration Plot for Water Saving Cultivation
Appoint several farm plots for demonstration by water source, by crop or by farming practice patter, paying petty amount. And to be introduced to the vicinities through mass media.

E. Establishment of Joint Committee for Enhancing Sound Irrigation Agriculture.

This committee shall be formed with decision making level officers with objectives to adjust project implementation schedule of each ministry agency. Main objective to reinforce coordination and its effects for enhancing irrigation agriculture, which is necessary for both proper water supply and land consolidation, also institutional set-up of WUC.
The Committee shall be held before commencing project appraisal for the next fiscal year. And adjust prioritization of projects from both sides, KWA and KJEAO.

F. Introduction of Project Team System for irrigation agriculture development.

After completing adjustment and decided a certain irrigation scheme by the above committee, both agencies appoint engineers to participate to a project team for the said project. The team shall owe whole of responsibilities and obligations to implement it, on behalf of the agencies.

6.5 Implementation Plan

6.5.1 Project Implementation

(1) Components of the Project

The Project aims to achieve the sustainable agriculture and improve the farmers living conditions through the increasing of the agricultural production and resources mobilization in the Project Area. The Project is chosen with the high priority by integrating project/programs, which were selected among the required activities proposed in the master plan of the Agricultural Development in the Study Area. The Project consists of 4 major components; 1) Integrated agriculture development, 2) Farmers organization development, 3) Extension system improvement, and 4) Ravansar canal irrigation system and management improvement.

These components of the Project introduce new technology and concepts to the Project Area and Iran, such as diversification of crops to the wheat-maize culture area, combination of feed cultivation and using of compost from livestock raising, joint purchasing and marketing by farmers organization, maximization of irrigation water resources through the participatory operation and management, etc.

(2) Starting and Target Year of the Project

The Project implementation schedule is set to formulate the model project of agricultural development in Kermanshah and the other similar areas in Iran. Rather large scale investment in comparison with ordinary budgeting shall be input within the 10 years of the Project implementation during the period of the 4th and 5th National Five Year Development Plan (FYDP). The preparatory period of the Project implementation set up to the end of 3rd FYDP (Iranian Fiscal Year (IFY) 1383). Target years are set as 1) Short Term target: high priority activities such as extension of development and demonstration, to be completed before full implementation in mid term, 2) Mid Term target: implement the pilot activities for expanding in the long term period, and 3) expanding the full extend of activities in the Project Area after the mid term review of the Project.

The implementation schedule is set as follows:

Starting the Project:	Iranian Fiscal Year (IFY)1383 (2004/03)
Implementation period:	10 years
Short term (within 3 years):	IFY 1384-86 (2004/07): middle of the 4th FYDP
Medium term (within 5 years):	IFY 1387-88 (2008/10) upto end of the 4th FYDP
Long term (within 10 years):	IFY 1389-93 (2010/15) upto end of the 5th FYDP

6.5.2 Executing Agencies

(1) Executing Agencies and Organization

The Project will basically be implemented by the Iranian Government budget and no external financial support is expected except technical support in specific fields. The stakeholders are consisted of individual farmers, farmers organization, Kermanshah Jihad-e-Agriculture (KJAO) under the Ministry of Jihad-e-Agriculture (MOJA), Western Regional and Kermanshah Provincial Water Affairs (WRWA and KPWA) of Ministry of Energy (MOE), Provincial Office of Ministry of Cooperative (MOC), Provincial Office of Environmental Protection Department, Agricultural Bank, and private companies. Project components are implemented individually or jointly with stakeholders. Their roles are summarized in Table 6.5.1.

(2) Establishment of Project Board and Steering Committee

Since the government organization of each ministry is managed as a top-down system, central – provincial – district – sub-district level, there is relatively less collaboration with the other ministries. Therefore, it is proposed to establish a “Ravansar–Sanjabi Agricultural Development Board” (RSADB) for the coordination of the Project implementation stakeholders. The Board members will be consists of representatives of all stakeholders, 1) representatives of provincial level government organizations/offices, KJAO, WRWA/KPWA, KPCO, KEDG, 2) farmers representative and others. The secretariat of RSADB set in the office of Technical Executive Deputy, KJAO and chairman will be the General Director of KJAO. Periodical general meetings will be held on the coordination of 1) budgetary preparation for the Project implementation, 2) implementation schedule adjustment, and 3) monitoring evaluation of the Project implementation. Through the experience of the joint

discussion on irrigation management of the Study, the representatives of provincial level government organization/office shall be decision makers of each organization/offices.

In order to support, monitor and evaluate the Project, Steering Committee (SC) is also proposed. The SC will consist of the representatives of related ministries of central government including Management Planning Organization, university and NGO. The conceptual relation with stakeholders for the Project implementation is shown in Fig. 6.5.1.

6.5.3 Implementation Plan

(1) Integrated Agriculture Development

Targets of integrated agriculture development plan during short, mid and long term are shown in the following tables.

1) Site 1

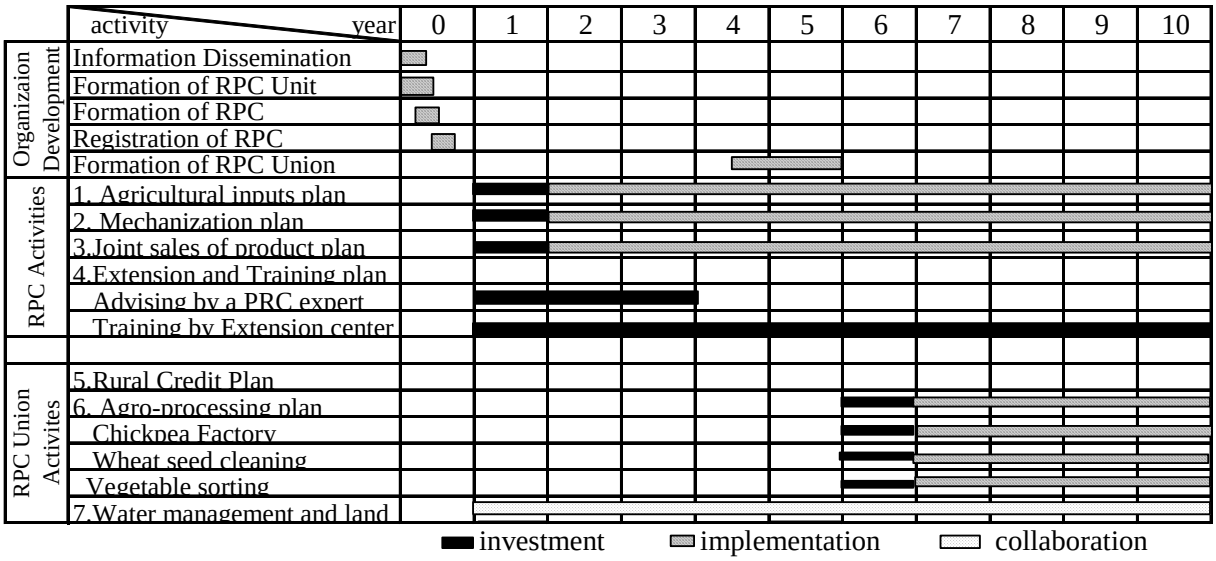
Category	Item	Short term (1^{st} year ~ 3^{rd} year)	Medium term (4^{th} year ~ 5^{th} year)	Long term (6^{th} year ~ 10^{th} year)
Agriculture	Crop rotation Dry farm land	3,445 ha wheat-chickpea-barley	3,445 ha wheat-chickpea-barley	3,445 ha wheat-chickpea-barley
	Total amounts of production	Rls. 6,572 million /year	Rls. 8,155 million/year	Rls. 19,369 million/year
	Irrigated land in Spring	1,302 ha wheat-chickpea or vegetables	1,302 ha wheat-chickpea or vegetables	1,302 ha wheat-chickpea or vegetables
	Irrigated land in all season	1,937 ha wheat-rape-maize-sugar beet or vegetables & alfalfa	1,937 ha wheat-rape-maize-sugar beet or vegetables & alfalfa	1,937 ha wheat-rape-maize-sugar beet or vegetables &alfalfa
	Total amounts of production	Rls. 36,544 million /year	Rls. 41,805 million/year	Rls. 51,559 million /year
	Use of compost, which is made of wheat straw and cows' excrements	Amount of compost; 9,856 t/year use of compost; 1.5 t/ha/year	Amount of compost; 24,640 t/year use of compost; 3.7 t/ha/year	Amount of compost; 34,496 t/year use of compost; 5.2 t/ha/year
	Plastic green house 2,000m^2	1 house	2 houses	2 houses
	Mechanization; Supply of short machinery	50% of all shortage Share of supply; Company.: 40% Private: 60%	20% of all shortage Share of supply; company: 40% Private: 60%	30% of all shortage Share of supply; company: 40% Private: 60%
Horticulture	Rose for perfume or Chinese medicine	10 ha	15 ha	25 ha
	Total amounts of production	Rls. 227 Million/year	Rls. 341 Million/year	Rls. 568 million/year
Animal husbandry	5 heads of Holstein	110 households (20% of total)	165 households (30% of total)	110 households (20% of total)
	Amount of milk production	3,462 t/year	7,425 t/year	10,067 t/year
	Production of compost	Amount of compost; 9,856 t/year	Amount of compost; 24,640 t/year	Amount of compost; 34,496 t/year
Beekeeping	40 bee-hives/ household	200 hives	400 hives	400 hives
	Honey production	6.3 t/year	12.3 t/year	18.3 t/year
Inland fishery	Trout culture using irrigation well	1 household	2 households	1 household
	Total amounts of production	1 t/year Rls. 6 million/year	3 t/year Rls. 18 million year	4 t/year Rls. 24 million/year

2) Site 2

Category	Item	Short term (1st year ~ 3rd year)	Medium term (4th year ~ 5th year)	Long term (6th year ~ 10th year)
Agriculture	Crop rotation Dry farm land	6,609 ha wheat-chickpea-barley	6,609 ha wheat-chickpea-barley	6,609 ha wheat-chickpea-barley
	Total amounts of production	Rls. 14,474 million /year	Rls. 16,927 million/year	Rls. 21,521 million/year
	Irrigated land in all season	3,218 ha wheat-rape-maize-sugar beet or vegetables & alfalfa	3,218 ha wheat-rape-maize-sugar beet or vegetables & alfalfa	3,218 ha wheat-rape-maize-sugar beet or vegetables & alfalfa
	Total amounts of production	Rls. 37,363 million/year	Rls. 44,207 million/year year	Rls. 51,740 Million/year
	Use of compost, which is made of wheat straw and cows' excrements	Amount of compost; 15,648 t/year use of compost; 1.6 t/ha/year	Amount of compost; 39,120 t/year use of compost; 4.0 t/ha/year	Amount of compost; 54,768 t/year use of compost; 5.6 t/ha/year
	Plastic green house 2,000m^2	1 house	2 houses	2 houses
	Mechanization; Supply of short machinery	50% of all shortage Share of supply; Mechanization Service Company: 40% Private: 60%	20% of all shortage Share of supply; Mechanization Service Company: 40% Private: 60%	30% of all shortage Share of supply; Mechanization Service Company: 40% Private: 60%
Horticulture	Cultivation of rose for perfume or Chinese medicine	10 ha	15 ha	25 ha
	Total amounts of production	Rls. 227 million /year	Rls. 341 million/year	Rls. 568 million/year
Animal husbandry	5 heads of Holstein	187 households (20% of total)	283 households (30% of total)	187 households (20% of total)
	Amount of milk production	4,986 t/year	11,755 t/year	16,269 t/year
	Production of compost	Amount of compost; 15,648 t/year	Amount of compost; 39,120 t/year	Amount of compost; 54,768 t/year
Beekeeping	40 bee-hives/ household	600 hives	600 hives	600 hives
	Honey production	9 t/year	18 t/year	27 t/year
Inland fishery	Trout culture using irrigation well	4 households	4 households	5 households
	Total amounts of production	4 t/year Rls. 24 million/year	8 t/year Rls. 48 million /year	13 t/year Rls. 78 million/year
	Trout culture using spring water	3 households	2 households	5 households
	Total amounts of production	3.9 t/year Rls. 23.4 million/year	6.5 t/year Rls. 39 million/year	13 t/year Rls. 78 million/year

(2) Farmers Organization Development

When the registration of the RPCs will be completed after 6 to 7 months of preparation, the organization and its functions will be developed every one and then. The following table shows the annual plan of activities for 10 years. As indicated, the activities of the RPC Union will start from the 6th year. By this time, each RPC will have enough experiences on the cooperative activities. With the completion of repayment of the loan, the RPC will also become financially more viable and be ready to undertake Union's activities.



(3) Agricultural Extension System Improvement

1) Early Completion of the Implementation

The Agricultural Extension System Improvement shall be completed at the initial stage of the Project implementation, because of the extension service including the demonstration and experimental cultivation to be used for the extension of the Project implementation.

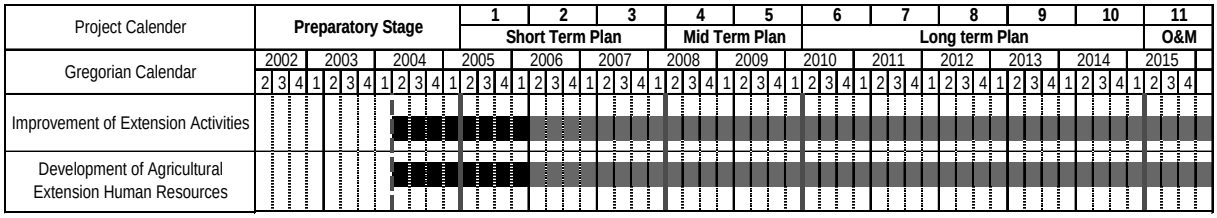
2) Implementation Plan

The major activities proposed in the extension system improvement plan are as follows:

i) Improvement of extension activities of the service centers

ii) Strengthening of human resources, facilities and equipments

It is proposed that the implementation of these activities shall be completed within the first year of the short term plan and then the activities shall be continued. The implementation schedule of the agricultural extension system improvement is shown below.

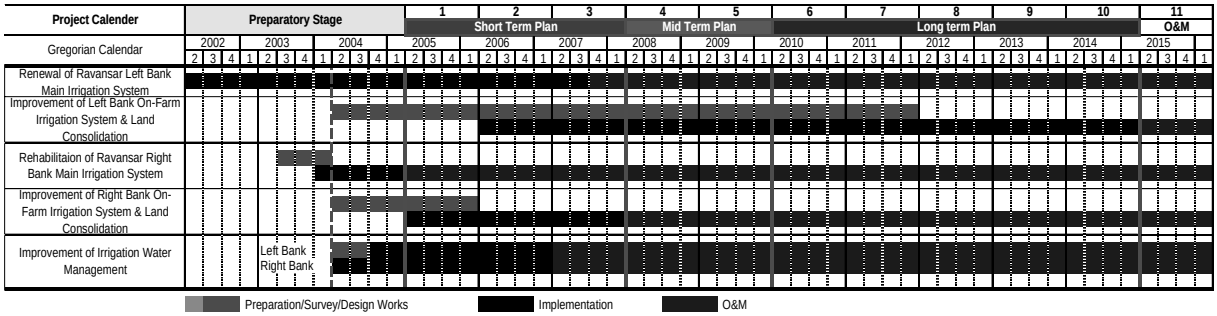


(4) Ravansar Irrigation System and On-farm Improvement

According to the budgetary plan for the main and secondary canal of the left bank irrigation system, it will take 3 years to complete. Design of the land consolidation for the left bank canal area will be started from one year before termination of the construction work on main and secondary irrigation canal. Implementation of the land consolidation will be carried out from the first of 2007 to the end of 2013.

As for the right bank canal, design of rehabilitation on main canal will take one year because farmer's participation is necessary for the design. The rehabilitation work will be carried out

form the first of 2005 to the middle of 2006 because irrigation period is included. Distance between the main canal and the Gharasu River is relatively narrow, so, secondary irrigation canals will not be necessary. Therefore, the design of land consolidation will be prepared in 2006 and implementation will be completed until the end of 2008.



(5) Total Implementation Schedule

Whole Project implementation schedule are summarized in Fig. 6.5.2.

6.6 Project Costs and Benefits

6.6.1 Bases of Cost and Benefit Estimate

(1) Standards for Estimation of Project Costs and Benefits

The Project consists of two main components; 1) Integrated Agriculture Development and 2) Ravansar Irrigation Improvement. In relation with the Integrated Agriculture Development, 3) the Agricultural Extension System Improvement and 4) Farmers Organization Development are component of the Project. The relationship between the investment costs and their corresponding benefits could be identified by the following table. The Project Area is divided into two sub-project area, Site 1 and Site 2.

The Project at Glance

1) Target Area of the Project

Site	Integrated Agriculture Development Area(ha)			Ravansar Irrigation Improvement	
	Category	Present	Target	Area(ha)	Contents
1	Rainfed Field	4,241	3,445		
	Irrigated Field	2,443	3,239	1,115	Left Bank: 933 ha, Right Bank: 182 ha
	Sub-total	6,684			
2	Rainfed Field	6,609	6,609		
	Irrigated Field	3,802	3,802		without Kilanbar dam project
	Sub-total	9,827			
Total		16,511		1,115	

Planed Application of Crop Rotation

Cropping Rotation pattern	Rained Cultivation		Irrigated Cultivation			
			Spring Irrigation		All season Irrigation	
	Small Farm	Large Farm	Small Farm	Large Farm	Small Farm	Large Farm
1	Site 1 : 3,445 ha		-	-	-	-
	Site 2 : 6,609 ha		-	-	-	-
2	-	-	Site 1: 645.5ha	-	-	-
3	-	-	-	Site 1: 656.1ha	-	-
4	-	-	-	-	Site 1: 533.9ha	-
5	-	-	-	-	-	Site 1: 1,403.5ha
	-	-	-	-	-	Site 2: 3,218ha

(2) Project Costs

The project costs of the Ravansar Sanjabi Plain Agricultural Development Project (RSPADP) consist of 1) Integrated Agricultural Development Program 2) Farmers organization Development Program, 3) Extension System Improvement Program and 4) Ravansar Irrigation Improvement Program.

Integrated Agricultural Development Program is composed of three major parts; the integrated farming, the farmers organization development program (FOIP) and the extension system improvement program (ESIP), which will push the existing agricultural method steps forward in three directions, namely, diversification of cropping patterns, integration of dairy farming into generic agriculture, and mechanization of agriculture. As mechanization of agriculture is an indispensable part of our plan, more intensified and efficient use of the machines is envisaged in our plan. We have given a trial estimate of investment in machines, which is given in the annex one.

Ravansar Irrigation Improvement Program is consisted of two canal systems. They are the left bank canal, and the right bank canal. All the primary, secondary and tertiary canals will be provided with land consolidation including land leveling works, and provision of networks of farm roads, and drainage. The project will help the 1,115 ha of farmland with imperfect or no irrigation facilities to realize their full potential.

The program has four ancillary projects both to utilize the potential resources as well as to increase the income. As their intended beneficiaries do not cover the majority of the people in the project area as dairy development sub-program does, those plans are explained in the annex two to five. The corresponding project benefits will be harvested in the form of increased sale of produce along with the cost reduction.

(3) Bases of Cost Estimation

The Project cost has been estimated in due compliance with the following conditions.

1) Cost of machinery, equipment and materials

The construction works is to be carried out by the contractor(s) on contract basis with the project executing agency. The contractor(s) shall be responsible for procurement of machinery,

equipment and materials to be used for construction works and the cost of machinery and equipment shall be included in the depreciation cost.

2) Unit price

Unit price for the governmental project has been published by MPO every year. The Project cost has been estimated based on the unit price. Provincial coefficient, workshop coefficient and overhead coefficient will be multiplied to standard unit price taking condition of province or type of project into account. Coefficient rates are 1.15, 1.06 and 1.30 respectively. These prices are including direct implementation cost. As indirect costs, supervision cost, employer's cost and insurance and municipality due cost are going to add to implementation cost. Rates of these indirect costs are 5.0 %, 7.0 % and 5.0 % of direct implementation cost respectively.

3) Demarcation of foreign currency portion and local currency portion

Each component of the investment and construction works is divided into foreign currency portion and local currency portion; the former price is estimated based on CIF price at port of Bandar-e-Base as of October 2003 and the latter is on the market price at the proposed project site in Iran. These estimation will be presented in the draft final report.

4) Physical contingency

The physical contingency shall be 10% of the total investment cost.

5) Foreign exchange rate

The foreign exchange rates applied for this estimate are US$ 1.00 = ¥ 111.50 = Iranian Rials (Rls.) 8,216 as of October 1, 2003.

6.6.2 Project Costs

(1) Initial Investment Costs

1) Integrated agriculture development

Initial investment in implementation of the agricultural development plan is shown in Table 2 every stages of implementation in the agricultural development plan.

	Category	Item	Short term (1^{st} year ~ 3^{rd} year)	Medium term (4^{th} year ~ 5^{th} year)	Long term (6^{th} year ~ 10^{th} year)
Site 1	Agriculture	Plastic green house 2,000m^2; Rls. 380 million	1 Rls. 380 million	2 Rls. 760 million	2 Rls. 760 million
		Mechanization Supply of short machinery	50% of shortage Rls. 15,682 million	20% of shortage Rls. 6,273 million	30% of shortage Rls. 9,409 million
	Horticulture	Cultivation of rose for perfume; Rls. 5.9 million/ha	10 ha Rls. 59 million	15 ha Rls. 88.5 million	25 ha Rls. 147.7 million
	Animal husbandry	5 heads Holstein plan Investment; Rls. 100 million (Purchase 5 milk cows, building, facilities)	110 households Rls. 11,000 million	165 households Rls. 16,500 million	110 households Rls. 11,000 million
	Beekeeping	40 bee-hives; Rls. 15 million (Hives, nest, facilities)	200 hives Rls.75 Million	400 hives Rls. 150 million	400 hives Rls. 150 million
	Inland fishery	Trout culture using irrigation well; Rls. 17.5 million (60 m^2 pool, aeration facilities and pump)	1 household Rls. 17.5 million	2 households Rls. 35 million	1 household Rls. 17.5 million
	Total		Rls. 27,213.8 million	Rls. 23,806.5 million	Rls. 21,484.2 million

Site 2	Agriculture	Plastic green house 2,000m^2; Rls. 380 million	1 Rls. 380 million	2 Rls. 760 million	2 Rls. 760 million
		Mechanization Supply of short machinery	50% of shortage Rls. 23,558 million	20% of shortage Rls. 9,423 million	30% of shortage Rls. 14,135 million
	Horticulture	Cultivation of rose for perfume; Rls. 5.9 million/ha	10 ha Rls. 59 million	15 ha Rls. 88.5 million	25 ha Rls. 147.7 million
	Animal husbandry	5 heads Holstein plan Investment; Rls. 100 million (Purchase 5 milk cows, building, facilities)	187 households Rls. 18,700 million	283 households Rls. 28,300 million	187 households Rls. 18,700 million
	Beekeeping	40 bee-hives; Rls. 15 million (Hives, nest, facilities)	600 hives Rls. 225 million	600 hives Rls. 225 million	600 hives 225 Million Rls.
	Inland fishery	Trout culture using irrigation well; Rls. 17.5 million (60 m^2 pool, aeration facilities and pump)	4 household Rls. 70 million	4 households Rls. 70 million	5 household Rls. 87.5 million
		Trout culture using spring water; Rls. 3 million (80 m^2 pool, and facilities)	3 households Rls. 9 million	2 households Rls. 6 million	5 households Rls. 15 million
	Total		Rls. 43,001.0 million	Rls. 38,872.5 million	Rls. 34,070.2 million

2) Farmers organization development

Both the site 1 and 2 will have a RPC Union Building each at Ravansar and Kuzaran. The new building with office equipments costs is estimated at Rls. 478 million each. Total Project cost of the Site 1 and Site 2 will be Rls. 8,568 million as follows:

Initial Investment and O&M Cost of Farmers Organization Development

RPC Union Site 1 (Ravansar)

	year	1		2		3		4		5		6		7		8		9		10		Total		
		Initial	O&M	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Total
RPC Activities	Office and Equipement (Ravansar)	478	30		30		30		30		30		30		30		30		30		30	478	303	781
	1. Agricultural inputs plan	340	11		11		11		11		11		11		11		11		11		11	340	108	448
	2. Mechanization plan	308	29		29		29		29		29		29		29		29		29		29	308	288	596
	3.Extension and Training plan																							
	Advising by a PRC expert		24		24		24		24		24		24		24		24		24		24	0	240	240
	Training by Extension center		13		13		13		13		9		9		9		4		4		4	0	92	92
	4. Joint sales of product plan	450	25		25		25		25		25		25		25		10		25		25	450	235	685
	Total	1,126	132	0	132	0	132	0	132	0	128	0	128	0	128	0	108	0	123	0	123	1,126	1,265	2,391
RPC Union Activites	5. Agro-Processing plan																							
	Packing factory (chickpea & pulse)											1,390	150		150		150		150		150	1,390	750	2,140
	wheat seed cleaning											800	98		98		98		98		98	800	490	1,290
	vegetable grading											640	150		150		150		150		150	640	750	1,390
	Total			0		0		0		0		2,830	398	0	398	0	398	0	398	0	398	2,830	1,990	4,820
	Total of PRC Union Activity (RPC 1 + RPC2)	1,774	234	0	234	0	234	0	234	0	225	2,830	623	0	623	0	585	0	614	0	614	4,604	4,218	8,822
		2,008		234		234		234		225		3,453		623		585		614		614		**8,822**		

RPC Union Site 2 (Kuzaran)

	year	1		2		3		4		5		6		7		8		9		10		Total		
		Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Initial	OM	Total
RPC Activities	Office and Equipement (Kuzaran)	478	30		30		30		30		30		30		30		30		30		30	478	303	781
	1. Agricultural inputs plan	340	11		11		11		11		11		11		11		11		11		11	340	108	448
	2. Mechanization plan	308	29		29		29		29		29		29		29		29		29		29	308	288	596
	3.Extension and Training plan																							
	Advising by a PRC expert		24		24		24		24		24		24		24		24		24		24	0	240	240
	Training by Extension center		13		13		13		13		9		9		9		4		4		4	0	92	92
	4.Joint sales of product plan	450	25		25		25		25	0	25		25		25		10		25		25	450	235	685
	Total	1,126	132	0	132	0	132	0	132	0	128	0	128	0	128	0	108	0	123	0	123	1,126	1,265	2,391
RPC Union Activites	5. Agro-Processing plan																							
	Packing factory (chickpea & pulse)											1,390	150		150		150		150		150	1,390	750	2,140
	wheat seed cleaning											800	98		98		98		98		98	800	490	1,290
	Total	0		0		0		0		0		2,190	248	0	248	0	248	0	248	0	248	2,190	1,240	3,430
	Total of PRC Union Activity (RPC 1 + RPC2)	1,774	234	0	234	0	234	0	234	0	225	2,190	473	0	473	0	435	0	464	0	464	3,964	3,468	7,432
		2,008		234		234		234		225		2,663		473		435		464		464		**7,432**		

3) Agricultural Extension System Improvement

The Site 1 already has two extension centers. The investment cost is estimated on furnish the centers with office equipments and vehicles for extension activities at cost of Rls. 399 million.

The Site 2 has no extension center. So a part of the investment will be spent on building a new extension center at Zalou Ab with cost of Rls. 578 million. The second part, the investment cost is estimated on furnish the centers with office equipments and vehicles for extension

activities at a cost of Rls. 600 million.

They will be invested with in short term plan period for the early completion within the Project period. Item of these costs are shown in the following tables:

Site 1			Site 2		
Category	Item	Short term (1st year ~ 3rd year)	Category	Item	Short term (1st year ~ 3rd year)
Car	For 2 ESCs	Rls. 200 million	Construction of new ESC (Zalu Ab)	Land 500 m^2	Rls. 25 million
				Building 300 m^2	Rls. 300 million
				Facilities	Rls. 153 million
				Vehicle 4wd X 5	Rls. 500 million
				Training room	Rls. 100 million
Equipment For 2 ESCs	Overhead projector Computers & printers Desktop 1, laptop 1 Digital camera Video camera Fax machine Projector Photocopy machine	Rls. 199 Million	Equipment	Overhead projector Computers & printers Desktop 1, laptop 1 Digital camera Video camera Fax machine Projector Photocopy machine	Rls. 99.6 million

4) Ravansar canal irrigation system and management improvement

i) The left bank irrigation scheme

Since 2000 the primary and the secondary irrigation canals which are around 15 kilometers in length have been constructed. Yet it would take three more years to complete the planned length of the canal, which is included in this project. This project will further improve the total canal system by providing necessary tertiary canals with land leveling works, and provision of networks of farm roads and drainage canals.

ii) The right bank irrigation scheme

The entire existing primary and the secondary irrigation canals will be improved, while the total canal system will be provided with necessary tertiary canals. Land leveling works with the provision of networks of farm roads and drainage canals are also carried out.

iii) Left bank scheme main system improvement costs under MOE

The previous budget allocation and future estimate to be constructed are collected from executing agency, KPWA of MOE. The detailed breakdown of construction cost for the left bank new main system and right bank of both completed and planned are not available at present. They are summarized as follows:

Category	F/Year	Amount (million Rls.)	Contents of works
Expended	2000	3,480	5.3 km of concrete lined canal
	2001	1,900	2.4 km of concrete lined canal
	2002	2,720	3.3 km of concrete lined canal
	2003	2,000	3.6 km of concrete lined canal
Remains	Construction	6,500	2 km of main canal, & 17 km of secondary canals
	Design	800	
Total		17,400	

Source: KPWA, October 2003

iv) Right bank main system rehabilitation cost

MOE is going to implement the right bank main irrigation system rehabilitation and the budget has been estimated by WRWA as follows;

Items	Estimation (million Rls.)
Renewal canal lining	1,000
Preparation & installation Measurement devices	30
Renewal gates of intakes	30
Other hydraulic structures	14
Total	1,074

Source: Utilization section of WRWA, July 2003

The urgent rehabilitation with approved in F/Y 2003/04 budget at Rls 520 million will be started from November 2003 by MOE.

v) Land consolidation

Implementation cost of land consolidation on the left bank canal and the right bank canal area have been estimated based on above stated unit price and indirect costs respectively. As for the estimation of land consolidation cost for the right bank canal area, Meskin Abad area with 144.0 ha, has been selected as a model area. And also for the left bank canal area, Khoram Abad area with 280.4 ha, has been selected as a model area.

Implementation cost of each canal area has been estimated based on implementation cost of each model areas. Plans are shown in Fig. 6.4.10 and Fig. 6.4.11 As results of estimation, implementation costs Rls. 26,936 million for the left bank canal, Rls. 4,077 million for the right bank canal area, Rls. 17,256 million for the Gharasu pump irrigation area. Details of estimation are shown in Table 6.6.1.

In regard to the rainfed area of Site 1 and all the area of Site 2, the unit price was used similar to the pumped irrigated area from Gharasu river. The total land consolidation expense of site 1 and site 2 is estimated as Rls. 106,622 Million and Rls. 132,926 Million respectively as shown in Table 6.6.2.

6.6.3 Operation Maintenance Costs

(1) Integrated Agriculture Development

At every stages of implementation in the agricultural development plan, the material costs of main items in agricultural farming, such as fertilizer, chemicals, seeds, employee, and main items in livestock farming, such as roughage, concentrates, wheat straw for litter, are shown in Annex.

(2) Farmers Organization Development

The O&M cost for each year varies from Rls. 135 million/year and the details are shown in the previous section.

(3) Agricultural Extension System Improvement

	サイト１		サイト２	
Category	Item	O&M Costs	Item	O&M Costs
Extension materials For 2 ESCs	Monthly magazine For all contact farmers Technical books etc.	Monthly magazine For all contact farmers Technical books etc.	Monthly magazine For all contact farmers Technical books etc.	Monthly magazine For all contact farmers Technical books etc.
	Sum	Rls. 80 Million/year	Sum	40 Million Rls./year
Salary	Ravansar Experts +3 Technician +5 Hassan Abad Experts +5 Technician +7	For experts Rls. 192 Million For technician Rls. 173 Million	New Zalu Ab ESC Human resources Director 1 Experts 9 Technician 14 Others 3	Salary:
	Sum	Rls. 365 Million/year	Sum	Rls. 444 million/year
Training for farmers			Trainer 4 trainer, 10 days	10 Million Rls./year
	Lunch & transport 30 farmers, 20 times	Rls. 6 Million/year	Lunch & transport 30 farmers, 20 times	Rls. 3 Million/year
	Training cost 1 day course 3 days course	Rls. 46 Million/year Rls. 142 Million/year	Training cost 1 day course 3 days course	Rls. 23 Million /year Rls. 71 Million/year
	Sum	188 Million Rls./year	Sum	Rls. 107 Million/year
Training for experts Province;(3 days,3 times,3 centers)	Lunch & tea	Rls. 37 Million/year	Lunch & tea	Rls. 19 Million/year
	Training materials	Rls. 12 Million/year	Training materials	Rls. 6 Million/year
	Allowance for expert	Rls. 149 Million/year	Allowance for expert	Rls. 75 Million/year
	Sum	Rls. 198 Million/year	Sum	Rls. 100 Million/year
Training in Tehran For experts; 1 week	20 experts/year	Rls. 10 Million/year	10 experts/year	Rls. 5 Million /year

(4) Ravansar Canal Irrigation System and Management Improvement

It is said that the life of concrete structure will be 25 years after completion of construction work usually. Then these irrigation facilities will be re-constructed as it is. The structure will not have any problem for first 5 years if the quality control of the construction work is carried out successfully. Hence, it is assumed that maintenance work for concrete facilities will be 0% for the first 5 years after construction, and after that maintenance fee will be 5.0 % of construction fee. As for the gate, gates may be replaced in every 10 years, and all gates cost will be appropriated as replacement cost. However, gates cost concerning main and secondary irrigation canals could not obtained, and hence these cost were assumed.

On the other hand, the canal cleaning and mowing on the embankment should be carried out once per year before starting the irrigation period. It is assumed that one labor can clean up the canal and also mowing the embankment 100 m per day for the estimation.

As an operation fee, one operator of main gates at the diversion weir will be employed for whole year. 6 water distribution managers consist of 3 persons for day and 3 persons for night, for the left bank canal will be allocated during the irrigation period. 2 water distribution managers consist of one person for day and one person for night, for the right bank canal will be allocated during the irrigation period. On the other hand, administration cost of WUCs should be included in the operation cost. These costs will be appropriated as operation fee.

Under the above stated condition, operation and maintenance cost of each irrigation system and the Gharasu River will be estimated as following table;

(Unit: million Rls./year)

Name of system	Operation cost for every year	Maintenance cost for every year	Replacement cost every 10 years
Left Bank Canal	131	26	465
Right Bank Canal	91	6	356
Total	222	32	821
	254		

(5) Operation Cost for Irrigation Pumps

Based on the hearing in the field of the Study Area, the annual irrigation pump operation cost is set at Rls. 0.96 million/ha of irrigation area.

6.6.4 Project Benefits

(1) Integrated Agriculture Development

The tangible benefit of the Integrated Agriculture Development on the generic agriculture is expressed in the form of an aggregate net income from the increased produce from the project area, as they are resulted by the change of cropping patterns, more efficient mechanization with more intensive extension activities stipulated in the plan. The calculation includes the gross income, costs, and net income of the twelve component produce as well as those as a whole. More detailed information is provided in Annex 9.

The tangible benefit of the Integrated Agriculture Development from the dairy farming is derived from the increased volume of milk production, which will be twice as much as the present milking rate. Table 6.6.2, 6.6.3 and 6.6.4 gives the aggregate net incomes both from the Site 1 and 2. It also gives the financial statement of a unit dairy farm.

