

Moreover, it must be noted that this reward for the family labour is extremely higher than general farming wages for employees, which are only about 250 Rls per hour in the off-farming season. The paddy cultivating farmers gain the reward from paddy production by 2.6 times higher from Amol-3 and 3.4 times higher from Tarom than the other general agricultural wages. And they gain the reward about two times higher than the general agricultural wages of 330 - 380 Rls per hours even in the busy farming season. Therefore, it is assumed that they will be very eager to reduce hired labour cost which accounts for the major part of the production cost excluding family labour cost, while they strive further for the stable production of paddy.

#### 2.5.4. The Farmers' Intention to Agricultural Development

Aiming to grasp the farmers' will and needs on development for agricultural production, infrastructures and supporting services as one of the fundamental data for planning the development in the Project Area, farmers' intention has been surveyed for 30 farmers (8 farmers in the high land, and each 11 farmers in the middle and the low lands), together with the farm economic survey.

The results are shown as follows:

##### (1) Development of Agricultural Production

Most farmers are interested in introducing the second crops into their paddy fields and the mechanization of farming work.

##### 1) Introduction of the Second Crops

All of farmers who wish to introduce the second crops are selecting the berseem as suitable second crop. Not all of those farmers are intending to apply the paddy-livestock combined agriculture in order to enlarge their capital in scale, but about a half of them are intending to introduce berseem as a crop which needs less farming works.

Intention of the paddy cultivating farmers wishing to introduce berseem can be classified into the following three types;

- i) To scheme for the paddy-livestock combined agriculture.
- ii) To improve the supply of forage for the self-sufficiency of livestock products in the same way as at present. (for household consumption)
- iii) To introduce berseem for selling it to other livestock farming farmers.

## 2) Mechanization of Farming Works

One reason why the farmers want the farm mechanization is to save paddy labour requirement, especially for transplanting and harvesting. When they save their family labour, about 70 percent of them wish to introduce the livestock farming, etc. Also the farmers who are comparatively large scale landowners intend to finish paddy farming works only by their family labour, eliminating hired labour by means of mechanization.

## (2) Land Improvement

### 1) Irrigation Improvement

Farmers who complain on insufficient or unstable irrigation water are about 30 percent, and most of them are inhabitant of the low land. That is, since the Lar dam has been completed in the upper stream of the Haraz River, the condition of irrigation in the high and middle lands excluding some parts is nearly stable or satisfactory. But farmers in some parts of the middle land and most of them in the low land still worry about insufficient or unstable irrigation and need for the improvement of it. Moreover, including farmers who answered that they had no worry about insufficient or unstable irrigation, more than a half of the farmers want implementation of the irrigation improvement works.

### 2) Drainage Improvement

About a half of the farmers answered that they worried about inundation in every autumn and winter, the wet season. Especially in the low land, 10 farmers out of 11 worry about it and wish its improvement. As the inundation occurs in autumn and winter, paddy production is not damaged directly, but the introduction of second crops is restricted in some parts of the middle land and all parts of the low land due to inundation of 20 cm depth for more 90 consecutive days. Including 10 farmers in the low land, 18 farmers (60 percent) wish to implement the drainage improvement works.

### 3) Land Consolidation

In looking over the land condition of 30 farmers, the cultivated fields have been scattered with 5.7 pieces per hectare in Babol area and 8.7 pieces per hectare in Amol area on the average. The size of one plot is 1.5 ha in the largest case and 0.01 ha in the smallest case. The averages are 0.4 ha in the large cases and 0.1 ha in the small cases. But these plots are divided by many ridges.

The distance to the field is 7,000 m long in the longest case and 0 m long in the shortest case from a dwelling. The average distances are 1,300 m long in the long cases and 700 m long in the short cases.

The existing conditions of farm roads are not sufficient in length and width. Out of 30 farmers, only 7 farmers are satisfied with the present farm road condition.

Under such land conditions, 26 farmers out of 30 are wishing to improve the present land conditions and to implement the land consolidation including the land exchange and readjustment. On the other hand, the land which are owned by farmers having so difficulties on their land condition lie in convenient condition and need less improvement. From these matters, it is assumed that almost of farmers in the Project Area wish to implement the land consolidation for farm mechanization, though there exist tortuous courses to the implementation.

### (3) Agri-Productivity Promotion Scheme

Most farmers want the introduction of second crops, the seed multiplication and farm mechanization as for promoting agri-productivity increase program. The introduction of the second crops and farm mechanization has been already discussed and summarized above. Farmers are also interested in the seed multiplication. The farmers' demand for higher quality seeds is in parallel with the extension of the high yield varieties recommended by the Ministry of Agriculture such as Amol-2, Amol-3, etc.

To the contrary, the farmers are less interested in the post harvesting improvement, the agricultural research reinforcement and the agricultural extension service reinforcement. The farmers who are demanding these projects are counted to 15, 6 and 12 households respectively, or less than a half of interviewed farmers. Especially, very few farmers demand the agricultural research reinforcement, and only 1 household out of 10 in Babol area showed interest thereto.

It is a problem for accelerating the agricultural development project in future that farmers are less interested in the reinforcement of agricultural research and the agricultural extension service. Therefore, it is necessary to consider their ways of improvement seriously. It was unexpected that the farmers had less interest in the improvement of post harvesting.

There are rice mills more than 280 in the Project Area, most of which have been deteriorated. These are all privately owned and the scale is very small. As it is said that there is a considerable amount of processing loss in this milling stage, it is very important for promoting the agri-productivity increase scheme to give farmers full understanding on post harvesting improvement.

## 2.6. Farmers' Organizations

### 2.6.1. Cooperative Activities in Iran

The cooperative activities in Iran have been started since 1335 after the parliamentary approval on the Legal Bill for Cooperatives, and the Government had encouraged the establishment of rural cooperatives when the Land Reform Law was executed in early 1340s. In 1346, the Ministry of Land Reform and Rural Cooperatives which was in charge of guidance and control of rural cooperative activities was established. The Ministry became the Ministry of Cooperative and Rural Affairs in 1350, and in 1356 re-consolidated into the Ministry of Agriculture and Rural Development, presently the Ministry of Agriculture.

Initial activities of the rural cooperatives were to supply the credit to the farmers who received the land as their own ownership under the Land Reform Law, and the Government established the Agricultural Cooperative Bank in 1348.

In 1348, the Central Organization of Rural Cooperatives was established as a special company under the guidance and control of the Ministry of Land Reform and Rural Cooperatives. The organizational chart of the COORC is as shown in Figure D.1.7 of the Appendix.

### 2.6.2. Rural Cooperative Society

The unit agricultural cooperative in Iran is called as Rural Cooperative Society which has been established in village/villages unit.

The standard Articles of the Association of Rural Cooperative Society provided by the Central Organization in 1353 define the Subject and Activities of the Cooperative as below.

Article 5 - Subject and Activities of the Society are as follows:

- a) To open the deposit or savings account for members of the society and/or non-member resident in the servicing area of society's activities on behalf of the Agricultural Cooperative Bank of Iran.
- b) To procure and to provide material and tools necessary for the use of person and family or professional use of the members as well as the tools and fodder for livestock farming, forage of poultry, and other tools of this category.
- c) To perform collection, storing, processing, grading, packing, transporting and/or sale of products of the members.

- d) To perform services for betterment of professional and/or daily life of the members such as providing agricultural machinery and cooperative use of them, providing transportation facilities for the use of the members, providing residential unit, securing and distributing drinking water and water for agricultural use for the members observing the law for Nationalization of Water Resources, forecasting of facilities for sanitary, health and education for group and joint use, distributing electricity, establishing telephone network, artificial insemination of livestock, and control of pest and insect of plant and livestock.
- e) Group and joint use of manor or rental land.
- f) To secure credit and loan required for the members.
- g) The society can approve at its General Assembly, without observing the Law for Cooperative Societies, to accept the membership of other society and union of cooperatives and/or to invest at other kinds of companies as partner.
- h) The society can accept the reference or representative of societies and cooperative unions or banks, governmental organizations and institutions for their or the Society's required actions and services, or entrusting the representative to perform the purpose of the Society.
- i) The Society can request the arbitration of Union if any disagreement appears between the Society and societies, other unions of rural and agricultural cooperative, or member of supervisory and coordinating union of agriculture in the command area of the Society on any subject with acceptance of other side of conflict.

The decision of the Union is final and to be served by the Society in such case.

- j) To provide supplemental financial resource for the Society by means of receiving credit or differ payment.

The unit Rural Cooperative Societies form the Shahrestan Union of Rural Cooperatives and the Shahrestan Unions form the Ostan (Province) union, and then the Central Union of Rural Cooperatives has been established in Tehran. The total of unit cooperatives was 3,058 with total member of 3,616,000 and the capital was 17,351 million Rls. in 1361, and most of unit cooperatives belonged to 162 Shahrestan Unions. The total capital of Shahrestan Unions was 5,278 million Rls. Besides, the total loan supplied through the cooperatives was reported as 55,965 million Rls.

### 2.6.3. Rural Cooperative Activities in the Project Area

In the Project Area, the rural cooperatives had been established mainly by village unit according to the execution of Land Reform in the beginning of 1940s. The first consolidation of rural cooperatives was carried out in 1947, and the present rural cooperative networks have almost been completed after the re-consolidation in 1951. At the early period of establishment, the cooperatives were under the direct control of the Ministry of Agriculture of the time aiming to supply short-term credit to the farmers who became land owner farmer under the Land Reform, but the cooperatives were not considered as the farmer's own organization. However, nowadays the rural cooperatives have grown as farmer's self support organization and most of farmers of the Project Area join the cooperatives.