(2) Ravansar Irrigation and Management Improvement

Annual benefit from the Project is estimated at Rls. 0.18 million/ha, equivalent to the water fee collected by the Government.

6.7 Project Evaluation

6.7.1 Bases of Project Evaluation

(1) Methodology of Evaluation

Both economic and financial analyses have been conducted. The first analysis sees the Project from the viewpoint of the national economy. The methodology used in this appraisal is to estimate the countable net benefits of the most suitable plan, which are calculated from the equation: “with project situation” minus “without project situation” in their discounted flow during the Project life.

The estimated benefits from introduction of integrated agriculture, development of farmers organization, improvement of agricultural extension system and Ravansar irrigation improvement are those from increased production and sustainability of agricultural and livestock production, whose quality will be improved by introduction of better farming and post-harvest treatment through the joint purchasing inputs, marketing and agro-processing that increase the agricultural income of farmers. The sensitivity analysis is carried out as a form of risk analysis. Three cases, i.e. a case with the cost 10 % higher than the estimated, a case with the benefit 10 % lower than the estimated, and the combined case of aforesaid two

cases, are selected to see how IRR are influenced.

(2) Bases of Evaluation

Tangible costs and corresponding tangible benefits of key components of the Project are estimated in the previous section and the estimates obtained are used in this section.

Site 1: combined investment plus O&M costs in the Ravansar irrigation project both the left and the right bank schemes, and in the integrated agriculture development project, and corresponding benefits in the form of increased produce from the Project area.

Site 2: investment plus O&M costs in the integrated agriculture development Project and corresponding benefit derived from the Project in the form of increased produce from the Project Area.

Indirect/intangible benefits of the Project are qualitatively assessed.

Three indices; internal rate of return (IRR), net present value (NPV), and benefit and cost ratio (B/C), different formulae calculated from the same cash flow, are estimated. 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 (Islamic Republic of Iran: rate of return on deposits, Statistical appendix, IMF Country Report No. 03/280).

The Project life is set at 50 years after the initiation of the project. Taking the incurred costs by one year of preparatory works for the Integrated Agriculture Development and the sunk costs by the previous five years of construction works on the Left Bank Canal into account, though, indices are estimated for the period of 55 years. The base period of the price estimation is set in the second quarter of 2003. An annual inflation rate of 13 %, equivalent to annual inflation rate of goods during August 2002 and August 2003, is applied to 2002 price across the board.

As to sunk costs, 5.1 per cent, general wholesale price index for 2000-2001, 11.0 per cent for both 2001-2002, 2002-2003 are used.

6.7.2 Economic Evaluation

(1) Standard Conversion Factor and Economic Producer Price of Wheat

Standard conversion factor (SCF) estimated in this analysis is set at 0.96 (Table 6.7.1). The relevant data for the years between 1375 and 1379 provided in the Statistical Year Book of 1380 (Central Statistic Office) and the data for the year 1380 found in ‘Economic Trends, #30, III-Q 1381’ (Central Bank of Iran) of the central bank of Iran are used to determine the SCF. Another factor is also taken into account. One and half years have past since a unified managed float exchange system was introduced in March 2002 with less government intervention into the international trade activities. We presume that the Government’s effort of opening up of its economy during the period is equivalent to 1 % in the SCF estimate as shown in Table 6.7.1. Shadow wage rate (SWR) for skilled labor will be equivalent to SCF and SWR for unskilled labor will set at the half of SCF.

To meet the national demand on wheat consumption, Iran has been importing it, while it subsidizes its cost, though it has a goal to reduce the subsidy to a CIF price of imported wheat at a port in Iran by the end of TDP. (In the second quarter of 2003 the CIF price of Canadian

wheat at Bandal-e-Abbas was 173 US$/ton, whereas, guaranteed producer price was set at US$ 176/ton at the exchange rate of Rls. 8,216/$.) This analysis assumes that produce of wheat in the project area could be taken as an import substitute, and price comparison with imported wheat is made at the silo in Kermanshah city. We choose Russian wheat as a representative of imported wheat, because it is one of the cheapest and distance between its entry port in Caspian Sea and Kermanshah is almost one third of that between the southern port in Persian Gulf and Kermanshah. The CIF price of Russian wheat at Bandal-e-Anzali is US$ 154/ton. Including transport and insurance costs, the CIF price of wheat at the silo in Kermanshah city is estimated at US$ 183/ton. The economic price of wheat at an average farm gate in the project area is, therefore, estimated at US$ 180/ton. (Table 6.7.2)

(2) 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 6.7.3 -5.

	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%

The worst case in Site 2, the lowest of all clears the social acceptable discount rate by two per cent.

6.7.3 Financial Evaluation

(1) Project Financial Evaluation

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 6.7.6 to 8);

	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 feasible. But in the case of without sunk costs,

it regarded as feasible by a narrow margin.

(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%

In case of with sunk cost, all cases do not clear the set discount rate.

Thanks to the higher level of rate of return on deposits (17 %) compared to the socially acceptable discount rate (10 %), the project's feasibility is highly susceptible to the change of prices of both costs and benefits.

This means that favorable loan terms should be considered by the government at the initiation of the project. (If we discard the sunken costs from the cash flow, FIRR of the combined case will be 15 %t, closer to the level, yet, slightly below it.)

(3) Analysis of Financial Conditions of an Average Farm Household

Financial conditions of average farm household under the Project Plan in Site 1 and Site 2 are estimated as follows:

	Site 1		Site 2	
	Million Rls.	+%	Million Rls.	+%
At Present	32.4		28.8	
At 3rd Year	46.3	42%	35.8	24%
At 5th Year	56.3	74%	45.4	57%
At 10th Year	75.5	133%	57.9	101%

With the implementation of the Project, the present annual net agricultural income of Rls. 32.4 million in Site 1 will reach Rls. 76 million at the 10th year, equivalent to an average annual growth rate of 9.2 percent.

With the implementation of the Project, the present annual net agricultural income of Rls. 29 million in Site 2 will reach Rls. 58 million at 10th year, equivalent to an average annual growth rate of 8.4 %.

(4) Dairy Farming

Financial statements of the typical farm household to be introduced the five milking cow dairy farm plan is estimated as follows:

Balance Sheet

	cash	Shed 25.0	Cow	(Cum. Dep.)	Total	Self Capital	Loan 16.0	Retained Earning	Total
1	4.0	24.0	75.0	1.0	103.0	20.0	80.0	3.0	103.0
2	2.0	23.0	75.0	2.0	100.0	5.0	64.0	16.0	85.0
3	2.1	22.0	75.0	3.0	99.1	5.0	48.0	31.1	84.1
4	12.2	21.0	75.0	4.0	108.2	5.0	32.0	56.2	93.2
5	24.5	20.0	75.0	5.0	119.5	5.0	16.0	83.5	104.5
6	38.8	19.0	75.0	6.0	132.8	5.0	0.0	112.8	117.8
7	96.8	18.0	75.0	7.0	189.8	5.0	0.0	169.8	174.8

Profits and Losses

	L	Dep 25.0	interest 13%	Loss Total	Balance	Milk	C&C	refund (13-5)%	Profit Total
1	24.0	1.0	10.4	35.4	3.0	38.4	0.0		38.4
2	24.0	1.0	10.4	35.4	13.0	38.4	10.0		48.4
3	24.0	1.0	8.3	33.3	15.1	38.4	10.0		48.4
4	24.0	1.0	6.2	31.2	25.2	38.4	18.0		56.4
5	24.0	1.0	4.2	29.2	27.2	38.4	18.0		56.4
6	24.0	1.0	2.1	27.1	29.3	38.4	18.0		56.4
7	24.0	1.0	0.0	25.0	57.0	38.4	18.0	25.6	82.0

Unit dairy farm cash flow mil.IRR

	cow	calf*	milk	calf	cow	Benefit	Cost	B-C
1	5	4	38.4	0.0	0.0	38.4	(124.0)	(85.6)
2	5	6	38.4	10.0	0.0	48.4	(24.0)	24.4
3	5	8	38.4	10.0	0.0	48.4	(24.0)	24.4
4	5	8	38.4	10.0	8.0	56.4	(24.0)	32.4
5	5	8	38.4	10.0	8.0	56.4	(24.0)	32.4
6	5	8	38.4	10.0	8.0	56.4	(24.0)	32.4
7	5	8	38.4	10.0	8.0	56.4	(24.0)	32.4

*=(cf*3Y+cm*1Y)*2 IRR= 24%

A unit started with an own capital of twenty million Rials with a six year term loan of Rls. 80 million with 1 year grace period at 13 % interest. (Strictly speaking, additional Rls. 4 million of running cost for the first two months is required if the account for sale of milk is settled monthly.)

The unit will build a shed and buy five Holstein cows. Then operation will go smoothly paying interest and amortization in time. In the seventh year, when all the debt service is over, a lending bank, according to the loan agreement, will refund the balance of interest as a token of its acknowledgement of hard work on the part of the unit. At the end of the sixth year, the unit will have a deposit of more than IRR.100 million in a current account of the bank without any liabilities.

(5) Analysis on the Indirect/Intangible Benefits of the Project

The project will demonstrate the agriculturalists in the project area the three new ideas; diversification of crops, improvement in efficiency, and combining of dairy farming with generic agriculture.

Diversification of crops with multiple cropping pattern and introduction of dairy farming firstly maintain the productivity of soil, secondly promote the processing industries with more job opportunities for rural youth, and thirdly bring the agriculturalists into contact with more aspects of market economy, which in turn will stimulate potential entrepreneurs in the area.

Mechanization also brings ancillary industries relating to operation and maintenance activities in agriculture sector, which in turn increase the job opportunity for rural youth.

All in all the Project Area eventually will enjoy smaller sized intensive farming in the suburbs of growing Kermanshah city.

6.7.4 Environmental Consideration

(1) Development Plans to be considered

When any development activity of a significant scale needs to be carried out, environmental considerations should be made as mentioned below:

- To study the environmental impact of development
- To assess the results of the environmental Study
- To formulate measures to prevent or alleviate the impact, if necessary.

For the purpose of sustainable development, it is necessary to consider the following :

- Balance between the benefit of development (positive impact) and adverse effect (negative impact) of development
- Balance between the natural resource management in the Study Area and the required resources for the social and economic activities of the population concerned

There are four development plans in the Feasibility Study as mentioned below.

1. Integrated Agricultural Development Plan
2. Improvement Plan of Ravansar Irrigation Management and On-Farm Water Management System
3. Farmers Organization Development Plan
4. Agricultural Extension System Improvement Plan

Among these four plans, Farmers Organization Development Plan and Agricultural Extension System Improvement Plan are mainly related to the improvement of organizational and administration system and do not have any direct relationship or impact on the Environment. Therefore, Initial Environmental Examination (IEE) is made mainly for the Integrated Agricultural Development and Improvement of Ravansar Irrigation Management and On-Farm Water Management System.

(2) Results of Initial Environmental Examination (IEE)

During the 1st field survey from January to March 2003, an Initial Environmental Examination (IEE) was conducted together with the counterparts of Kermanshah Provincial Directorate of Environment and Kermanshah Jihad-e-Agriculture Organization and the results were reported in ANNEX-6.

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 an area of more than 400 ha
- Man-made lake with an area of more than 400 ha

As a result of IEE, it was concluded that EIA is not necessary, since the development plans includes only rehabilitation or improvement works.

(3) Environmental Impacts of Integrated Agricultural Development

Integrated agricultural development plan is prepared based on integrated farming of agriculture, livestock, apiculture, mechanization, horticulture and inland fishery. EIA is not necessary according to the regulation. However, it is better to consider the environmental impact of the project during implementation of the project. The positive and negative environmental impacts on both natural and social environment through the integrated development are listed below:

1) Positive Environmental Impacts

i) Effective use of soil, water (surface and groundwater), and organic matter to perform sustainable agriculture, which maintains the natural circulatory system
ii) Improvement of soil physical and chemical characteristics through the use of organic matter
iii) Reduction of plant diseases because of introducing crop rotation system and avoiding mono culture.
iv) Minimum use of agricultural fertilizers and chemicals and thereby reducing the pollution on the soil and water
v) Maintaining food safety through agriculture extension
vi) Improvement of sanitation conditions of the villages because of the use of compost, which are kept as piles in the villages
vii) Substantial increase of farmers' income and standard of living
viii) Coordination among the communities and villages by carrying out the processing and marketing activities through RPC
ix) Improvement of regional economy through diversified cropping and promotion of agro industries

2) Negative Environmental Impacts

i) Increase of animal wastes through the introduction of livestock development plan cause pollution, uncleanliness and unhygienic conditions of the villages.
ii) Substantial changes in the way of life through changes from the traditional farming and applying of compost may be restricted because of the local customs.
iii) Division of farming area to introduce multiple crops and reduction of efficiency of farm machinery
iv) Dying of bees because of agrochemical application
v) Use of water of agricultural wells for fish culture
vi) Pollution of surface and groundwater because of excess use of pesticides and chemical

fertilizers.

vii) Some useful insects & birds (predators) which feed from the harmful insects will gradually be killed, because of increase in spraying of pesticides

3) Measures needed to alleviate Negative Environmental Impacts

i) Livestock stalls should be constructed at the periphery of the villages and the animal excreta shall be used as manure by proper excrement management
ii) Although it takes time to change from traditional farming, the significant effect of compost may be promulgated through extension and demonstration farms.
iii) In order to avoid division of farming area, group cultivation through formation of RPC is needed
iv) Bee keeping boxes need to be carried far away during agro chemical application or the area of crops which do not need agro chemical application should be increased.
v) After using water in the pool for fish culture, the over flowed water will be used for crop irrigation and thereby the supply of irrigation water will not be influenced
vi) Application of fertilizers and chemicals should be controlled by regular monitoring of surface and groundwater
vii) Application of pesticides should be controlled by regular monitoring

(4) Environmental Impacts of Improvement Plan of Ravansar Irrigation Management and On-Farm Water Management System

Improvement Plan of Ravansar Irrigation Management mainly includes irrigation and drainage infrastructure facilities improvement, and land consolidation in Site 1. The positive and negative environmental impacts on both natural and social environment through the integrated development are listed below:

1) Positive Environmental Impacts

i) Effective use of water (surface and groundwater), proper water distribution and prevention of leakage, excess or illegal water use
ii) Proper operation and maintenance system can be established.
iii) Improvement of the workability of land through land consolidation
iv) Reduction of flooding through proper drainage
v) Substantial increase of farmers' income and standard of living

2) Negative Environmental Impacts

i) Conflicts among the villagers in the usage of irrigation water
ii) Conflicts within the community in the allotment of plots after land consolidation. For eg. Most of the farmers might prefer to select the plots closer to the roads for easy transport.
iii) Because of excess use of river water for irrigation, the quantity of water in the river becomes less, and there will be more organic materials in the river increasing eutrophication and threatens the aquatic life, including fishes etc. in the river.

3) Measures Needed to alleviate Negative Environmental Impacts

i) Miscommunication among the farmers of different villages can be prevented through

formation of WUA

ii) Conflicts in allotment of plot should be solved through mutual consensus among the farmers through village meetings.

iii) Optimum use of water and regular monitoring of quantity and quality of river water is necessary.

(5) Conclusions

As a result of environmental study during the Phase-I and Phase-II, the following conclusions shall be made.

1) Based on the results of Initial Environmental Examination (IEE), it is concluded that Environmental Impact Assessment (EIA) is not necessary for implementing the development plans discussed in the Feasibility Study.
2) In regard to the natural environment, positive environmental impacts are highly significant, especially the development plans aim at the effective use of soil, water (surface and groundwater), and organic matter to perform sustainable agriculture, which maintains the natural circulatory system. Minor negative impacts can be solved by following proper measures discussed above.
3) In regard to social environment, substantial increase in farming income and standard of living will be achieved by implementing the development plans. However, proper measures are also necessary to avoid the conflicts within the villagers in the allotment of plots and distribution of water.

Table 6.1.1 Agricultural Net Income of Average Farm Household under the Plan (2002 prices)

Site	Farm scale	Dry land or irrigated land	Crops	Yield (ton/ha)	Unit price (Producer's prices, Rls./kg)	Gross income (Million Rls.)	Costs (Million Rls./ha)	Net income (Million Rls./ha)
Site 1	All	Dry land	Wheat	1.7	1,450	2.47	0.67	1.79
			Chick pea	0.8	2,500	1.88	0.75	1.13
			Barley	1.7	1,000	1.70	0.65	1.05
			Sum				**3 ha**	**3.97**
	< 5 ha	Irrigating in spring only	Wheat	5.0	1,450	7.25	1.54	5.71
			Coriander	1.8	2,581	4.65	2.43	2.22
			Chick pea	1.6	2,500	4.00	1.47	2.54
			Sum				**3 ha**	**10.46**
	> 5 ha	Irrigating in spring only	Wheat	5.2	1,450	7.54	1.54	6.00
			Chick pea	1.6	2,500	4.00	1.62	2.38
			Sum				**2 ha**	**8.38**
	< 5 ha	Irrigating at all seasons	Wheat	5.4	1,450	7.83	1.54	6.29
			Rape	2.8	2,500	7.00	1.47	5.54
			Maize (silage)	50.0	150	7.50	4.98	2.52
			Maize (grain)	8.0	1,070	8.56	2.26	6.30
			Vegetables (potato)	20.0	700	14.00	11.38	2.62
			Vegetables (tomato)	20.0	500.0	10.00	3.97	6.03
			Vegetables (onion)	30.0	475	14.25	3.35	10.90
			Alfalfa (hay)	7.0	1,000	7.00	3.66	3.34
			Sum				**5 ha**	**30.50**
	> 5 ha	Irrigating at all seasons	Wheat	5.5	1,450	7.98	1.54	6.43
			Rape	3.0	2,500	7.50	1.47	6.04
			Maize (silage)	50.0	150	7.50	4.98	2.52
			Maize (grain)	8.5	1,070	9.10	2.26	6.84
			Sugar beet	25.0	303	7.58	3.49	4.09
			Alfalfa (hay)	7.5	1,000	7.50	3.66	3.84
			Sum				**5 ha**	**29.75**
Site 2	All	Dry land	Wheat	1.5	1450	2.18	0.67	1.50
			Chick pea	0.7	2500	1.75	0.75	1.00
			Barley	1.6	1000	1.60	0.65	0.95
			Sum				**3 ha**	**3.45**
	All	Irrigating at all seasons	Wheat	5.3	1450	7.69	1.54	6.14
			Rape	2.6	2500	6.50	1.47	5.04
			Maize (silage)	50.0	150	7.50	4.98	2.52
			Maize (grain)	7.8	1070	8.35	2.26	6.09
			Sugar beet	35	303	10.61	3.49	7.12
			Alfalfa (hay)	7	1,000	7.00	3.66	3.34
			Sum				**5 ha**	**30.24**

Note: Producer's price of alfalfa hay was 800 Rls./kg during August to October, but was higher in winter.
Therefore, 1,000 Rls./kg is adapted as average of alfalfa hay all the year round.

Table 6.1.2 Agricultural Plan of the Project (2002 Prices)

Site	Year after implementation of plan	Dry land or irrigated land	Crops	Wheat	Cick pea	Barley	Rape	Maize (silage)	Maize (grain)	Sugar beet	Alfalfa	Coriander	Potato	Tomato	Onion	Total of annual amounts (Million Rls.)
			Unit prices Rls./kg	1,450	2,500	1,000	2,500	150	1,070	303	1,000	2,581	700	500	475	
Site 1	At present (Presumption)	Dry land	Area	3,062	875	437										
			Yield	1.70	0.75	1.65										
			Production	5,205	656	722										
			Amounts (Millon Rls.)	7,547	1,640	722										9,909
		Irrigated land	Area	1,226	350	175			559							
			Yield	5.50	1.60	5.50			8.50							
			Production	6,742	560	963			4,752							
			Amounts (Millon Rls.)	9,775	1,401	963			5,084							17,223
		Total amounts (Million Rls./year)		17,323	3,041	1,685			5,084							27,132
	3rd year	Dry land	Area	861	1,723	861										
			Yield	1.90	0.90	1.95										
			Production	1,636	1,550	1,679										
			Amounts (Millon Rls.)	2,373	3,876	1,679										7,928
		Irrigated land	Area	1,036	489		385	385	385	281	385	161	35	35	35	
			Yield	6.80	1.80		3.80	50.00	9.60	40.00	9.30	2.10	30.00	31.00	41.00	
			Production	7,047	881		1,465	19,274	3,701	11,228	3,585	339	1,048	1,083	1,432	
			Amounts (Millon Rls.)	10,218	2,202		3,662	2,891	3,960	3,402	3,585	875	733	541	680	32,750
		Total amounts (Million Rls./year)		12,590	6,078	1,679	3,662	2,891	3,960	3,402	3,585	875	733	541	680	40,677
	5th year	Dry land	Area	861	1,723	861										
			Yield	2.20	1.10	2.10										
			Production	1,895	1,895	1,809										
			Amounts (Millon Rls.)	2,747	4,737	1,809										9,293
		Irrigated land	Area	1,033	489		382	382	382	278	382	161	35	35	35	
			Yield	7.50	2.00		4.10	55.00	10.20	60.00	11.00	2.50	35.00	35.00	47.00	
			Production	7,750	979		1,568	21,036	3,901	16,662	4,207	403	1,222	1,222	1,642	
			Amounts (Millon Rls.)	11,237	2,447		3,920	3,155	4,174	5,049	4,207	1,041	856	611	780	37,478
		Total amounts (Million Rls./year)		13,984	7,184	1,809	3,920	3,155	4,174	5,049	4,207	1,041	856	611	780	46,771
	10th year	Dry land	Area	861	1,723	861										
			Yield	2.60	1.50	2.45										
			Production	2,239	2,584	2,110										
			Amounts (Millon Rls.)	3,247	6,459	2,110										11,816
		Irrigated land	Area	1,028	489		377	377	377	273	377	161	35	35	35	
			Yield	9.00	2.50		5.00	60.00	13.00	80.00	15.00	3.50	50.00	50.00	60.00	
			Production	9,255	1,224		1,887	22,649	4,907	21,816	5,662	565	1,746	1,746	2,096	
			Amounts (Millon Rls.)	13,419	3,059		4,719	3,397	5,251	6,610	5,662	1,458	1,222	873	995	46,666
		Total amounts (Million Rls./year)		16,666	9,518	2,110	4,719	3,397	5,251	6,610	5,662	1,458	1,222	873	995	58,482
Site 2	At present (Presumption)	Dry land	Area	4,626	1,322	661										
			Yield	1.50	0.70	1.60										
			Production	6,939	925	1,057										
			Amount	10,062	2,313	1,057										13,433
		Irrigated land	Area	1,609					1,609							
			Yield	5.30					7.80							
			Production	8,528					12,550							
			Amount	12,365					13,429							25,794
		Total amounts (Million Rls./year)		22,427	2,313	1,057			13,429							39,227
	3rd year	Dry land	Area	1,652	3,305	1,652										
			Yield	1.80	0.85	1.90										
			Production	2,974	2,809	3,139										
			Amount	4,312	7,022	3,139										14,474
		Irrigated land	Area	642			642	642	642	642	642					
			Yield	6.20			2.90	50.00	9.20	50.00	9.50					
			Production	3,978			1,861	32,080	5,903	32,080	6,095					
			Amount	5,768			4,652	4,812	6,316	9,720	6,095					37,363
		Total amounts (Million Rls./year)		10,080	7,022	3,139	4,652	4,812	6,316	9,720	6,095					51,837
	5th year	Dry land	Area	1,652	3,305	1,652										
			Yield	2.10	1.00	2.20										
			Production	3,470	3,305	3,635										
			Amount	5,031	8,261	3,635										16,927
		Irrigated land	Area	639			639	639	639	639	639					
			Yield	7.80			3.70	55.00	10.50	60.00	11.00					
			Production	4,981			2,363	35,123	6,705	38,316	7,025					
			Amount	7,223			5,907	5,268	7,175	11,610	7,025					44,207
		Total amounts (Million Rls./year)		12,254	8,261	3,635	5,907	5,268	7,175	11,610	7,025					61,134
	10th year	Dry land	Area	1,652	3,305	1,652										
			Yield	2.50	1.40	2.40										
			Production	4,131	4,626	3,965										
			Amount	5,989	11,566	3,965										21,521
		Irrigated land	Area	634			634	634	634	634	634					
			Yield	8.50			4.50	60.00	12.50	70.00	14.50					
			Production	5,386			2,851	38,016	7,920	44,352	9,187					
			Amount	7,809			7,128	5,702	8,474	13,439	9,187					51,740
		Total amounts (Million Rls./year)		13,799	11,566	3,965	7,128	5,702	8,474	13,439	9,187					73,260
the Study Area	At present	Dry land	Area	7,688	2,197	1,098										
			Production	12,144	1,581	1,779										
			Amount	17,609	3,953	1,779										23,342
		Irrigated land	Area	2,835					2,168							
			Production	15,269					17,302							
			Amount	22,140					18,513							40,653
		Total amounts (Million Rls./year)		39,750	3,953	1,779			18,513							63,995
	3rd year	Dry land	Area	2,514	5,027	2,514										
			Production	4,610	4,359	4,819										
			Amount	6,685	10,898	4,819										22,402
		Irrigated land	Area	1,678			1,027	1,027	1,027	922	1,027	161	35	35	35	
			Production	11,025			3,325	51,354	9,603	43,308	9,680	339	1,048	1,083	1,432	
			Amount	15,986			8,314	7,703	10,276	13,122	9,680	875	733	541	680	67,910
		Total amounts (Million Rls./year)		22,671	10,898	4,819	8,314	7,703	10,276	13,122	9,680	875	733	541	680	90,312
	5th year	Dry land	Area	2,514	5,027	2,514										
			Production	5,364	5,199	5,444										
			Amount	7,778	12,998	5,444										26,220
		Irrigated land	Area	1,672			1,021	1,021	1,021	916	1,021	161	35	35	35	
			Production	12,731			3,931	56,159	10,607	54,978	11,232	403	1,222	1,222	1,642	
			Amount	18,459			9,827	8,424	11,349	16,658	11,232	1,041	856	611	780	79,238
		Total amounts (Million Rls./year)		26,238	12,998	5,444	9,827	8,424	11,349	16,658	11,232	1,041	856	611	780	105,458
	10th year	Dry land	Area	2,514	5,027	2,514										
			Production	6,370	7,210	6,075										
			Amount	9,236	18,025	6,075										33,337
		Irrigated land	Area	1,662			1,011	1,011	1,011	906	1,011	161	35	35	35	
			Production	14,640			4,739	60,665	12,827	66,168	14,849	565	1,746	1,746	2,096	
			Amount	21,228			11,847	9,100	13,725	20,049	14,849	1,458	1,222	873	995	95,347
		Total amounts (Million Rls./year)		30,464	18,025	6,075	11,847	9,100	13,725	20,049	14,849	1,458	1,222	873	995	128,684

Table 6.1.3 Present Agricultural Conditions by Zone in the Study Area

Site	Zone	Deh	Agriculture		Number of Machinery				Cow		Beehive		Number of wells		
			No. of farm households	Cultivated area (ha)	Tractor	Combine	Seeder	Others	Local Variety	Hybrid & Holstein	Local	Modern	Total	Discharge < 10 lit./se	Discharge > 10 lit./se
1	1	Ghalancheh	16	240	7	0	2	37	143	0	0	0			
		Meskin Abad-e-Sofla	32	393	3	0	0	10	31	21	0	0			
		Meskin Abad-e-Olya	36	426	10	0	0	35	-	-	-	-	1		1
		Khoram Abad-e-Sofla	64	603	8	1	1	37	73	75	0	6	2	2	
		Khoram Abad-e-Olya	43	562	6	1	1	17	66	47	0	0			
		Deh Sadeh	33	434	8	0	1	43	6	6	0	0			
		Zarin Chagha	58	634	13	2	0	52	13	18	0	0	2		2
		Zone 1 Total	282	3,292	55	4	5	231	332	167	0	6	5	2	3
	2	Tapeh Rash	29	245	5	1	4	26	66	8	0	0			
		Tapeh Kuick	26	316	6	1	3	28	50	15	0	0	7	6	1
		Tapeh Lori	34	452	14	0	2	61	7	17	0	0	13	7	6
		Hassan Abad	71	777	6	4	2	15	108	69	0	199	12	6	6
		Hossein Abad	7	50	3	1	0	12	0	0	0	0	5	3	2
		Deh Bagh	6	48	1	1	1	7	7	1	0	17			
		Shali Abad	39	213	2	0	0	6	24	7	0	0			
		Ghale Zakariya	71	586	14	0	1	66	69	31	0	0	11	1	10
		Ghale Reza	24	329	5	0	0	20	1	0	0	0	3	2	1
		Kareim Abad	27	376	4	2	2	23	3	13	0	0	2	2	
		Zine 2 Total	334	3,392	60	10	15	264	335	161	0	216	53	27	26
			616	6,684	115	14	20	495	667	328	0	222	58	29	29
2	3	Daulat Abad	55	759	3	0	0	10	134	0	0	0	3	2	1
		Reis	40	482	9	2	2	38	52	0	0	0	4	2	2
		Kareh Ghale Sefid	31	276	4	2	0	8	16	1	0	0			
		Kareh Ghale Kouneh	30	317	4	0	0	15	64	5	0	1			
		Deh Jan-jan	22	257	5	2	0	16	12	2	0	0	11	1	10
		Zone 3Total	178	2,091	25	6	2	87	278	8	0	1	18	5	13
	4	Deh Cheragh	37	448	8	3	1	24	39	2	0	0	18	2	16
		Zalou Ab	74	695	16	5	5	59	68	39	0	0	25	10	15
		Kalaveh Haidar Khan	46	411	4	0	1	16	25	0	0	0			
		Lamini	38	244	2	0	0	6	3	0	0	0			
		Zone 4 Total	195	1,797	30	8	7	105	135	41	0	0	43	12	31
	5	Elyasei	29	302	2	0	2	7	0	9	0	0	8	4	4
		Pirouzeh	19	265	2	2	0	9	24	0	0	0	4	3	1
		Tapeh Ghol	74	598	6	0	1	28	8	85	0	0	11	7	4
		Jil Abad	26	155	1	0	0	3	36	5	0	0			
		Chagha Shekar	28	241	5	0	1	20	31	0	0	0	9	4	5
		Dayar Asad Khan	19	199	2	0	0	7	13	2	0	0			
		Rootvand	33	343	4	0	0	13	55	0	0	0	8	1	7
		Sabz Bolagh	34	291	14	0	0	40	91	2	0	0	4	1	3
		Siyah Siyah Dayar	23	271	2	0	2	14	6	8	0	0	5	1	4
		Siyah Siyah	25	300	3	0	0	8	3	0	0	0	4		4
		Hossein Abad Shaleh	47	433	10	0	2	26	11	4	0	0			
		Ghale Khoda Mororat	46	332	2	0	0	25	68	0	0	0	8	3	5
		Ghale Farajollah-e-Beig	22	268	20	0	0	16	14	0	0	0	4		4
		Kachkineh	31	322	3	0	0	10	23	2	0	0	4	1	3
		Kandouleh	55	459	7	0	0	21	117	0	0	0	2	0	2
		Nouroleh Safla	19	266	4	0	2	16	14	0	0	0	2	1	1
		Nouroleh Oliya	57	694	13	2	1	60	158	19	0	0	8	2	6
		Vali Abad	18	201	2	0	0	5	15	4	0	0	8	1	7
		Zone 5 Total	605	5,939	102	4	11	328	687	140	0	0	89	29	60
		Site 2 Total	978	9,827	157	18	20	520	1,100	189	0	1	150	46	104
Grand total of Study Area			1,594	16,511	272	32	40	1,015	1,767	517	0	223	208	75	133

Table 6.1.4 Agricultural Machinery Procurement Plan

Area	No.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
	Name of machinery			Heavy tractor (140 PS)	Heavy tractor (4WD 110 PS)	Heavy tractor (2WD 110 PS)	Light tractor (75 PS)	Combine	Heavy plow	Light plow	Heavy disk	Light disk	Border	Ditcher	Furrower	Rotavator	Harrow	Leveler	Roller	Fertilizer sprayer	Seeder	Chemical sprayer	Seed cleaner	Seed disinfection facility	Thresher	Mower	Mower	Baler	Rake	Chopper	Trailer	Pump	Munure spreader	Total	Cumulative Total	Total During Period
	Unit Price (mill. Rls)			270.0	95.0	79.0	62.0	189.0	4.5	3.7	30.0	6.0	2.2	1.8	1.9	3.2	2.1	7.0	1.9	2.5	35.2	5.3	60.0	3.0	1.4	6.5	13.5	45.5	2.9	30.0	13.0	20.0	5.0			
Site1	Nos. of machinery shortage at present			25	25	26	127	12	76	127	40	80	40	32	36	60	32	40	20	36	48	40	20	20	20	20	24	24	24	16	32	40	36			
	3rd year after implementation of plan	By 3 Mechanization Service Companies	No. of Supply	5	5	5	25	2	15	25	8	16	8	6	7	12	6	8	4	7	10	8	4	4	4	4	5	5	5	3	6	8	7			
			Amount (mill. Rls.)	1,350	475	411	1,575	454	68	93	240	96	18	12	14	38	13	56	7	18	338	42	240	12	5	26	65	218	14	96	83	160	36	6,273			
		By private farmers	No. of Supply	8	8	8	38	4	23	38	12	24	12	10	11	18	10	12	6	11	14	12	6	6	6	6	7	7	7	5	10	12	11			
			Amount (mill. Rls.)	2,025	713	616	2,362	680	103	139	360	143	26	17	21	58	20	84	11	27	507	64	360	18	8	39	97	328	21	144	125	240	54	9,409	15,682	15,682
	5th year after implementation of plan	By 3 Mechanization Service Companies	Cumulative Nos. of supply	7	7	7	36	3	21	36	11	22	11	9	10	17	9	11	6	10	13	11	6	6	6	6	7	7	7	4	9	11	10			
			Cumulative Amount (mill. Rls.)	1,890	665	575	2,205	635	96	130	336	134	25	16	19	54	19	78	10	25	473	59	336	17	8	36	91	306	19	134	116	224	50	8,782			
		By private farmers	Cumulative Nos. of supply	11	11	11	53	5	32	53	17	34	17	13	15	25	13	17	8	15	20	17	8	8	8	8	10	10	10	7	13	17	15			
			Cumulative Amount (mill. Rls.)	2,835	998	863	3,307	953	144	195	504	201	37	24	29	81	28	118	16	38	710	89	504	25	11	55	136	459	29	202	175	336	76	13,173	21,955	21,955
	10th year after implementation of plan	By 3 Mechanization Service Companies	Cumulative Nos. of supply	10	10	10	51	5	30	51	16	32	16	13	14	24	13	16	8	14	19	16	8	8	8	8	10	10	10	6	13	16	14			
			Cumulative Amount (mill. Rls.)	2,700	950	822	3,150	907	137	185	480	191	35	23	27	77	27	112	15	36	676	85	480	24	11	52	130	437	27	192	166	320	72	12,546			
		By private farmers	Cumulative Nos. of supply	15	15	16	76	7	46	76	24	48	24	19	22	36	19	24	12	22	29	24	12	12	12	12	14	14	14	10	19	24	22			
			Cumulative Amount (mill. Rls.)	4,050	1,425	1,232	4,724	1,361	205	278	720	287	53	35	41	115	40	168	22	54	1,014	127	720	36	16	78	194	655	41	288	250	480	108	18,818	31,364	31,364
Site2	Nos. of machinery shortage at present			38	38	38	190	18	114	190	60	120	60	48	54	90	48	60	30	54	72	60	30	30	30	30	36	36	36	24	48	60	54			
	3rd year after implementation of plan	By 4 Mechanization Service Companies	No. of Supply	8	8	8	38	4	23	38	12	24	12	10	11	18	10	12	6	11	14	12	6	6	6	6	7	7	7	5	10	12	11			
			Amount (mill. Rls.)	2,052	722	600	2,356	680	103	139	360	143	26	17	21	58	20	84	11	27	507	64	360	18	8	39	97	328	21	144	125	240	54	9,423			
		By private farmers	No. of Supply	11	11	11	57	5	34	57	18	36	18	14	16	27	14	18	9	16	22	18	9	9	9	9	11	11	11	7	14	18	16			
			Amount (mill. Rls.)	3,078	1,083	901	3,534	1,021	154	208	540	215	40	26	31	86	30	126	17	41	761	95	540	27	12	59	146	491	31	216	187	360	81	14,135	23,558	7,876
	5th year after implementation of plan	By 4 Mechanization Service Companies	Cumulative Nos. of supply	11	11	11	53	5	32	53	17	34	17	13	15	25	13	17	8	15	20	17	8	8	8	8	10	10	10	7	13	17	15			
			Cumulative Amount (mill. Rls.)	2,873	1,011	841	3,298	953	144	194	504	201	37	24	29	81	28	118	16	38	710	89	504	25	11	55	136	459	29	202	175	336	76	13,193			
		By private farmers	Cumulative Nos. of supply	16	16	16	80	8	48	80	25	50	25	20	23	38	20	25	13	23	30	25	13	13	13	13	15	15	15	10	20	25	23			
			Cumulative Amount (mill. Rls.)	4,309	1,516	1,261	4,948	1,429	215	291	756	301	55	36	43	121	42	176	23	57	1,065	134	756	38	17	82	204	688	43	302	262	504	113	19,789	32,981	11,027
	10th year after implementation of plan	By 4 Mechanization Service Companies	Cumulative Nos. of supply	15	15	15	76	7	46	76	24	48	24	19	22	36	19	24	12	22	29	24	12	12	12	12	14	14	14	10	19	24	22			
			Cumulative Amount (mill. Rls.)	4,104	1,444	1,201	4,712	1,361	205	277	720	287	53	35	41	115	40	168	22	54	1,014	127	720	36	16	78	194	655	41	288	250	480	108	18,847			
		By private farmers	Cumulative Nos. of supply	23	23	23	114	11	68	114	36	72	36	29	32	54	29	36	18	32	43	36	18	18	18	18	22	22	22	14	29	36	32			
			Cumulative Amount (mill. Rls.)	6,156	2,166	1,801	7,068	2,041	308	416	1,080	430	79	52	62	173	60	252	33	81	1,521	191	1,080	54	24	117	292	983	62	432	374	720	162	28,270	47,116	15,753
Total	Nos. of machinery shortage at present			63	63	64	317	30	190	317	100	200	100	80	90	150	80	100	50	90	120	100	50	50	50	50	60	60	60	40	80	100	90			
	3rd year after implementation of plan	By 7 Mechanization Service Companies	No. of Supply	13	13	13	63	6	38	63	20	40	20	16	18	30	16	20	10	18	24	20	10	10	10	10	12	12	12	8	16	20	18			
			Amount (mill. Rls.)	3,402	1,197	1,011	3,931	1,134	171	231	600	239	44	29	34	96	34	140	19	45	845	106	600	30	14	65	162	546	34	240	208	400	90	15,696			
		By private farmers	No. of Supply	19	19	19	95	9	57	95	30	60	30	24	27	45	24	30	15	27	36	30	15	15	15	15	18	18	18	12	24	30	27			
			Amount (mill. Rls.)	5,103	1,796	1,517	5,896	1,701	257	347	900	358	66	43	51	144	50	210	28	68	1,268	159	900	45	20	98	243	819	51	360	312	600	135	23,544	39,240	15,682
	5th year after implementation of plan	By 7 Mechanization Service Companies	Cumulative Nos. of supply	18	18	18	89	8	53	89	28	56	28	22	25	42	22	28	14	25	34	28	14	14	14	14	17	17	17	11	22	28	25			
			Cumulative Amount (mill. Rls.)	4,763	1,676	1,416	5,503	1,588	239	324	840	334	62	40	48	134	47	196	26	63	1,183	148	840	42	19	91	227	764	48	336	291	560	126	21,974			
		By private farmers	Cumulative Nos. of supply	26	26	27	133	13	80	133	42	84	42	34	38	63	34	42	21	38	50	42	21	21	21	21	25	25	25	17	34	42	38			
			Cumulative Amount (mill. Rls.)	7,144	2,514	2,124	8,255	2,381	359	486	1,260	501	92	60	72	202	71	294	39	95	1,775	223	1,260	63	28	137	340	1,147	72	504	437	840	189	32,962	54,936	21,955
	10th year after implementation of plan	By 7 Mechanization Service Companies	**Cumulative Nos. of supply**	**25**	**25**	**26**	**127**	**12**	**76**	**127**	**40**	**80**	**40**	**32**	**36**	**60**	**32**	**40**	**20**	**36**	**48**	**40**	**20**	**20**	**20**	**20**	**24**	**24**	**24**	**16**	**32**	**40**	**36**			
			Cumulative Amount (mill. Rls.)	**6,804**	**2,394**	**2,022**	**7,862**	**2,268**	**342**	**463**	**1,200**	**478**	**88**	**58**	**68**	**192**	**67**	**280**	**37**	**90**	**1,690**	**212**	**1,200**	**60**	**27**	**130**	**324**	**1,092**	**68**	**480**	**416**	**800**	**180**	**31,392**			
		By private farmers	**Cumulative Nos. of supply**	**38**	**38**	**38**	**190**	**18**	**114**	**190**	**60**	**120**	**60**	**48**	**54**	**90**	**48**	**60**	**30**	**54**	**72**	**60**	**30**	**30**	**30**	**30**	**36**	**36**	**36**	**24**	**48**	**60**	**54**			
			Cumulative Amount (mill. Rls.)	**10,206**	**3,591**	**3,034**	**11,792**	**3,402**	**513**	**694**	**1,800**	**716**	**132**	**86**	**103**	**288**	**101**	**420**	**56**	**135**	**2,535**	**318**	**1,800**	**90**	**41**	**195**	**486**	**1,638**	**103**	**720**	**624**	**1,200**	**270**	**47,088**	**78,480**	31,364

Table 6.1.5 Milk Cow (Holstein) Raising Plan

Plan	Items	Zone					Total
		1	2	3	4	5	
Short-term 1st ~ 3rd years	Total number of farm household	282	334	178	195	605	1,594
	Existent number of improved cows	167	161	8	41	140	517
	Existent number of households owned improved cows	33	32	2	8	28	103
	Number of households newly introducing improved cows	50	60	35	37	115	298
	Number of newly introduced Holstein	**248.6**	**301.8**	**176.4**	**186.8**	**577**	**1,491**
	Total number of improved cows	415.6	462.8	184.4	227.8	717	2,008
	Total milk production a year by improved cows (ton)	**1,611**	**1,851**	**867**	**999**	**3,120**	**8,447**
	Maxmum quantity of milk per day (ton)	12	14	6	7	22	60
	Quantity of milk briefly stored at milk center (ton)	2	2	3	3	9	19
	Required number of milk center with plate cooler of 5 tons	**1**	**1**	**1**	**1**	**2**	6
Medium-term 3rd ~ 5th years	Total number of farm household	282	334	178	195	605	1,594
	Existent number of improved cows	167	161	8	41	140	517
	Existent number of households owned improved cows	33	32	2	8	28	103
	Number of households newly introducing improved cows	124	151	88	93	289	745
	Number of newly introduced Holstein	**621.5**	**754.5**	**441**	**467**	**1,443**	**3,727**
	Total number of improved cows	788.5	915.5	449	508	1,583	4,244
	Total milk production a year by improved cows (ton)	**3,401**	**4,024**	**2,137**	**2,344**	**7,274**	**19,180**
	Maxmum quantity of milk per day (ton)	24	27	13	15	47	127
	Quantity of milk briefly stored at milk center (ton)	10	13	7	7	23	60
	Required number of milk center with plate cooler of 5 tons	**2**	**2**	**2**	**2**	**4**	12
Long-term 5th ~ 10th	Total number of farm household	282	334	178	195	605	1,594
	Existent number of improved cows	167	161	8	41	140	517
	Existent number of households owned improved cows	33	32	2	8	28	103
	Number of households newly introducing improved cows	174	211	123	131	404	1,043
	Number of newly introduced hybrid	**870.1**	**1,056**	**617**	**654**	**2,020**	**5,217**
	Total number of improved cows	1037.1	1,217	625	695	2,160	5,734
	Total milk production a year by improved cows (ton)	**4,594**	**5,473**	**2,984**	**3,241**	**10,044**	**26,335**
	Maxmum quantity of milk per day (ton)	31	37	19	21	65	172
	Quantity of milk briefly stored at milk center (ton)	15	17	9	10	32	83
	Required number of milk center with plate cooler of 5 tons	**3**	**3**	**2**	**2**	**6**	16

Table 6.1.6 Beekeeping Development Plan

Plan	Items	Zone					Total
		1	2	3	4	5	
Short-term 1st ~ 3rd years	Existent number of beehives	6	216	1	0	0	223
	Number of newly introduced beehives	**200**	0	**200**	200	200	800
	Number of households newly introducing beekeeping	5	0	5	5	5	20
	Total number of beehives	206	216	201	200	200	1,023
	Total honey production (ton)	**3.1**	**3.2**	**3.0**	**3**	**3**	**15**
Medium-term 3rd ~ 5th years	Existent number of beehives						0
	Number of newly introduced beehives	**400**	200	400	400	400	1,800
	Number of households newly introducing beekeeping	10	5	10	10	10	45
	Total number of beehives	406	416	401	400	400	2,023
	Total honey production (ton)	**6.1**	**6.24**	**6.015**	**6**	**6**	**30**
Long-term 5th ~ 10th	Existent number of beehives						0
	Number of newly introduced beehives	**600**	400	600	600	600	2,800
	Number of households newly introducing beekeeping	15	10	15	15	15	70
	Total number of beehives	606	616	601	600	600	3,023
	Total honey production (ton)	**9.1**	**9**	**9**	**9**	**9**	**45**

Table 6.1.7 Income of Standard Farm Household under Integrated Farming Development Plan (2002 Prices)

Unit: million Rls

Area	Farm Scale	Dry land or irrigated land	Unit Net Income(million Rls.)						Conditions of integrated farming	Integrated Farming
			1	2	3	4	5	6		
			Agriculture per ha	Vegetable per ha	Animal husbandry per 5 milk caws	Rose for perfume per ha	Beekeeping per 40 bee hives	Trout culture per ton		
Site 1	All	Dry land	1.32		21.40				1: 10 ha 3: 5 heads raising of cows	34.63
							6.10		1: 10 ha 5: 40 bee-hives	19.33
	< 5 ha	Irrigated in spring only	2.75	2.22	21.40				1: 3 ha 2: 1 ha 3: 5 heads raising of cows	31.86
	> 5 ha		4.19		21.40				1: 10 ha 3: 5 heads raising of cows	63.30
	< 5 ha	Irrigated through the year	2.26	19.61	21.40				1: 3 ha 2: 1 ha 3: 5 heads raising of cows	47.80
						22.70			1: 3 ha 3: 5 heads raising of cows 4: 1 ha	50.89
	> 5 ha		6.12		21.40	22.70			1: 10 ha 3: 5 heads raising of cows 4: 1 ha	105.31
								6.00	1: 10 ha 3: 5 heads raising of cows 6: Yield of 1ton of trout	88.61
Site 2	All	Dry land	1.15		21.40				1: 10 ha 3: 5 heads raising of cows	32.91
							6.10		1: 10 ha 5: 40 bee-hives	17.61
		Irrigated throught the year	6.05		21.40	22.70			1: 10 ha 3: 5 heads raising of cows 4: 1 ha	104.59
								6.00	1: 10 ha 3: 5 heads raising of cows 6: Yield of 1ton of trout	87.89

Table 6.4.1 Calculation of Diversion Water Requirement (Cropping Pattern 2)

Item		Unit	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Agu.	Sep.	Oct.	Nov.	Dec.	Year
Basic Data															
a ETo		mm/month	27	35	69	105	165	232	300	284	211	132	55	32	1,647
b Basic Rainfall (1/5)		mm/month	35.0	57.0	73.9	101.2	70.5	10.6	0.0	0.0	0.0	1.9	24.5	8.5	383.1
c Irrigation effeciency		51%													
A Wheat	50%														
1 Cropping Pattern															
2 Crop coefficient	Kc-1		0.85	0.85	0.85	1.24	0.79	0.51					0.45	0.85	
	Kc-2		0.85	0.85	0.85	0.85	1.24	0.75	0.51					0.46	
	Average		0.85	0.85	0.85	1.05	1.02	0.63	0.51				0.45	0.66	
3 Days of irrigation		days	31	28	31	30	31	30	8				30	31	
4 ETcrop (Eto x Kc)		mm	23.0	29.8	58.7	109.7	167.5	146.2	153.0				24.8	21.0	
5 Area factor (Af)			1.00	1.00	1.00	1.00	1.00	0.73	0.03				0.50	1.00	
6 ETcrop net (Eto x Kc x Af)		mm	23.0	29.8	58.7	109.7	167.5	106.7	4.6				12.4	21.0	
7 Effective rainfall		mm/month	18.5	25.5	44.8	65.5	51.8	8.9	0.0				15.6	5.1	
8 Effective rainfall (=(3)*(7)/days of month)		mm	18.5	25.5	44.8	65.5	51.8	8.9	0.0				15.6	5.1	
9 Net requirement (=(6)-(8))		mm	4.5	4.3	13.9	44.2	115.7	97.8	4.6				0.0	15.9	
10 Diversion requirement (=(9)/c)		mm	8.7	8.3	27.2	86.7	226.8	191.8	9.0				0.0	31.1	
11 Diversion requirement		mm/day	0.3	0.3	0.9	2.9	7.3	6.4	1.1				0.0	1.0	
B Coliander	25%														
1 Cropping Pattern															
2 Crop coefficient	Kc-1					0.75	0.90	1.01							
	Kc-2					0.70	0.81	0.96	0.99						
	Average					0.73	0.86	0.99	0.99						
3 Days of irrigation		days				30	31	30	19						
4 ETcrop (Eto x Kc)		mm				76.1	141.1	228.5	297.0						
5 Area factor (Af)						0.67	1.00	0.92	0.29						
6 ETcrop net (Eto x Kc x Af)		mm				51.0	141.1	210.2	86.1						
7 Effective rainfall		mm/month				65.5	51.8	8.9	0.0						
8 Effective rainfall (=(3)*(7)/days of month)		mm				65.5	51.8	8.9	0.0						
9 Net requirement (=(6)-(8))		mm				0.0	89.3	201.3	86.1						
10 Diversion requirement (=(9)/c)		mm				0.0	175.0	394.8	168.9						
11 Diversion requirement		mm/day				0.0	5.6	13.2	8.9						
C Chick pea	25%														
1 Cropping Pattern															
2 Crop coefficient	Kc-1				0.40	0.63	0.99	0.69							
	Kc-2					0.40	0.64	1.00	0.69						
	Average				0.40	0.52	0.82	0.85	0.69						
3 Days of irrigation		days			10	30	31	30	19						
4 ETcrop (Eto x Kc)		mm			27.6	54.1	134.5	196.0	207.0						
5 Area factor (Af)					0.05	0.77	1.00	0.86	0.19						
6 ETcrop net (Eto x Kc x Af)		mm			1.4	41.6	134.5	168.6	39.3						
7 Effective rainfall		mm/month			44.8	65.5	51.8	8.9	0.0						
8 Effective rainfall (=(3)*(7)/days of month)		mm			14.5	65.5	51.8	8.9	0.0						
9 Net requirement (=(6)-(8))		mm			0.0	0.0	82.7	159.7	39.3						
10 Diversion requirement (=(9)/c)		mm			0.0	0.0	162.1	313.1	77.1						
11 Diversion requirement		mm/day			0.0	0.0	5.2	10.4	4.1						
Average diversion requirement of the cropping pattern		mm/day	0.2	0.2	0.5	1.5	6.4	9.1	3.8	0.0	0.0	0.0	0.0	0.5	

Table 6.5.1 Task Allocation of Priority Project/Programs Implementation

Project/Programs	Farmers	Ravansar, Kuzaran Agriculture Centers	Kermanshah Jihad & Agriculture Organization & District Offices								Western Regional & Provincial Water Affairs	Kermanshah Agricultural Research Institute	Kermanshah Cooperative	Agricultural Bank	Private Companies	JICA Short Term Expert
			Agronomy	Mechanization	Animal Husbandry	Horticulture	Fishery	Extension	Utilization (RPC)	Soil & Water						
New Crop Rotation Program	◎	■	■									□		▲		□
Plastic Green House Plan	◎	■	■									□		▲	◎	□
Mechanization Plan	○	□		■								□		▲	◎	
Horticultural Development Plan	◎	□				■						□	□	▲	■	
Enhancement of Manure Usage Program	◎	□	■		□							□				□
5 Heads Holstein Program	◎	□			■							□		▲	□	
Beekeeping Development Plan	◎	□										□	□	▲		
Trout Cultivation Plan	◎	□					■					□	□	▲		
Rural Production Cooperatives (RPC)	◎	□	□	□	□	□	□		■			□		▲		□
Extension Activities Improvement Program		◎						◎				■				
Extension Human Resources Development Program	○	◎	□	□	□	□	□	◎	□	■		■			□	
Improvement of Ravansar Main Irrigation System	○	□								□	◎					
Improvement of Ravansar On-farm Irrigation System	◎	□								◎				▲		□
Improvement of Irrigation Management by WUC	◎	□								□■	◎■		□	▲		□
Land Consolidation in Ravansar Irrigation Area	◎	□								◎			□	▲		□

Notes; ◎: Main Implementator, ○: Secondary Implementator, ■: Main Supporter/Facilitator, □: Secondary Supporter, ▲: Financial Supporter

Table 6.6.1 Land Consolidation Costs

Unit; Million Rials

Item	Unit	Left Bank Beneficial Area is 933.4 ha		Right Bank Beneficial Area is 181.6 ha		Gharasu Pumping Area Beneficial Area is 1,036.0 ha		Remarks
		Quantity	Price	Quantity	Price	Quantity	Price	
1. Preparation Works	ha	933.4		181.6		1,036.0		Pumping area, land replotting is
･Land Replotting			179		35		120	finished at half the area, as assumption
2. Land Leveling	ha	933.4		181.6		1,036.0		
･Land Leveling			2,760		537		3,063	
3. Farm Road Network	km	50.4		8.8		53.1		
･Main Body			2,769		484		2,916	
･Gravel Pavement			29		5		31	
･Others			420		73		442	
Sub Total			3,218		562		3,389	
4. Irrigation Network	km	38.6		8.4				
･Lining Canals			3,984		993			Pumping by farmers who have pumps
･Related Structures			1,386		360			individually. Then irrigation canal
･Others			806		203			network is not necessary.
Sub Total			6,176		1,556		0	
5. Drainage Network	km	34.5		4.4		31.6		
･Earth Canals			4,118		463		3,607	
･Related Structures			5,091		211		3,426	
･Others			1,381		101		1,054	
Sub Total			10,590		775		8,087	
6. Direct Cost Total			22,923		3,465		14,638	
7. Indirect Cost								
･Supervision Cost	%	5.0	1,146	5.0	173	5.0	732	5.0 % of Direct Cost
･Employer's Service Cost	%	7.0	1,605	7.0	243	7.0	1,025	7.0 % of Direct Cost
･Insurance and Municipality Due Cost	%	5.0	1,146	5.0	173	5.0	732	5.0 % of Direct Cost
Sub-Total			3,897		589		2,489	
8. Design Cost	ha	933.4	116	181.6	23	1,036.0	129	
Total Implementation Cost			26,936		4,077		17,256	
Average Cost Per ha			28.9		22.4		16.7	

Table 6.6.2 Annaul Disbursement of Project Investment Costs

(Unit: million Rls.)

	Area	Code	Year	Quantity/ Unit Rate		Year														Total
						2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	200708	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	
Land Consolidation	Site 1	L1-1	Irrigable area on Left Bank Canal	1,038.4ha	28.9Rls/ha					2,693.6	2,693.6	2,693.6	2,693.6	2,693.6	2,693.6	2,693.6	2,693.6	2,693.6		26,936.0
		L1-2	Pump & Well Irrigation area	2,019.0ha	16.7Rls/ha						3,371.7	3,371.7	3,371.7	3,371.7	3,371.7	3,371.7	3,371.7	3,371.7	3,371.7	33,717.3
		L1-3	Irrigable area of Right Bank Canal	181.6ha	22.4Rls/ha					1,355.9	1,355.9	1,355.9								4,067.8
		L1-4-1	Rainfed Area (excluding completed 121.5 ha)	1,969.0ha	12.7Rls/ha						2,493.2	2,493.4	2493.377	2493.377	2493.377	2493.377	2493.377	2493.377	2493.377	24,933.6
		L1-4-2	Rainfed Area partially completed	1,354.5ha	12.5Rls/ha						1,696.7	1,696.7	1696.739	1696.739	1696.739	1696.739	1696.739	1696.739	1696.739	16,967.4
		L1	**Total in Site 1**	**6,562.5ha**						**4,049.5**	**11,611.2**	**11,611.4**	**10,255.4**	**10,255.4**	**10,255.4**	**10,255.4**	**10,255.4**	**10,255.4**	**10,255.4**	**7,561.8**	**106,622.1**
	Site 2	L2-1	Pump Irrigation area (excl. completed 228.5 ha)	2,989.5ha	16.7Rls/ha						4,992.5	4,992.5	4,992.5	4,992.5	4,992.5	4,992.5	4,992.5	4,992.5	4,992.5	49,924.7
			Rainfed Area partially completed	5,041.5ha	12.5Rls/ha						6,315.3	6,315.3	6,315.3	6,315.3	6,315.3	6,315.3	6,315.3	6,315.3	6,315.3	63,153.3
		L2-2	Rainfed Area	1,567.5ha	12.7Rls/ha						1,984.8	1,984.8	1,984.8	1,984.8	1,984.8	1,984.8	1,984.8	1,984.8	1,984.8	19,848.0
		L2	**Total in Site 2**	**9,598.5ha**							**13,292.6**	**13,292.6**	**13,292.6**	**13,292.6**	**13,292.6**	**13,292.6**	**13,292.6**	**13,292.6**	**13,292.6**	**132,925.9**
	L		Total	16,161.0ha		0.0	0.0	0.0	0.0	**4,049.5**	**24,903.8**	**24,904.0**	**23,548.0**	**23,548.0**	**23,548.0**	**23,548.0**	**23,548.0**	**23,548.0**	**23,548.0**	**20,854.4**	**239,548.0**
Ravansar Irrigation System		C1	Left Bank Main System Renewal			3,480.0	1,900.0	2,720.0	2,000.0	2,966.7	2,166.7	2,166.7									17,400.0
		C2	Right Bank Main System Rehabilitation						520	554											1,074.0
		C	Total			**3,480.0**	**1,900.0**	**2,720.0**	**2,520.0**	**3,520.7**	**2,166.7**	**2,166.7**									**18,474.0**
Civil Works Total						3,480.0	1,900.0	2,720.0	2,520.0	7,570.2	27,070.5	27,070.6	23,548.0	23,548.0	23,548.0	23,548.0	23,548.0	23,548.0	23,548.0	20,854.4	258,022.0
Integrated Agricultural Development	Site 1	IA1-1	Plastic Green House	380/house									380.0		760.0					760.0	1,900.0
		IA1-2	Mechanization								5,227.3	5,227.3	5,227.3	3,136.5	3,136.5	1,881.8	1,881.8	1,881.8	1,881.8	1,881.8	31,364.0
		IA1-3	Horticulture	5.9/ha							19.7	19.7	19.7	44.3	44.3	29.5	29.5	29.5	29.5	29.5	295.2
		IA1-4	**Animal Husbandry**	**100/hh**							**3,666.7**	**3,666.7**	**3,666.7**	**8,250.0**	**8,250.0**	**2,200.0**	**2,200.0**	**2,200.0**	**2,200.0**	**2,200.0**	**38,500.0**
		IA1-5	Bee Keeping	15/40hives							25.0	25.0	25.0	75.0	75.0	30.0	30.0	30.0	30.0	30.0	375.0
		IA1-6	Inland Fishery	17.5 or 3							5.8	5.8	5.8	17.5	17.5	3.5	3.5	3.5	3.5	3.5	70.0
		IA1	Total								8,944.5	8,944.5	9,324.5	11,523.3	12,283.3	4,144.8	4,144.8	4,144.8	4,144.8		72,504.2
	Site 2	IA2-1	Plastic Green House	380/house									380.0		760.0					760.0	1,900.0
		IA2-2	Mechanization								7,852.7	7,852.7	7,852.7	4,711.5	4,711.5	2,827.0	2,827.0	2,827.0	2,827.0	2,827.0	47,116.0
		IA2-3	Horticulture	5.9/ha							19.7	19.7	19.7	44.3	44.3	29.5	29.5	29.5	29.5	29.5	295.2
		IA2-4	**Animal Husbandry**	**85/hh**							**6,233.3**	**6,233.3**	**6,233.3**	**14,150.0**	**14,150.0**	**3,740.0**	**3,740.0**	**3,740.0**	**3,740.0**	**3,740.0**	**65,700.0**
		IA2-5	Bee Keeping	15/40hives							75.0	75.0	75.0	112.5	112.5	45.0	45.0	45.0	45.0	45.0	675.0
		IA2-6	Inland Fishery	17.5 or 3							26.3	26.3	26.3	38.0	38.0	20.5	20.5	20.5	20.5	20.5	257.5
		IA2	Total								14,207.0	14,207.0	14,587.0	19,056.3	19,816.3	6,662.0	6,662.0	6,662.0	6,662.0		115,943.7
	Total	IA-1	Plastic Green House								0.0	0.0	760.0	0.0	1,520.0	0.0	0.0	0.0	0.0	1,520.0	3,800.0
		IA-2	Mechanization								13,080.0	13,080.0	13,080.0	7,848.0	7,848.0	4,708.8	4,708.8	4,708.8	4,708.8	4,708.8	78,480.0
		IA-3	Horticulture								39.3	39.3	39.3	88.5	88.5	59.1	59.1	59.1	59.1	59.1	590.4
		IA-4	**Animal Husbandry**								**9,900.0**	**9,900.0**	**9,900.0**	**22,400.0**	**22,400.0**	**5,940.0**	**5,940.0**	**5,940.0**	**5,940.0**	**5,940.0**	**104,200.0**
		IA-5	Bee Keeping								100.0	100.0	100.0	187.5	187.5	75.0	75.0	75.0	75.0	75.0	1,050.0
		IA-6	Inland Fishery								32.2	32.2	32.2	55.5	55.5	24.0	24.0	24.0	24.0	24.0	327.5
		IA	Total								**23,151.5**	**23,151.5**	**23,911.5**	**30,579.5**	**32,099.5**	**10,806.9**	**10,806.9**	**10,806.9**	**10,806.9**	**12,326.9**	**188,447.9**
Extension System Improvement		**ES-1**	**Site 1 Area**							**399.0**											**399.0**
		ES-2	**Site 2 Area**							**1,177.6**											**1,177.6**
		ES	Total							1,576.6											1,576.6
RPC Development	4 RPCs	RP-1	Office and Equipement	2 RPC							956.8										956.8
		RP-2	Agricultural inputs plan	4 RPC							1,360.0										1,360.0
		RP-3	Mechanization plan	4 RPC							1,231.4										1,231.4
		RP-4	Joint sales of product plan	4 RPC							1,800.0										1,800.0
	2 RPC Unions	RPU-1	Packing factory	2 units												2,780.0					2,780.0
		RPU-2	wheat seed cleaning	2 units												1,600.0					1,600.0
		RPU-3	vegetable grading	1 unit												640.0					640.0
		RP	Total								5,348.2	0.0	0.0	0.0	0.0	5,020.0	0.0	0.0	0.0	0.0	10,368.2

Table 6.6.3 Net Income of Agricultural Development Plan Site 1 (2002 prices)

Stage	Category	Item	Unit	Wheat	Chick pea	Barley	Maize	maize*	Alfalfa	Rapeseed	Sugarbeet	Coriander	Potato	Tomato	Onion	Total
		Unit Price	Rls./kg	1,450	2,500	1,000	1,070	150	1,000	2,500	303	2,581	700	500	475	
		Unit Cost Irr.	'000 Rls/ha	1,544	1,622	1,098	2,262	4,980	3,662	1,465	3,491	2,431	11,383	3,966	3,353	
		Unit Cost RF	'000 Rls/ha	673	1,046	654										
Present (presumption)	Irrigated	Yield	ton/ha	5.5	1.6	5.5	8.5									
		Area	ha	1,226	350	175	559									2,310
		Production	ton	6,742	560	963	4,752									13,016
		Gross Income	mil.Rls.	9,775	1,401	963	5,084									17,223
		Cost	mil.Rls.	1,893	568	192	1,264									3,917
		Net Income	mil.Rls.	7,883	833	771	3,820									13,306
	Rainfed	Yield	ton/ha	1.7	0.8	1.7										
		Area	ha	3,062	875	437										4,374
		Production	ton	5,205	656	722										6,583
		Gross Income	mil.Rls.	7,547	1,640	722										9,909
		Cost	mil.Rls.	2,062	915	286										3,263
		Net Income	mil.Rls.	5,485	725	435										6,646
	Total	Area	ha	4,288	1,225	613	559									6,684
		Production	ton	11,947	1,216	1,685	4,752									19,599
		Gross Income	mil.Rls.	17,323	3,041	1,685	5,084									27,132
		Cost	mil.Rls.	3,955	1,483	479	1,264									7,180
		Net Income	mil.Rls.	13,368	1,558	1,206	3,820									19,952
the 3rd Year	Irrigated	Yield	ton/ha	6.8	1.8		9.6	50.0	9.3	3.8	40.0	2.1	30.0	31.0	41.0	
		Area	ha	1,036	489		385	385	385	385	281	161	35	35	35	3,614
		Production	ton	7,047	881		3,701	19,274	3,585	1,465	11,228	339	1,048	1,083	1,432	51,081
		Gross Income	mil.Rls.	10,218	2,202		3,960	2,891	3,585	3,662	3,402	875	733	541	680	32,750
		Cost	mil.Rls.	1,600	794		872	1,920	1,412	565	980	392	398	139	117	9,187
		Net Income	mil.Rls.	8,618	1,409		3,088	971	2,173	3,097	2,422	482	336	403	563	23,563
	Rainfed	Yield	ton/ha	1.9	0.9	2.0										
		Area	ha	861	1,723	861										3,445
		Production	ton	1,636	1,550	1,679										4,866
		Gross Income	mil.Rls.	2,373	3,876	1,679										7,928
		Cost	mil.Rls.	580	1,801	564										2,945
		Net Income	mil.Rls.	1,793	2,074	1,116										4,983
	Total	Area	ha	1,898	2,212	861	385	385	385	385	281	161	35	35	35	7,059
		Production	ton	8,683	2,431	1,679	3,701	19,274	3,585	1,465	11,228	339	1,048	1,083	1,432	55,948
		Gross Income	mil.Rls.	12,590	6,078	1,679	3,960	2,891	3,585	3,662	3,402	875	733	541	680	40,677
		Cost	mil.Rls.	2,180	2,595	564	872	1,920	1,412	565	980	392	398	139	117	12,132
		Net Income	mil.Rls.	10,410	3,483	1,116	3,088	971	2,173	3,097	2,422	482	336	403	563	28,545
the 5th Year	Irrigated	Yield	ton/ha	7.5	2.0		10.2	55.0	11.0	4.1	60.0	2.5	35.0	35.0	47.0	
		Area	ha	1,033	489		382	382	382	382	278	161	35	35	35	3,596
		Production	ton	7,750	979		3,901	21,036	4,207	1,568	16,662	403	1,222	1,222	1,642	60,593
		Gross Income	mil.Rls.	11,237	2,447		4,174	3,155	4,207	3,920	5,049	1,041	856	611	780	37,478
		Cost	mil.Rls.	1,596	794		865	1,905	1,401	560	969	392	398	139	117	9,135
		Net Income	mil.Rls.	9,641	1,653		3,309	1,251	2,807	3,360	4,079	649	458	473	663	28,343
	Rainfed	Yield	ton/ha	2.2	1.1	2.1										
		Area	ha	861	1,723	861										3,445
		Production	ton	1,895	1,895	1,809										5,598
		Gross Income	mil.Rls.	2,747	4,737	1,809										9,293
		Cost	mil.Rls.	580	1,801	564										2,945
		Net Income	mil.Rls.	2,167	2,936	1,245										6,348
	Total	Area	ha	1,895	2,212	861	382	382	382	382	278	161	37	37	37	7,048
		Production	ton	9,644	2,874	1,809	3,901	21,036	4,207	1,568	16,662	403	1,222	1,222	1,642	66,192
		Gross Income	mil.Rls.	13,984	7,184	1,809	4,174	3,155	4,207	3,920	5,049	1,041	856	611	780	46,771
		Cost	mil.Rls.	2,176	2,595	564	865	1,905	1,401	560	969	392	398	139	117	12,080
		Net Income	mil.Rls.	11,809	4,589	1,245	3,309	1,251	2,807	3,360	4,079	649	458	473	663	34,691
the 10th Year	Irrigated	Yield	ton/ha	9.0	2.5		13.0	60.0	15.0	5.0	80.0	3.5	50.0	50.0	60.0	
		Area	ha	1,028	489		377	377	377	377	273	161	35	35	35	3,566
		Production	ton	9,255	1,224		4,907	22,649	5,662	1,887	21,816	565	1,746	1,746	2,096	73,553
		Gross Income	mil.Rls.	13,419	3,059		5,251	3,397	5,662	4,719	6,610	1,458	1,222	873	995	46,666
		Cost	mil.Rls.	1,588	794		854	1,880	1,382	553	952	392	398	139	117	9,048
		Net Income	mil.Rls.	11,831	2,265		4,397	1,517	4,280	4,165	5,658	1,065	825	735	878	37,618
	Rainfed	Yield	ton/ha	2.6	1.5	2.5										
		Area	ha	861	1,723	861										3,445
		Production	ton	2,239	2,584	2,110										6,933
		Gross Income	mil.Rls.	3,247	6,459	2,110										11,816
		Cost	mil.Rls.	580	1,801	564										2,945
		Net Income	mil.Rls.	2,667	4,658	1,546										8,871
	Total	Area	ha	1,890	2,212	861	377	377	377	377	273	161	37	37	37	7,018
		Production	ton	11,494	3,807	2,110	4,907	22,649	5,662	1,887	21,816	565	1,746	1,746	2,096	80,486
		Gross Income	mil.Rls.	16,666	9,518	2,110	5,251	3,397	5,662	4,719	6,610	1,458	1,222	873	995	58,482
		Cost	mil.Rls.	2,168	2,595	564	854	1,880	1,382	553	952	392	398	139	117	11,993
		Net Income	mil.Rls.	14,498	6,923	1,546	4,397	1,517	4,280	4,165	5,658	1,065	825	735	878	46,489
Incremental Benefits	Irrigated	3rd Year	mil.Rls.	735	576	-771	-732	971	2,173	3,097	2,422	482	336	403	563	10,256
		5th Year	mil.Rls.	1,759	820	-771	-511	1,251	2,807	3,360	4,079	649	458	473	663	15,037
		10th Year	mil.Rls.	3,949	1,432	-771	577	1,517	4,280	4,165	5,658	1,065	825	735	878	24,312
	Rainfed	3rd Year	mil.Rls.	-3,693	1,349	680										-1,663
		5th Year	mil.Rls.	-3,318	2,210	810										-298
		10th Year	mil.Rls.	-2,818	3,933	1,111										2,225
	Total	3rd Year	mil.Rls.	-2,958	1,925	-90	-732	971	2,173	3,097	2,422	482	336	403	563	8,593
		5th Year	mil.Rls.	-1,559	3,031	39	-511	1,251	2,807	3,360	4,079	649	458	473	663	14,739
		10th Year	mil.Rls.	1,130	5,365	340	577	1,517	4,280	4,165	5,658	1,065	825	735	878	26,537