The rural cooperatives' management is undertaken by the Board of Directors who are the representatives of the member villages, and period of duty of the Directors is 2 years. Each rural cooperative is employing some numbers of paid staff such as the managing director, accountant, sales staff, etc. and the main activities are as below;

- i) To secure short-term credit to the members. This kind of credit amount is decreasing in recent year. (ref. Table D.5.5 of Appendix)
- ii) To procure and to sell the consumptive goods. The shop is mainly opened at the building of cooperative office, but some cooperatives have branch shops in the member villages.
- iii) To sell kerosene and light oil (for tiller). The shop is mainly opened at the adjacent of cooperative office, but some cooperatives have branches in the member villages.
- iv) To distribute agricultural inputs such as fertilizers, chemicals, seeds, etc. The Agriculture Office decides the quantity and kind of inputs, and the farmers procure such inputs through the cooperatives.
- v) To distribute government controlling commodities such as edible oil, sugar, etc.

Other than the above, many cooperatives in the Project Area gained some commission charge for undertaking collection and procurement of government supporting variety of rice such as Amol-3 in 1960 and 1962. The sources of income of the rural cooperatives are the aforementioned items, and the items (i) and (ii) are main income sources, but there are some trends of decrease of income due to decrease of total amount of short-term credit and/or shortage of suitable consumptive goods.

Besides, as the activities of the Shahrestan level union, procurement and sale of rice have been undertaken, and the union of Ghaemshahr which is out of the Project Area has been operating a cooperative rice mill.

In recent years, the production cooperatives have been established besides the rural cooperatives, and, in case of the Project Area, the cooperatives of Poultry Raisers, Bee Keepers and Cattle Breeders were established in 1360, 1361 and 1363 respectively for undertaking procurement and distribution of required inputs.

Generally, the managing director of the Shahrestan Union of Cooperative is dispatched from the Shahrestan branch office of the Central Organization of Rural Cooperatives, and the cooperative activities are strongly guided by the Central Organization of Rural Cooperatives by mean of dispatching patrolling supervisor (a pair supervisors in charge of 2 - 3 unit cooperatives) to the unit cooperative, etc.

#### 2.6.4. Village and Village Society

The formation of villages has a close relation with the water availability in the Iranian Plateau. The villages have been built along the rivers or at springs, and developed with wells dug at the skirt of mountains where aquifer is available, and then the remoted plain areas from the water resources have been reclaimed in accordance with the development of excavating technique of Ghanat. The landlord-tenancy system had been established through the progress of village development, and the collective type of villages have been settled providing walls around the villages to protect properties, livestock, etc. from invaders and/or wild animals such as wolf. The security of water resources has been essential condition for village formation; therefore, the developer of water resources has often become the landlord and there are many villages named as developers name with "abad" which means "reclaimed".

The coastal area of the Caspian Sea was covered with thick flat land forest. There have been abundant rainfall, streams flowing in the forest and springs at the alluvial fan. Therefore less toil has been required to secure the water resources at the reclamation, but instead the area was unhealthy humid land where malaria was rampant. For such reason, the villages at the coastal area of the Caspian Sea were developed from the highland of mountain, then expanded to the mountain skirt and reached the flat plain finally. The thick forest protected the area from the invasion of enemies, but also it hindered internal traffic. The sea coastal traffic had also not developed so much because of residing of inhabitants at the high land so that the regional independency has been maintained.



It is not clear how the Haraz river basin has been developed. It is recorded that the town of Amol had been built in and around 4th century AD by the king who ruled Behshahr area at the east. The original inhabitants of this area were mountainous tribe who resided at the Larijan which is located at the upper reach of the Haraz river. The contact with easterly regions had been started after built-up of small town of Amol, and villages had been formed at the alluvial fan accordingly. The old book says that Dashtsar, Lalehabad, Sasi Kolam, Ganji Afruz, etc. have been existing in 15-17th century AD between Amol and Babol (Bar Fursh Deh-Trader's Village in old name), and the name of Khoshkeh Haraz is only found at the lower reach of the Haraz river. There are many villages which have such suffix as Kola or Keti which mean shade or hill in the area, and such village names suggest that the villages have been spread among the woods and been developed at the place of well drained.

The distinctive difference with the plateau region in the progress of village formation is considered due to such physical conditions and progress of reclamation. Namely, in the Haraz river basin, it is assumed that the spread type villages had been formed among the woods at the beginning, then the neighbouring small villages group have been consolidated in accordance with the progress of reclamation, and come to present semi-spread type villages. The houses had been built with mud wall roofed with straw or grass which is called as Ghaaleh in the dialect of the area, and timber roof had also been popular. But the roofing material has been changed to the galvanized iron sheet in the recent decades and the wall materials are also changing to brick and/or concrete block. Moreover, the village type itself is changing toward the collective village type or urban-like type of which the residential quarter is lined with continuous walls surrounding each unit house with inner yard.

The villages in the Project Area are roughly classified into 3 categories from the origin of the inhabitants as migrants of Larijan area, migrants of southern mountainous area of Babol and migrant of remoted areas such as Khorrasan region, but the distribution is rather complicated and the consciousness of originality has been cooling, and the habit of Yeilagh amongst some of the migrant of Larijan is only remaining as insistent of originality. This habit is deemed as a trace that the reclamation of the Haraz river basin have been undertaken by those semi-nomadic farmers who pass summer season at Yeilagh of mountainous area and winter at Gheshlagh of flat plain beside permanent resident, and such habit was rather popular till rather recent years.

Before the Land Reform, there had been many villages where all inhabitants were tenants, and most of big landlords were living in urban area. The collection of farm rent had been undertaken by the land agent of village resident or patrolling. Most of medium and small landlords were village residents and they often held the position of land agent of the big landlord concurrently. Some tenants had cattle for plowing, but some did not have it, and there was a custom of cooperative works among the tenants for plowing, transplanting and harvesting.

The head of village so called as Kad Khoda was a mediator in the village as well as the liaison at the negotiation with surrounding villages. In many case, the Kad Khoda was a medium or small landlord of village residents and/or a village resided land agent of the big landlord.

After the Land Reform, the establishment of village assembly as self-governing system of rural inhabitants had been tried, but such attempt was not successful and the Kad Khoda system has still remained. Furthermore, the introduction of tiller and penetration of cash basis economy into the rural area have been causing the collapse of cooperative working system in the villages, but the maintenance and repair works of irrigation canal are still remaining as a cooperative work.

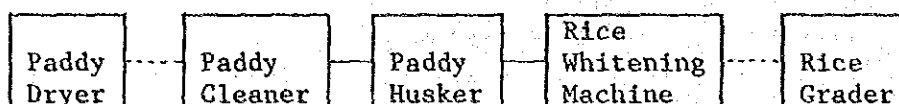
After the Islamic Revoluation, Islamic Association (Anjoman) or Islamic Society (Shoora) has been established and some villages have both of them. Those organizations are considered as a kind of self governing body, but the members are assigned without election by the inhabitants and forming a terminal organization of revolutional bodies. The Islamic Village Societies have formed unions of Shahrestan and Provincial level, and the Ministry of Interior has aimed to formulate an administrative structure using Islamic Village Society System.

## 2.7. Rural Industries

### 2.7.1. Rice Milling Industry

The total number of rice mills as of 1363 in Amol and Babol Shahrestans is reported as 193 and 485 respectively, and 184 in Amol and 97 in Babol Shahrestans are located in the Project Area.

The rice miller is the most important industry among the existing rural industries in the Project Area, and its standard mechanical combination is as below;



The paddy dryer is mostly concrete made horizontal batch type which is blowing heated air from one side at the bottom of batch to dry paddy in 24 hours or more, but some rice mills have been equipped with steel body elevated dryer of West German or Israel made which can dry the paddy in 5 - 6 hours per batch.

The paddy cleaner is equipped with a fan at the upper portion to blow out the straw chips and other light mixtures and with a double screen vibrating separator at the lower portion to separate heavier-mixtures such as stone or mud lump from paddy.

The cleaned paddy is transferred to the paddy husker. There is a pair of rubber roll in horizontal position at the upper portion and the paddy is dehusked passing through the gap of 2 rubber rolls (0.5 - 2.0 mm gap) which are driven in different revolving speed, then become unpolished rice. The unpolished rice and husk are separated at the aspirator which is installed at the lower portion, and the husk is blown out to the out door through the pipe.

The efficiency of dehusking is reported by the rice millers as 60%, but the result of sample survey in 1364 was as below:

Unpolished rice	51.7%
Complete Grain	(45.0)
Broken rice	( 5.9)
Others	( 0.8)
Paddy	48.3%

After dehusking, procedure is transferred to the rice whitening machine by the bucket elevator, without separating unpolished rice and paddy.

The rice whitening machine is of Engelburg type which enables to perform dehusking and whitening in one process, but, in case of

the Project Area, this machine is mainly used for whitening, and the un-husked paddy is also dehusked and whitened in this machine. Most of rice whitening machines are equipped with rough grading screen at the outlet and part of broken rice is separated.

To perform dehusking and whitening in one process, the friction power added to rice grain is rather strong causing high ratio of appearance of broken rice. The yield rate of rice whitening with Amol-3 in the sampling test was as below;

Complete grain	70.43%
Large broken rice	6.96
Small broken rice	21.31
Other variety of rice	1.30
<u>Total</u>	<u>100.00</u>

The rice graders were introduced to the rice mill in recent year, but have not become so popular yet. The equipment is a rectangular box of screen bottom vibrated with motor but not enabled size by size grading. Besides, the standard price of governmental procurement of Amol-3 rice in 1364 was 230 Rls. per kilogram as free from mixture of broken rice, and the price is decreased two Rls. per one percent of mixture of broken rice. If the mixture of broken rice is more than 40%, it is not subject to procurement by the governmental agencies.