Economic Price

Economic Price																
	Total	3rd Year	mil.Rls.	-2,907	1,828	-86	-695	923	2,065	2,942	2,301	458	319	383	535	8,066
		5th Year	mil.Rls.	-1,533	2,879	37	-485	1,188	2,666	3,192	3,875	616	435	449	629	13,950
		10th Year	mil.Rls.	1,111	5,097	323	548	1,442	4,066	3,957	5,375	1,012	784	698	834	25,248
	Financial Wheat price			1,450												
	Economic wheat price			1,475												
	Stabdard Conversion Factor (SCF)			95%												

Table 6.6.4 Net Income of Agricultural Development Plan Site 2 (2002 prices)

Stage	Category	Item	Unit	Wheat	Chick pea	Barley	Maize	maize*	Alfalfa	Rapeseed	Sugarbeet	Coriander	Potato	Tomato	Onion	Total
		Unit Price	Rls./kg	1,450	2,500	1,000	1,070	150	1,000	2,500	303	2,581	700	500	475	
		Unit Cost Irr.	'000 Rls/ha	1,544	1,622	1,098	2,262	4,980	3,662	1,465	3,491	2,431	11,383	3,966	3,353	
		Unit Cost RF	'000 Rls/ha	673	1,046	654										
Present (presumption)	Irrigated	Yield	ton/ha	5.3			7.8									
		Area	ha	1,609			1,609									3,218
		Production	ton	8,528			12,550									21,078
		Gross Incom	mil.Rls.	12,365			13,429									25,794
		Cost	mil.Rls.	2,485			3,639									6,123
		Net Income	mil.Rls.	9,881			9,790									19,671
	Rainfed	Yield	ton/ha	1.50	0.70	1.60										
		Area	ha	4,626	1,322	661										6,609
		Production	ton	6,939	925	1,057										8,922
		Gross Incom	mil.Rls.	10,062	2,313	1,057										13,433
		Cost	mil.Rls.	3,116	1,382	433										4,930
		Net Income	mil.Rls.	6,947	931	625										8,502
	Total	Area	ha	6,235	1,322	661	1,609									9,827
		Production	ton	15,467	925	1,057	12,550									30,000
		Gross Incom	mil.Rls.	22,427	2,313	1,057	13,429									39,227
		Cost	mil.Rls.	5,600	1,382	433	3,639									11,054
		Net Income	mil.Rls.	16,827	931	625	9,790									28,173
the 3rd Year	Irrigated	Yield	ton/ha	6.2			9.2	50.0	9.5	2.9	50.0					
		Area	ha	642			642	642	642	641.6	641.6					3,850
		Production	ton	3,978			5,903	32,080	6,095	1860.64	32080					81,996
		Gross Incom	mil.Rls.	5,768			6,316	4,812	6,095	4651.6	9720.24					37,363
		Cost	mil.Rls.	991			1,451	3,195	2,349	939.944	2239.67					11,166
		Net Income	mil.Rls.	4,777			4,865	1,617	3,746	3711.66	7480.57					26,197
	Rainfed	Yield	ton/ha	1.80	0.85	1.90										
		Area	ha	1,652	3,305	1,652										6,609
		Production	ton	2,974	2,809	3,139										8,922
		Gross Incom	mil.Rls.	4,312	7,022	3,139										14,474
		Cost	mil.Rls.	1,113	3,456	1,081										5,650
		Net Income	mil.Rls.	3,200	3,566	2,058										8,824
	Total	Area	ha	2,294	3,305	1,652	642	642	642	642	642					10,459
		Production	ton	6,952	2,809	3,139	5,903	32,080	6,095	1,861	32,080					90,919
		Gross Incom	mil.Rls.	10,080	7,022	3,139	6,316	4,812	6,095	4,652	9,720					51,837
		Cost	mil.Rls.	2,103	3,456	1,081	1,451	3,195	2,349	940	2,240					16,816
		Net Income	mil.Rls.	7,977	3,566	2,058	4,865	1,617	3,746	3,712	7,481					35,021
the 5th Year	Irrigated	Yield	ton/ha	7.80			10.50	55.00	11.00	3.70	60.00					
		Area	ha	639			639	639	639	639	639					3,832
		Production	ton	4,981			6,705	35,123	7,025	2,363	38,316					94,513
		Gross Incom	mil.Rls.	7,223			7,175	5,268	7,025	5,907	11,610					44,207
		Cost	mil.Rls.	986			1,444	3,180	2,338	936	2,229					11,114
		Net Income	mil.Rls.	6,236			5,730	2,088	4,686	4,972	9,381					33,093
	Rainfed	Yield	ton/ha	2.10	1.00	2.20										
		Area	ha	1,652	3,305	1,652										6,609
		Production	ton	3,470	3,305	3,635										10,409
		Gross Incom	mil.Rls.	5,031	8,261	3,635										16,927
		Cost	mil.Rls.	1,113	3,456	1,081										5,650
		Net Income	mil.Rls.	3,918	4,806	2,554										11,278
	Total	Area	ha	2,291	3,305	1,652	639	639	638.6	638.6	638.6					10,441
		Production	ton	8,451	3,305	3,635	6,705	35,123	7,025	2,363	38,316					104,922
		Gross Incom	mil.Rls.	12,254	8,261	3,635	7,175	5,268	7,025	5,907	11,610					61,134
		Cost	mil.Rls.	2,099	3,456	1,081	1,444	3,180	2,338	936	2,229					16,763
		Net Income	mil.Rls.	10,155	4,806	2,554	5,730	2,088	4,686	4,972	9,381					44,371
the 10th Year	Irrigated	Yield	ton/ha	8.50			12.50	60.00	14.50	4.50	70.00					
		Area	ha	634			634	634	634	634	634					3,802
		Production	ton	5,386			7,920	38,016	9,187	2,851	44,352					107,712
		Gross Incom	mil.Rls.	7,809			8,474	5,702	9,187	7,128	13,439					51,740
		Cost	mil.Rls.	978			1,433	3,155	2,320	928	2,212					11,027
		Net Income	mil.Rls.	6,831			7,042	2,547	6,867	6,200	11,227					40,713
	Rainfed	Yield	ton/ha	2.50	1.40	2.40										
		Area	ha	1,652	3,305	1,652										6,609
		Production	ton	4,131	4,626	3,965										12,722
		Gross Incom	mil.Rls.	5,989	11,566	3,965										21,521
		Cost	mil.Rls.	1,113	3,456	1,081										5,650
		Net Income	mil.Rls.	4,877	8,110	2,884										15,871
	Total	Area	ha	2,286	3,305	1,652	634	634	633.6	633.6	633.6					10,411
		Production	ton	9,516	4,626	3,965	7,920	38,016	9,187	2,851	44,352					120,434
		Gross Incom	mil.Rls.	13,799	11,566	3,965	8,474	5,702	9,187	7,128	13,439					73,260
		Cost	mil.Rls.	2,091	3,456	1,081	1,433	3,155	2,320	928	2,212					16,676
		Net Income	mil.Rls.	11,707	8,110	2,884	7,042	2,547	6,867	6,200	11,227					56,584
Incremental Benefits	Irrigated	3rd Year	mil.Rls.	-5,103	0	0	-4,925	1,617	3,746	3,712	7,481	0	0	0	0	6,526
		5th Year	mil.Rls.	-3,644	0	0	-4,059	2,088	4,686	4,972	9,381	0	0	0	0	13,423
		10th Year	mil.Rls.	-3,050	0	0	-2,748	2,547	6,867	6,200	11,227	0	0	0	0	21,043
	Rainfed	3rd Year	mil.Rls.	-3,747	2,636	1,433										322
		5th Year	mil.Rls.	-3,028	3,875	1,929										2,775
		10th Year	mil.Rls.	-2,070	7,179	2,259										7,368
	Total	3rd Year	mil.Rls.	-8,850	2,636	1,433	-4,925	1,617	3,746	3,712	7,481	0	0	0	0	6,848
		5th Year	mil.Rls.	-6,672	3,875	1,929	-4,059	2,088	4,686	4,972	9,381	0	0	0	0	16,198
		10th Year	mil.Rls.	-5,120	7,179	2,259	-2,748	2,547	6,867	6,200	11,227	0	0	0	0	28,411

Economic Price

Economic Price	Total	3rd Year	mil.Rls.	-8,700	2,504	1,361	-4,679	1,536	3,559	3,526	7,107	0	0	0	0	6,213
		5th Year	mil.Rls.	-6,559	3,681	1,832	-3,857	1,984	4,452	4,723	8,912	0	0	0	0	15,168
		10th Year	mil.Rls.	-5,033	6,820	2,146	-2,611	2,420	6,524	5,890	10,666	0	0	0	0	26,821
	Financial Wheat price			1,450												
	Economic wheat price			1,475												
	Stabdard Conversion Factor (SCF)			95%												

Table 6.6.5 Cash Flow of Dairy Farming Development

Site 1		Present 0	Short 1-3	Medium 4-5	Long 6-10	Remarks
Zone 1	282	33	50	124	174	New introduction hh
	ttl Hh#	33	83	158	207	Total hh
	5	167	249	622	870	New introduction cow
	/Hh	167	416	789	1,037	cumulative cow
	2.5	418	1,611	3,401	4,594	Milk(ton)/Year
	4.8	0	1	2	3	deposit numbers
Zone 2	334	32	60	151	211	New introduction hh
	ttl Hh#	32	94	184	245	Total hh
	5	161	302	755	1,056	New introduction cow
	/Hh	161	463	916	1,217	cumulative cow
	2.5	403	1,851	4,024	5,473	Milk(ton)/Year
	4.8	0	1	2	3	deposit numbers
Site 1	**616**	66	177	342	452	total No. of hh
		328	878	1,704	2,254	Total No. of caw
		820	3,462	7,425	10,067	Milk(ton)/Y
		0	2	4	6	depoΣ
						mil.Rls.
	1600	1,312	5,539	11,880	16,107	milk production
	10	590	1,179	6,156	8,137	head of calf & cow
	24	-1,574	-4,245	-8,208	-10,850	O&M cost
		328	2,473	9,828	13,394	net income

Site 2		Present 0	Shaort 1-3	Medium 4-5	Long 6-10	Remarks
Zone 3	178	2	35	88	123	New introduction hh
		2	37	90	125	Total hh
	5	8	176	441	617	New introduction cow
		8	184	449	625	cumulative cow
	2.5	20	867	2,137	2,984	Milk(ton)/Year
	4.8	0	1	2	2	deposit numbers
Zone 4	195	8	37	93	131	New introduction hh
		8	46	102	139	Total hh
	5	41	187	467	654	New introduction cow
		41	228	508	695	cumulative cow
	2.5	103	999	2,344	3,241	Milk(ton)/Year
	4.8	0	1	2	2	deposit numbers
Zone 5	605	28	115	289	404	New introduction hh
		28	143	317	432	Total hh
	5	140	577	1,443	2,020	New introduction cow
		140	717	1,583	2,160	cumulative cow
	2.5	350	3,120	7,274	10,044	Milk(ton)/Year
	4.8	0	2	4	6	deposit numbers
Site 2	**978**	38	226	508	696	total No. of hh
		189	1,129	2,540	3,480	Total No. of caw
		473	4,985	11,755	16,268	Milk(ton)/Y
		0	4	8	10	depoΣ
						mil.Rls.
	1600	756	7,977	18,808	26,029	milk production
	10	340	1,506	9,142	12,527	head of calf & cow
	24	-907	-5,420	-12,190	-16,703	O&M cost
		189	4,062	15,760	21,853	net income

* Household

milk yield: 2.5lpcd=presnt; 4.8lpcd=planned

Table 6.7.1 Standard Conversion Factor (SCF)

units		Billion Rls.					million $	
Iranian Calender Year		1375	1376	1377	1378	1379	1380*	1392
		1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2003/04
Exports	Total	48,161	46,816	42,572	81,951	148,218		
	Goods	47,699	46,213	40,398	79,188	144,121		
	oil and gas	37,253	36,466	22,620	49,740	109,822		
	gas liquids	506	386	265	568	801		
	Non-oil	9,940	9,361	17,513	28,880	33,498	4,224	
	Services	462	603	2,174	2,763	4,097		
	transport	370	522	530	501	1,618		
	other	92	81	1,644	2,262	2,479		
Imports	Total	31,743	32,350	52,369	62,156	89,036		
	Goods	30,852	31,090	51,855	59,694	88,033	17,627	
	Services	891	1,260	514	2,462	1,003		
	transport	48	42	6	54	20		
	other	842	1,218	507	2,408	983		
Import Tax		3,110	4,477	5,078	6,592	8,488	1,469	
Import Subsidy		-2,872	-2,158	-1,361	-1,443	-1,859	-294	
Total		238	2,319	3,717	5,149	6,629	1,175	
		1%	7%	7%	9%	8%	7%	as of Oct.'03
Exchange Rate Rls./US$							7,921	8,216
SCF		99.4%	94.6%	94.9%	94.5%	94.8%	94.9%	96.0%
					average(76-79)=	94.7%	SER=	8,558

Source 1: Statistical year book 1380 for 1375-1379

*Source 2: 'Economic Trends No. 30, 3rd Quatery, 1381' of CBI for 1380

Table 6.7.2 Economic Price of Wheat

as of 2nd Qaterly, 2003

Producer	CIF	at Port of	Distance*	Transport Cost		Economic Price	
	$/MT		km	mil.Rls./MT	$/MT		
Australia	170	Bandar-e-Abbas	1,770				
Canada	173	Bandar-e-Abbas					
Russia	154	Bandar-e-Anzali: Rasht	605	0.24	28.9	183	
		Project area	70	0.0275	3.3	(3.3)	
Kazakhstan	150<, fob via rail, entry at Sarakh		At average farm gate			180	
* from Kermanshah			Exchange Rate Rls./US$=		8,216	1.475	mil.Rial./MT

Table 6.7.3 Economic Cash Flow of Project Site 1

Unit : mil. Rls.

Year	Project Year	Cost											Benefit						Cash Flow (Benefit-Cost)			
		Ravansar Irrigation				Integrated Agricultuural Development						Total	Water fee	Integrated Agriculture Devlp.				Total	Base Plan	Cost Increase 10 %	Benefit Reduce 10%	Cost +10% & Benefit -10%
		Initial Cost			O&M	Initial Cost		O&M Cost		Dairy				Irrigation		rain-fed	dairy					
		Irrigation Canals	Land Consol.	Economic Cost	Cost(incl. pump)	Extension	RPC	Extension	RPC	Initial Cost	O/M		ha/year	Spring only	All Seaons							
2000	-4											4,281							-4,281	-4,709	-4,281	-4,709
2001	-3											2,224							-2,224	-2,446	-2,224	-2,446
2002	-2											2,868							-2,868	-3,155	-2,868	-3,155
2003	-1											2,394							-2,394	-2,633	-2,394	-2,633
2004	0	3,521	4,050	7,192	1,083	379	454	813	52			9,973						0	-9,973	-10,971	-9,973	-10,971
2005	1	2,167	11,611	13,089	1,216			813	52	**9,042**	**966**	25,178	237	932	1,764	342	776	4,050	-21,128	-23,645	-21,533	-24,050
2006	2	2,167	11,611	13,089	1,349			813	52	9,042	1,931	26,277	237	1,864	3,529	683	1,551	7,864	-18,412	-21,040	-19,199	-21,827
2007	3	0	10,255	9,743	1,482			813	52	9,042	2,897	24,029	237	**2,796**	**5,293**	**1,025**	**2,327**	11,678	-12,351	-14,753	-13,518	-15,921
2008	4	0	10,255	9,743	1,614			813	52	**9,236**	**5,047**	26,505	237	3,750	7,099	1,590	6,316	18,992	-7,513	-10,163	-9,412	-12,062
2009	5	0	10,255	9,743	1,747			813	52	9,236	7,196	28,787	237	**4,704**	**8,905**	**2,156**	**10,305**	26,306	-2,481	-5,360	-5,112	-7,990
2010	6	0	10,255	9,743	1,880			813	52	**2,463**	7,769	22,720	237	5,444	10,305	2,568	11,079	29,633	6,913	4,641	3,950	1,678
2011	7	0	10,255	9,743	2,013			813	52	2,463	8,343	23,426	237	6,184	11,706	2,980	11,853	32,960	9,534	7,192	6,238	3,896
2012	8	0	10,255	9,743	2,145			813	52	2,463	8,916	24,132	237	6,924	13,107	3,393	12,627	36,287	12,155	9,742	8,526	6,113
2013	9	0	10,255	9,743	2,278			813	52	2,463	9,489	24,837	237	7,664	14,508	3,805	13,400	39,614	14,776	12,292	10,815	8,331
2014	10	0	7,562	7,184	2,411			813	52	2,463	10,062	22,984	237	**8,404**	**15,909**	**4,217**	**14,174**	42,941	19,956	17,658	15,662	13,364
2015	11	821	0	780	1,327			813	52		10,062	13,034	237	8,404	15,909	4,217	14,174	42,941	29,906	28,603	25,612	24,309
2016	12	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2017	13	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2018	14	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2019	15	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2020	16	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2021	17	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2022	18	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2023	19	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2024	20	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2025	21	4,506	0	4,281	1,327			813	52		10,062	16,535	237	8,404	15,909	4,217	14,174	42,941	26,405	24,752	22,111	20,458
2026	22	2,341	0	2,224	1,327			813	52		10,062	14,478	237	8,404	15,909	4,217	14,174	42,941	28,462	27,014	24,168	22,720
2027	23	3,019	0	2,868	1,327			813	52		10,062	15,123	237	8,404	15,909	4,217	14,174	42,941	27,818	26,306	23,524	22,012
2028	24	2,520	0	2,394	1,327			813	52		10,062	14,648	237	8,404	15,909	4,217	14,174	42,941	28,292	26,827	23,998	22,533
2029	25	3,521	0	3,345	1,327			813	52		10,062	15,599	237	8,404	15,909	4,217	14,174	42,941	27,341	25,781	23,047	21,487
2030	26	2,167	0	2,059	1,327			813	52		10,062	14,313	237	8,404	15,909	4,217	14,174	42,941	28,628	27,196	24,334	22,902
2031	27	2,167	0	2,059	1,327			813	52		10,062	14,313	237	8,404	15,909	4,217	14,174	42,941	28,628	27,196	24,334	22,902
2032	28	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2033	29	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2034	30	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2035	31	821	0	780	1,327			813	52		10,062	13,034	237	8,404	15,909	4,217	14,174	42,941	29,906	28,603	25,612	24,309
2036	32	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2037	33	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2038	34	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2039	35	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2040	36	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2041	37	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2042	38	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2043	39	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2044	40	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2045	41	821	0	780	1,327			813	52		10,062	13,034	237	8,404	15,909	4,217	14,174	42,941	29,906	28,603	25,612	24,309
2046	42	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2047	43	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2048	44	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2049	45	0	0	0	1,327			813	52		10,062	12,254	237	8,404	15,909	4,217	14,174	42,941	30,686	29,461	26,392	25,167
2050	46	4,506	0	4,281	1,327			813	52		10,062	16,535	237	8,404	15,909	4,217	14,174	42,941	26,405	24,752	22,111	20,458
2051	47	2,341	0	2,224	1,327			813	52		10,062	14,478	237	8,404	15,909	4,217	14,174	42,941	28,462	27,014	24,168	22,720
2052	48	3,019	0	2,868	1,327			813	52		10,062	15,123	237	8,404	15,909	4,217	14,174	42,941	27,818	26,306	23,524	22,012
2053	49	2,520	0	2,394	1,327			813	52		10,062	14,648	237	8,404	15,909	4,217	14,174	42,941	28,292	26,827	23,998	22,533
2054	50	3,521	0	3,345	1,327			813	52		10,062	15,599	237	8,404	15,909	4,217	14,174	42,941	27,341	25,781	23,047	21,487

with sunk cost NPV(10%)= 221,916 NPV(10%)= 294,081

without sunk cost NPV(10%)= 193,501 NPV(10%)= 267,347

Wiith sunk Costs	EIRR=	15.41%	13.45%	13.25%	11.44%
	NPV(10%)=mil.Rls.	72,166			
	B/C=	1.33			
Without sunk Costs	EIRR=	16.93%	14.67%	14.44%	12.39%
	NPV(10%)=mil.Rls.	106,876			
	B/C=	1.38			

Table 6.7.4 Economic Cash Flow of Project Site 2

Unit : mil. Rls.

Year	Project Year	Cost								Benefit				Cash Flow (Benefit-Cost)			
		Infrastructure		Integrated Agricultuural Development					Total Cost	Integrated Agriculture Devlp.			Total Benefit	Base Plan	Cost Increase 10 %	Benefit Reduce 10%	Cost +10% & Benefit -10%
		Land Consol.	O&M Cost	Initial Cost		O&M Cost		Dairy		Well Irrigation	Rain-fed	Dairy					
				Extension	RPC	Extension	RPC	Initial Cost	O/M								
2004	0		2,935	1,119	454	668	52			5,228				0	-5,228	-5,750	-5,228	-5,750
2005	1	12,628	2,935			668	54	**7,012**	1,632	24,929	2,230	110	1,401	3,741	-21,188	-23,681	-21,562	-24,055
2005	2	12,628	2,935			668	54	7,012	3,264	26,561	4,461	220	2,801	7,482	-19,079	-21,735	-19,827	-22,483
2006	3	12,628	2,935			668	54	7,012	4,896	28,193	**6,691**	**330**	**4,202**	11,222	-16,970	-19,789	-18,092	-20,912
2006	4	12,628	2,935			668	54	**15,777**	8,567	40,629	10,447	1,633	10,547	22,627	-18,002	-22,065	-20,265	-24,328
2007	5	12,628	2,935			668	54	15,777	12,239	44,301	**14,203**	**2,936**	**16,892**	34,031	-10,270	-14,700	-13,673	-18,103
2007	6	12,628	2,935			668	54	**4,207**	13,218	33,710	15,852	3,921	18,214	37,987	4,276	905	478	-2,893
2008	7	12,628	2,935			668	54	4,207	14,197	34,690	17,501	4,906	19,536	41,942	7,253	3,784	3,059	-410
2008	8	12,628	2,935			668	54	4,207	15,177	35,669	19,150	5,891	20,857	45,898	10,229	6,662	5,639	2,073
2009	9	12,628	2,935			668	54	4,207	16,156	36,648	20,799	6,876	22,179	49,853	13,206	9,541	8,220	4,556
2009	10	12,628	2,935			668	54	4,207	17,135	37,627	**22,448**	**7,860**	**23,501**	53,809	16,182	12,419	10,801	7,038
2010	11		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2010	12		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2011	13		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2011	14		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2012	15		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2012	16		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2013	17		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2013	18		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2014	19		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2014	20		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2015	21		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2015	22		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2016	23		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2016	24		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2017	25		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2017	26		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2018	27		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2018	28		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2019	29		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2019	30		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2020	31		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2020	32		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2021	33		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2021	34		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2022	35		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2022	36		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2023	37		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2023	38		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2024	39		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2024	40		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2025	41		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2025	42		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2026	43		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2026	44		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2027	45		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2027	46		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2028	47		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2028	48		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2029	49		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
2030	50		2,935			668	54		17,135	20,792	22,448	7,860	23,501	53,809	33,017	30,938	27,636	25,557
									NPV(10%)=	261,990			NPV(10%)=	330,673			
									Discount Rate=	10%							

EIRR=	15.69%	13.19%	12.95%	10.71%
NPV(10%)=mil. Rls	68,682			
B/C=	1.26			

Table 6.7.5 Economic Cash Flow of Whole Project

(unit: million Rls.)

Year	Project Year	Costs			Benefits			Cash Flow			
		Site 1	Site 2	Total	Site 1	Site 2	Total	Base	Cost +10%	Benefit -10%	Cost +10% & Benefit -10%
2000	-4	4,281		4,281	0		0	-4,281	-4,709	-4,281	-4,709
2001	-3	2,224		2,224	0		0	-2,224	-2,446	-2,224	-2,446
2002	-2	2,868		2,868	0		0	-2,868	-3,155	-2,868	-3,155
2003	-1	2,394		2,394	0		0	-2,394	-2,633	-2,394	-2,633
2004	0	9,973	5,228	15,201	0	0	0	-15,201	-16,721	-15,201	-16,721
2005	1	25,178	24,929	50,107	4,050	3,741	7,791	-42,316	-47,326	-43,095	-48,105
2006	2	26,277	26,561	52,837	7,864	7,482	15,346	-37,491	-42,775	-39,026	-44,310
2007	3	24,029	28,193	52,221	11,678	11,222	22,900	-29,321	-34,543	-31,611	-36,833
2008	4	26,505	40,629	67,134	18,992	22,627	41,619	-25,515	-32,229	-29,677	-36,391
2009	5	28,787	44,301	73,088	26,306	34,031	60,337	-12,751	-20,060	-18,785	-26,093
2010	6	22,720	33,710	56,430	29,633	37,987	67,620	11,189	5,546	4,427	-1,216
2011	7	23,426	34,690	58,115	32,960	41,942	74,902	16,787	10,975	9,297	3,485
2012	8	24,132	35,669	59,800	36,287	45,898	82,185	22,384	16,404	14,166	8,186
2013	9	24,837	36,648	61,485	39,614	49,853	89,467	27,982	21,833	19,035	12,887
2014	10	22,984	37,627	60,611	42,941	53,809	96,750	36,138	30,077	26,463	20,402
2015	11	13,034	20,792	33,826	42,941	53,809	96,750	62,924	59,541	53,249	49,866
2016	12	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2017	13	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2018	14	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2019	15	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2020	16	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2021	17	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2022	18	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2023	19	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2024	20	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2025	21	16,535	20,792	37,327	42,941	53,809	96,750	59,422	55,690	49,747	46,015
2026	22	14,478	20,792	35,270	42,941	53,809	96,750	61,480	57,953	51,805	48,278
2027	23	15,123	20,792	35,914	42,941	53,809	96,750	60,835	57,244	51,160	47,569
2028	24	14,648	20,792	35,440	42,941	53,809	96,750	61,309	57,765	51,635	48,091
2029	25	15,599	20,792	36,391	42,941	53,809	96,750	60,359	56,719	50,684	47,044
2030	26	14,313	20,792	35,105	42,941	53,809	96,750	61,645	58,134	51,970	48,459
2031	27	14,313	20,792	35,105	42,941	53,809	96,750	61,645	58,134	51,970	48,459
2032	28	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2033	29	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2034	30	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2035	31	13,034	20,792	33,826	42,941	53,809	96,750	62,924	59,541	53,249	49,866
2036	32	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2037	33	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2038	34	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2039	35	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2040	36	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2041	37	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2042	38	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2043	39	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2044	40	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2045	41	13,034	20,792	33,826	42,941	53,809	96,750	62,924	59,541	53,249	49,866
2046	42	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2047	43	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2048	44	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2049	45	12,254	20,792	33,046	42,941	53,809	96,750	63,703	60,399	54,029	50,724
2050	46	16,535	20,792	37,327	42,941	53,809	96,750	59,422	55,690	49,747	46,015
2051	47	14,478	20,792	35,270	42,941	53,809	96,750	61,480	57,953	51,805	48,278
2052	48	15,123	20,792	35,914	42,941	53,809	96,750	60,835	57,244	51,160	47,569
2053	49	14,648	20,792	35,440	42,941	53,809	96,750	61,309	57,765	51,635	48,091
2054	50	15,599	20,792	36,391	42,941	53,809	96,750	60,359	56,719	50,684	47,044
		NPV(10%) W/O SC=		455,492	NPV(10%) W/O SC=		598,019				109406
		NPV(10%)w/SC=		516,373	NPV(10%)w/SC=		657,821				91541

With Sunk Cost EIRR=	15.06%	12.96%	12.74%	10.80%
NPV(10%) million Rls.=	141,448			
B/C=	1.27			
Without Sunk Cost EIRR=	16.28%	13.89%	13.65%	11.50%
NPV(10%) million Rls.=	142,528			
B/C=	1.31			

Table 6.7.6 Financial Cash Flow of Project Site 1

Unit : mil. Rls.

Year	Project Year	Cost								Total	Benefit						Cash Flow (Benefit-Cost)			
		Ravansar Irrigation			Integrated Agricultuural Development						Ravansar Irrigation	Integrated Agriculture Devlp.								
		Initial Cost		Canal	Initial Cost		O&M Cost		Dairy		Water fee	Irrigation				Total	Base Plan	Cost Increase 10 %	Benefit Reduce 10%	Cost +10% & Benefit - 10%
		Irrigation Canals	Land Consol.	O&M Cost	Extension	RPC	Extension	RPC	Initial Cost / O/M		ha/year	Spring only	All Seaons	rain-fed	dairy					
2000	-4									4,506						0	-4,506	-4,506	-4,506	-4,506
2001	-3									2,341						0	-2,341	-2,341	-2,341	-2,341
2002	-2									3,019						0	-3,019	-3,019	-3,019	-3,019
2003	-1									2,520						0	-2,520	-2,520	-2,520	-2,520
2004	0	3,521	4,050	1,140	399	478	847	54		10,489						0	-10,489	-11,538	-10,489	-11,538
2005	1	2,167	11,611	1,280			847	54	**4,146** **1,006**	21,111	246	1,552	2,311	-627	808	4,291	-16,820	-18,931	-17,249	-19,360
2006	2	2,167	11,611	1,419			847	54	4,146 2,012	22,257	246	3,105	4,622	-627	808	8,154	-14,102	-16,328	-14,918	-17,143
2007	3		10,255	1,559			847	54	4,146 3,018	19,880	246	**4,657**	**6,932**	**-1,880**	**2,424**	12,381	-7,499	-9,487	-8,737	-10,725
2008	4		10,255	1,698			847	54	**9,329** **5,257**	27,441	246	5,743	8,548	-1,108	6,579	20,008	-7,433	-10,177	-9,433	-12,177
2009	5		10,255	1,838			847	54	9,329 7,496	29,819	246	**6,828**	**10,164**	**-337**	**10,735**	27,636	-2,183	-5,165	-4,947	-7,929
2010	6		10,255	1,977			847	54	**2,488** 8,093	23,714	246	7,671	11,417	233	11,541	31,108	7,394	5,023	4,283	1,912
2011	7		10,255	2,117			847	54	2,488 8,690	24,451	246	8,513	12,671	804	12,347	34,581	10,130	7,685	6,672	4,227
2012	8		10,255	2,256			847	54	2,488 9,287	25,188	246	9,355	13,925	1,374	13,153	38,053	12,866	10,347	9,060	6,542
2013	9		10,255	2,396			847	54	2,488 9,884	25,924	246	10,197	15,179	1,944	13,959	41,526	15,602	13,009	11,449	8,857
2014	10		7,562	2,535			847	54	2,488 10,481	23,967	246	**11,040**	**16,432**	**2,515**	**14,765**	44,998	21,031	18,635	16,531	14,135
2015	11	821		1,394			847	54	10,481	13,598	246	11,040	16,432	2,515	14,765	44,998	31,400	30,041	26,901	25,541
2016	12			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2017	13			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2018	14			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2019	15			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2020	16			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2021	17			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2022	18			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2023	19			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2024	20			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2025	21	4,506		1,394			847	54	10,481	17,283	246	11,040	16,432	2,515	14,765	44,998	27,715	25,987	23,215	21,487
2026	22	2,341		1,394			847	54	10,481	15,118	246	11,040	16,432	2,515	14,765	44,998	29,880	28,369	25,381	23,869
2027	23	3,019		1,394			847	54	10,481	15,796	246	11,040	16,432	2,515	14,765	44,998	29,202	27,623	24,702	23,123
2028	24	2,520		1,394			847	54	10,481	15,297	246	11,040	16,432	2,515	14,765	44,998	29,701	28,172	25,202	23,672
2029	25	3,521		1,394			847	54	10,481	16,298	246	11,040	16,432	2,515	14,765	44,998	28,700	27,071	24,201	22,571
2030	26	2,167		1,394			847	54	10,481	14,944	246	11,040	16,432	2,515	14,765	44,998	30,054	28,560	25,555	24,060
2031	27	2,167		1,394			847	54	10,481	14,944	246	11,040	16,432	2,515	14,765	44,998	30,054	28,560	25,555	24,060
2032	28			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2033	29			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2034	30			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2035	31	821		1,394			847	54	10,481	13,598	246	11,040	16,432	2,515	14,765	44,998	31,400	30,041	26,901	25,541
2036	32			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2037	33			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2038	34			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2039	35			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2040	36			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2041	37			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2042	38			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2043	39			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2044	40			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2045	41	821		1,394			847	54	10,481	13,598	246	11,040	16,432	2,515	14,765	44,998	31,400	30,041	26,901	25,541
2046	42			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2047	43			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2048	44			1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2049	45	0		1,394			847	54	10,481	12,777	246	11,040	16,432	2,515	14,765	44,998	32,221	30,944	27,722	26,444
2050	46	4,506		1,394			847	54	10,481	17,283	246	11,040	16,432	2,515	14,765	44,998	27,715	25,987	23,215	21,487
2051	47	2,341		1,394			847	54	10,481	15,118	246	11,040	16,432	2,515	14,765	44,998	29,880	28,369	25,381	23,869
2052	48	3,019		1,394			847	54	10,481	15,796	246	11,040	16,432	2,515	14,765	44,998	29,202	27,623	24,702	23,123
2053	49	2,520		1,394			847	54	10,481	15,297	246	11,040	16,432	2,515	14,765	44,998	29,701	28,172	25,202	23,672
2054	50	3,521		1,394			847	54	10,481	16,298	246	11,040	16,432	2,515	14,765	44,998	28,700	27,071	24,201	22,571
							with sunk cost		NPV(17%)=	124,801				NPV(17%)=		123,823				
							without sunk cost			117,603						127,826				

Wiith sunk Costs	FIRR=	15.99%	14.24%	13.86%	12.19%
	NPV(17%)=mil.Rls.	-7,315			
	B/C=	0.953			
Without sunk Costs	FIRR=	19.31%	16.68%	16.42%	14.06%
	NPV(17%)=mil.Rls.	**10,222**			
	B/C=	1.09			

Table 6.7.7 Financial Cash Flow of Project Site 2

Unit : milloion Rls.

Year	Project Year	Cost								Total Cost	Benefit				Cash Flow (Benefit-Cost)			
		Irrigation		Integrated Agricultuural Development							Integrated Agriculture Devlp.							
		Initial Cost	Pump O&M Cost	Initial Cost		O&M Cost		Dairy			Irrigated All Seaons	Rain-fed	dairy	Total	Base Plan	Cost Increase 10 %	Benefit Reduce 10%	Cost +10% & Benefit - 10%
		Land Consol.		Extension	RPC	Extension	RPC	Initial Cost	O&M Cost									
2004	0		3,089	1,178	478	709	54			5,508				0	-5,508	-6,059	-5,508	-6,059
2005	1	13,293	3,089			709	54	**7,083**	1,700	25,928	2,458	121	1,459	4,038	-21,889	-24,482	-22,293	-24,886
2006	2	13,293	3,089			709	54	7,083	3,400	27,627	4,917	242	2,918	8,077	-19,551	-22,314	-20,358	-23,121
2007	3	13,293	3,089			709	54	7,083	5,100	29,327	**7,375**	**363**	**4,377**	12,115	-17,212	-20,145	-18,424	-21,357
2008	4	13,293	3,089			709	54	**15,936**	8,924	42,006	11,271	1,750	10,986	24,007	-17,998	-22,199	-20,399	-24,600
2009	5	13,293	3,089			709	54	15,936	12,749	45,830	**15,168**	**3,136**	**17,596**	35,900	-9,931	-14,514	-13,521	-18,104
2010	6	13,293	3,089			709	54	**4,250**	13,769	35,164	16,890	4,174	18,973	40,037	4,873	1,357	869	-2,647
2011	7	13,293	3,089			709	54	4,250	14,789	36,184	18,612	5,212	20,350	44,174	7,990	4,372	3,573	-46
2012	8	13,293	3,089			709	54	4,250	15,809	37,203	20,334	6,250	21,726	48,311	11,107	7,387	6,276	2,556
2013	9	13,293	3,089			709	54	4,250	16,829	38,223	22,056	7,288	23,103	52,448	14,224	10,402	8,979	5,157
2014	10	13,293	3,089			709	54	4,250	17,849	39,243	**23,778**	**8,326**	**24,480**	56,585	17,341	13,417	11,683	7,759
2015	11		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2016	12		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2017	13		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2018	14		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2019	15		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2020	16		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2021	17		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2022	18		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2023	19		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2024	20		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2025	21		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2026	22		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2027	23		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2028	24		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2029	25		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2030	26		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2031	27		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2032	28		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2033	29		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2034	30		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2035	31		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2036	32		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2037	33		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2038	34		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2039	35		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2040	36		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2041	37		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2042	38		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2043	39		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2044	40		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2045	41		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2046	42		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2047	43		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2048	44		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2049	45		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2050	46		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2051	47		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2052	48		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2053	49		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
2054	50		3,089			709	54		17,849	21,701	23,778	8,326	24,480	56,585	34,884	32,714	29,225	27,055
									NPV(17%)=	162,236			NPV(17%)=	157,128				
									Discount Rate = 17%									

FIRR=	16.08%	13.53%	13.27%	10.99%
NPV(17%)=mil.IRR	-5,107.96			
B/C=	0.97			

Table 6.7.8 Fianancial Cash Flow of Whole Project

(unit: million Rls.)

Year	Project Year	Costs			Benefits			Cash Flow			
		Site 1	Site 2	Total	Site 1	Site 2	Total	Base	Cost +10%	Benefit -10%	Cost +10% & Benefit -10%
2000	-4	4,506		4,506	0		0	-4,506	-4,957	-4,506	-4,957
2001	-3	2,341		2,341	0		0	-2,341	-2,575	-2,341	-2,575
2002	-2	3,019		3,019	0		0	-3,019	-3,321	-3,019	-3,321
2003	-1	2,520		2,520	0		0	-2,520	-2,772	-2,520	-2,772
2004	0	10,489	5,508	15,997	0	0	0	-15,997	-17,596	-15,997	-17,596
2005	1	21,111	25,928	47,039	4,291	4,038	8,330	-38,709	-43,413	-39,542	-44,246
2006	2	22,257	27,627	49,884	8,154	8,077	16,231	-33,653	-38,641	-35,276	-40,265
2007	3	19,880	29,327	49,207	12,381	12,115	24,496	-24,711	-29,632	-27,161	-32,081
2008	4	27,441	42,006	69,447	20,008	24,007	44,016	-25,431	-32,376	-29,832	-36,777
2009	5	29,819	45,830	75,650	27,636	35,900	63,536	-12,114	-19,679	-18,468	-26,033
2010	6	23,714	35,164	58,878	31,108	40,037	71,145	12,267	6,379	5,152	-735
2011	7	24,451	36,184	60,635	34,581	44,174	78,754	18,120	12,056	10,244	4,181
2012	8	25,188	37,203	62,391	38,053	48,311	86,364	23,973	17,734	15,337	9,097
2013	9	25,924	38,223	64,147	41,526	52,448	93,973	29,826	23,411	20,429	14,014
2014	10	23,967	39,243	63,210	44,998	56,585	101,583	38,373	32,052	28,214	21,893
2015	11	13,598	21,701	35,299	44,998	56,585	101,583	66,284	62,754	56,126	52,596
2016	12	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2017	13	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2018	14	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2019	15	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2020	16	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2021	17	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2022	18	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2023	19	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2024	20	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2025	21	17,283	21,701	38,984	44,998	56,585	101,583	62,599	58,700	52,440	48,542
2026	22	15,118	21,701	36,819	44,998	56,585	101,583	64,764	61,082	54,606	50,924
2027	23	15,796	21,701	37,497	44,998	56,585	101,583	64,086	60,336	53,927	50,178
2028	24	15,297	21,701	36,998	44,998	56,585	101,583	64,585	60,885	54,427	50,727
2029	25	16,298	21,701	37,999	44,998	56,585	101,583	63,584	59,784	53,426	49,626
2030	26	14,944	21,701	36,645	44,998	56,585	101,583	64,938	61,273	54,780	51,115
2031	27	14,944	21,701	36,645	44,998	56,585	101,583	64,938	61,273	54,780	51,115
2032	28	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2033	29	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2034	30	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2035	31	13,598	21,701	35,299	44,998	56,585	101,583	66,284	62,754	56,126	52,596
2036	32	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2037	33	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2038	34	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2039	35	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2040	36	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2041	37	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2042	38	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2043	39	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2044	40	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2045	41	13,598	21,701	35,299	44,998	56,585	101,583	66,284	62,754	56,126	52,596
2046	42	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2047	43	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2048	44	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2049	45	12,777	21,701	34,478	44,998	56,585	101,583	67,105	63,657	56,947	53,499
2050	46	17,283	21,701	38,984	44,998	56,585	101,583	62,599	58,700	52,440	48,542
2051	47	15,118	21,701	36,819	44,998	56,585	101,583	64,764	61,082	54,606	50,924
2052	48	15,796	21,701	37,497	44,998	56,585	101,583	64,086	60,336	53,927	50,178
2053	49	15,297	21,701	36,998	44,998	56,585	101,583	64,585	60,885	54,427	50,727
2054	50	16,298	21,701	37,999	44,998	56,585	101,583	63,584	59,784	53,426	49,626
		NPV(17%) W/O SC=		279,839	NPV(17%) W/O SC=		284,953	36,496	7,274	3,624	-25,597
		NPV(17%)w/SC=		346,686	NPV(17%)w/SC=		333,395	17,220	-13,929	-15,651	-46,800
							With Sunk Cost FIRR=	16.03%	13.80%	13.57%	11.51%
							NPV(17%) million Rls.=	-13,291			
							B/C=	0.96			
							Without Sunk Cost FIRR=	17.51%	16.64%	15.78%	13.63%
							NPV(17%) million Rls.=	5,114			
							B/C=	1.02			

Fig. 6.1.1 Crop Rotaion Plan

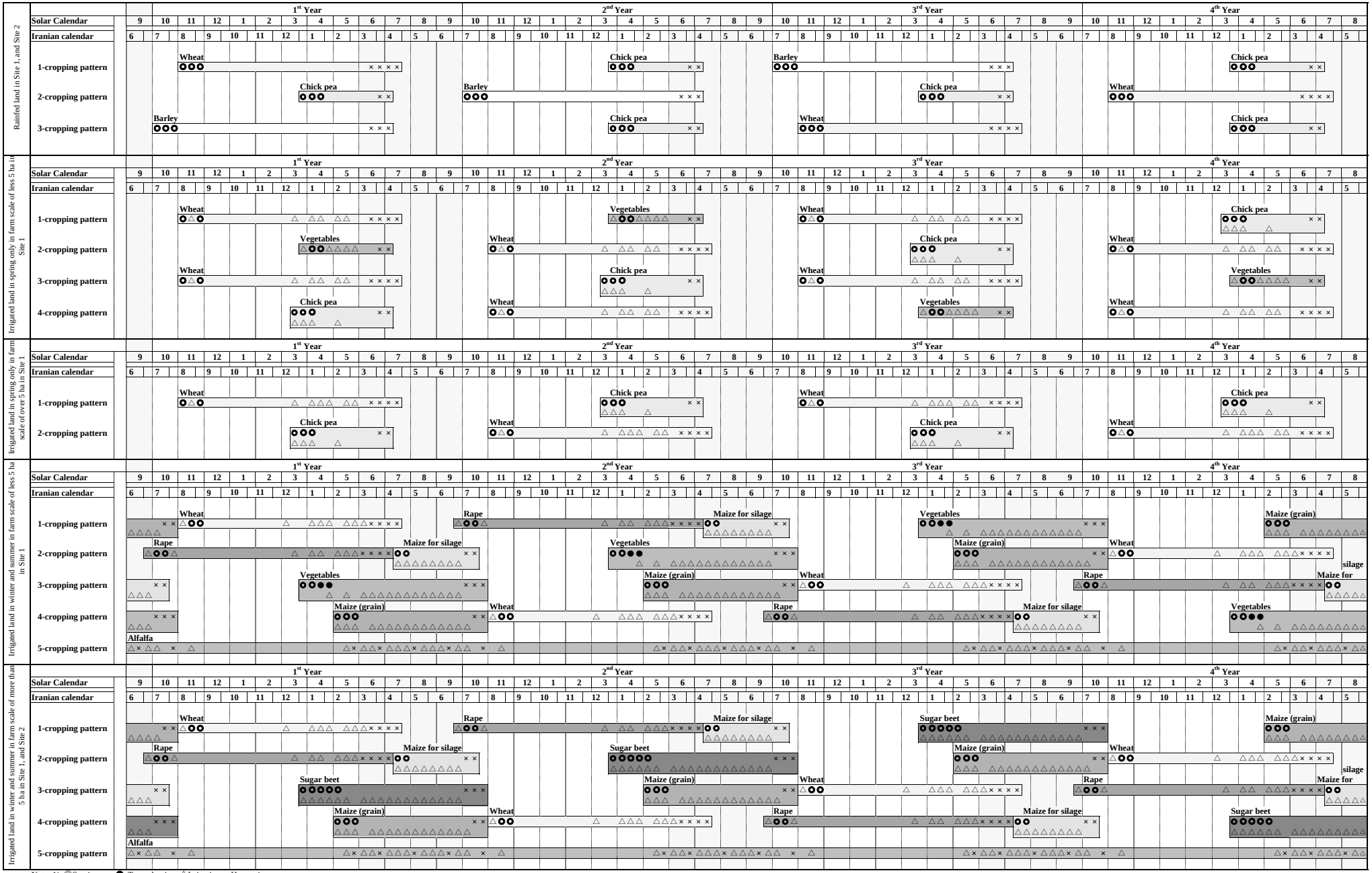


Fig. 6.4.1 (1) Irrigable Area of the Right Bank Canal Under the Fair Distribution Based on Registered Water Right

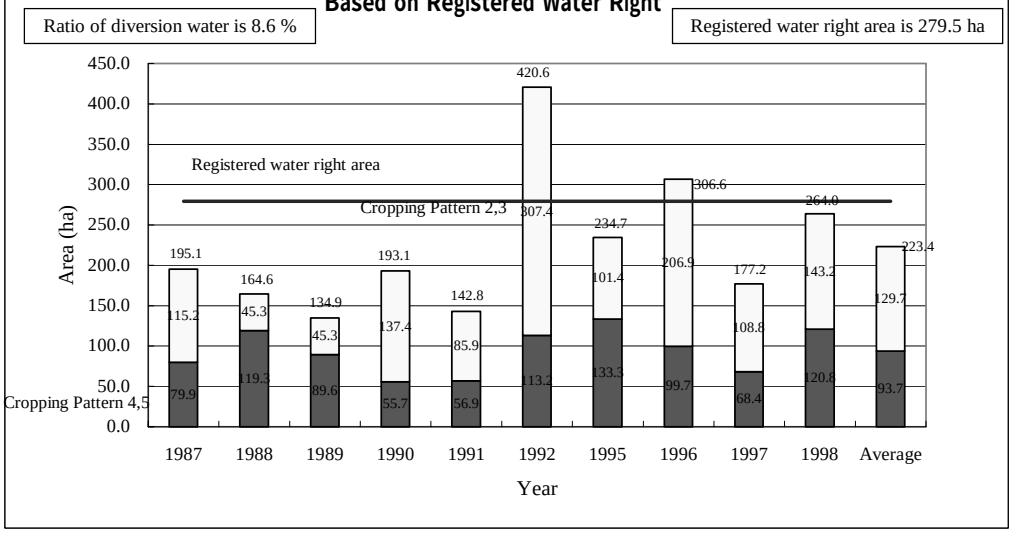


Fig. 6.4.1 (2) Irrigable Area of the Left Bank Canal Under the Fair Distribution Based on Registered Water Right

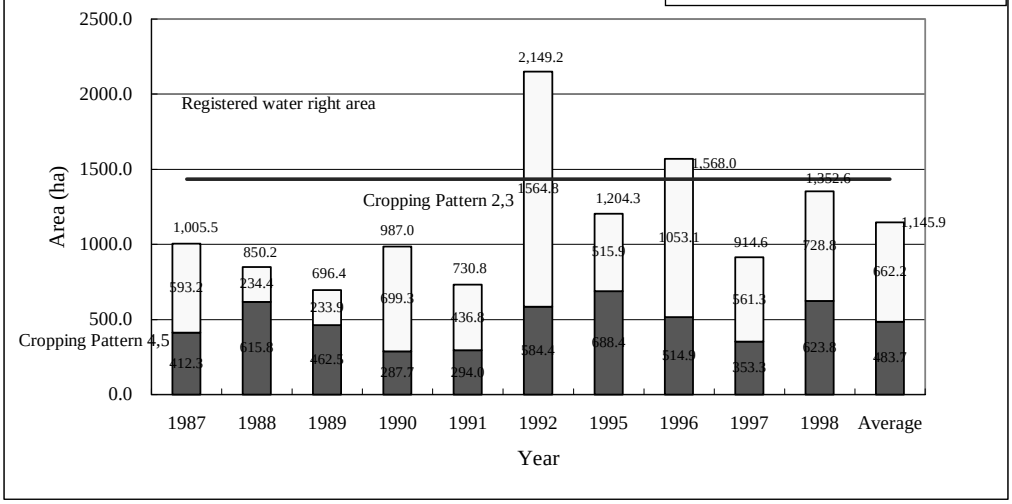
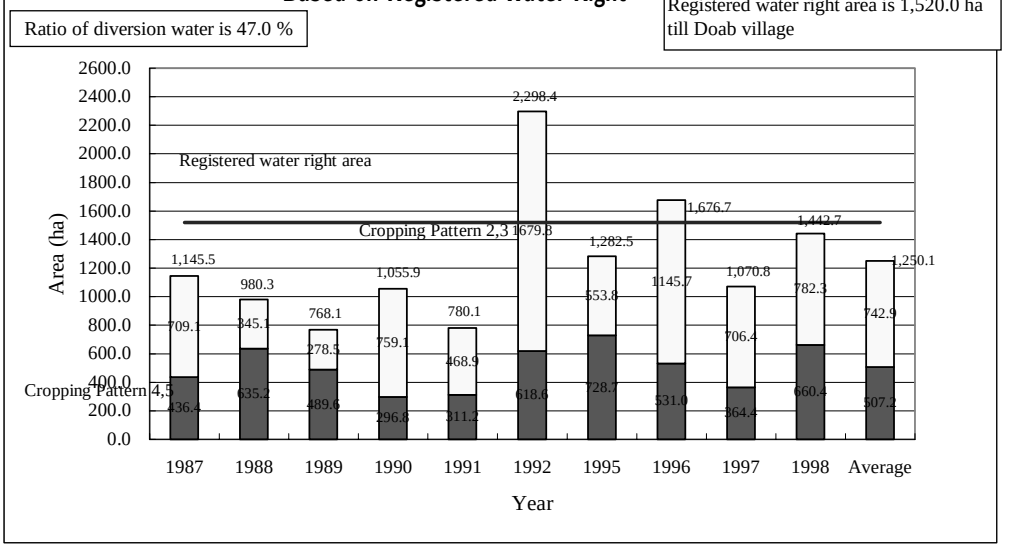


Fig. 6.4.1 (3) Irrigable Area of the Gharasu River Under the Fair Distribution Based on Registered Water Right



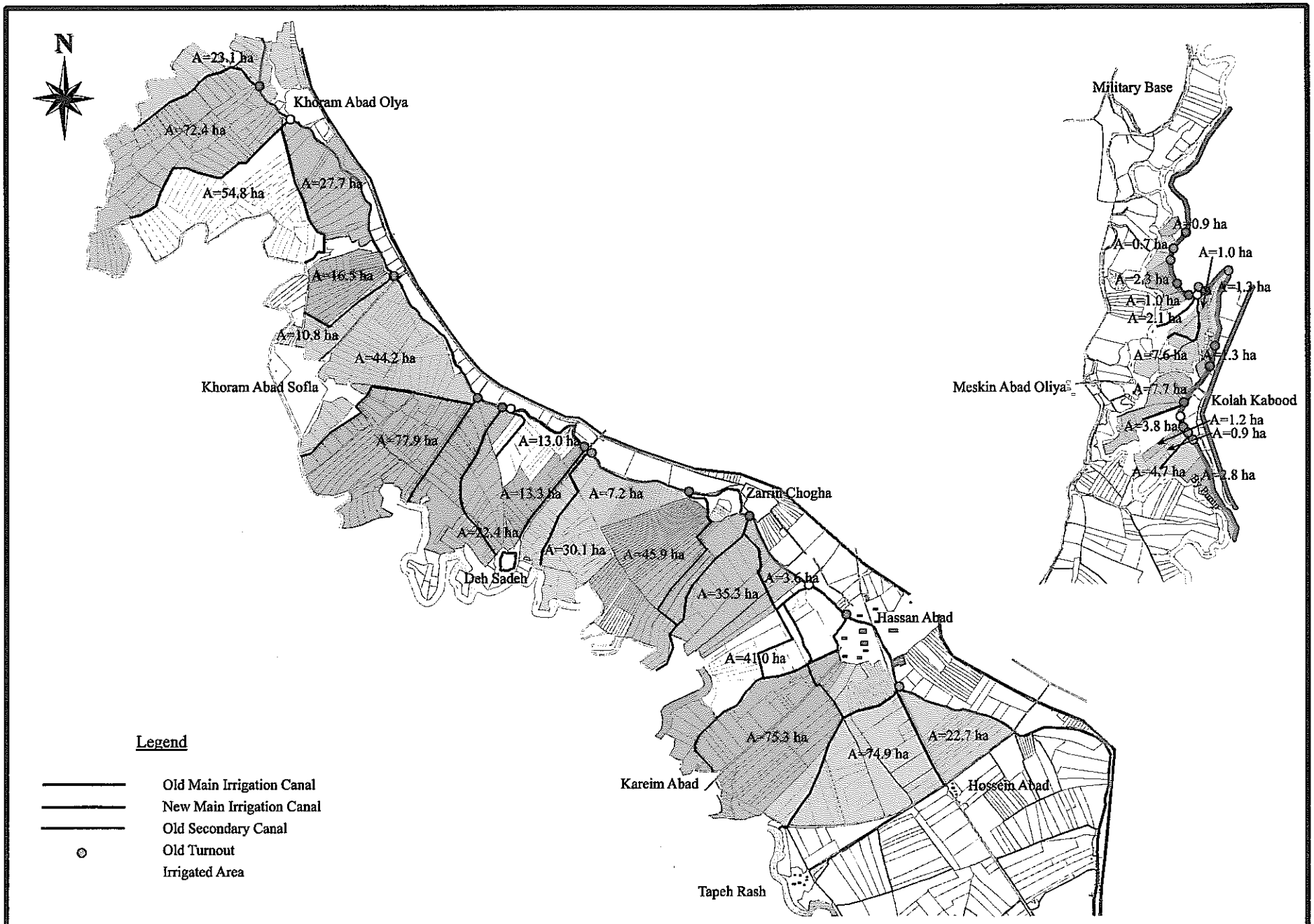
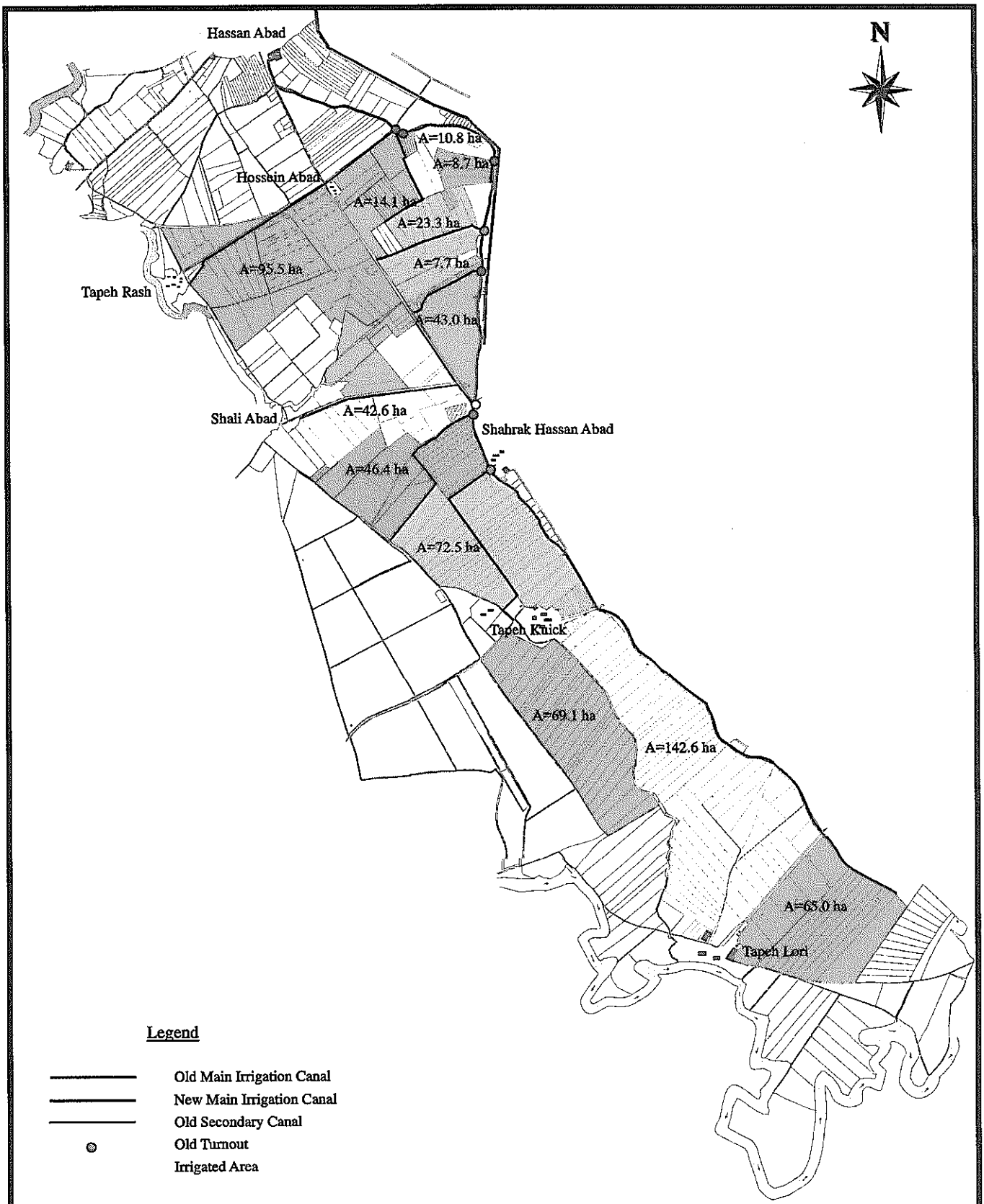