The rice mill has mostly a scale in the combination of less than 3 paddy dryers with less than 2 paddy huskers, and 80% of rice mills in Amol area are of such combination type. The capacity of paddy dryer is mostly 4 - 5 t/batch in case of 24 hours drying type and that at rapid drying type is 2 - 2.5 t. On the other hand, the capacity of paddy husker is 1.3 - 1.6 t/hour of paddy, therefore 3 paddy dryers of 24 hours drying type are required per each paddy husker, but the combination of equipment is not considered so seriously. The treating capacity of rice whitening machine is 300 - 600 kg/hour in rice; therefore, two rice whitening machines per one paddy husker are standard combination. Besides, the transferring from the paddy dryer to the paddy husker is undertaken by workers in repacking the dried paddy in bags, but the transferring from the paddy husker to the rice whitening machine is carried out with a bucket elevator. Except the paddy husker, most of rice mill facilities are Iranian made.

The quantity of milling rice has been increased very rapidly owing to successful introduction of high yield variety rice, and therefore, the improvement and new installation of rice mills in recent 2 - 3 years are rather distinguished in the Project Area. The establishment of the rice mill is subject to permission of the Regional General Department of Industries, and the data offered by the said Department reported the number of issuance of installation and operation permission as 44 in Amol and 51 in Babol Shahrestan in 1363. (ref. Table D.5.7 of Appendix).

The rice milling technology in Iran is still in very elementary stage because the rice milling is only carried out for domestic consumption and application of international standard on the quality of rice has not been requested. The milling charge is fixed at provincial level at 5,000 Rls. per one ton of paddy or 8,000 Rls. per one ton of polished rice. Therefore the paddy/rice ratio is assumed at 62.5% from the difference of the charge, but the actual ratio is considered rather lower. The weighing of paddy is not carried out at the most of private rice mills; therefore, the actual ratio of paddy/rice is not clear, but the record of the cooperative rice mill in Ghaem Shahr in 1355 - 1363 period shows that the average ratio with broken rice is about 65.9% and average ratio after grading (assumed content of large size broken rice as less than 5%) is about 50.4% per total quantity of 18,500 t dealt in the above 9 years. (ref. Table D.5.6 of Appendix) The main reason of high content of broken rice is considered due to over drying and function of the rice whitening machine; therefore, the farmer is obliged to be suffering unfair damage because the difference ratio of price of rice and broken rice is more than 2.5:1.

#### 2.7.2. Fruit and Vegetable Processing Industry

There are five (5) factories of fruit and vegetable processing in the Project Area, and the main products from these existing factories are sour pickles (onion and garlic), salted cucumber, mixed vegetable pickles, jam and juices (orange and lime). The raw materials are collected from the Caspian Sea coastal area and Mashhad area through markets or brokers except lime which is brought from southern regions of Kerman or Fars.

As far as fresh raw materials are concerned, there is no serious problem for the time being except cost fluctuations. However, it seems that there are some problems about government controlled materials such as sugar and imported material for can manufacturing. Especially jam and juice processing factories complain of the shortage of sugar.

The production scale is not so big except one (1) factory capable to process 500,000 bottles of lime juice and 1,000 tons of orange juice by the automatic extracting system. Remaining four (4) factories are run on a small scale but just a little bigger than home industry scale. They produce the processed food using the minimum machines which are prerequisite for processing such as cooker, seamer, pasteurization hot water bath and juice extractor. The estimated annual production of commodities in this area are as follows: sour pickles -- 400 tons, salted cucumber; 500 tons, jam; 40 tons, lime juice; 500,000 bottles, orange juice; 200 tons and syrup; 50 tons.

#### 2.7.3. Poultry Feed Industry

The poultry feed factory in the Project Area can be grouped into two types; that is, the factory which produces feed for

distribution of feed to the licensed poultry farms and the self-support feed mill attached to poultry farm. Five (5) of the former type factory and eight (8) of the latter type mill exist in Amol area.

Main machine is mill and conveyor (belt/basket/screw). Two (2) or three (3) units of mill are installed in a factory. Corn, soybean cake, fish meal, ground shell, bone powder, vitamin compound and minerals are used as the raw material and wheat and barley are used sometimes instead of corn when shortage of corn occurs. Most of these materials are imported except ground shell and salt. Consequently, no factory can accomplish their annual production capacity authorized by the government owing to the fluctuation in quota and in delivery of imported raw materials under the present situation of war time. The said exclusive feed factories produced about 16,310 tons of feed in total during the last season. This is about 41 percent of licensed production capacity.

#### 2.7.4. Animal Products Processing Industry

The annual milk production in the Project Area is estimated at about 40 thousand tons from about 90 thousand heads of cattle but actually the amount of marketable milk has been very little due to absence of milk factory and milk collecting system. The average number of the cattle per farm household is at about two heads; therefore, most of produced milk has been consumed for family use including suckling for calves. A part of milk is sold to retail shops directly by farmers and some are distributed by retail dealers to the consumers. Produced milk is mostly processed into yoghurt, dough and/or butter by farmers or at retail shops due to lack of cooling facilities. These dairy products can be processed very easily, especially yoghurt is made in every farm household.

There is one milk factory established in 1342 outside the Project Area located in Sari city. The capacity of this factory is about 10 tons per day and drinking milk, yoghurt, butter and ice cream are produced from raw milk brought from relatively large-scale farms. The capacity of the factory is projected to extend from 10 tons to 22 tons per day.

In Amol city, there is a public slaughterhouse established in 1350 with a capacity of 40 heads cattle and 400 heads sheep and goats per day. Generally, slaughtering and dressing are conducted by butchers themselves, and when treated by staffs, 500 Rls. per head are charged. This facility has been managed by the charge to the users by 190 Rls. per cattle and 100 Rls. per sheep and goat.

Hide and skins produced here as by-products have been transported to Tehran because of absence of leather factory in the Project Area and there is no equipment in existing slaughterhouse for processing other by-products such as blood and bones into animal feeds.

There are 133 bee farmers in the Project Area, producing honey, its processing and bottling of honey are made by farmers themselves.

#### 2.7.5. Agricultural Machinery Repair/Manufacturing Industry

The repair shop of Agricultural Machinery and manufacturing of tools are increasing rapidly in the Project Area, and the General Department of Industries has issued the permission of establishment of 105 iron works and of 56 of non-steel metal works in 1355 - 64 period in Amol. The repair shops are mainly repairing tiller and threshing machine and concentratedly opening at the surrounding area of urban areas such as Amol, Mahmudabad and Feridon Kanar. The technical level of repairing is rather high and rather old machinery are also repaired skillfully, but the repair often needs long period because of shortage of spare parts.

The repair shop is mostly in small scale having 2 - 3 of skilled or semi skilled mechanics with 1 - 2 apprentice workers, but some of such repair shops have been manufacturing trailer and other tools besides their main line of business.

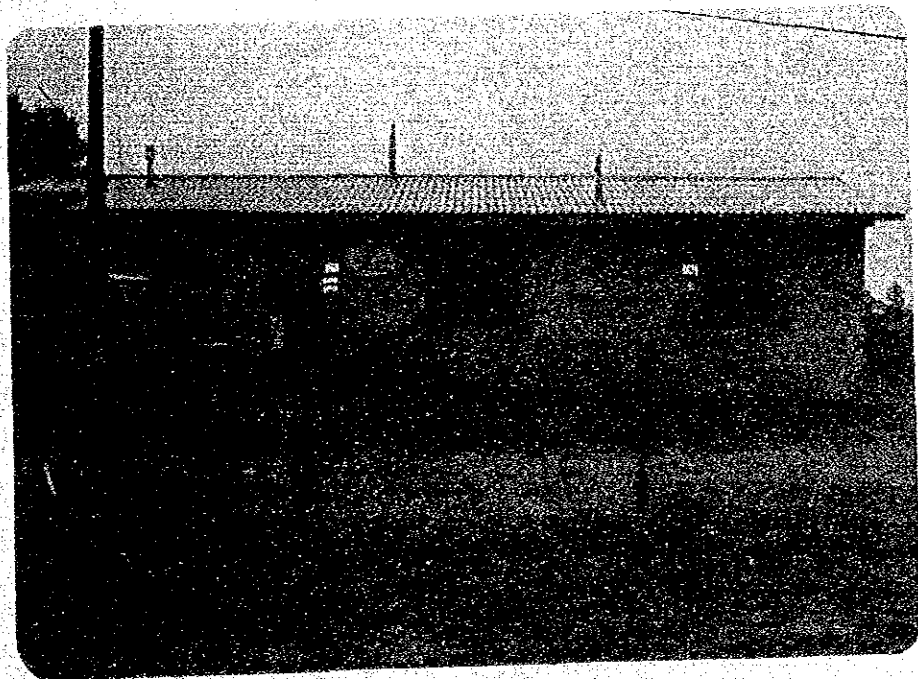
The manufacturing of agricultural tools are mainly located at the roadside of Amol - Babol Highway at the vicinity of Babol city as well as east and northern suburbs of Amol city, and their main products are rice mill facilities such as bucket elevator, rice grader, etc. Although there is a manufacturer who has been producing Engelburg type rice whitening machine and small irrigation pump, the equipment, number of worker, capacity of production, etc. are not beyond the scale of a workshop.

#### 2.7.6. Other Industries

Steel made desk, bookshelf and other furniture, wooden furniture, steel or aluminum sash, etc. are manufactured in the town of Amol. In the rural area, the main industries other than the repair of agri-machinery are timber mill (19 villages), carpet weaving (17 villages), and concrete block making for house building (14 villages), then service shop of motor vehicles (11 villages) follows them. As a special character industry, a jute bag manufacturing has been operating in Ahu Mahaleh near to Mahmud Abad. The material had been produced in the surrounding area of the factory in the past, but presently operating with imported materials. Two sugarcane extraction mills of home industry scale are operating in Suteh of Babol Shahrestan as a trace of active cultivation of sugarcane in the past.

CHAPTER 3.

AGRICULTURAL ADMINISTRATION  
AND SUPPORTING SERVICES







## CHAPTER 3. AGRICULTURAL ADMINISTRATION AND SUPPORTING SERVICES

### 3.1. Agricultural Administration

#### 3.1.1. Administrative Organizations

Since the first cabinet of Constitution in 1286, there had not been any notable action on the country's agricultural policy until the beginning of 1310s. In 1313, the 67th cabinet after the Constitution had established Central Department of Industries and Agriculture which had independent function. In 1314, the 68th cabinet had separated Industries and Agriculture and Central Department of Agriculture was established.

The Ministry of Agriculture was established in 1316 recognizing the importance of renovation of agriculture in the country and to issue integrated policy therefor, and many agriculture offices were opened in the main towns of the country. The agriculture offices had the function of demonstration farms, and it became familiar to the inhabitant as agricultural park.

After the end of World War II, the cabinet revised the organization of Ministry of Agriculture in 1325, and the policy of Plant Pest Protection was studied in the same year. The agricultural products were main items of export, and the effort of production increase was a national demand, but the Ministry of Agriculture of the time had not sufficient function to response to such demand. Especially, the security for irrigation water has been un-negligible necessity for Iranian agriculture, but there was not any administrative organization to cover this sector. Therefore the government established development authorities by the main rivers to commence the preparation of water resources development plan since the later period of 1320s, and also established the Independent Irrigation Authority in 1334 to manage the water policy of the country comprehensively.

The agricultural administrative organization was changed rather drastically according to the execution of the Land Reform Act in 1340s. At the beginning, the Land Reform Organization of the Ministry of Agriculture charged the land reform, but the Ministry of Agriculture was divided into 4 Ministries of Agriculture, Land Reform-Rural Cooperatives, Natural Resources and Agricultural/Consumptive Goods Production in 1346. Meanwhile, the Independent Irrigation Authority was consolidated into the newly established Ministry of Water & Power in 1343. The terminal organizations of the Ministry of Agriculture were also improved or reinforced during the period; establishing new research institutes, reinforcement of extension services activities and improvement of livestock and plant pest/disease control system were main subjects in this concern.

The purpose of dividing the Ministry of Agriculture in 1346 was reinforcement and expansion of agricultural administration by the fields of activities, but the actual results were confusion of agricultural administration, therefore the decade of 1350s was re-consolidation period of such divided agricultural ministries. Namely, the Ministries of Agriculture and Natural Resources were consolidated in 1350 and became as Ministry of Agriculture and Natural Resources, and the Ministry of Land Reform & Rural Cooperatives changed the name as Ministry of Cooperatives & Rural Affairs. The Ministry of Agricultural/Consumptive Goods Production was resolved and its functions were transferred to other Ministries. Furthermore, the Ministries of Agriculture & Natural Resources and Cooperative & Rural Affairs were consolidated in 1356 and became as the Ministry of Agriculture and Rural Development, then changed the name as the Ministry of Agriculture in 1363. It is not negligible that such reform caused many confusion at personnel affairs and terminal organizations, and the tendency of vertical management system by the Departments of the Ministry of Agriculture have been strengthened. As the result, the farmers have been obliged to contact with different branches of the Ministry of Agriculture by the subjects, therefore the Agricultural, Rural and Tribal Service Center (ARTSC) was established in 1359 aiming to solve such problem. The ARTSC unifies the door for agricultural administration at its terminal level consolidating most of agricultural organizations in Shahrestan level except the rural cooperative. The schedule of establishment of ARTSC is as below;

<u>ARTSC of Shahrestan</u>	<u>Rural Service Center</u>	<u>Year</u>
15	200	1360
20	250	1361
20	300	1362
25	350	1363
25	300	1364
20	200	1365
20	-	1366
20	-	1367
<b>Total: 165</b>	<b>1,600</b>	

The ARTSC of Shahrestan takes the place of existing Shahrestan Agriculture Office and consists of Extension Services, Plant Protection, Livestock, Veterinary, etc. as main function, but the function of rural infrastructure improvement which has been charged by the Cooperative and Rural Affairs Office is also added with proper reinforcement.

Besides, the Rural Service Center is basically established by Dehstan unit, but the boundary is drawn taking the number of villages, household, farm land area, distance with center and other factors into consideration.

### 3.1.2. Agricultural Law and Regulation

The legislation related to agriculture after the World War II in Iran distinguished in their subjects at the 3 periods of before and after the Land Reform and after the Islamic Revolution. Namely, in the period of 1324 - 1338, although the policy related to plant protection was studied and the basic plan of Seed Improvement was established in parallel with the execution of Cooperative Law, there was not any drastical movement to change the traditional agricultural basis. Iran was suffered from post war disorder, and political and economical confusion due to the nationalization of oil company which had continued in this period. Therefore the potentiality of development was groped within the limited financial sources. The main legislation in this period was Cooperative Law (1334), Law related to Animal and Plant Protection (1334), and Law for establishment of Seed/Seedle Improvement and Production Institute (1338) as well as law for transferring national farm land and arable land to the Ministry of Agriculture (1336), Law for establishing Agriculture Committee (1338) and Law for National Forest and Range land (1338) which were considered as preparatory acts for new policies in the decade of 1340s.

The Land Reform Act was submitted to the Majilis in 1339. This act aimed to change the agricultural basis in Iran from its foundation. The Land Reform Law was enacted in 1341, and the law, together with the Law for Nationalization of Forest and the Law for Conservation and Utilization of Forest and Rangeland, changed the situation of land ownership in Iran. The agricultural policy thereafter is considered as effort to achieve the target of Land Reform and to improve the farm managerial conditions according to the change in land ownership.

The period of 1339 - 1357 (before the Islamic Revolution) is divided into two periods of 1340s when the land reform had been undertaken and of 1350s when the land reform was almostly completed, and the summary is as below;

- ° Conclusion of the Land Reform Law (1341), Law for Nationalization of Forest (1342) and Law for Conservation and Utilization of Forest and Rangeland (1346), and revision and supplement of articles of those laws. Besides, some revision and supplement have been provided after 1350 in accordance with the actual execution of those laws.
- ° In relation with the Land Reform, the manner of loan supply by the Agriculture Bank had been revised, and the Agricultural Development Fund was established in 1345. Furthermore, the Agriculture Bank was re-organized and became Agricultural Cooperative Bank in 1348, and the Agricultural Development Fund became the Agricultural Development Bank in 1352.

- ° To solve the problem of water caused from the Land Reform, the law for Conservation and Control of Groundwater was enacted in 1345, and, moreover, the Law of Water and its Nationalization was concluded in 1347. By such acts, the responsibility in the development and control of irrigation water, which was mainly secured by the landlord's responsibility before the Land Reform, was transferred to the government.
- ° As a reflection of fractionization of land ownership under the Land Reform Act, introduction of cooperative farming system, establishment of agri-business, etc. were planned, and relative laws were enacted. Namely, the Law for Establishing Farming Company (1355), the Law for Establishing the Company for Utilization of Beneficial Area under Dam (1347), the Law for Cooperative Production and Land Consolidation in the Command Area of Rural Cooperative (1350), etc. were concluded.
- ° As services of legislative action related to rural area and its inhabitants, the Law for Establishing Village Assembly (1342), the Law for Social Insurance of Rural Inhabitant (1348), the Law for Loan Supply to Rural Inhabitant (1353), the Labour Law of Agriculture (1353), the Law for Establishing Assembly at Rural Area (1353), the Law for Crop Insurance (1355), etc. were concluded.

Other than the above, the legislative action related to services of organizational reform, establishment and consolidation of agricultural organizations, etc. took place besides enactment of Plant Protection Law (1346) and the Law for Establishing Agricultural Pole (1354).

After the Islamic Revolution, the agricultural law and regulation have been examined together with organization and system related to agriculture, and required amendment or abrogational measures were made, but the Law for Establishing Agricultural, Rural and Tribal Service Center (1359) is to be mentioned specially. As for the Land Reform Law, some minor amendment was done, but the new law has not yet enacted.

### 3.1.3. Budget

The ratio of agriculture sector in the Gross National Production by Sector in Iran has been increasing rapidly after the Revolution in 1357 as shown in Table D.4.1 of Appendix. Namely, the portion of Agriculture Sector has been more than 15% and taking the first position replaced with the Sector of Petroleum Industry since 1359. The reason for such replacement is considered mainly due to increase of market price of agricultural products, and the ratio on the constant price basis in 1353 were 8.3, 10.2, 11.1, 13.5, 14.9

and 14.1% respectively in the years of 1356 - 61, and its position was the second after the Petroleum Industry except the year of 1359-60 when the production of petroleum was fallen down.

On the other hand, the portion of oil and gas in the income of National Financial Balance was overwhelmingly large and the change of Financial Balance in the above period of 1356-61 were as shown in Table D.4.8 of Appendix.

As a particularity of the National Financial Balance, from 73.5% (1358) to 113.5% (1360) of oil revenue were summed up as the income, and the portion of tax revenue is about 25% of total income.

The budget of Iranian government consists of such item as Ordinary Expenditure, Defense, Social Affairs, Economic Affairs and other Expenditure, and the average ratio of each category of Expenditure in 1357-62 were 10% of Ordinary Expenditure, 14% of Defense, 32% of Social Affairs, 25% of Economic Affairs and 19% of other Expenditure. As the budget related to agriculture, expenditure for rural development which taken about 1% of Social Affairs Expenditure, expenditure of agriculture and natural resources (13.0% of Economic Affairs Expenditure) and large parts of expenditure of water resources development (8.9% of Economic Affairs Expenditure), and the portion of these expenditures in the total budget is about 5.8%. Furthermore, the budget for development to be invested constantly was about 47.3% of the expenditure of agriculture and natural resources as average of 1357-61, but the portion was fallen down to 33.0% in 1360 and the administrative expenditure became more than the development expenditure since 1359 despite of recorded portion of 71.4% in 1357.