Fig. 6.4.2 (1/2) Present Irrigation Network on the Left Bank Canal



FIg, 6.4.2 (2/2) Present Irrigation Network on the Left Bank Canal

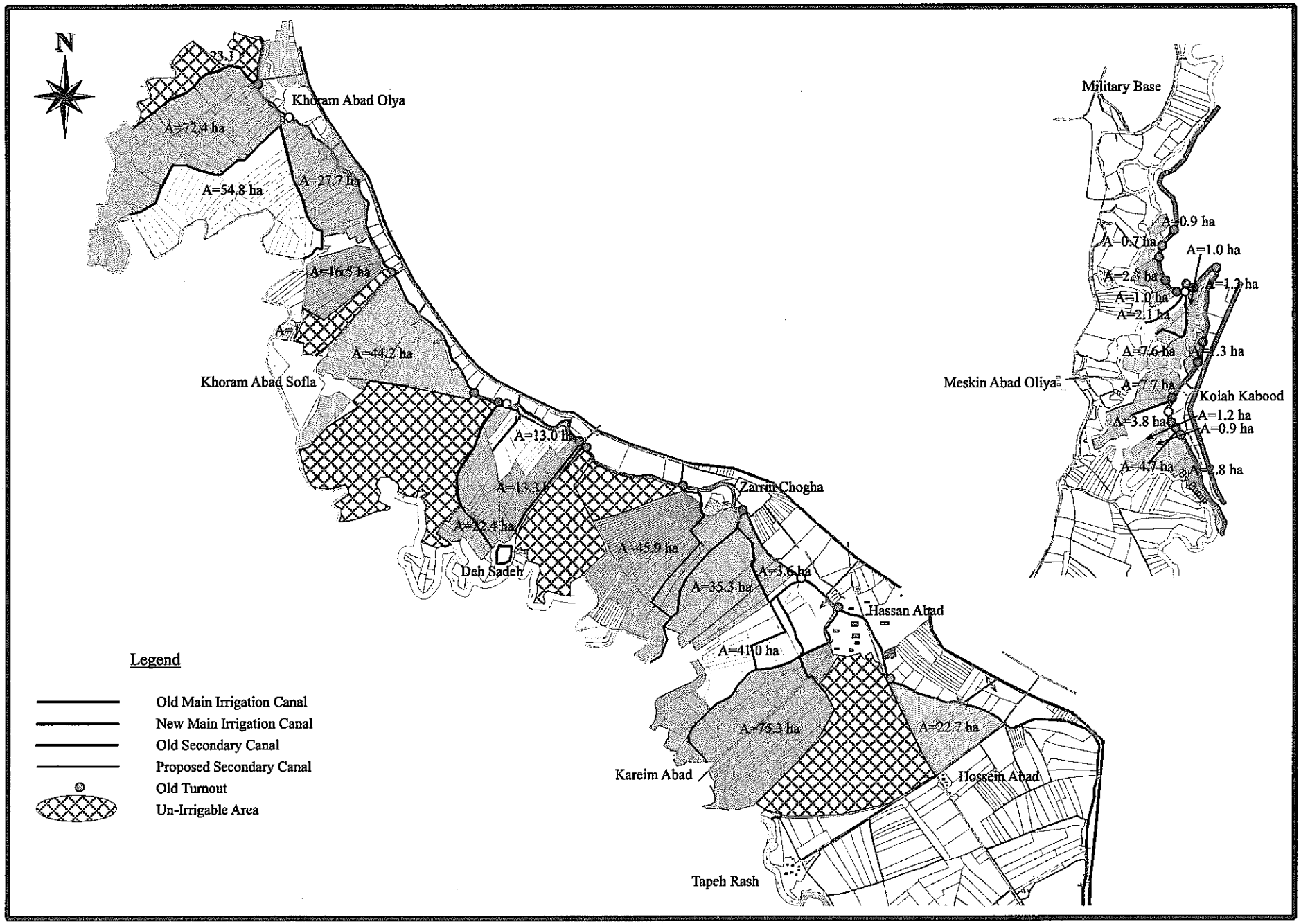


Fig. 6.4.3 (1/2) Unirrigable Area by the Proposed Irrigation Network

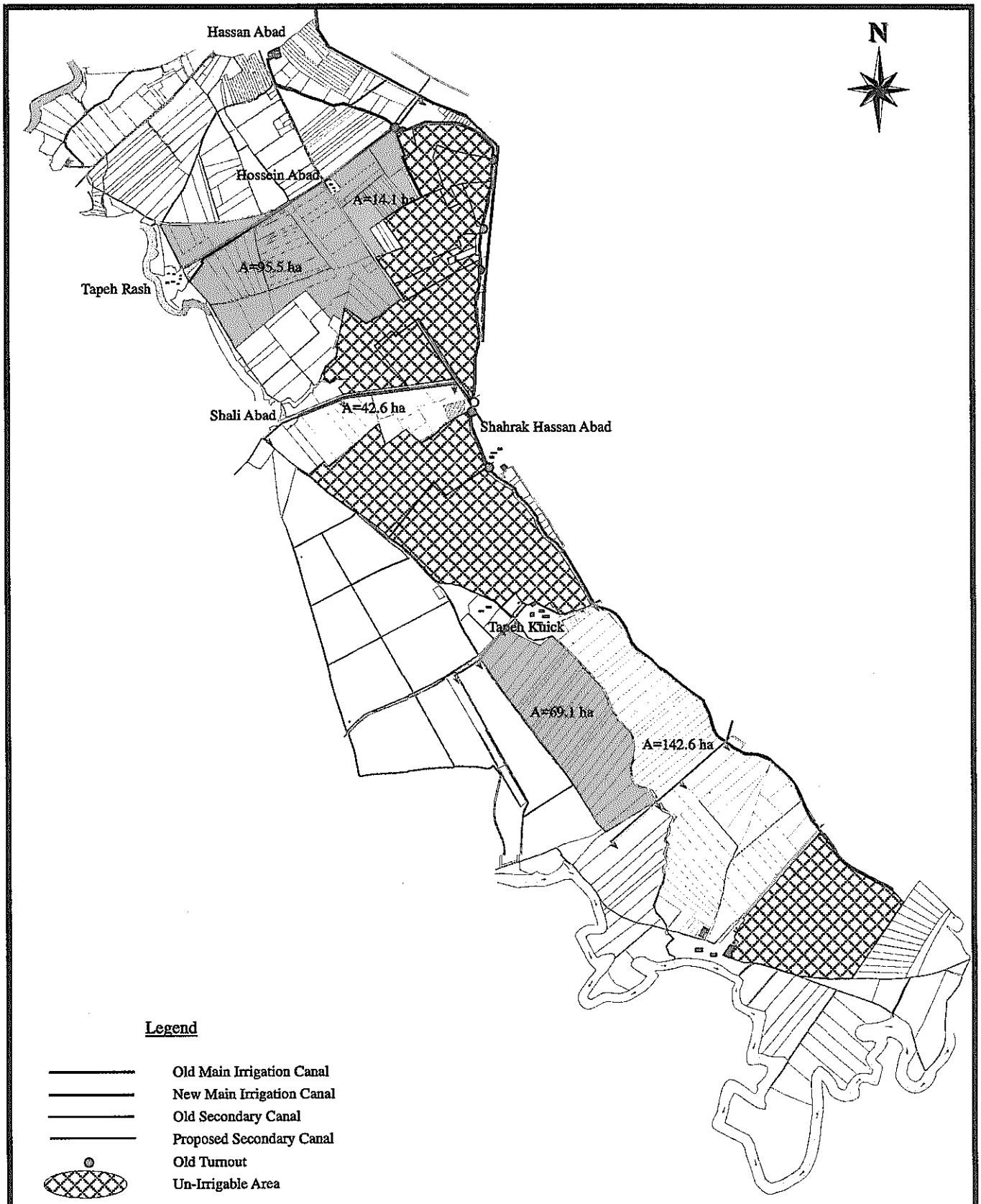


Fig. 6.4.3 (2/2) Unirrigable Area by the Proposed Irrigation Network

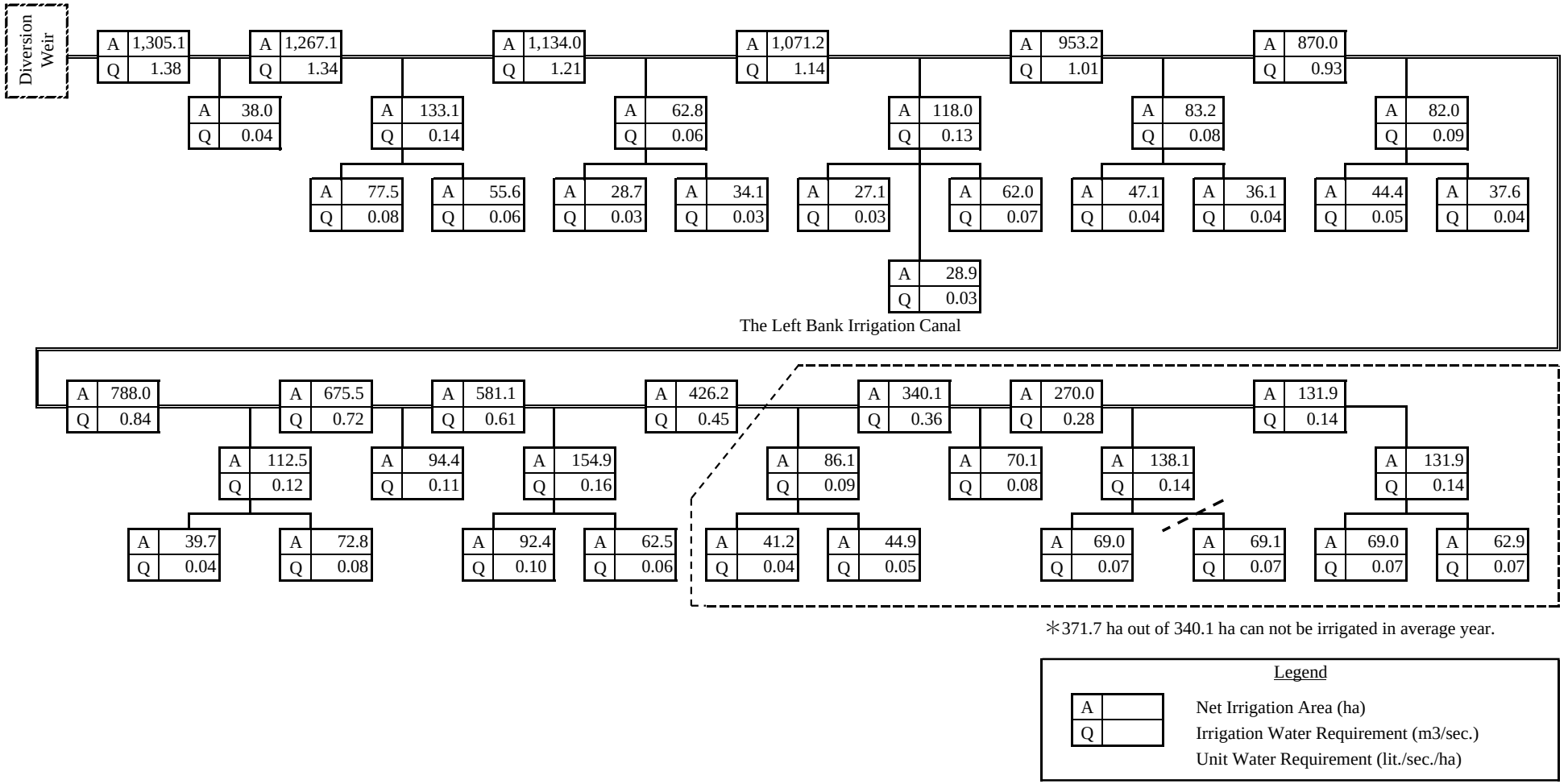


Fig. 6.4.4 Irrigation Schematic Diagram of Left Bank Scheme

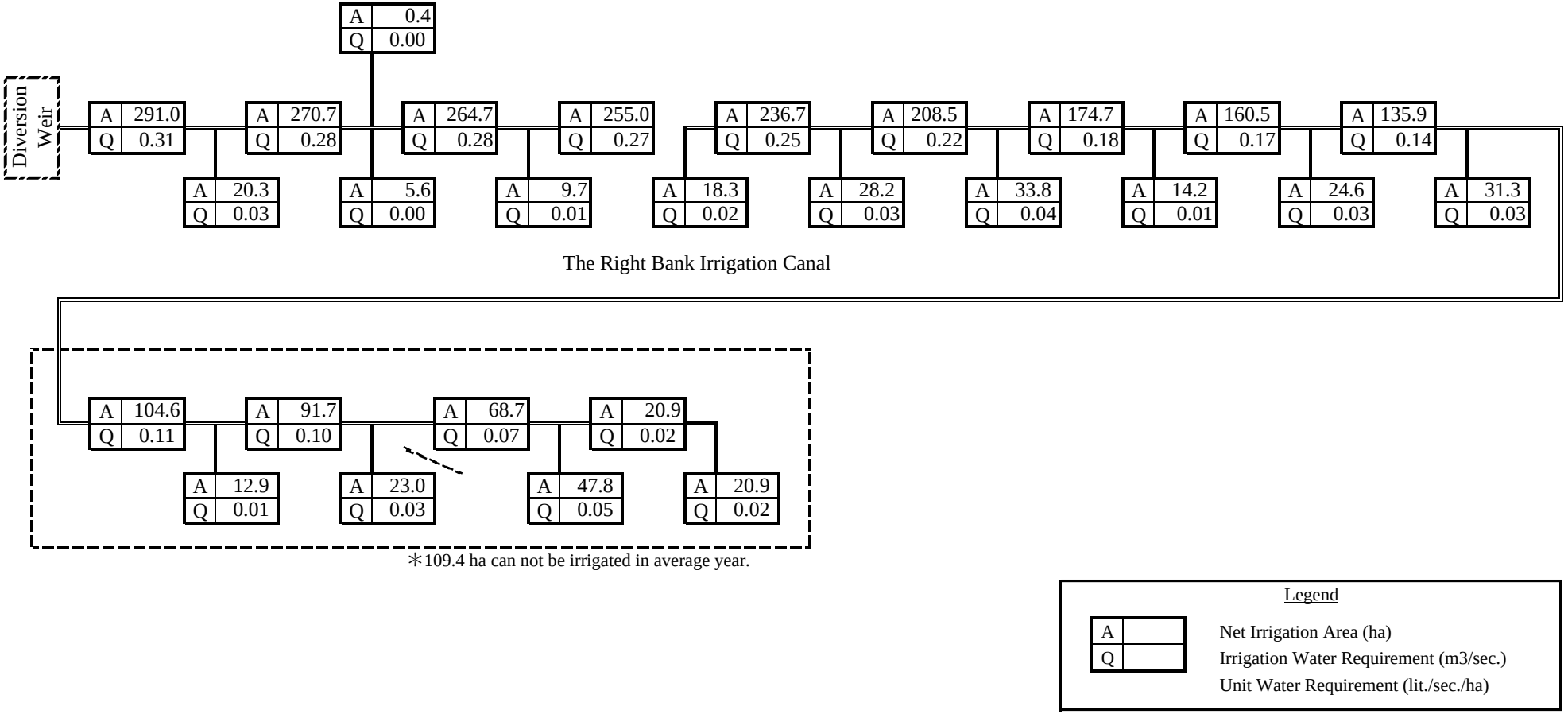


Fig. 6.4.5 Irrigation Schematic Diagram of Right Bank Scheme

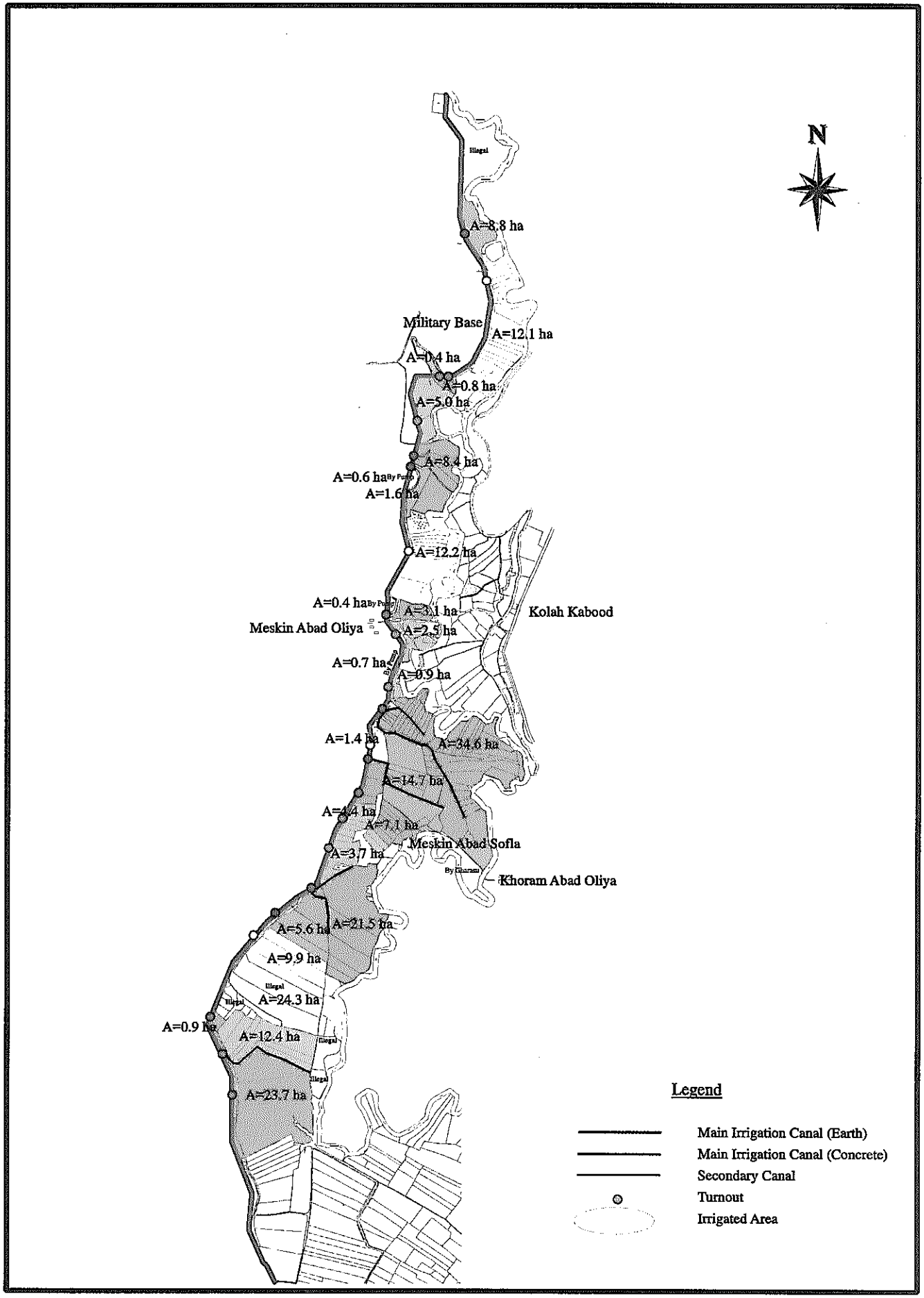


Fig. 6.4.6 (1/2) Present Irrigation Network on the Right Bank Canal

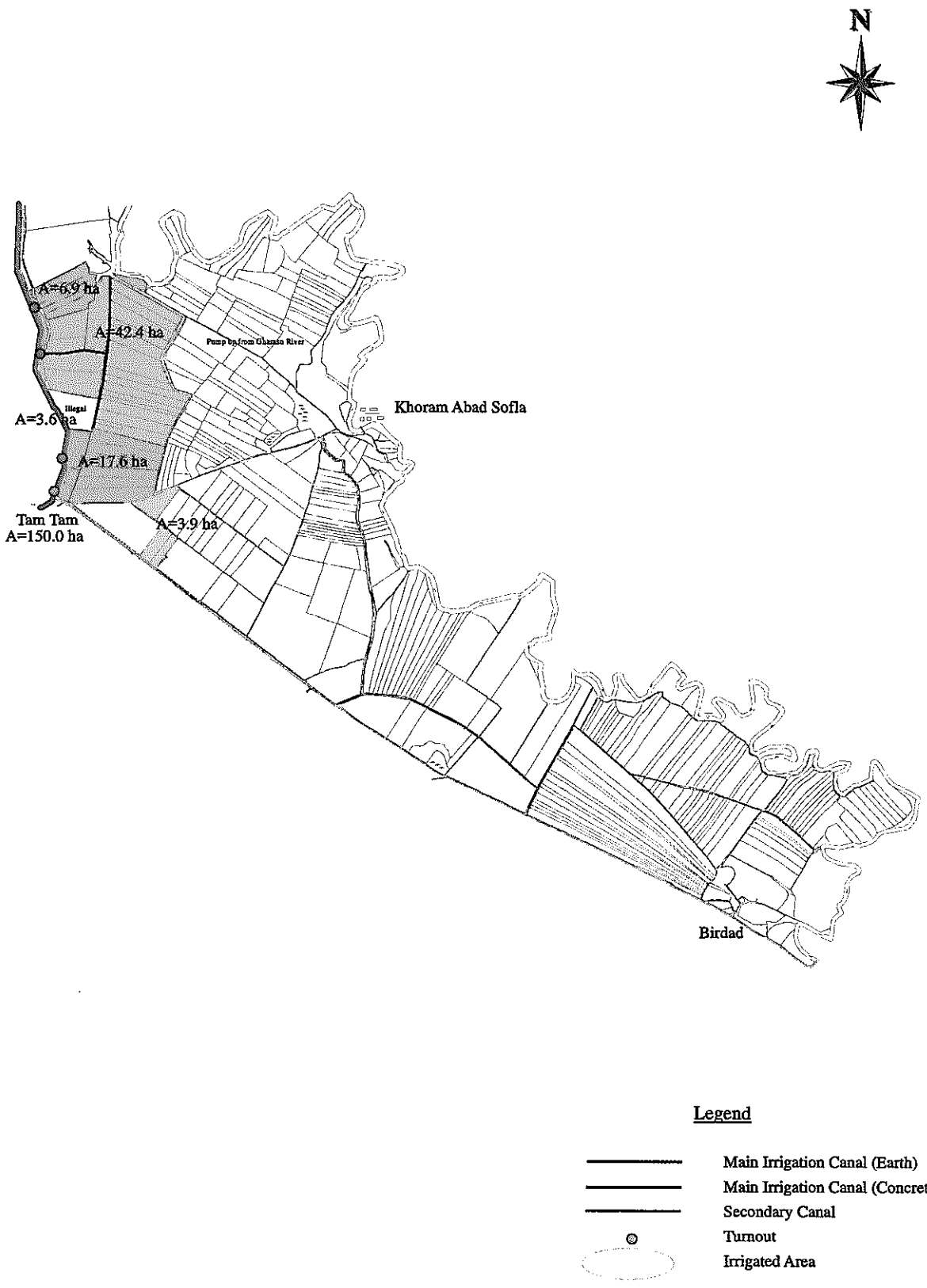


Fig. 6.4.6 (2/2) Present Irrigation Network on the Right Bank Canal

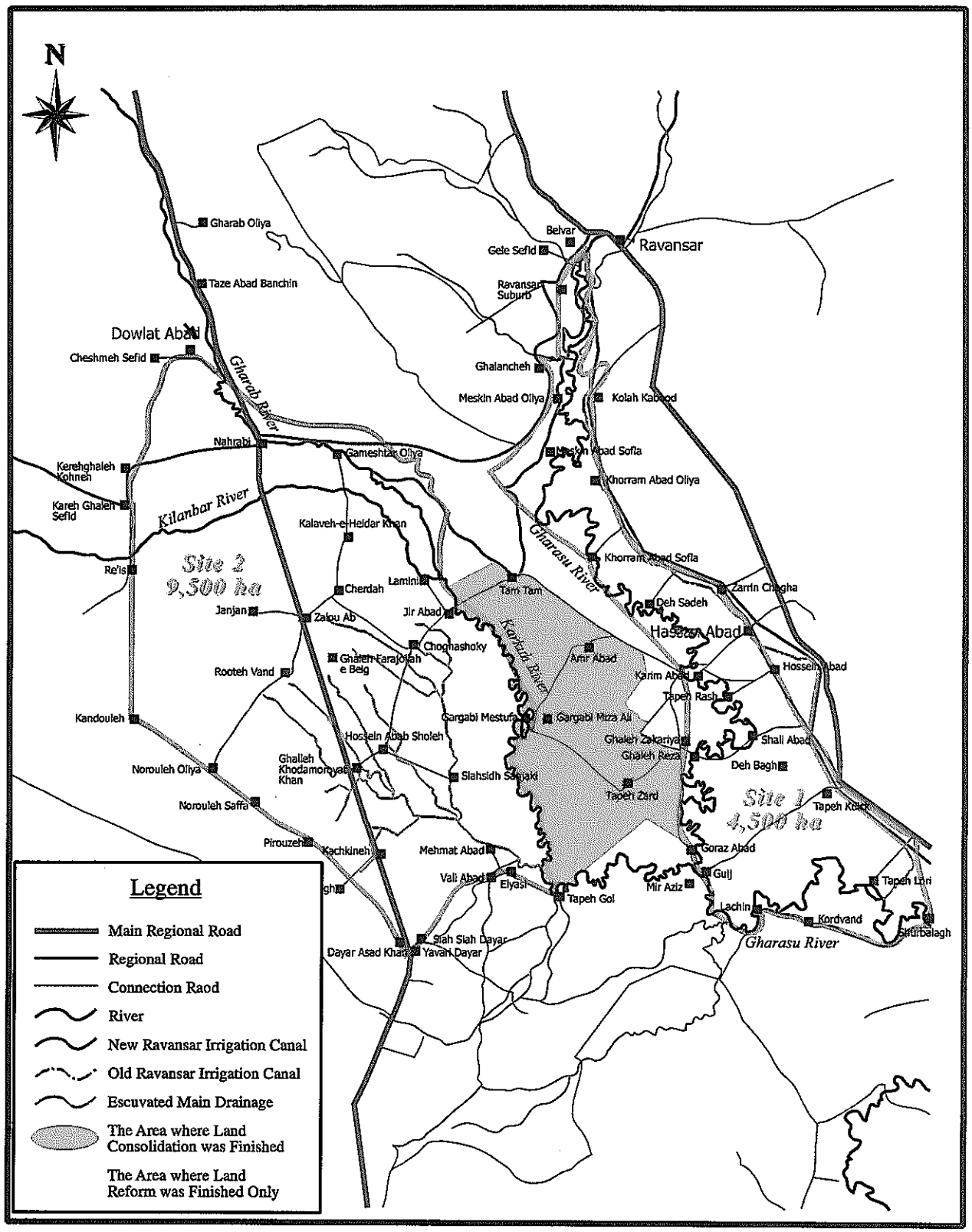


Fig. 6.4.7 Present Situation of Land Consolidation in the Study Area

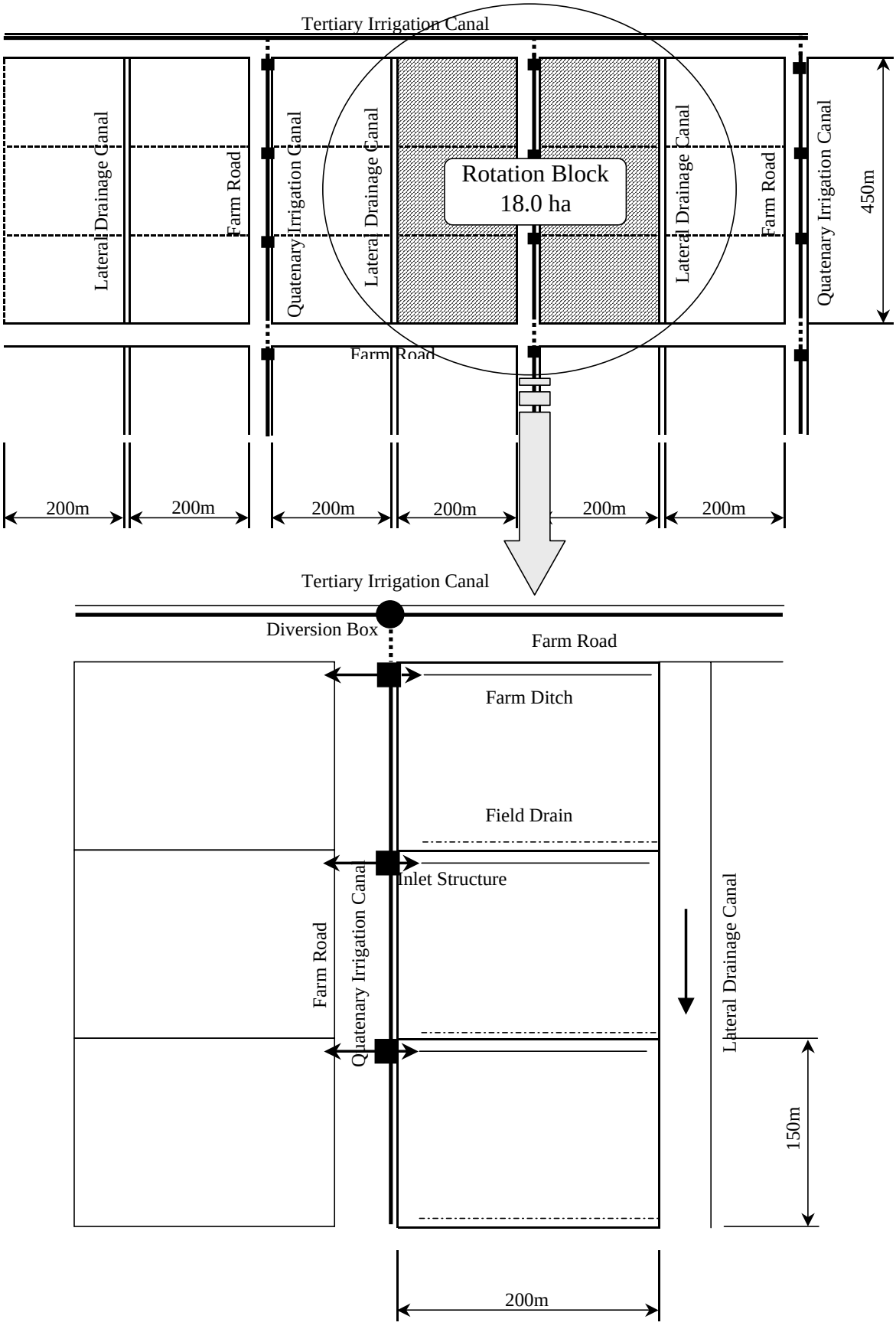


Fig. 6.4.8 Standard Layout of Land Consolidation

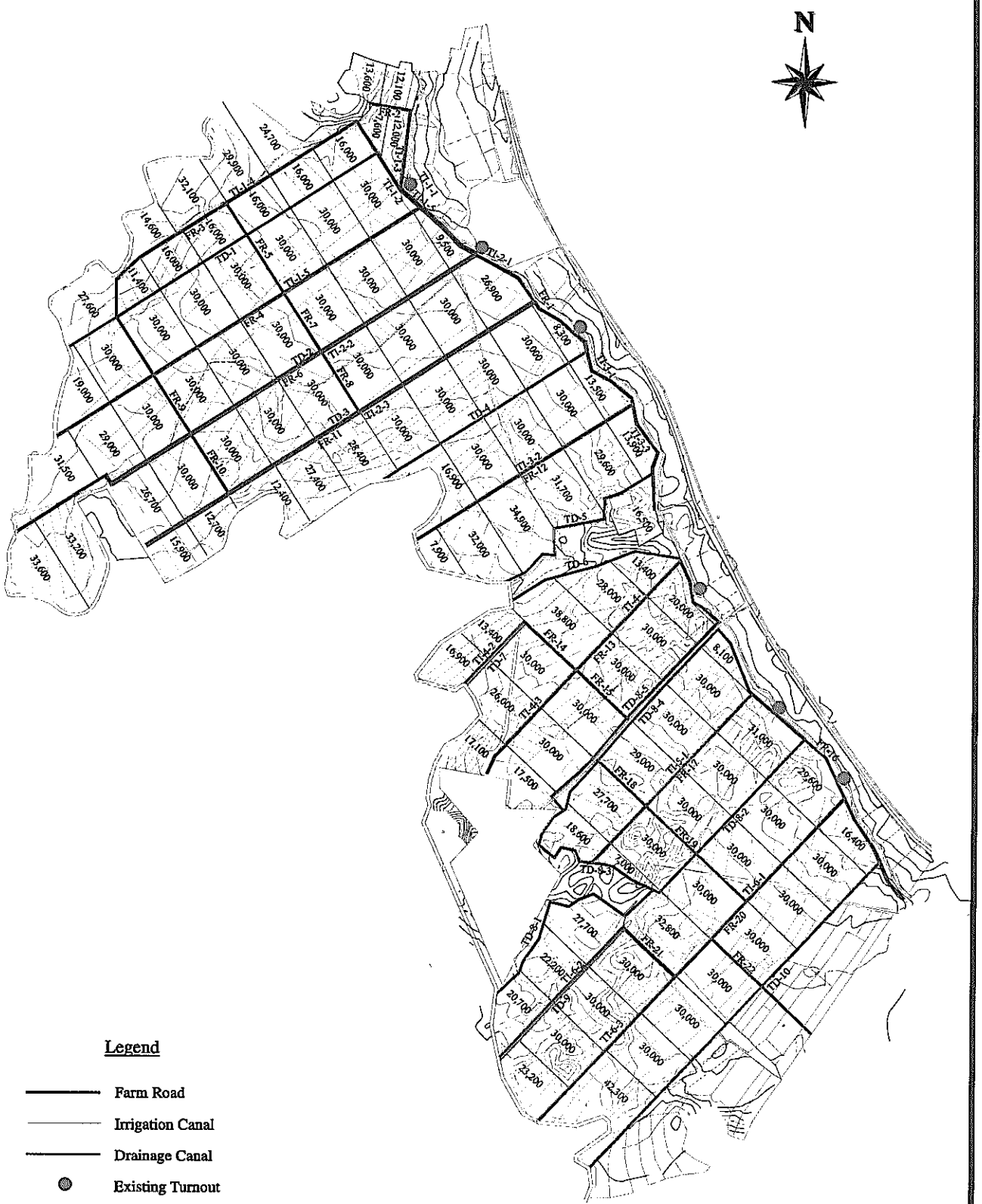


Fig. 6.4.9 Land Consolidation Plan Around Khoram Abad

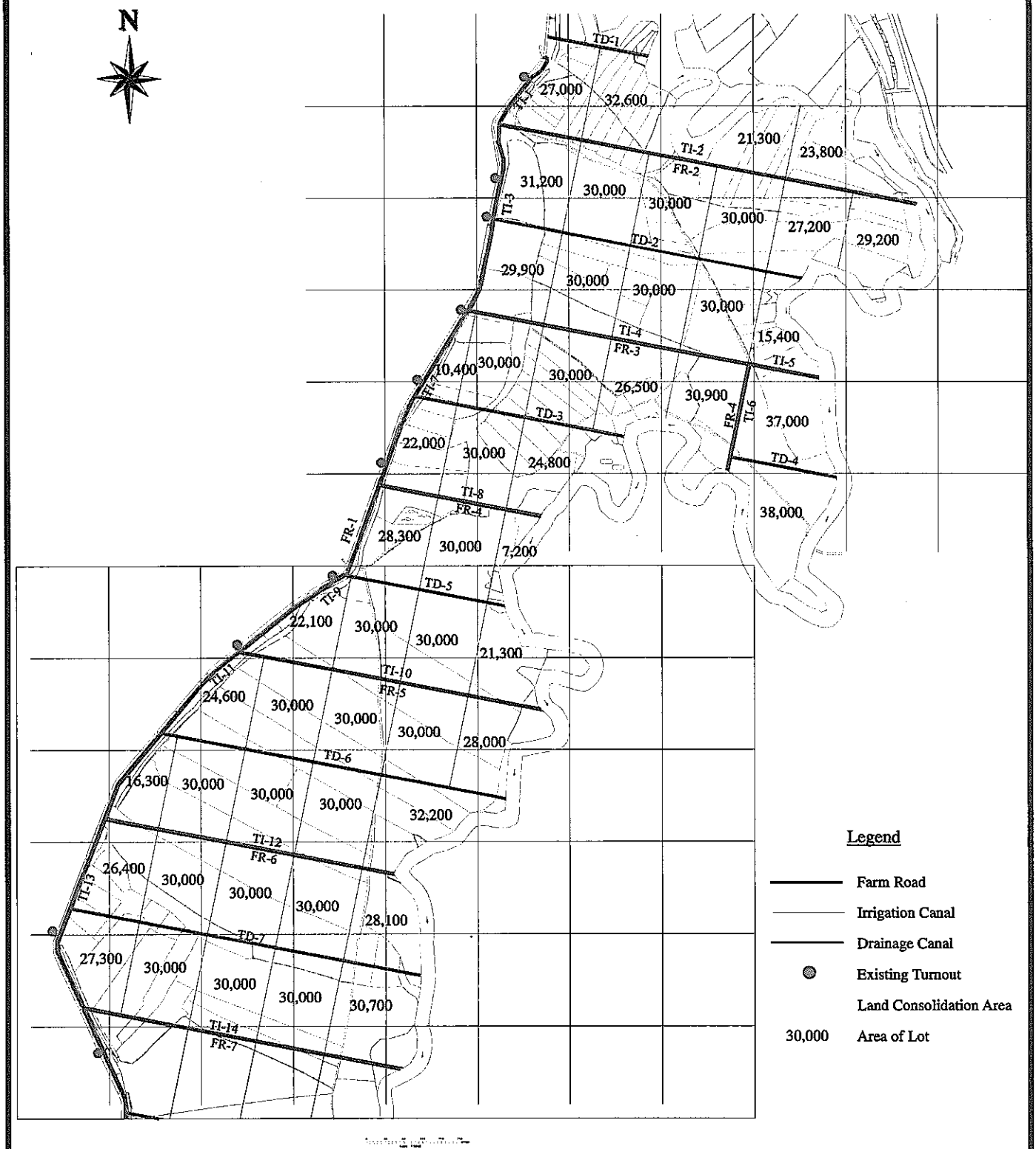


Fig. 6.4.10 Land Consolidation Plan Around Meskin Abad

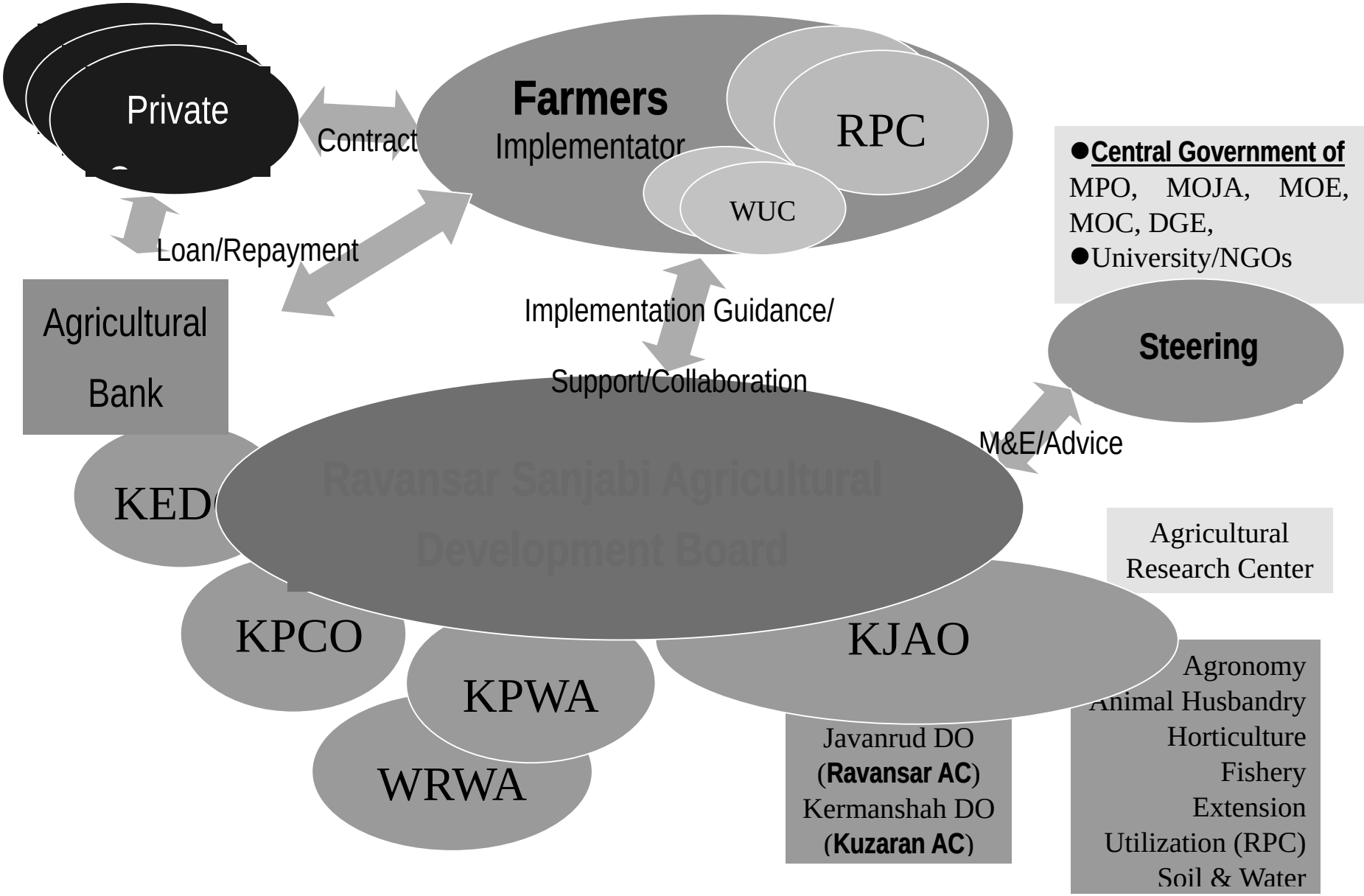
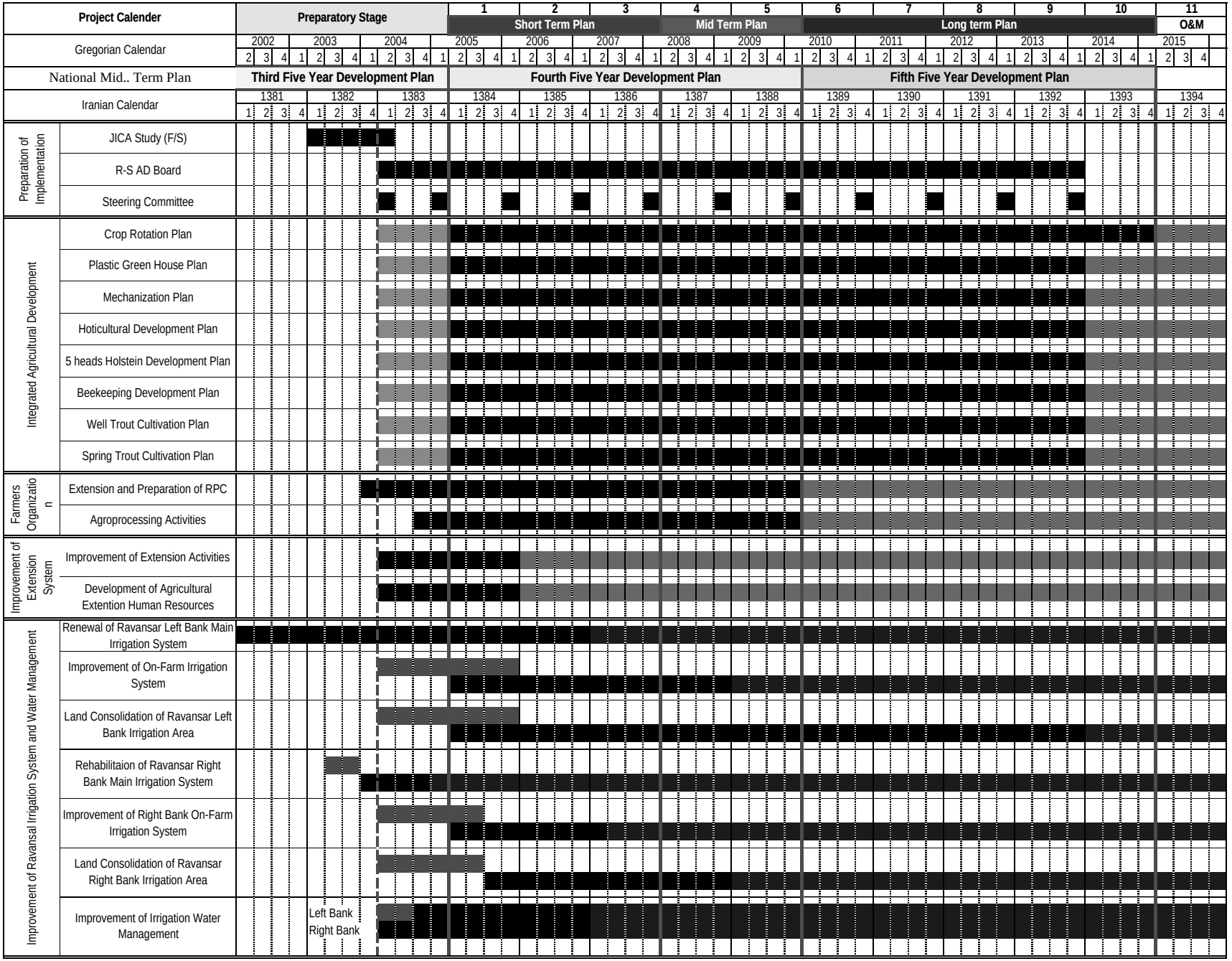


Fig. 6.5.1 Stakeholders of the Project Implementation

Fig. 6.5.2 Project Implementation Schedule



Chapter 7 Conclusions and Recommendations

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The Project is chosen with the high priority by integrating project/programs, which were selected among the required activities proposed in the master plan of the Agricultural Development in the Study Area. The Project consists of 4 major components; 1) Integrated agriculture development, 2) Farmers organization development, 3) Extension system improvement, and 4) Ravansar canal irrigation system and management improvement.

The agricultural development plan was prepared based on integrated farming of agriculture, livestock, apiculture, mechanization, horticulture and fishery. Integrated farming is essential for the effective use of land, water, and organic matter and to perform sustainable agriculture. Besides, through integrated farming, the farmer can attain a stable income by combining agriculture and other practices and can avoid the uncertainty of single practice in the region.

Most of the contents of the agricultural development plan have been never experienced in Iran, even in Iranian researches. Furthermore, most of the rural production cooperatives (RPC) in Iran have not sloughed off from supervision of the Governments yet. The implementation of the proposed plan will become the model in the whole Iran, except of the area of salinity. If succeeds in Kermanshah, the ripple effects to the whole Iran are huge.

The other components of the Project are also equally important since the successful implementation of the agricultural development depends on these components and there is a strong relationship and significant synergetic effect between each other.

Early implementation of the Project is strongly recommended in order to improve and stabilize the living standards of the farmers in the area through the improvement of their farming conditions by introducing integrated agricultural development.

Furthermore, the Project is regarded as the pilot project of the region, and the early implementation of the Project is very important as a sustainable development model for the for the agriculture development of the area and the region.

7.2 Recommendations

7.2.1 Participation of the Farmers in the Project

(1) Main Actors of the Development

The proposed Project aims to achieve the sustainable agriculture development, and the main actors of the Project are the farmers of the area. The Government is the facilitator or supporter of the Project in supporting the farmers to take off and move forward towards the agricultural and rural development of the area and the region.