### 3.2. Agricultural Research and Experiment

#### 3.2.1. Agricultural Research System in Iran

In this country, all of the agricultural research activities are unitedly conducted at a national level. At present, the following eleven institutes are set up:

- (1) Seed and Plant Improvement Institute (SPII)
- (2) Animal Husbandry Research Institute (AHRI)
- (3) Razi Institute (Animal Health) (RI)
- (4) Forests and Rangelands Research Institute (FRRI)
- (5) Plant Pests and Diseases Research Institute (PPDRI)
- (6) Safiabad Agricultural Research Centre (SARC)
- (7) Soil and Water Institute of Iran (SWII)
- (8) Sugar Beet Seed Institute (SBSI)
- (9) Iranian Tobacco Institute (ITI)
- (10) Sugarcane Research Institute (SRI)
- (11) Tea Research Institute (TRI)

Among them, eight institutes from (1) to (8) are under jurisdiction of the Ministry of Agriculture, (9) is attached to the Ministry of Commerce and (10) and (12) belong to the Sugarcane and Tea Companies, respectively. The eight institutes mentioned above are administered by an undersecretary of exclusive duty through his office, the Agricultural and Natural Resources Research Organization. Of these, five institutes, (1) to (4) and (8) are located in and near the city of Karaj, both of (5) and (7) are in Tehran and only (6) is in local area. Apart from AHRI, each institute has its own branches at the proper places throughout the country.

Besides the above, there are six universities performing research activities along with the higher agricultural education. They are the University of Tehran established in 1314 (1935) and five other universities as follows:

- (1) University of Tehran (College of Agriculture, College of Veterinary Medicine and College of Natural Resources)
- (2) Chamran University (College of Agriculture) at Ahwaz
- (3) University of Shiraz (Faculty of Agriculture and Faculty of Veterinary Medicine)
- (4) Mashhad University (Faculty of Agriculture)
- (5) University of Tabriz (Faculty of Agriculture)
- (6) University of Isfahan (Institute of Horticulture)

#### 3.2.2. Some Characteristics of the Ministerial Research System

Almost all of the institutes have been orderly organized to resolve crucial problems, with which the agricultural administration was facing. At the beginning, plant and animal protections from the specific pests and diseases were the most important public services

to be done, and the research institutes related to these protection activities have been set up in the earlier time. Even now, these institutes are keeping a large number of researchers comparing with other new institutes. The latest is FRRI organized after nationalization of forest and rangeland. The biggest in the number of research is SPII established 25 years ago, employing 252 researchers of the total number of 800. SARC is originally founded to develop an areal irrigation project under jurisdiction of the Khuzestan Development Authority and later on transferred to the Ministry of Agriculture.

Among the eight institutes, five are set up by commodity and two others are by study field such as soil and water science, entomology and plant pathology, but only one, SARC, is integrally organized by the composition of different fields.

As for the internal structure, for example SPII is sub-divided into eight commodity departments, and two common departments, plant physiology laboratory and gene bank. This institute has four local research centers and 80 service stations and the headquarter plays a role of one of the four centers. In the same manner, AHRI consists of three animal departments of cattle, sheep and goats, and poultry, and two common departments of animal nutrition and feeding.

Generally speaking, the research activities at the educational institutions are mostly concentrated in the basic sphere, whereas, those at the ministerial institutions tend to be in the applied and the more practical spheres. Of course, SWRI and PPDR are unavoidably liable to enter into a sphere of the basic research. The cooperative research activities between the research institutes by commodities and those by study fields at central and local levels seems to be fairly difficult to do, despite of the cross-wide seminar held at a central level regularly and the coordinating efforts of the Agricultural Research Organization.

### 3.2.3. Rice Research in the Caspian Sea Coastal Area

The rice research in Iran has been implemented in two stations located in Caspian Sea coastal area, the Rice Research Station at Amol and that at Rasht. The two stations or their proto-type stations were established in 1340 and have been cooperatively tackling with the problem of the technology development of rice farming under the administration of SPII at Karaj. Rice research is carried out on breeding, cultivation, pest and disease control and mechanization. (See details in Table C.2.14 in Appendix C.2.)

The Amol Rice Research Station located in the central part of the Province of Mazandaran keeps four experts (researchers), eight technicians and 34 laborers having a main station with a field of 14 ha. Other than the above, there are 3 small stations with a total area of about 11.0 ha such as Firuz Kande Station near Sari to carry out particular experiment.



Besides that, two other research stations related to paddy cultivation are situated in the Mazandaran province. One is the Soil and Water Institute and another is the Plant Pests and Diseases Institute. The two are respectively located in the western and eastern parts of this province.

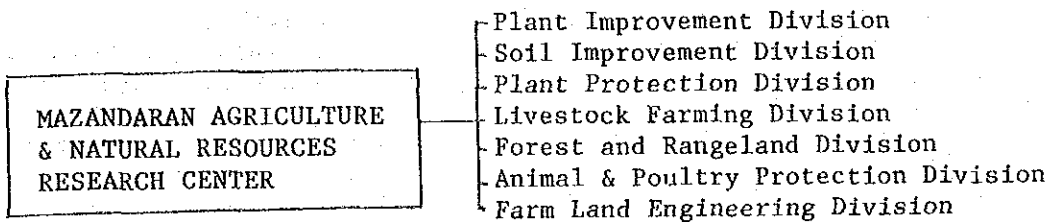
Certainly, the start of the research activities on the rice production in this area was late. Fortunately, not only advanced knowledge and research methodology but also farming technology to test could be freely introduced from foreign countries at that time. Furthermore, assistance by the FAO team and cooperation with IRRI in the Philippines were possible.

Regarding plant improvement, the first efforts were devoted to the improvement of some of the local and foreign imported varieties of rice by the pureline breeding and some new varieties were gained. Some of these new varieties are Mehr and Firuz selected from Tarom, the quality of which has got a high popularity. Secondly, the cross-breeding was commenced aiming at creating the high yielding rice with good quality, resistance to pests and diseases, tolerance to cold weather, early maturity, good seed dormancy, moderate threshability, durability for lodging and greater fertilizer response. Although all of these demands were not satisfied, a new variety, Amol-1 crossed between Taiching Native No.1 and Tarom Firuz Kande (a local variety of Tarom) were issued 12 years after the foundation of this station.

Concerning agronomy research, a good deal of experimental items needed for improving rice cultivation was conducted in cooperation with the Rasht Station. They were seed preparation, nursery bed, sowing date and rate, transplanting, direct sowing, pests diseases and weeds control, water management, fertilizer application, operation of machineries, second crops and so on. Some of the results were indirectly conveyed to farmers through the extension network and directly communicated to visitors and trainees. In 1352 and 1353, a large-scale training for farmers was held at the Amol Station. During three months, one full day every week was appropriated for training 120 representative farmers per annum.

As a result, the varieties of paddy have been changed to those of improved local varieties or hybrid varieties, and, especially the Amol-3 has taken more than a half of total cultivating land of paddy in the Province. Furthermore, the farmer became familiar to the new method of nursery preparation and cultivation practice, then the improved seed bed became prevailing and made it possible to advance the sowing date about 30 days, and other new technologies have also been widely adopted. However, some technologies to be developed on the assumption of the land improvement are still remaining as future problem.

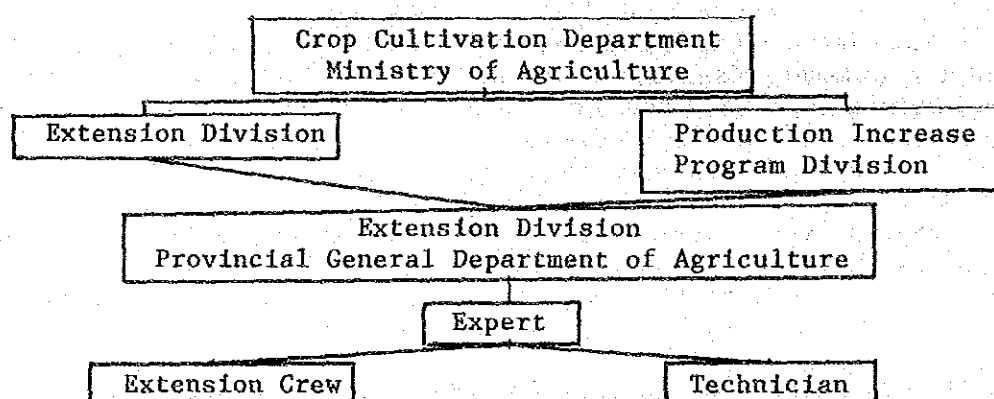
Besides, the Ministry of Agriculture has been planning to establish Agriculture & Natural Resources Research Center in each Province to respond to the diversified demands of improvement of cultivation practice, and the detailed study in this concern has been commenced in Mazandaran assigning the members of preparatory committee. The planned organization is as below:



The above center will be established at the vicinity of Sari and the existing facilities and staff will be consolidated to this center or remain as branches of the Center.

### 3.3. Agricultural Extension Services

The agricultural extension activities in Iran have been commenced since the mid of 1330s. The extension services have been composed with the experts (University Graduates) who charge the guidance and training of extension crew and the crew who undertakes the actual extension services in the rural area under the management of Extension Department of the Ministry, but the system of technicians who have specialized knowledge has been applied in recent year in accordance with the execution of production increase program. Furthermore, the structure of Extension Department was reformed in 1364, and two divisions of Extension and Production Increase Program are formed in the Crop Cultivation Department. Accordingly, the present organization of extension services is as below;



As shown above, the Extension and Production Increase Program Divisions are separated in the headquarter, but these two are managed by the one division of Extension at the Regional General Department. Principally, the expert and technician stay at the Shahrestan Agricultural Office, but the extension crew is to stay in the village covering about 10 villages of surrounding.

Besides, the organization of Extension Division of Mazandaran Regional General Department of Agriculture is as below:

- Training/Education Section .... Introduction and training on paddy, wheat, orchard, vegetable, fodder crops, maize, livestock and agri-machinery
- Public Relation & Publication Section
- Audi-vidual Section
- Rural Youth Education Section
- Production Increase Program Section ... Paddy, wheat, fodder crops and maize.

The extension crew who is usually a high school graduate and village born is to be employed in the first priority. The newly employed extension crew is to attend at the basic training course in 1 - 2 months at the training center, and receive the field training at the agricultural experimental stations by the Province, then be assigned to the Shahrestan Agricultural Office. In case of Mazandaran Province, the basic training is performed jointly with Gilan Province, and the field training is undertaken at the Amol Rice Research Station, Karaldasht Grain Research Station, Ramsar Citrus Research Station, Khoshkdaran Plant Disease/Insect Research Institute and Sari Veterinary Office spending 5 - 7 days per each station. The trainings after the assignment are carried out in accordance with the program of Extension Division of Regional General Department of Agriculture, and, in case of Mazandaran Province, the newly assigned crew will receive on-the-site training of 1 - 2 months at the previously assigned crew's duty area. Furthermore, the extension crew is to receive 1 - 2 weeks per annum of specialized field training. However, the stay of extension crew in the village is rather difficult at present due to budgetary problem, and except Nowshahr Shahrestan, most of extension crew is living in urban area and taking charge of more than 10 villages. In case of Amol Shahrestan, there are only 6 extension crew and one technician, and the extension crew is taking charge of plant protection services such as stem borer control. In the areas where the ARTSC have been established, each Rural Service Center is to have 3 - 5 extension crew in the fields of Crop, Orchard and livestock, but, as shown in the case of Babol Shahrestan, such principle has not been observed completely. For the activities of extension crew, motor bicycles have been popularly supplied to the crew, and the motor bicycles have been replaced to motor vehicle (one vehicle per each member of extension crew), but this system is also not observed completely.

Besides, the extension crew shall attend at 8 weeks re-training course for each 2 years to improve their knowhow, and such re-training course serves the grade promotion examination as well. In case of Mazandaran Province, such re-training course is taken at Agricultural Training Center in Tonekabon Shahrestan, and the course of study consists of principle of extension, its history, specialized training on crop, orchard, agri-machinery, livestock, veterinary, etc. and extension programming. This system will be changed to the 2 weeks field training at the experimental stations after 1365, and the trainee will be requested to submit the training report and a report on the specialized subject. The submitted reports will be examined by the jury, and the extension crew whose reports are accepted will be promoted to the higher grade.

As the future plan, the extension activities will be included in the ARTSC, but the establishment of ARTSC is behind the schedule due to financial and other problems, and the establishment of ARTSC for Amol Shahrestan has not yet materialized despite of scheduled establishment in 1364.

As the system, the agricultural extension activities have been well arranged, and the extension services have been playing fruitful contribution at the development of regional agriculture in the Project Area such as rice production increase scheme (ref. para. 1.4.2), but the present activities are hardly judged as sufficient. In case of Babol Shahrestan, the extension services have been carries out in rather close contact with the farmer within the frame work of ARTSC activities, but the stagnation of extension services in Amol Shahrestan is not neglective because of the transitional period to the formation of ARTSC. Especially, there is some tendency of separation of extension services from the farmer due to urban resident of most of extension crew, and there are some signs that the farmer are forgetting the existence of extension services (ref. para. 1.5.4-3) and that the member of extension crew themselves are not grasping actual situation of rural area sufficiently.

### 3.4. Agricultural Finance

The penetration of cash economy into the rural area is deemed as one of the changes caused by the Land Reform. Even before the Land Reform, there were cases of labour supply, but the settlement of such labour supply had been performed by mean of mutual supply and/or sharing of production, and the settlement with cash money had been strictly limited. It was the custom that the tenantry borrowed cash from the landlords and that the landowner farmer borrowed it from the merchants when some needed cash money and settled such borrowed money with their crop production at the harvesting season.

The main reason why the government urged the establishment of rural cooperatives was to supply stable financing system to those farmer who became landowner farmer as the result of the Land Reform, and the rural cooperatives have grown using the commission fee of such financing system as the main source of operational expenditure of the cooperatives.

As agricultural financing institution, the existence of Agriculture Bank has been well known from the past, but the reinforcement of capital, amendment of article of association, reform of organization, etc. had been taken the place in the decade from the late 1330s to 1340s, then the Agricultural Cooperative Bank and the Agricultural Development Fund (reformed as the Agricultural Development Bank in 1352) have been established finally. Besides them, the Khazar Development Bank was established in 1354 as a financing institution in the Caspian Sea Coastal Area and financed agricultural fund of less than 50 million Rls. After the Revolution, the banking system was also reformed, and the Agriculture Cooperative Bank and the Agricultural Development Bank were consolidated as the Agriculture Bank, and the branches of Khazar Development Bank and Saadirat Bank (a private operated bank which was nationalized) in Mazandaran Province formed the Ostan Bank. The Agriculture Bank and the Ostan Bank are operating the settlemental business of their previous bodies and the same line of business of those original bodies, but the financing system in the agricultural sector is as below:

	Kind of Loan	Period	Share of Profit and Commission/Annum
	Good Well Loan	less than 1 year	2.5% <sup>1/</sup>
Short Term	Differ Payment for Agriculture Inputs	1 - 3 years	4 - 8% <sup>2/</sup>
	Pre-harvest Procurement of Crop	less than 1 year	8 - 12%
Medium Term	Good Well Loan	less than 5 years	1.5% <sup>3/</sup>
	- ditto -	less than 5 years	2.5% <sup>4/</sup>
	Differ Payment for Agri-machinery	less than 10 years	4 - 8%
Long Term	Contracted Works	less than 10 years	6 - 8% <sup>5/</sup>
	Temporary Participation to Operation	less than 12 years	6 - 8% <sup>6/</sup>
	Permanent Participation to Operation	un-limited	case by case

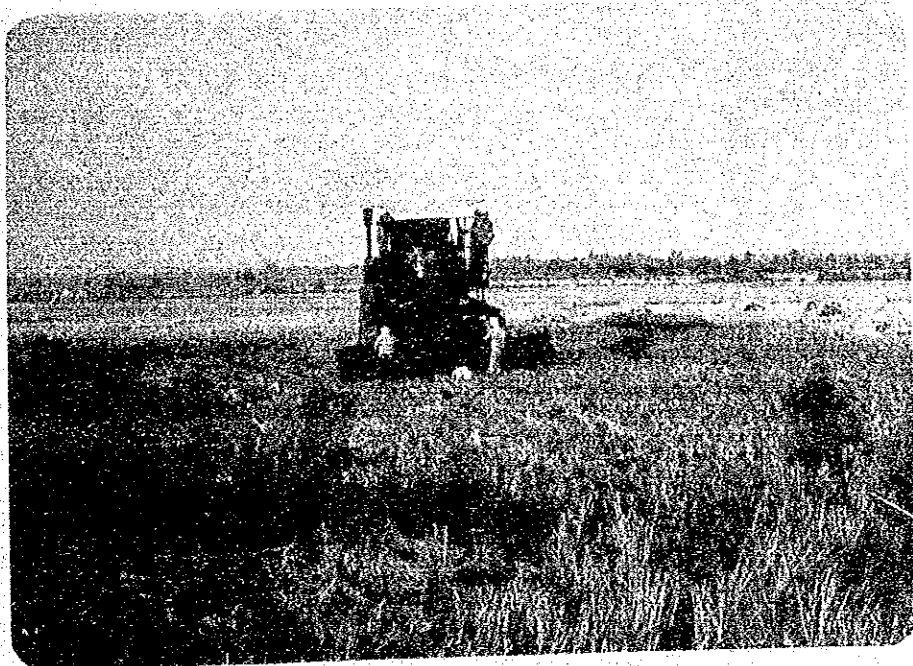
- Note: 1/: Loan supplied through cooperatives and 0.5% is commission charge for the cooperative
- 2/: Supply for procurement of seed, Fertilizer, etc.
- 3/: This loan is supplied in case of borrow of long term loan, and the limit is within 5.0% of long term loan.
- 4/: Loan supplied through cooperatives
- 5/: For digging well, land consolidation, etc.
- 6/: 2 years for participation in the operation with 6% of share of profit and commission/annum, and 10 years for selling the share with 8% of share of profit, etc./annum.

Besides, the maximum amount of loan supplied through the cooperative is 300,000 Rls., and the average of such loan is about 100,000 Rls. The direct financing by the banks is available up to 3,000,000 Rls. per the credit of borrower, but the loan supply over this amount is secured with real estate.

The Agriculture Bank is undertaking the saving business, although not so active, and the farmers save their money at the commercial banks because the commercial banks supply the loan secured with such saving. For saving, a share of profit of 7.2% is guaranteed.