In the case of agricultural and infrastructure development project, the positive participation of the farmers in the Project is indispensable for the successful operation and maintenance of the Project. During the study phase, the farmers living in the Study Area participated in the PCM-applied workshops, meetings and cooperated in the interview survey conducted by the

Study Team. Many activities such as workshops, seminars, study tour were carried out through out the Study to involve farmers participation at each stage of the study. Therefore, they clearly understand the objectives of the Project and the duties/responsibilities required for them to shoulder during the implementation of the Project. Farmers involvement is highly critical for the farmers organization development, which is one of the main components of the project. In addition, participation and involvement of farmers during the implementation of Ravansar canal irrigation system and management improvement is essential in order to confirm the objectives of the Project and the duties/responsibilities required for them.

(2) Breakthrough of Mistrust Dilemma between Farmers and the Government by Starting Communication

1) Lessons Learned from the Study

All the stakeholders have been making efforts on the stage of agriculture development to realize the advocated targets which are intended to be better than today. Farmers today could become “land owners” from their previous stage of farm laborer based on efforts poured by the Government about 3 decades ago. Their fathers made efforts to become “farmer“ from farm laborer” through their lives. They intended to obtain capabilities as farmer to secure more yield and more stable production through the communication with the nature. Efforts by the today’s farmers might be directed to become self-reliance farmers. That independence means actually to obtain sufficient knowledge, techniques and wisdom to survive in the social and economical circumstances.

Besides the above while concentrating to keep the national constitution against the war crisis at that time, the Government has been pouring efforts to consolidate measures for increment and stabilization of agricultural production to keep the basement of the country, the agriculture, up to today. In the same line of the government’s efforts, the government is getting closer to a more liberalized society with vital economic activities.

Under such conditions, it is expected recognize duties and rights as basic foundation to maintain free and self-reliance farm management and also self-innovation from the present to more diversified production activities and their independent management. Also the government / the administration is expected to owe burden to form sufficient circumstances for securing self reliance and act dynamically by the people (farmers). Main part of those expectation might be aspects to set institutions and regulations to ensure independent agricultural production, not only the provision of production infrastructure as previous approach.

It can be said that the present situation is like a condition that both the administration and people (farmers), are riding on the same boat floating on the tidal movement heading to a new paradigm and groping concrete mutual relation to operate the boat.

2) Government for All

It is often said over the world commonly that a social obligation is existing as premise of self-reliance and freedom. Farmers should innovate themselves to self-stand independently from the situation of depending on the government assistance and protection as given by the government previously. Obviously there should be self risk-management to survive and owe duties to get rights of receiving social welfare prepared by the Government.

Besides the farmers, the Regional Government is also in the same condition. If the Regional

Government is keeping the function to convey the policies or intensions of the Central Government to the people (farmers) as previous, it is available to predict that the Regional Government will be out-of-function due to being behind to the people's progress of their innovation. Provisions of environment to secure the free society and economy with self-reliance for the people means to reach to sufficient situation to generate ownership to co-share the constraints of the people, while taking roots in the concerned region.

Innovations of both the people (farmers) individually and the administration and also innovation to harmonize those one in expected in the process of proceeding to new paradigm.

3) Start from Communication

It is clear that mutual understating among stakeholders, who are the people (farmers), the administration body and staffs of the body as the first step to approach.

This Study focuses on the sustainable agricultural development in Ravansar Plain. For approaching to unite individuals and to enhance, co-working is indispensable instead of keeping family-wise production for realizing self-reliance and production diversification. Hence more close communication is required to understand neighboring people living in Dehs in the vicinities. The administration is facing to the subject to generate sufficient conditions that the local people can play their role in those activities.

Enhancing deeper communication is also a subject to the administration side, not only for the people, to synchronize the efforts of the relevant agencies to meet with people's demands. The subjects, which the administration is facing, have been changing rapidly from the previous conditions. If some stagnations were caused due to shortage of efforts of the administration one day, it will mean that the administration should be questioned its performance in front of the people. To avoid such a situation, the administration side is better to set effective measures to deepen the mutual understanding and synchronization among agencies as soon as possible. The first step should be the communication enhancement.

(3) Development Motivation with Clear Incentives for Stakeholders

The trails to innovate towards a new challenge is not an easy matter, and the most of the task and burden should be owed by the Government. Many government staffs efforts have been poured to maintain the such a huge organization. Staffs of extension service center worked hard not distinguishing day and night to keep communication with farmers and as interface to the government. Engineers in the provincial headquarter taking out their specialized knowledge to complete the I&D planning and designing. Also officers to set detailed schedule to implement programs to meet with the Central intensions and policies. Innovations are coming up to those individuals and the divisions of them in the administrative body. Progresses to the new paradigm should be conducted through those innovations with encouraging their sense of ownerships and deepening the recognitions on social responsibilities, overlaying with subjects of individual existence. As matter of course, some considerations of incentives to the staffs, who are going to challenge to overcome the new expectations, are indispensable to meet with their efforts.

The previous evaluations to the local administration officers were done by the seniors of the body or the Central But as stated as in the previous if the new function of the administration might be turned to contributions to the people, instead of replying to the orders from upstream of the body, it is natural that the evaluation itself is also to be changed to be conducted by the

people as “Social Evaluation System”. Accomplishment of this system would be a reference point to know the progresses of communication realization. If it is possible to provide such a system, it will be noticed that the system itself is a part of progresses of system provision which is able to inform those topics to the regional society. Such situation is also a step of approaching to the “Rural Activation”.

Revision of staff salary is also an important measure to change motivation of the government staffs. Both of revision of salary and applying the social evaluation system will cause rationalization of the administration certainly.

7.2.2 Agriculture Development Plan

(1) Characteristics of Agriculture Development Plan

1) The objectives of the proposed agriculture development plan are to carry out the sustainable farming in Ravansar and Sanjabi plains. The sustainable farming can be realized by following factors.

   a) Rational crop rotation, increase of organic matter in soil and maintaining of natural circulatory system in field.
   b) Improvement and stabilization of farmers’ economy
   c) Improvement of amenity in rural society by improving of rural environment and living standard, especially under coexistence and mutual prosperity of the weaker and the stronger farmers.
   d) Enough and timely supply of farm materials and enough supply of farm machinery
   e) Strengthening of farming basis of farmers themselves by organizing of RPC, which has an advantage of joint selling of farmers’ products and added values of products by processing to prevent beating down the prices by wholesalers.

   The plan was made under consideration of these factors.

2) Almost of contents of the plan have never experienced in Iran, even in Iranian researchers. Furthermore, almost of the rural production cooperatives in Iran have not sloughed off from supervision of the State Governments yet. The implementation of the proposed plan will become the model in the whole Iran, except of the area of salinity. If succeeds in kermanshah, the ripple effects to the whole Iran are huge.
3) To succeed in the implementation of the plan, it is required to support of various organizations, such as Ministry of Jihad-e-Agriculture in Tehran, National Research organization, Agricultural Research Center in Kermanshah, KJAO, Provincial Agricultural organization, Extension Service Centers, Agriculture Bank, Private Companies, etc., especially in early stage of commencement.

(2) Problems in early stage of implementation and recommendation to overcome

   1) We dared to propose the plan, which was different to social customs in Iran, such as crop rotation, use of compost made of straw and cow’s excrements, construction of cow’s stalls in surround of village, etc. The plan may be misunderstood that the plan is not participatory development plan with farmers. However, the participatory plan is to discuss with farmers, clarify farmers’ problems and intentions, and discuss how to dissolve problems together. Farmers’ intensions are reflected to the development plan,

but the planner should not cater to farmers. Because catered plan could not improve the farmers' problems. It is necessary to cut the traditional customs in some cases. Therefore, it is essential to carry out aggressively the extension activities on necessity of sloughing off from the traditional customs by agricultural research organizations, KJAO, extension service centers.

2) With regard to technical transfer, it is effective to establish the demonstration farms in each village, which exhibit and transfer the new techniques to farmers by collaboration of Research Center, KJAO, experts of ESCs and contact farmers. Especially, the studies on the new technologies related to the agricultural development plan should previously carry out in Research Center.

3) The sections of agricultural research organization and KJAO in Kermanshah are divided vertically with relationship to the Organizations in Tehran. In implementation of the plan, the project team, which is composed of various field staff, should be established in the Research Center and also in KJAO. Because separate activities of each section will be not effective.

4) The strengthening of Extension Service Centers, such as building, staff, extension materials, etc. is prerequisite to perform the plan.

5) Training on new techniques and farmers' organizations for staff of KJAO, researchers of RC, experts of ESCs, contact farmers, and farmers should be carried out under new curriculums and lecturers, which include foreign experts.

6) The development plan was made for whole farmers in the Study Area, which include the weeks. However, the weeks have not equity capital of loan, and cannot repay loan in the present conditions of repayment of bank. According to the farm household economic survey, in the farm households of less 40 of Gross Income Index, which represent the individual farmer's farm scale added potential of gross income, the household economies were nearly in red. It is necessary to improve the present conditions of repayment of loan for these farmers. Therefore, as one of the improvement of repayment for the weeks, discharge of equity capital, more 10 years of repayment terms (more 20 years in Japan) and 5% of annual interest rate are recommended. If the conditions are not improved, the development plan will be carried out only for the Strongs.

7) The shortage of farm machinery in the Study Area is very severe, and this is reason of low productivity of production in the Area. Supply of farm machinery by private mechanization service companies and privates and supply of machinery and processing factories by RPCs are very important in initial investment. Insufficient supply of these machinery and processing facilities are not effective, and then the income of these activities will be low. Therefore, the suppliers of machinery and facilities will be behind in their payments. It is recommended that as one of the subsidies of Government, the fund of about Rls.100 billion is established in Government for rural development, and Government supplies finance for these suppliers with conditions of discharge of equity capital and interest-free and the suppliers repay as fast as possible. By use of this fund, the sustainable farming and farmers' organizations (RPCs) proposed in the development plan will be gradually spread to the whole country.

(3) Technological Development in Early Stage of Implementation

It is necessary to develop the suitable technologies for the Study Area before implementation of the agricultural development plan. It is recommendable that the research and development of these suitable technologies are carried out in the demonstration farms, which are cultivate crops, raise cows according to the given crop rotation and the given methods of cow raising and compost production by contact farmers, under management plan and conduct of collaboration with visiting specialists of ESC, researchers of KARC and staff of KJAO.

The pressing matters in the suitable technologies for the Study Area are as follows. These technologies could be cooperated with Japan, in which there are many results of researches on these technologies and farmers use popularly these technologies.

1) Suitable method of compost production for the Study Area

   i) Improvement of simple methods of compost production and use in individual farmer; Simple production methods of compost, which is made with straw and excrements of cows: preparation of straw to promote the soaking up cow's excrements, suitable quantity of litter in stall, method of keeping moisture of heap of the mixtures of straw and excrements in dry season in order to suitable fermentation, improvement of tools for compost production, use of field residues as materials of compost, improvement of transportation and scattering of compost, suitable quantity of compost for crop cultivation, etc.
   ii) Low cost facility and management for compost production in common use of several farmers
   iii) Low cost facility and management for compost production in common use of village
   iv) Integrated technology of handling and use of slurry (liquid manure): Improvement of low cost slurry pool in stall, fermentation process and killing of weed seeds in slurry pool, mechanization of transportation and injection of slurry by slurry injector

2) Suitable method of silage making for the study area

   i) Improvement of simple methods and tools of silage making in individual farmer; : Plastic film, apparatus of sealing of stack plastic silo, portable vacuum pump, kind of artificial additives to prevent rot of silage, keeping method of silage quality (promoting of lactic acid fermentation and preventing of butyric acid fermentation), improvement of continuation of silage use, re-storing method of purchased silage, etc.
   ii) Improvement of simple methods and tools of silage making in common use of several farmers
   iii) Low cost silo and management for silage making in common use of village
   iv) Use of field residues as materials of silage, such as straw, residues of maize for grain, residues of sugar beet and chick pea, etc.
   v) Development of mechanization of collecting of crop residues as material of silage and compost

3) Simple drying facility of grains (maize, wheat, barley, etc.)

   i) Development of simple and homemade ventilating dryer for grains in individual farmer
   ii) Development of low cost ventilating dryer in common use of several farmers

4) Planning of annual farm work schedule and personnel management of operators in suppliers of farm machinery

   i) Development of software of personal computer on planning of schedule and operators' management
   ii) Development of software of personal computer on distribution of farm materials

7.2.3 Farmers Organization

(1) Mainstreaming the Importance of RPC Promotions in KJAO

Despite the emphasis on the importance of promoting farmer's initiatives in agricultural development policy of KJAO, the idea of PRC and how it should be developed has not yet been penetrated in other Deputies outside Utilization System. Utilization System only has its office at the Provincial level and there is no supporting system at the District or sub-district level. At the Dehestan level, staff of extension centers hardly know about the RPCs apart from the companies existed before the Revolution. In promoting RPCs in the Study Area, the first thing to start is to train the concerning personnel in KJAO to familiarize the idea of RPCs and how it should be informed to the farmers in the study area. Such training should be undertaken occasionally by the Utilization System. Also, in order to penetrate and mainstream the importance of RPCs, the current supporting system should be further strengthened. For this, in addition to appointing a RPC expert at the extension centers in Dehestan, there should be at least one expert in the district office who is responsible for the RPC affairs in the district.

(2) Development of Model RPCs in Kermanshah

The proposed RPCs in the Study Area would be the model RPCs to be promoted in other parts of Kermanshah and Iran as a whole. KJAO needs to give adequate technical and financial supports to establish the model RPCs. The development of model RPCs should be promoted together with restructuring agricultural centers, for which Kermanshah Province in selected as a model province.

7.2.4 Improvement of Ravansar Irrigation System and Irrigation Management Plan

(1) Improvement of Irrigation Management

Trade-off on irrigation water has been more serious rapidly in recent one decade, especially for dry season water use, which was extended by the Government from viewpoint of crop production increment. The task-allocation between MOE as "Water Supplier" and MOJA as "Water Users" has never reached to any sufficient results, in case of the irrigation development in the Study Area. Even though the proper water management is the highest priority as the National objective, it is obvious that farmers are not sharing the subject as their own obligation in the field. It might be quite difficult to let farmers participate to the subject, if the Government side owes the understandings the necessity to guide farmers to accept, to understand and to participate. It seems that the Central Government's intension and volition has not been conveyed to farmers as the end user of irrigation water, due to stagnant condition in the local government which has owed a function between them, especially for the aspects of the water management.

It is recommended that the administration shall adapt official permission rule for irrigation agriculture referring to availability of water for irrigation and land condition, instead of propelling irrigation agriculture excessively.

It seems to be indispensable to commence necessary actions to clarify regional hydrological circulation and water availability as soon as possible, instead of concentration to certain water source only.

It is required to the administration to apply the design standard water availability as basic reference source for examining any water use related projects, instead of the present way.

Before letting farmers involve to the subject of the water management, the administration should overcome the insufficient condition of water supply as its responsibility. Because farmers have kept the rain-fed farming, not depending on irrigation for generations. The subject should belong to the Government purely.

(2) Strengthening of WUC as a Pilot Project of the Irrigation Management

The whole of WUC program is quite a new subject for both the Government staffs and the farmers. Hence, it is hard to find out the mainstream of WUC program enhancement on both the sides. For the Government side, even though many organizations are involved in the activities in the field, nobody can distinguish which organization is the leading to take responsibility and to implement the program. Though such situation exists, it is obvious to expand the results to the irrigation area as the Central Government decided. So it seems to be better to assist farmers the 100% or more than that to provide a model WUC in the area. By generating a Success Story in the Project area, there might be many lessons for both the sides. WUCs of the Right Bank and Left Bank can be good references to both farmers and the Government.

(3) Measures to Activate Government Organizations

Many staff of the government has been working as per the scope defined by the Government. However, the circumstances of the society and economic conditions have been changing gradually. This WUC program is a program to change the previous system to new one. So farmers are facing to such tidal movement. Provision of WUC in the rural community means to establish “a farmers’ enterprise named WUC”. Only the system of the government is not going to be changed. If so, then how can guide the farmers with same measures as previous? So many possibilities are noticeable to change within the present system. It seems to be better to examine the possible ways to meet with the outer movement of the office. For instance, to increase occasions to exchange opinions among relevant organizations, or to try to simplify appraisal procedure of irrigation project between KJAO and KWAO or contracting by those organizations to hand over whole works from construction to management for small scale irrigation schemes. The government organizations shall guide the farmers in regard to rural activation, enhancement of cost-sharing concept, self-reliance, and sustainability.

(4) Early Completion of Right and Left Bank Main Irrigation System

The project area can be developed as a sustainable development model for the future agriculture development of the region and therefore expeditious implementation of development plan is necessary. Especially the early completion of the right and left bank main irrigation is necessary in order to implement the different cropping patterns proposed in the agricultural development plan. Besides, the formation of WUC is also based on the

completion of irrigation network in the project area.

7.2.5 Environmental Monitoring and Management System

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.

7.2.6 Kilanbar and Gharab Dam and Irrigation Projects

(1) Necessity of Additional Hydrological Information

The Studies for the Kilanbar and Gharab Dams have been carried out at first by the MOJA and now, MOE is conducting further studies for the Kilanbar dam including geological boring survey and others. In case of Gharab dam no study is carried out by the MOE and it is reported that the geological characteristics of the proposed dam area is not suitable for constructing Gharab dam.

The major problem of the proposed Kilanbar and Gharab dams is that there is no observed records on the rainfall and river discharge near the dam site. The existing discharge data is only observed records of Doab Marak station. However, the phenomenon of discharge between Doab Marak and Kilanbar, Gharab rivers may be different. So, the availability of the proposed dam can not be clarified excepted for the observed records on the rainfall and river discharge near the dam site. Also, one of the objectives of the proposed dams is irrigation and flood control. In this case, responsible organization has to make an accurate estimation before the flood season, and they have to adjust storage volume to make some margin for flood control. It is impossible to make an accurate estimation without observed records on the rainfall and river discharge near the dam site. It is considered as the most important problem of the proposed dam.

On the other hand, according to the report of the proposed dams, the spillway is designed by a

flood with a return period of 1,000 years. However, existing river can not have the capacity against those floods. In this case, the design of flood control should be examined taking into account of the capacity of existing rivers.

(2) Requirement of Environmental Impact Assessment

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

Studies were conducted by Jihad-e-Agriculture Organization to verify the possibility of implementing Kilanbar Dam and Gharab Dam. MOE is now conducting the Study on Kilanbar Dam and if it will be implemented, 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:

During the participatory workshop in Reis village, which is located within 1 km at the downstream part of the Kilanbar 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 1420 m, which is about 20m higher than the estimated high water level of 1398m. Therefore, public hearing for people should be held at the stage that basic criteria of the dam is prepared.

7.2.7 Others

In this Study, the problems of the Study Area, and the potentials which can solve those problems were analyzed and the possible strategies and the activities to be carried out in the Study Area were elaborated. As discussed in the Scope of Works of the Study, the Feasibility Study was carried out only for the higher priority projects and programs, which were selected among the candidate schemes. However, the projects which were not selected for the Feasibility Study such as Improvement of Drainage System in Sanjabi Plain should not be considered as insignificant for the development of the Study Area. Therefore, while using this Feasibility Study Report as a reference, the Iranian side shall carry out other feasibility studies and shall implement those projects based on the results of those studies.

Appendix

Appendix A Scope of Work (S/W) and M/M for the Study

SCOPE OF WORK
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL INFRASTRACTURE DEVELOPMENT PROJECT KERMANSHAH PROVINCE
IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE KERMANSHAH JIHAD-E-AGRICULTURE ORGANIZAION, KERMANSHAH PROVINCE,
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

Tehran, 16 March, 2002

Mr.Mohammad Hadi KHAZAI
Head of Kermanshah Jihad-e-Agriculture Organization,
Kermanshah Province,
Ministry of Jihad-e-Agriculture

Mr. Mitsuhiko OTA
Leader of Preparatory Study Team
Japan International Cooperation
Agency

Dr. Majid DEHGHAN-SHOAR
Director General
International and Regional Organizations,
Ministry of Jihad-e-Agriculture

I INTRODUCTION

In response to the request of the Government of the Islamic Republic of Iran (hereinafter referred to as "IRI"), the Government of Japan (hereinafter referred to as "GOJ") has decided to conduct THE STUDY ON GHARASU RIVER BASIN AGRICULTURAL INFRASTRACTURE DEVELOPMENT PROJECT IN THE ISLAMIC REPUBLIC OF IRAN (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the GOJ, will undertake the Study in close cooperation with the authorities concerned of IRI.

The Kermanshah Province Jihad-e-Agriculture Organization, the Ministry of Jihad-e-Agriculture shall act as the counterpart agency to the Japanese study team and also as the coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

This document sets forth the Scope of Work with regard to the Study.

II OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To study the feasibility of the improvement of irrigation, drainage and of agricultural development by the participation of farmers in the area selected from the study area, and
2. To carry out technology transfer to Iranian counterpart through on-the-job training in the course of the Study.

III STUDY AREA

The study area covers the area of the north-west of Kermanshah city. The total area would be approximately 14,000ha, and the location map is attached as ANNEX I

IV SCOPE OF THE STUDY

In order to achieve the above objectives, the Study will consist of two (2) phases, Phase I for the Inventory study and the Agricultural potential study and Phase II for the feasibility study in the specific priority area. They will cover the following items:

1.Phase I

1.1 Review and evaluation of other development projects/plans related to the study area.

1.2 Collection and analysis of relevant data through field surveys and available documents in terms of:

Hydrology, Meteorology, Drought frequency, Economics, Irrigation and Drainage systems and the facilities,Land use, Range land, Cropping Pattern ,Farming(agronomy, horticulture, animal husbandry, fishery and Bee keeping),Extension , Training and Water shed conditions, etc.

1.3 Identification of the technical and agro-social problems related to the subjects mentioned in items 1.2 and discuss of the items studied in the Phase II of study.

1.4 Conduct of Initial Environmental Examination(IEE)

1.5 Selection of the area for the feasibility study.

2.Phase II

Feasibility study will be implemented based on the result of Phase I of study.

However, issue related to;

① Soil and water management

② Drought management and monitoring in the study area

③ Cropping pattern based on the environmental condition and economical value

④ Agro-processing and food safety

Would be highly focused.

2.1 Field survey to collect supplementary data and information

2.2 Study of the feasibility including the plans for:

farming, irrigation and drainage systems and the operation and maintenance plan, sustainable agriculturel development plan, land use, increase in water productivity, environmental preservation , water shed management and others.

2.3 Preparation of the schedule for implementing the project proposed in the plan.

2.4 Estimation of the project costs and benefits

2.5 Evaluation of the project and recommendations.

V STUDY SCHEDULE

The Study will be carried out in accordance with the attached tentative schedule.

(See ANNEX II)

VI REPORTS

JICA shall prepare and submit the following reports to IRI:

1 Inception Report

Twenty (20) copies in English at the commencement of the fieldwork of Phase I.

2 Progress Report (I)

Twenty (20) copies in English at the end of the fieldwork of Phase I.

3 Interim Report

Twenty (20) copies in English at the commencement of the fieldwork of Phase II.

4 Progress Report (II)

Twenty(20) copies in English at the end of the fieldwork of Phase II.

5 Draft Final Report

Twenty(20) copies in English after the office work in Japan. IRI will provide JICA with its comments on the Draft Final Report within one (1) month of receipt of the Draft Final Report.

6 Final Report

Thirty (30) copies in English within two (2) months of receipt of Iranian comments on the Draft Final Report.

VII UNDERTAKINGS OF IRI

1 To facilitate smooth conduct of the Study, IRI shall take necessary measures :

1.1 to secure the safety of the Japanese study team,

1.2 to permit the members of the Japanese study team to enter, leave and sojourn in Iran, and exempt them from foreign registration requirements and consular fees,

1.3 to exempt the members of the Japanese study team from taxes, duties, fees and any other charges on equipment, machinery and other materials brought into and out of Iran for the conduct of the Study,

1.4 to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study,

1.5 to provide necessary facilities to the Japanese study team for the remittance as well as utilization of the funds introduced into Iran from Japan in connection with the implementation of the Study,

1.6 to secure permission for entry into private property or restricted areas for the implementation of the Study,

1.7 to secure permission for the Japanese study team to take all data and documents (including photographs and maps) related to the Study out of Iran to Japan;

and

1.8 to provide medical services as needed. Expense will be chargeable to the members of the Japanese study team.

2 IRI shall bear claims, if any arises, against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.

3 The Kermanshah province Jihad-e-Agriculture Organization, Ministry of Jihad-e-Agriculture (hereinafter referred to as "KAO") shall, at it's own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:

3.1 available data (including photographs and maps) and information related to the Study
3.2 counterpart personnels
3.3 suitable office space with necessary equipment and furniture in Tehran and Kermanshah.
3.4 credentials or identification cards

VIII UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

1 to dispatch, at its own expense, the Study team to Iran.

2 to pursue technology transfer to Iranian counterpart personnel in the course of the Study.

IX CONSULTATION

JICA and KAO shall consult with each other in respect of any matter that may arise from, or in connection with, the Study.

ANNEX · II

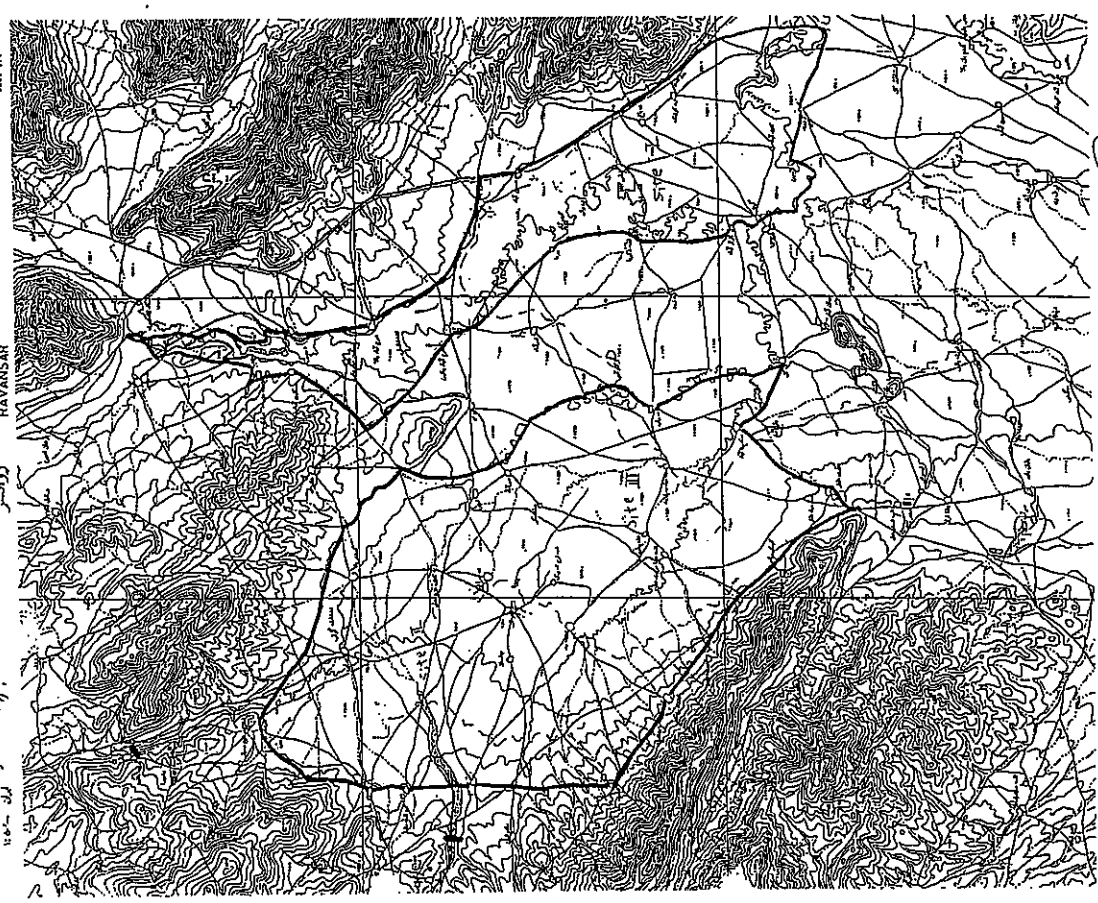
TENTATIVE WORK SCHEDULE

MONTH / ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Note
Work in Iran																◎	
Work in Japan																	
Phase	PHASE I				PHASE II												
Report	△ Ic/R			△ P/R(I)		△ IT/R							△ P / R(II)	△ Df/R		△ F/R	

(Remarks)

Ic / R	: Inception Report
P / R(I)	: Progress Report (1)
It / R	: Interim Report
P / R(II)	: Progress Report (2)
Df / R	: Draft Final Report
◎	: Comments on Df /R by Iran side
F / R	: Final Report

ANNEX I



MINUTES OF MEETINGS

FOR

THE STUDY ON

GHARASU RIVER BASIN AGRICULTURAL INFRASTRACTURE

DEVELOPMENT PROJECT KERMANSHAH PROVINCE

IN THE ISLAMIC REPUBLIC OF IRAN

AGREED UPON BETWEEN

THE KERMANSHAH JIHAD-E-AGRICULTURE ORGANIZATION,KERMANSHAH PROVINCE,

THE MINISTRY OF JIHAD-E-AGRICULTURE

AND

THE JAPAN INTERNATIONAL COOPERATION AGENCY

Tehran, 16 March, 2002

Mr.Mohammad Hadi KHAZAI
Head of Kermanshah Jihad-e-Agriculture Organization,
Kermanshah Province,
Ministry of Jihad-e-Agriculture

Mr. Mitsuhiko OTA
Leader of Preparatory Study Team
Japan International Cooperation
Agency

Dr. Majid DEHGHAN-SHOAR
Director General
International and Regional Organizations,
Ministry of Jihad-e-Agriculture

In response to a request from the Government of The Islamic Republic of Iran (hereinafter referred to as the "GOI"), the Preparatory Study Team (hereinafter referred to as "the Team") headed by Mr. Mitsuhiko OTA was sent to the Islamic Republic of Iran by the Japan International Cooperation Agency(hereinafter referred to as "JICA") from March 7, to March 18,2002.The Team held a series of discussions in relation to THE STUDY ON GHARASU RIVER BASIN AGRICULTURAL INFRASTRACTURE DEVELOPMENT PROJECT IN THE ISLAMIC REPUBLIC OF IRAN (hereinafter referred to as "the Study") with representatives of the Ministry of Jihad-e-Agriculture(hereinafter referred to as "MOJA") and other relevant organizations. The list of participants in the series of meetings is attached as ANNEX 1. The following were agreed upon by both Iran and Japanese sides in relation to the Study.

1.Objectives of the study

Iran and Japanese both sides agreed the two main objectives that are mentioned in Scope of Work of the study. Then both sides confirmed that it was very important to formulate not only irrigation and drainage plan, but also its operational and maintenance plan, agricultural development plan including livestock development and small scale agro-products processing, etc, and training and educational plan for the extension workers and farmers.

2.Study area

Both sides agreed the study area which is mentioned in Scope of Work of the study.

GOK requested to Japanese side to make include the water shed area and the two of planned Dam sites, namely GARAB and KILANBAR to the study area. The Team understood necessity of the study to the limited water shed areas where affect directly to water resources of the study area.

Then, GOK requested to make the model plan of water shed management related to the study area.

3.Feasibility study

Feasibility study area will be selected based on the result of Phase 1 study that are the priority of MOJA and the technically reasonable criteria such as available water amount, irrigation and drainage methods, land use and farmers recipient capacity, etc. Feasibility study is conducted Phase2 study.

4.Water Resources

MOJA requested to consider water resources development plan of river, spring and underground water. The Team agreed to review the underground water resources and that of river and spring in the study area. The Team and MOJA both sides recognized that it was quite important to have a close contact with Ministry of Energy in this matter.

5.Coordinating body

For smooth and effective implementation of the Study in terms of technical and administrative aspects, it was mutually agreed that a committee, which shall be comprised of various organizations concerned with the study, shall be established National level and Provincial Level. The committee meeting will be held when the Japanese Study Team explains the reports and/or as necessary.

The committee would be comprised of representatives of the following organizations

1)National Level

Ministry of Jihad-e-Agriculture
Ministry of Energy
Environment Protection Department
Embassy of Japan
JICA Expert
The Japanese Study Team

2)Provincial Level

Kermanshah Jihad-e-Agriculture Organizations
Kermanshah Water Supply General Office
Kermanshah Environment General Office
Kermanshah Provincial Government
The Japanese Study Team

6.Counterpart organization and counterpart personnel

The Team confirmed that MOJA shall act as counterpart agency to the Japanese Study Team.

In implementing the Study, MOJA will nominate the counterpart personnels to the Study Team, as follows: (ANNEX 2)

MOJA will provide office space for the Study Team at Teheran and Kermanshah Province.

7,Equipment and Facilities for the study

MOJA requested the following items;

Desktop computer, Note Computer printer, OHP , Digital Camera, Hydrology observation instrument.

The Team promised to convey this request to JICA HDQ.

8,Training of Counterpart Personnel

MOJA requested that counterpart personnel was allowed to take advantage of training in Japan in order to promote effective technology transfer in the Study period. The Team promised to convey this request to JICA HDQ.

ANNEX I

1. Iranian Side:

The Ministry of Jihad-e-Agriculture

Dr. Majid Dehghan-shoar	Director General office for International and Regional Organizations
Mr. Mohammad A.Yazdanikhoorasgani	Expert in Charge of International Projects
Mr. Hossein Askari	International Projects Expert and JICA program officer.

Kermanshah Province Jihad-e-Agriculture Organization

Mr.Mohammad Hadi Khazai	Head of province Jihad-e-Agriculture Organization
Mr.Ramazan Rouintan.	Technical&executive Deputy of Jihad-e-Agriculture organization
Mr.Morteza Isamaili	Director of soil&water dept
Mr.Ezattolah Abbasi	Senior expert of soil&water
Mr.Darioush Rezai	Agriculture expert
Mr.Mohammad Taher Abdollahi	Soil&water expert
Mr.Nosratollah Fallahi	Agriculture expert

Kermanshah Province Government

Mr.Rahimi	Deputy of Budget & planning

2. Japanese Side

The Preparatory Study Team, JICA

1. Mr. Mitsuhiko OTA	Leader
2. Mr. Akinori SASAKI	Member
3. Mr. Takeshi KARASAWA	Member
4. Mr. Shinji KAWABE	Member

JICA Expert:

Dr. Katsumi CHIDA	JICA Expert, the Ministry of Jihad-e-Agriculture

ANNEX 2

LIST OF PROPOSED COUNTERPARTS

Mr.Ezattolah Abbasi	Senior expert of soil&water JICA Project Coordinator in Kermansha Province	Kermanshah Jihad-e-Agriculture Organization
Mr.Ramazan Rouintan	Technical Deputy & Senior Expert In Plant-protection	Ditto
Mr.Esmaeili Mortaza	Director of Soil & water Department	Ditto
Mr.Mohammad Taher Abdollahi	Expert in soil & water	Ditto
Mr.Relaee-Danush	Expert in Agronomy	Ditto
Mr.Khamosh-Saidmorad	Expert in Environment	Kermanshah Environmental Office
Mr.Mirlaei-Hosein	Expert in Planning & Development	Kermanshah, Water Supply Office

MINUTES OF MEETING
ON
THE INCEPTION REPORT
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL
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IN KERMANSHAH PROVINCE
IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

B 1 - 1

Tehran, January 12, 2003

Dr. Majid Dehghan-Shoar
Director General
International and Regional Organizations,
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

Witness :

川部伸治

Mr. Shinji Kawabe
Advisor of the Study
JICA Head Office, Tokyo

Proceedings of the Meeting between Ministry of Jihad-e-Agriculture and Representatives from JICA on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province

(18 Jan. 2003, Tehran)

Whereas,

The Islamic Republic of Iran and JICA have experienced fruitful cooperation, particularly in the field of development programs,

JICA, with its all effort and hard working staff has contributed to the agricultural development project of I.R.Iran, and

The technical cooperation have led the two countries to deepen their all- inclusive mutual ties in the light of cultural similarities of the two nations,

The Islamic Republic of Iran requested a project to study the Gharasu River Basin agricultural infrastructure development by JICA.

After the approval of the project by Japanese agency, the necessary site visits and meetings with provincial and national authorities took place and the scope of work was determined. Taking into consideration the provision of agreed minute and scope of work, the inception report (20 copies) was prepared by the JICA Team and handed over to the Iranian concerned body, Ministry of Jihad-e-Agriculture.

Therefore, to put forward the final touches and reviews, a meeting was held in Tehran (Ministry of Jihad-e-Agriculture) in a warm and friendly environment with the presence of the Preparatory Study Team of JICA, headed by Mr. Mitsuhiko OTA, and the Iranian delegation from the Ministry of Jihad-e-Agriculture, headed by Mr. Majid Dehghan-Shoar.

In this meeting, the Iranian side expressed its appreciation for the previous and prevailing cooperation of JICA and emphasized on the condition of the present study sites in Kermanshah which has unique geomorphological and climatological condition, specially

S.kawabe

Minutes of Meeting (M/M) on the Reports during the Study Period

characterized by steep slopes and availability of watershed in the region. The Iranian side stated that the present study would leave a benchmark for the future agricultural development projects as complex, integrated and multidisciplinary study aiming at sustainable development toward the production of globally acceptable healthy agricultural products and protection of natural and ecological resources.

For the successful implementation of the current study, the Iranian side expressed its full readiness to render all possible facilities to JICA and in this regard also proposed some minor modification, which can be considered by JICA at performance stage of the study.

The JICA Team agreed the viewpoints stated and will consider them within the study activity.

The outlined suggestions put forward were as follow:

In the view of the Minutes of Meeting (signed by Head of Kermanshah Jihad-e-Agriculture Organization, Leader of Preparatory Study Team of JICA, and D.G. for the Office of Int'l & Regional Organizations), in addition to soil and water studies, the issues related to the animal husbandry, health and production, agro- processing, aquaculture, eco- environment and their relation with each other shall be studied in the sites (14000 ha) under a pilot project, with due regard to capacity building and training, within the context of sustainable agricultural development.

- Based on the provision of section 4 of Agreed Minutes for Scope of Work, the Iranian side sees the completion of specialized JICA Study Team composition by adding, animal husbandry, agro-industry, food safety (pesticide residue, veterinary drug residue...) specialists. The gap seems necessarily to be filled in this regard to cover all disciplines necessary for the project good implementation.
- Some technical issues particularly in the fields of soil & water and animal health and production as well as aquaculture, agro-processing and extension activities would be addressed in the study (the list is attached here as annexes in 2 pages).

The Japanese side will do the best to fulfill the requested items during the process of study execution, particularly in the 2nd phase of the study.

- The Iranian side stated that project can not be an overall successful plan if the study is not extended to the source aquifers, which has been excluded in the project site. The Japanese side advised Iranian side, if decides to do so, to formulated another request of project to cover the immediate up land region of the site, and submit it to JICA for consideration.
- Both sides agreed to dispatch the members of the steering committee comprised of the JICA Study Team & the Ministry of Jihad-e-Agriculture to the Study Site for the further consideration of the existing condition of the location.

A. Amirabe

S. Kawabe

The issues to be mentioned in soil study section

1- Types of soil survey studies

2- The scale and resolution of soil surveys

3- Methodology of soil survey studies

4- Land suitability classification on the bases of soil survey studies

The general items that should be included in the content of the inception report, preferably in the second phase of the study

1- Method for integration of multi sources and multiple data

2- Method for coordination between the various sectors involved in the study

3- Method for technology transfer to Iranian side

Animal Production and health

- Including an animal husbandry expert in study team. Study of existing production systems and their improvement or development based on the area's condition.
- Study of the feeding resources available in the area and utilization methods of products/ wastes as regards quantity, quality and health issues.
- Possibility of livestock replacement (small with large ones, indigenous with hybrid ones), introducing artificial insemination, embryo transfers…)
- Possibility of setting up intensified and semi-intensified production systems
- Possibility of setting up animal products processing industries in various capacities
- Possibility of setting up milk collection centers
- Possibility of initiating improvement plans for rehabilitation of animal housing and increasing efficiency in the livestock raising units
- Possibility of apiculture (bee keeping…) activity in the area and the technical approaches applicable in the area
- Study of livestock's' diseases and the remedies to control then, as well as setting up quarantine and veterinary laboratories

Appendix

LIST OF PARTICIPANTS

Iranian Side

Ministry of Jihad-e-Agriculture

Dr. Majid Dehghan-shoar	Director General, Office for International & Regional Organizations(IRO) & Assistant Professor, Agricultural Research, Education & Extension Organization (AREEO)
Mr. Mohammad Reza Shariati	Deputy Director General of Office for International and Regional Organization & Member of Scientific Board of Soil & Water Research Institute.
Dr.A. Kamal Zadeh	Vice Deputy Minister, Animal Husbandry Department
Mr.A.H.Shahmanesh	Deputy Director General, Farming System Office
Mr. Hossein Askari	International Projects Expert and JICA program officer
Mr. Yazdani Khoorasgani	Expert for International and Regional Projects
Mr.Gh.R. Miraki	Senior Expert for Environmental Survey Projects
Mr.S.A.R. Bani Hashemi	Senior Expert for Underground Water Resources, Watershed Management Department
Mr. Amir Fanee	Expert for Studies Monitoring & Evaluation
Mr.F.Pakdel	Expert, Agricultural Planning Office

Kermanshah Jihad-e-Agriculture Organization, Ministry of Jihad-e-Agriculture

Mr. E.Abbasi	Coordinator of the Study in Kermanshah Province Kermanshah Jihad-e-Agriculture Organization

Japanese Side

JICA Study Team

Mr. Matsumoto Keiji	Team Leader
Mr.Atsuhiko Yamamoto	Irrigation and Drainage
Dr.C.Murugaboopathi	Watershed Management/Environment

JICA

Mr. Shinji Kawabe	Advisor of JICA Head Office Tokyo
Mr. Seigo Furudono	JICA Expert, Ministry of Jihad-e-Agriculture
Mr.Izumi Tanaka	JICA Representative in Tehran

Kawabe

MINUTES OF MEETING
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AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Kermanshah, January 16, 2003

Mr.Mohammad Hadi Khazai
Head of Kermanshah Jihad-e-Agriculture Organization
Kermanshah Province
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

Witness :

川部 伸治

Mr. Shinji Kawabe
Advisor of the Study
JICA Head Office, Tokyo

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Inception Report for the Study to the Steering Committee organized by Kermanshah Jihad-e-Agriculture Organization, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran.

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Inception Report to the Steering Committee.

The Meeting on the Inception Report was held with the Steering Committee in Kermanshah on January 14, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the contents of the Inception Report which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. Both sides agreed to cooperate for the effective and timely implementation of the present Study in such manner as to accomplish the objectives of the Study and to keep work schedule as contemplated in the Inception Report.

3. Both sides confirmed the importance of the full involvement of the counterpart personnel for the Study. Therefore, the counterpart personnel shall be assigned on a full time basis until the completion of the Study.

4. Iranian side suggested the Japanese side to keep close communication between the Study Team and the Steering Committee to provide an effective outcome of the Study.

LIST OF PARTICIPANTS

Iranian Side

Kermanshah Jihad-e-Agriculture Organization, Ministry of Jihad-e-Agriculture

Mr. Ramazan Ruintan	Technical and Executive Deputy of Kermanshah Jihad-e-Agriculture Organization
# Dr. Mostafa Aghaee	Director General of Kermanshah Agricultural Research Center
Dr. Mohsen Farshadfar	Deputy of Research and Education
Mr. Allahyar Mohammadi	Head of Watershed Management
Mr. Alifaraj Paramdin	Horticulture Management
Mr. Mohd. Reza Jamshidi	Head of Aquaculture
Mr. Mohd. Reza Kouchkpour	Expert, Natural Resources
Mr. Morteza Esmaeili	Manager, Soil & Water
Mr. Mohd. Taher Abdolahy	Deputy Manager, Soil & Water
Mr. Ezatullah Abbasi	JICA Project Coordinator
Mr.Iraj Daniali	Animal Husbandry
Mr. Mansoor Karkooti	Agronomist
Mr.Golam Ali Kazmi Fard	Manager, Rural Industry

Japanese Side

JICA Study Team

Mr. Matsumoto Keiji	Team Leader
Mr.Atsuhiko Yamamoto	Irrigation and Drainage
Dr.C.Murugaboopathi	Watershed Management/Environment

JICA

Mr. Shinji Kawabe	Advisor of JICA Head Office Tokyo

MINUTES OF MEETING
ON
THE PROGRESS REPORT (1)
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL
INFRASTRUCTURE DEVELOPMENT PROJECT
IN KERMANSHAH PROVINCE
IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

B 2 - 1

Tehran, March 18, 2003

Dr. Majid Dehghan-Shoar
Director General
International and Regional Organizations,
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Progress Report (1) for the Study to the Steering Committee, chaired and organized by Dr. Majid DEHGHAN-SHOAR, Director General of International and Regional Organizations, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran (hereinafter referred to as "The Steering Committee").

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Inception Report to the Steering Committee on March 18, 2003.

The Meeting on the Progress Report (1) was held with the Steering Committee in Tehran on March 18, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the general contents of the Progress Report (1) had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report within one month, if any. The Iranian side accepted to send the comments as being requested.

3. Both sides confirmed the importance of the further collaborations and involvements of relevant other agencies for the next study phase of the Study. Iranian side promised to strengthen the coordination with other agencies as being confirmed.

Appendix

LIST OF PARTICIPANTS

Iranian Side

Ministry of Jihad-e-Agriculture

Dr. Majid Dehghan-shoar	Director General, Office for International & Regional Organizations(IRO) & Assistant Professor, Agricultural Research, Education & Extension Organization (AREEO)
Mr. Mohammad Reza Shariati	Deputy Director General of Office for International and Regional Organization & Member of Scientific Board of Soil & Water Research Institute.
Dr. A. Kamal Zadeh	Vice Deputy Minister, Animal Husbandry Department
Mr. A.H.Shahmanesh	Deputy Director General, Farming System Office
Mr. Hossein Askari	International Projects Expert and JICA program officer
Mr. Yazdani Khoorasgani	Expert for International and Regional Projects
Mr.Gh.R. Miraki	Senior Expert for Environmental Survey Projects
Mr.S.A.R. Bani Hashemi	Senior Expert for Underground Water Resources, Watershed Management Department
Mr. Amir Fanee	Expert for Studies Monitoring & Evaluation

Kermanshah Jihad-e-Agriculture Organization, Ministry of Jihad-e-Agriculture

Mr. E.Abbasi	Coordinator of the Study in Kermanshah Province Kermanshah Jihad-e-Agriculture Organization

Japanese Side

JICA Study Team

Mr. MATSUMOTO Keiji	Team Leader
Mr. YAMAMOTO Atsuhiko	Irrigation and Drainage
Dr. C.Murugaboopathi	Watershed Management/Environment
Mr. SUZUKI Seishiro	Water Management
Ms. Mikiko Tsurui	Regional Socio-economy

JICA

Mr. Izumi TANAKA	JICA ODA Advisor to Iran
Mr. Seigo FURUDONO	JICA Expert, Ministry of Jihad-e-Agriculture

B 2 - 2

Steering Committee Meeting for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province

Date : 18 March 2003, Tehran

Name	Designation	Signature
Mr. M.R. Shariati	Deputy D.G. of IRO	
Mr. M. Ali. Yazdani	Int'l Project Senior Expert	
Mr. H. ASKARI	" " Expert (IRO) and JICA Program officer	
Dr. M. Dehghan Shoar	IRO D. G	
Mr. E. A. Abbassi	Kermanshah (KOJA)	
S.A.R. Banihashemi	watershed mangment. Dept	
Amir Fanee	charg expert study monitoring and evaluation	
Dr A. Kamalzadeh	Deputy Ministry for Livestock Affairs	Kamal
Q. Miraki	Environmental Office Officer in Charg	

MINUTES OF MEETING
ON
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THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL
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IN KERMANSHAH PROVINCE
IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Kermanshah, March 16, 2003

Mr.Mohammad Hadi Khazai
Head of Kermanshah Jihad-e-Agriculture Organization
Kermanshah Province
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto submitted the Progress Report (1) of the Study to the Steering Committee at the provincial level organized by Kermanshah Jihad-e-Agriculture Organization, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran.

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Progress Report (1) to the Kermanshah Jihad-e-Agriculture Organization.

The Meeting on the Progress Report (1) was held with the Kermanshah Jihad-e-Agriculture Organization on March 16, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the contents of the Progress Report (1) which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report to the Study Team within one month, if any. The Iranian side accepted to send the comments as being requested.

3. Both sides confirmed the importance of further collaborations and involvements of relevant other agencies for the next study phase of the Study. Iranian side promised to strengthen the coordination with other agencies as being confirmed.

4. Iranian side requested for a set of Laptop computer and a LDC projector, for extension activities of farmers' participatory approach in the field as the JICA Study Team conducted during this study phase. The Study Team promised to convey the request to the Headquarter of the Japan International Cooperation Agency.

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B-2 プログレスレポート(1)に係わる協議議事録(ケルマンシャ農業局)

Steering Committee Meeting for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province

Date : 16 March 2003, Kermanshah

Name	Designation	Signature
Mohammad Ghazi Marsini	Economy of Animal husbandry fisheries	
PARVIZ ABDOLI	Agronomy	
Khalil Heidarie	Soil seiuce	
Mr. Ramzan Rouintan	Leader of team	
F. Katoli Shirazi	Coordinator	
Morteza Esmaeili	Soil and water Mangment	
M.R. Esmaeili matine	Rural Development(extension and participation)	

Steering Committee Meeting for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province

Date : 16 March 2003, Kermanshah

Name	Designation	Signature
Manoochehr Atashzar	Engineer watershed management	
Seyyed Morad khamoshi	// Environment	
Manoochehr Gorjipur	Engineer plant protection	
M.T. Abdolahi	Deputy water & Soil	
Ali. A. Azizi	Ag mechanization	
Gasban Hydari	Dep of water & Soil	
M. Saied Hoosheyar	Agronomi	
Gholamreza AZiZi	Animal Husbandary	
Tahereh Chupani	Agricultural extention	
Sarhaddar haidary	Natural Resorse	
mehran rahdari	Ground water-Geology	

MINUTES OF MEETING
ON
THE INTERIM REPORT
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL
INFRASTRUCTURE DEVELOPMENT PROJECT
IN KERMANSHAH PROVINCE
IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Tehran, May 11, 2003

Dr. Majid Dehghan-Shoar
Director General
International and Regional Organizations,
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

Mr.Mohammad Hadi Khazai
Head of Kermanshah Jihad-e-Agriculture Organization
Kermanshah Province
Ministry of Jihad-e-Agriculture

Witness :

川部伸治

Mr. Shinji Kawabe
Advisor of the Study
JICA Head Office, Tokyo

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Interim Report for the Study to the Steering Committee, chaired and organized by Dr. Majid DEHGHAN-SHOAR, Director General of International and Regional Organizations, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran (hereinafter referred to as "The Steering Committee").

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Interim Report to the Steering Committee.

The Meeting on the Interim Report was held with the Steering Committee in Tehran on May 11, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the general contents of the Interim Report which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report within one month, if any. The Iranian side accepted to send the comments as being requested.

3. Both sides agreed to cooperate for the effective and timely implementation of the Study so as to accomplish the objectives of the Study and to follow the work schedule as contemplated in the Interim Report.

4. Both sides agreed that the following subjects shall be considered in the further study.

   1) Food safety such as integrated pest management, sanitation of slaughter houses etc.
   2) Possibilities of fisheries development in Kermanshah
   3) Agricultural processing
   4) Integrated agricultural development Plan for the whole Study Area including Site 1 and Site 2.

S.k

LIST OF PARTICIPANTS

Iranian Side

Ministry of Jihad-e-Agriculture

Dr. Majid Dehghan-shoar	Director General, Office for International & Regional Organizations(IRO) & Assistant Professor, Agricultural Research, Education & Extension Organization (AREEO)
Mr. Mohammad Reza Shariati	Deputy Director General of Office for International and Regional Organization & Member of Scientific Board of Soil & Water Research Institute.
Mr. Hossein Askari	International Projects Expert and JICA program officer

Kermanshah Jihad-e-Agriculture Organization, Ministry of Jihad-e-Agriculture

Mr. Mohammad Hadi Khazai	Head of Kermanshah Jihad-e-Agriculture Organization
Mr. E.Abbasi	Coordinator of the Study in Kermanshah Province Kermanshah Jihad-e-Agriculture Organization

Japanese Side

JICA Study Team

Mr. Matsumoto Keiji	Team Leader
Mr. Atsuhiko Yamamoto	Irrigation and Drainage
Dr. C.Murugaboopathi	Watershed Management/Environment

JICA

Mr. Shinji Kawabe	Advisor of JICA Head Office Tokyo
Mr. Seigo Furudono	JICA Expert, Ministry of Jihad-e-Agriculture

S.k

MINUTES OF MEETING
ON
THE PROGRESS REPORT (2)
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL INFRASTRUCTURE DEVELOPMENT PROJECT IN KERMANSHAH PROVINCE IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Tehran, October 25, 2003

Dr. Majid Dehghan-Shoar
Director General
International and Regional Organizations,
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

Mr. Abdulhamid Mohseni
Head of Kermanshah Jihad-e-Agriculture Organization
Kermanshah Province
Ministry of Jihad-e-Agriculture

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Progress Report (2) for the Study to the Steering Committee, chaired and organized by Dr. Majid Dehghan-Shoar, Director General of International and Regional Organizations, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran (hereinafter referred to as "The Steering Committee").

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Progress Report (2).

The Meeting on the Progress Report (2) was held with the Steering Committee in Tehran on October 25, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the contents of the Progress Report (2), which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report within two weeks, if any. The Iranian side accepted to send the comments as being requested.

3. The Iranian side requested the technical cooperation from the Japanese side for the implementation of the proposed development plans, by dispatching of Japanese experts in the fields of agriculture, irrigation management, animal husbandry and other related fields. The Japanese side promised to convey the request to the Headquarter of the Japan International Cooperation Agency.

Steering Committee Meeting for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province

Date : 25 October 2003, Tehran

Name	Designation	Signature
Dr. M. Dehghan Shoar		[signature]
E. Abbasi	Jihad-e-Agr- Organ.	[signature]
A. D. Mohseni	Head of J. Kermanshah	[signature]
M.R. Shariati	D. Puty of IRO	[signature]
K. Matsumoto	JICA Study Team	[signature]
A. Yamamoto	"	[signature]
C. Murugaboopathi	"	[signature]
F. Onoda	"	[signature]
[signature]	"	[signature]
S. FURUDONO	JICA expert	[signature]
H. ASKARI	International Projects Expert JICA Programme Officer	[signature] 25th Oct. 2003

MINUTES OF MEETING
ON
THE PROGRESS REPORT (2)
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL INFRASTRUCTURE DEVELOPMENT PROJECT IN KERMANSHAH PROVINCE IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Kermanshah, October 23, 2003

Mr. Abdulhamid Mohseni	**Mr. Keiji Matsumoto**
Head of Kermanshah Jihad-e-Agriculture Organization	**Leader**
Kermanshah Province	**JICA Study Team**
Ministry of Jihad-e-Agriculture	

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto submitted the Progress Report (2) of the Study to the Steering Committee at the provincial level organized by Kermanshah Jihad-e-Agriculture Organization, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran.

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Progress Report (2) to the Kermanshah Jihad-e-Agriculture Organization.

The Meeting on the Progress Report (2) was held with the Kermanshah Jihad-e-Agriculture Organization on October 23, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the contents of the Progress Report (2), which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report to the Study Team within two weeks time, if any. The Iranian side accepted to send the comments as being requested.

3. The Iranian side requested the technical cooperation from the Japanese side for the implementation of the proposed development plans, by dispatching of Japanese experts in the fields of agriculture, irrigation management, animal husbandry and other related fields. The Japanese side promised to convey the request to the Headquarter of the Japan International Cooperation Agency.

لیست شرکت کنندگان درجلسه ارائه گزارش پیشرفت 2 - اول آبانماه 1382

	ردیف	نام و نام خانوادگی	سمت	سازمان مربوطه	امضاء	تلفن
Ali Aghaei	1	علی آقائی	[illegible]	KJAO		۸۳۵۸۲۱۵
Alifaraj Parandin	2	علی‌فرج پرندین	مدیر باغبانی	- - -		۸۳۹۰۵۵۷
Adel Nemat	3	عادل نعمتی	[illegible]	Research Center		۸۳۹۷۲۰۱
Seyyed Morad Khamushi	4	سیدمراد خاموشی	کارشناس محیط زیست	Environment		۸۲۳۰۹۰-۴
Amirahmad Pornamaze	5	امیراحمد [illegible]	[illegible]	W.R.W.B		۸۳۷۰۱۲۱
Nasrin Afsh[illegible]	6	نسرین افشار	[illegible]	KJAO		[illegible]
Mohammad Taher Abdollahi	7	محمدطاهر عبداللهی	[illegible]	KJAO		[illegible]
Morteza Esmaili	8	[illegible]	[illegible]	KJAO		۸۳۶۰۰۶۰
Mohsen Farshad Fa[illegible]	9	[illegible]	[illegible]	KJAO		۸۲۷۰۰۸۶
Hojjat Alla[illegible]	10	[illegible]	[illegible]	KJAO		[illegible]
Mohammad Reza Moshi[illegible]	11	[illegible]	[illegible]	Fisheries		[illegible]
Mah[illegible] Kha[illegible]	12	[illegible]	[illegible]	extension office		۲۴۲۰
Abd[illegible] Ebrahimi	13	عبدالکریم ابراهیمی	[illegible]	extension office		[illegible]
Esmaili matin	14	[illegible]	[illegible]	KJAO		[illegible]
Mahmud Naseri	15	محمود ناصری	[illegible]	KJAO		[illegible]
Ghodratollah Azizi	16	قدرت‌الله عزیزی	[illegible]	KJAO		۷۲۸۰۱۸۰
Naser Parvareh	17	ناصر پرواره	[illegible]	Province W.A		[illegible]
Iraj Danya[illegible]	18	[illegible]	[illegible]	livestock deputy		[illegible]
Ali akbar Deli haghi	19	[illegible]	[illegible]	KJAO		[illegible]
Parviz Kakai	20	پرویز کاکائی	[illegible]	KJAO		[illegible]
Seyyed afshin Safavi	21	[illegible]	[illegible]	KJAO		[illegible]
Khalil Heydari	22	خلیل حیدری	[illegible]	KJAO		۸۳۷۰۲۴۹
Abdolhami[illegible]	23	[illegible]	[illegible]	KJAO		[illegible]
Ezzatollah Abbasi	24	[illegible]	[illegible]	water & soil		[illegible]
Mohseni	25	[illegible]	[illegible]	KJAO		[illegible]

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Japanese Side

JICA Study Team

Mr. Keiji Matsumoto	Team Leader
Mr. Atsuhiko Yamamoto	Irrigation and Drainage
Mr. Seishiro Suzuki	Water Management
Mr. Fumiakira Onoda	Project Evaluation
Dr. C.Murugaboopathi	Watershed Management/Environment

JICA

Mr. Seigo Furudono	JICA Expert, Ministry of Jihad-e-Agriculture
Mr. Izumi Tanaka	JICA Representative in Iran

MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL
INFRASTRUCTURE DEVELOPMENT PROJECT
IN KERMANSHAH PROVINCE
IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Tehran, December 21, 2003

Dr. Majid Dehghan-Shoar
Director General
International and Regional Organizations,
Ministry of Jihad-e-~~Agriculture~~

Mr. Keiji Matsumoto
Leader
JICA Study Team

Witness:

Mr. Nobuyuki Kobayashi
Advisor of the Study
JICA Head Office, Tokyo

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto presented the Draft Final Report for the Study to the Steering Committee, chaired and organized by Dr. Majid Dehghan-Shoar, Director General of International and Regional Organizations, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran (hereinafter referred to as "The Steering Committee").

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Draft Final Report.

The Meeting on the Draft Final Report was held with the Steering Committee in Tehran on December 16, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the contents of the Draft Final Report, which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report to the Study Team within one month time, if any. The Iranian side accepted to send the comments as being requested.

3. Iranian side requested the technical and other supports for implementation of the planned project to the Japanese side. And Japanese side agreed to transfer the request to JICA headquarter

LIST OF PARTICIPANTS

Iranian Side

Ministry of Jihad-e-Agriculture

Dr. Majid Dehghan-shoar	Director General. Office for International & Regional Organizations (IRO) & Assistant Professor, Agricultural Research, Education & Extension Organization (AREEO)
Mr. A. Fanee	Monitoring and Evaluation Office
Mr. M. B. Marandi	Mechanization Development Office
Mr. R. Panahi	Deputy of Rural Industry
Mr. S. J. Moosavi Nia	RCO
Mr. M. Dabiri Vaziri	RCO
Mr. F. Vahaei	Irrigation Methods Development Office, Deputy of Soil & Water
Mr. G. Abol Hasani	Irrigation Network Development Office, Deputy of Soil & Water
Mr. G. R. Mozaffari Pour	Industrial Crop Office, Deputy of Agronomy
Mr. G. Afshan	Agriculture Supporting Service Company
Mr. Ali Narjes Pour	Fishery Company of I. R. Iran
Mr. A Norouzi	Deputy of Agricultural Extension and Farming System
Mr. F. Akhlagi	Agricultural Education Organization
Mr. G. R. Miraki	Environment and Agriculture Sustainable Development Office
Mr. M. Barahimi	Agricultural Water Resources Development Office, Deputy of Soil and Water
Mr. M. S. Hamidi	Deputy of Animal Husbandry Affairs
Mr. S. M. T. Hashemi	Deputy of Horticulture
Mr. Hossein Askari	International Projects Expert and JICA program officer, IRO

Ministry of Energy

Mr. A. R. Fallah Rastegar	Iran Water Resources Management Organization

Japanese Side

JICA Study Team

Mr. Keiji Matsumoto	Team Leader
Mr. Atsuhiko Yamamoto	Irrigation and Drainage
Dr. Hiroshi Ikeda	Agriculture and Soil

JICA

Mr. Nobuyuki Kobayashi	Advisor of JICA Head Office, Tokyo
Mr. Seigo Furudono	JICA Expert, Ministry of Jihad-e-Agriculture

MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT
FOR
THE STUDY ON
GHARASU RIVER BASIN AGRICULTURAL
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IN THE ISLAMIC REPUBLIC OF IRAN
AGREED UPON BETWEEN
THE MINISTRY OF JIHAD-E-AGRICULTURE
AND
THE STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATION AGENCY

Kermanshah, December 18, 2003

for **Mr. Abdulhamid Mohseni**
Head of Kermanshah Jihad-e-Agriculture Organization
Kermanshah Province
Ministry of Jihad-e-Agriculture

Mr. Keiji Matsumoto
Leader
JICA Study Team

Witness :

Mr. Nobuyuki Kobayashi
Advisor of the Study
JICA Head Office, Tokyo

The Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "The Study Team") for the Study on Gharasu River Basin Agricultural Infrastructure Development Project in Kermanshah Province in the Islamic Republic of Iran (hereinafter referred to as "the Study"), headed by Mr. Keiji Matsumoto submitted the Draft Final Report of the Study to the Steering Committee at the provincial level organized by Kermanshah Jihad-e-Agriculture Organization, the Ministry of Jihad-e-Agriculture, the Islamic Republic of Iran.

In accordance with the Scope of Works for the Study signed between the Kermanshah Jihad-e-Agriculture Organization, JICA and International and Regional Organizations, the Ministry of Jihad-e-Agriculture on March 16, 2002, the Study Team officially submitted twenty (20) copies of the Draft Final Report to the Kermanshah Jihad-e-Agriculture Organization.

The Meeting on the Draft Final Report was held with the Kermanshah Jihad-e-Agriculture Organization on December 17, 2003. Both the Iranian and Japanese sides have agreed upon the following.

1. The Iranian side agreed with the contents of the Draft Final Report, which had been prepared in due compliance with the conditions set forth in the Scope of the Works for the Study.

2. The Japanese side requested to convey any comments on the report to the Study Team within one month time, if any. The Iranian side accepted to send the comments as being requested.

3. Iranian side requested the technical and other supports for implementation of the planned project to the Japanese side. And Japanese side agreed to transfer the request to JICA headquarter.

LIST OF PARTICIPANTS

Iranian Side

Kermanshah Jihad-e-Agriculture Organization, Ministry of Jihad-e-Agriculture

Mr. Ramazan Ruintan	Technical and Executive Deputy of Kermanshah Jihad-e-Agriculture Organization
Mr. Allahyar Mohammadi	Head of Watershed Management
Mr. Alifaraj Paramdin	Horticulture Management
Mr. Mohd. Reza Jamshidi	Head of Aquaculture
Mr. Mohd. Taher Abdollahi	Deputy Manager, Soil & Water
Mr. Ezatullah Abbasi	JICA Project Coordinator
Mr. Iraj Daniali	Animal Husbandry
Mr. Ahmad Pornamazeh	Western Region Water Affirms
Mr. Parviz Abduli	Agronomist
Mr. Mohammad Ghazi	Fisheries
Mr. Khalil Heidary	Soils
Mr. Abdul Karim Ibrahimi	Ravansar Extension Office
Mr. Mahmood Naseri	Kuzaran Extension Office
Mr. Mohammad Reza Esmaeili	Extension and Participatory Expert
Ms. Nasrin Afshar	Planning Office
Mr. Atash Zar	Watershed Management Expert
Mr. Seyyed Morad Khamoshi	Department of Environment
Mr. Sarhadar Heidari	Department of Natural Resource
Mr. Naser Parvareh	Provincial Water Affairs

Japanese Side

JICA Study Team

Mr. Keiji Matsumoto	Team Leader
Mr. Atsuhiko Yamamoto	Irrigation and Drainage
Dr. Hiroshi Ikeda	Farming & soil

JICA

Mr. Nobuyuki Kobayashi	Advisor of JICA Head Office Tokyo
Mr. Seigo Furudono	JICA Expert, Ministry of Jihad-e-Agriculture

Appendix C Comments of the Iranian Government on the Draft Final Report and Answers of the JICA Study Team

No.	Comments on the Draft Final Report		Answers of JICA Study Team
	From	Comments	
1	M&E Department of MOJA	On selection of Kc of plants and estimation of water requirement, MOJA use the method described in FAO I&D Paper No. 56 instead of No. 24 which mentioned in the Draft Final Report (DFR). Please apply the No. 56 for the final report.	Kc mentioned in the DFR for the crop water requirement used the figures presented by the Kermanshah Jihad-e-Agriculture Organization (KJAO) as shown in Annex 3, Table A3.1.2 of the Final Report (FR).
2		Due to lack of methodology on planning the cropping pattern and amount and share of each crop in DFR, it is requested to calculate the percentage and amount of crops in addition to examination methodology of crop pattern (it is necessary also to describe that to bring up crops in existent conditions and introduce it in the plan without amount of each crop is not develop study). During setting the crop pattern in addition to take account some constraints (like water resource, soil, climate, population, social conditions, experiences of farm economy, necessity of food in the area so on), we have to use software for planning the cropping pattern (like liner planning) which is not described in the Draft Final Report.	As described in Sub-chapter 6.1, all of the crops in the crop rotation were selected and determined with due consideration of natural and social conditions, necessity of food sufficiency and familiarity of the crops in the Study Area and other conditions, in consultation and discussion with the counterparts in KJAO thought the field Study.
3		Ratio of B/C for development in Site 1 is 2.26 that is unreasonable comparing to Site 2. It needs to be reviewed.	The Economic evaluation of the plan was thoroughly reviewed and revised by the JICA Study Team as shown in Final Report (FR).
4		It is expected to add the description in the Final Report on the following points: 1) Examination of participatory and collaboration of farmers in activities such as cultivation, horticulture, animal husbandry, land consolidation, and agro-processing, etc. 2) Examination of acceptability and opposition of social groups and local people against modification as results of implementation of the plan	1) Farmers' group activities are described in the RPC activities, which are already conducted in the Kermanshah Provinces. After the study tour to progressed RPC area, farmers in the Study Area expressed their interests and intention to formulate and conduct the farmers group. 2) All of the plan proposed in the DFR are explained and confirmed by farmers at the farmers gathering in Ravansar in December 2003.
5		As mentioned in the S/W, land use map dividing crops of the Study Area shall be shown in Final Report.	Land use map is not mentioned in the S/W, but the present and proposed land use of each crop area are planned based on the data collected by the extension offices in the Study Area.

6		Introduction of plan for organizing the product factor (water resources, soil, machinery and agricultural inputs, livestock and handcrafts) in the Final Report.	We understand that 'organizing the product factor' means organizing of both inputs and outputs. Farmers organization development plan including inputs distribution plan, joint sales and marketing plan, mechanization, agro processing and industry plan (packing chick pea and others, seed cleaning of wheat, vegetable selection and others) and irrigation management are described in section 6.2 of the Final Report.
7		To calculate required forage by TDN or UF at present and in the plan. Also estimate the number of livestock in the plan and rotation of animal husbandry, its products, and effects of animal husbandry on the household economy.	In discussion with the livestock raising and breeding department of KJAO, the feed requirement of the livestock raising development plan was prepared based on the requirement as discussed in section 6.1.5 of the FR.
		Kermanshah Jihad-e-Agriculture Organization	
1	Animal Husbandry section	a) To set the price of 1 head of Holstein cow for Rls. 15 Million (due to increasing of the price). b) To reconsider the area of stable as $170m^2$. c) As rising of Holstein cow needed high technology and investment and also need to provide enough forage (that's need Irr. Land) so it's better that we consider this plan at first stage just for those who have intention to do that.	In regard to items a), and b), the corrections were made in the Final Report section 6.1.5. In regard to item c), Holstein is selected for the stable milk production in the region and in discussion with the Livestock department of KJAO. It is planned to be introduced for 20% of the farmers at the first stage and the farmers who have high intention can be selected at first.
2	Watershed Management	To clear the Internal problems, page 4-14.	As per the suggestion, it was removed in the Final Report. We hope that the problems can be solved by the Dept itself.
3	Fishery Section	To review necessary water for earth pools, as its can not equal to needed water for 9 ha of land (27 mm water for 1 ha pond per day).	It was reviewed, and the correction was made in the Final Report section 6.1.7.
4	Agronomy	a) As this plan is as a model for all regions of the province, please clarify the winter cropping area and needed machinery. b) To more consideration to the cultivation of Rape seed and maize (forage) in same year, considering the necessary machinery. c) In crop rotation for all seasons irrigation lands, to consider the economic and social issues and also capacity of each crop (demand) and its price, to make intention to farmers to keep crop rotation.	a) The cropping area is mentioned in section 6.1.2, and the machinery plan mentioned in section 6.1.4 was prepared based on shortage of machinery in the region. b) Machinery selection was made based on the existing availability and the proposed cropping pattern. c) Enough considerations were made in regard to socio-economic issues and the present & future marketing conditions of the region.