## CHAPTER 4.

### STAGE AND DIRECTION OF AGRICULTURAL DEVELOPMENT IN THE PROJECT AREA







## CHAPTER 4. STAGE AND DIRECTION OF AGRICULTURAL DEVELOPMENT IN THE PROJECT AREA

### 4.1. Present Stage of Regional Agriculture

#### 4.1.1. Transition of Agricultural Development in the Project Area

The history of paddy cultivation in the Caspian Sea Coastal Area is said to go back to 13-14 centuries, and the first record of cultivation is found in the Sefidrud delta in Gilan Province. It is assumed that the paddy cultivation has been expanded eastward and reached the Project Area, but the time has not been specified. Most of the farmers in the Project Area have been cultivating paddy since several centuries ago, and the paddy cropping was begun in the coastal area of the Haraz river expanded to whole area as the irrigation canals were excavated, but the paddy cultivation at the eastern district has been expanded since the excavation of the Kari-rud and establishment of its water right in the later period of 19th Century.

In the pre-agrarian reform period, the agriculture in the Project Area seems to have been carried out with paddy cropping in combination with the livestock breeding under landlordism. It is said that the landlords ensured the irrigation water supply from the natural rivers via canals, by reservoirs/ponds or by springing water so as to employ tenants. And the landlords gave the tenants seeds to grow paddy and collected polished rice from the tenants by 500 kg/ha. as rent for tenancy.

Most of the tenants are supposed to have been the semi-nomadic inhabitants in the hilly areas, settling themselves down in this area since 3-4 generations ago. The routine of their living would have had a major cycle in planting paddy in spring, keeping summer-long herdsmanhip in the mountains, and returning for harvesting paddy in autumn. Naturally, non-fertilizer farming was practised at that time in the major system of three-year paddy cropping and three-year fallowing in consideration of time consuming recovery of soil fertility. This practice has permitted them to leave previous forestland and bushy areas intact including unreclaimed land, and the paddy fields which were enclosed by wooden fences to prevent the grazed cattle from trespassing in stray.

Tillage was done by plough drawn by a pair of cattle, haulage of tools/harvests by horse-back, reaping and threshing by manual labour or horses, and polishing of rice by water mill or foot-pounding mortar. Apart from cattle and horses as many draught animals, sheep and goats were also raised whose milk was processed into products for family consumption and their hides and wool were for sales as cash-products as well as the rice for sales. Roads were in lamentably wretched conditions and electricity was far beyond the reach of local inhabitants.

In the mid-1330s, a part of the royal land was started to be released to the people and the Iranian agriculture was developed into the one with land-owner farmers as core in 1340 when the Land Reform Act was established. The Land Reform has been executed in three stages; the land holding of more than one complete village was prohibited in the first stage and the ownership more than the fixed area (50 ha in case of the Project Area) in the second stage. The third stage covered improvement of rural infrastructure and modernization of farming practices and management.

The population of the Project Area increased rapidly to settle down there as a result of Land Reform. Due to such factors, the traditional fallow system disappeared, while the cropping area rapidly expanded.

Simultaneously, the modern agricultural technology began pouring into the country, and it did not take long time before the first rice experiment farm was opened at Firuz Kande in the Province in 1336. The soil research institute and rice experiment station were established in succession. And in 1352, earlier than expected, the first improved variety of Amol-1 came into the stage through crossing works.

In parallel with these technological advancement, tillers began to be introduced from Japan around 1338 for ploughing, transportation of agricultural inputs and also power sources for operating threshers which came into the picture 3-4 years later. The combined use of the farm machinery rapidly spread among the farming communities to help increase efficiency and precision of their farm work in place of a pair of cattle plus a horse which had been widely used for the purpose previously.

Around 1340, mechanical rice polishing started in the peripheral areas of electrified; cities and towns. This practice became popular even in the villages most of which came to be electrified since 1350, and helped release farmers from the strenuous labour required for manual rice polishing which had continued for the last several centuries. Also such mechanization served to secure the market for the polished rice. Chemical fertilizers which have been used since 1340 or so got an impetus for diffusion among the farmers by 50% subsidization of their price by the Government from 1348, and such chemical fertilizers application has been contributed to increasing yield per unit area of paddy.

Around 1350, water-lifting pumps came into use among the farmers in the Area to facilitate their lifting of groundwater, riverwater and springing water and to convert the upland fields scattered into the paddy fields as well as the unreclaimed land into additional paddy fields one after another. Introduction of dry

nursery-bed for seedlings which has come to be adopted recently has allowed seedlings to be transplanted early and enabled to make timely harvest and it has also helped the local farmers to reclaim the coastal belt, which had been liable to suffer from water-shortage, into paddy field and to stabilize yield.

It is natural, however, that such a process for large-scale land reclamation aiming at paddy mono-culture could not be executed without any impediments, particularly, an outbreak of pests and diseases which understandably resulted from breaking-up of the ecological balance so far maintained in the Area: stem-borers came to occur and became chronic in this area since 1351, together with such diseases like rice blast and sheath-blight. Emergency pest-control including helicopter-spraying of chemicals were made until the Plant Pest-Disease Research Institute was established at Tonekabon in 1354 and the Plant Protection Office at Sari in 1361; this pest-control system has enabled this Area to enjoy stable harvesting of rice since then.

In the institutional aspect, the local farmers were encouraged in the Land Reform to organize their own agricultural cooperatives through which multiple services were rendered including the credit facilities at low interest-rates, supply of farm-inputs apart from fertilizers and chemicals, and the marketing of farm products other than rice.

Under the circumstances, the farmers in the Project Area expanded the paddy cropping acreage in successfully coping with technological innovation of mechanized farming, although in the stage of small-size power tillers. And application of improved varieties and improved techniques has allowed the farmers to enjoy high yield. Furthermore, the farmers, supported by high prices of rice resulting from demand increase, could have developed the unexpected high income farming with relatively large-scale fields, in spite of paddy mono-culture, while the agriculture came to the stage to meet the national requirement of securing the nation's foods.

Livestock being released from the draught works, the main efforts for animal breeding were shifted to cattle primarily for production of milk and meat through the improvement of local species with Holstein stock; the method of cattle raising has also been changing from pasturing to barn breeding to prevent the cattle from parasitic infection. Meanwhile, the number of sheep and goats has been decreased. Such a switch-over naturally involved a fodder problem which was basically solved by successful introduction of berseem in 1360. Once the fodder problem is solved, the regional farmers are expected to pay more attention to those works for improvement of cattle, increase in production of fodder crops and betterment of distribution of both inputs/outputs and processing. By taking a full advantage of its geographical and climatic conditions, the local farmers are rapidly changing their way of

cattle raising and poultry breeding into a more capital-intensive one: broiler facilities so far equipped in this Area stand for some 20% of the national total, and fattening of meat cattle becomes now prosperous by huge investment for facilities for large-scale raising.

The rural life has been improved remarkably with agricultural production and rural infrastructure improved. For instance, many farmers have rebuilt or newly built their houses, their roofing has been changed from grass-thatching to galvanized-iron sheet thatching, bricks or concrete blocks have been used as building materials, and the farm households have television sets, refrigerators, and some of them have motor bicycles or even mini-trucks. On top of the above, there have been such public facilities provided as mosques, meeting houses, and public baths, etc. Some farmers have bath rooms in their houses.

#### 4.1.2. Present Agriculture in the Project Area

As mentioned above, the regional agriculture has attained a surprising advancement within a short span of time of 20-25 years through a rapid socio-economic development on the national level as a whole. The present agricultural development in the Project Area may be summarized as paddy mono-culture with high potentiality for a complex management with animal husbandry. Under the given conditions, however, it seems that such a development trend is obviously approaching the maximum.

In other words, agriculture prevailing in this region now faces its critical productivity and, unless structurally innovated, the agriculture as a whole would tend to show a steady downward curve in future. The farmers who are eager to increase their income have not made efforts additionally to raise productivity but tried to hit their target by handling their products wisely through loopholes of the marketing system; for example, they try to grow the more marketable varieties at high prices than the higher yielding varieties, to control the marketing opportunity, and some of them intend to sell their rice even in mixing with similar varieties but low-quality rice.

Even now, however, there exists much room for agricultural improvement in the Area. For example, the MOA's survey reveals that there is a considerable difference in paddy yields between the local variety of Tarom by 2.2-4.7 ton/ha and Amol-3 by 5.5-8.3 ton/ha. And the pest forecasting and controlling systems have not been firmly established yet, inspite that the frequent pest occurrences are considered as the major cause. Or, no particular attention has been paid to prevention of losses in the post-harvest, especially in the milling process, although the farmers have an interest in increasing the unit yield of paddy.

In respect to animal husbandry, feed supply for broilers is dependent largely upon the imports from foreign countries and the regions outside the Project Area. The cattle raising as well

depends its condensed feed supply upon imports. The farmers in the Project Area, therefore, should make much more effort in every respect to increase agricultural production for developing the Area as the effective production area in the country, unless satisfied with their production to supply for the self-sufficiency in their own region only.

#### 4.2. The Role of Local Agriculture in the Iranian Agriculture

As mentioned in the para. 3.1.3, the agriculture sector has occupied more than 15% in the Gross National Products (GNP) while the agricultural products in the international trade balance have marked an extremely large over-import as shown in Table D.4.11. in Appendix. The table cited above illustrates that the imports of agricultural products in a period from 1356 to 1360 occupy about 15.5% of the national total imports.

The self-sufficiency rates of the major foods of Iran can not be clarified definitely due to shortage in necessary data for analysis, and the average values for five years from 1356 to 1360 are estimated based on the year-books for agricultural products and international trade by FAO to show the results in Table D.4.12. in Appendix.

On the other hand, however, the production of the major agricultural products, excepting some, has steadily increased. In comparison of the average values in taking each two years for 1352-1353 and 1360-1361 in a period from 1352 to 1361, the production of wheat was increased by 42.7%, barley by 101.7%, paddy by 22.0%, oil seed crops by 50%, pulses by 42.9% and potato by 230.8%, whereas the production of cotton was decreased by 52.4% and sugar beet by 11.6 percent, respectively. For some crops, there was extreme increase or decrease in production due to cropping conversion resulting from drastical change in prices of agricultural products, but it is judged from the data that efforts to the agricultural production increase has resulted in raising the production as a whole. In spite of such increasing trend in production, however, the imports of the agricultural products for each two years cited above are found increasing by 43.4% for wheat, 233.2% for barley, 429.1% for rice, 77.4% for edible oil and 346.2% for meat. It can be learnt clearly that the import dependency has become rather higher than before. It cannot be neglected that the food consumption increase comes largely from the per-capita consumption increase by income rise, in Iran, although undeniable by population increase in this respect. In particular, change in the dietary life is expected to increase steadily in demand of rice, meat, edible oil (vegetable oil in particular), etc.

The rise in dependency upon food imports has come to drive the Iranian economy into higher dependency upon petroleum income. The limited petroleum resources and the bearish tendency of oil price in the international market have suggested that the Iranian economy may face a fatal crisis. It is deemed quite pessimistic that the international trade balance of the Iranian agricultural products cannot be achieved by expansion of the economic scale. In other words, the meteorological conditions and increase in production cost have weakened the competitiveness of the Iranian agricultural products in the international market. Therefore, balancing of international trade of agricultural products cannot help depending upon

contraction of the economic scale; in a word, raising the self-sufficiency rate in farm products. The best way to raise the self-sufficiency rate is to make new reclamation which is able to increase the agricultural production drastically; however, there is very little possibility to realize the new reclamation in the country due to absolute shortage in the water resources. And economically, there will be no other ways than the improvement of farming techniques and increase in the cropping intensity in the best use of existing arable land.

In this view, the agriculture of the Project Area is considered to play the following roles in the total Iranian agriculture and the rules are described as below.

	Iran	Project Area	National percentage
Total Area	164,350,000 ha	105,220 ha	0.06%
Cropping Acreage (1361)	14,845,000	78,370	0.5
Irrigated Acreage "	3,465,000	72,610	2.1
Paddy Fields "	397,000	72,610	18.3
Rice Production "	1,098,000 t	370,000 t	33.7
Breeding Head of Cattle "	5,089,000 head	90,600 head	1.8
Total Population (1355)	33,708,744	304,710	0.9
Rural Population "	17,854,064	214,705	1.2

Further to the explanation, the Project Area occupies slightly over 18% in paddy cropping acreage and one third in the paddy production to the national total, although the land area and population of the Area are extremely small to the national total. Therefore, rise and fall of the paddy production of the Project Area will give a considerably large effect on the total amount of the national paddy production.

On the other hand, the rice production will be able to bring about rice bran oil as by-product. And there has been no rice bran oil production operated yet in Iran, and in taking into consideration the estimation that the annual consumption of edible vegetable oil is about 340,000 tons, 90% of which is imported, it is worthy to consider the way to utilize rice bran as edible oil resources.

When taking the production ratio of paddy to rice bran oil by 200:1, rice bran oil will be produced by 1,850 tons per annum. The amount of edible vegetable oil can be supplied with about 130,000 people on the estimation that the per-capita annual consumption of vegetable oil is about 14.2 kg in Iran.



As for cattle breeding, one head of cattle is kept by 3.4 persons in the Project Area, while by 6.6 persons on the national average. Therefore, the Project Area will be promising in breeding surplus head of cattle in simple terms of number of breeding cattle. Actually, however, the productivity of meat cattle and milk cows will be so low as not to meet even the local demand, and the further development of the animal husbandry in the Project Area seems to exist in availability for securing the feed resources.

Under the circumstances, the roles given to the agricultural production of the Area can be itemized as follows from the viewpoints of the aforesaid conditions and development potential of the Area.

- i) Paddy production of the Area can give so large effect on the national production as to make supplemental paddy supply to the regions outside the Area.
- ii) The rice bran to be produced as by-product can supply a part of edible vegetable oil.
- iii) The animal husbandry development with meat and dairy products as major items can meet the demand in the Area and furthermore, supply the surplus to the regions outside the Area.

The present conditions of the rural areas which are the base of the aforesaid development objectives, have been remarkably improved in the recent years as mentioned in the above para. 4.1.1. There have been, however, very few data available to prove such improvement substantially, and a comparison has been made on home economy in taking a model case each from Mazandaran Province and other area and the result is shown in Table D.5.1. in Appendix.

In details, the Mazandaran Province is ranked high in the country in terms of the income level and the Project Area is deemed most prosperous in the province. However, the income disparity between the urban area and rural area in Iran was found at 37.0% in 1356, 41.5% in 1358, and 51.4% in 1362, while that of the Mazandaran Province was found at 53.1%, 56.5%, and 71.5%, respectively, and the gaps between them have been filled up little by little. But there still remains a considerably large gap left. In respect to the expenditures, the disparity between the urban area and rural area in the Mazandaran Provinces was found at 44.7% in 1356, 55.4% in 1358, and 75.9% in 1362. It is learned clearly that the gap in the case of expenditures is narrower than that in the case of income. The home economy has a tendency to be pressed relatively.

In other respect, in Amol Shahrestan, the population of the age group between 20-39 years old occupies 45.3% of the population of age group over 15 years old in the rural area in 1345 and 44.4% in 1355. These figures indicate that the population of the working age has been in gradual decrease; in other words, the increase in the aged people in the working age group. The increase in agricultural production requires a qualitative improvement of labour force, for which the most energetic working group aging between 20 and 39 should be prevented from discharging to the outside areas.

According to the above, the following points are taken into consideration for directing the development of the Project Area.

- (1) to increase the paddy self-sufficiency rate by production increase,
- (2) to increase the self-sufficiency rate of edible oil by production increase in oil seed crops,
- (3) to increase the self-sufficiency rate of meat, and
- (4) to moderate the regional disparity between urban area and rural area.

The above four points should be taken into careful consideration and taken up as socio-economic goals for formulation of the development plan.

#### 4.3. Direction of Agricultural Development in the Region

##### 4.3.1. Reinforcement of Equipmental Devices

It is considered undeniable at present that agriculture will be a base for the economic development of the Project Area in the future, and the Paddy cropping will play a major role in the regional agriculture. The paddy cropping in the Project Area has been developed in depending upon the Haraz river as relatively stable water sources and in corresponding effectively to the discharge fluctuation of the river and meteorological conditions. And the improvement of farming practices and cropped varieties has helped to develop the regional agriculture in a great stride in a short term. Under the situation, the problems for further agricultural development in the Area will exist in raising the unit yield keeping the level of harvest as stable as and reducing the production costs to international market requirement as much as possible, since the expansion of the cropping acreages cannot be expected any longer. Consequently, there will be no other way to totally develop the agriculture of the Project Area than to start the consolidation of the fundamental farming facilities.

In details, it appears to be a limit in further improvement of the fields under the present land conditions and the start of water shortage in the Lar dam is expected to solve the problem of the irrigation water shortage. At the same time, the total area drainage will enable the existing wet fields to be dried up for two crops a year to be secured. Together with such improvement, land consolidation and farm mechanization will allow the present extensive agriculture to be converted into the so-called mechanized farming with various equipment and instruments applied. Both the farmers and Iranian authorities concerned have well recognized these matters already, and the farmers in the Project Area seem to have much expectation for implementation of this Project.

##### 4.3.2. Paddy-Livestock Combined Agriculture

Due to meteorological conditions in the Project Area it is difficult to have two paddy croppings in a year, and the local farmers will be able to have income increase only by market price hike of paddy, so far as they depend largely their income upon paddy cropping. Under the circumstances, the farmers' income, which may be increased to some extent by labour-saving by introduction of mechanized farming and increase in unit yield, will have to be increased only in depending upon price hike in the market, since there will be a limit in the effort to increase income through improvement of the farming works.

Only the way to increase the farmers' income with rice price controlled to low level, is to practise the multiple farming and to secure the labour opportunities in the Area throughout the year.

At present for securing the year-round labour opportunities, the farmers have to go out of their home for working in other areas in the sluggish time of the farming. Since, however, the labour demand for unskillful works is decreasing, there is a limit in the farmers' work-out in the sluggish season. Consequently, the year-round labour opportunity should be provided within the Project Area and not in the work-out in other areas. The Project Area, fortunately, will be promising in practising fodder crops growing and vegetables growing as the second cropping of the paddy, although the two paddy croppings a year is not expected therein. The fodder cropping is deemed to ensure the stable market to encourage the animal husbandry in a long term as well, although the vegetable cropping will involve some problems in selecting the highly marketable kinds of vegetables.

The bottleneck in introducing the second crop is inundation caused by rainfall in autumn and winter, in a word, ill-drainage in some low-lying land. But the on-farm development works with various facilities will provide a breakthrough of the bottleneck for the most parts of the ill-drained area. As a matter of fact, the high-lying area and a part of middle land can grow the second crop even at present. It is recommended in view of the above that the Project Area should be developed in a direction to keep the paddy cropping on one side and to encourage the animal husbandry on the other to carry out so-called the paddy-livestock combined agriculture.

#### 4.3.3. Systematized Agriculture

The paddy cultivation system in the Project Area appears to be consolidated to a reliable extent. The governmental agencies have been serving for development and diffusion of new strains/varieties, the agricultural inputs like fertilizers, chemicals, farming machines, etc., and the Agriculture Bank is crediting the required fund, while the rural cooperatives are serving for purchasing the daily necessities. And the rice milling and marketing have been practised on the commercial consignment basis. The study in details of the transactions, however, reveals that there is "absence" of farmers throughout the system. Although the high yielding varieties are encouraged to be cropped for production increase, there have happened some cases that the local varieties are profitable in the market because of absence of the policy for rice-price control. Or, it has been sometimes observed that the farmers suffer from selling the paddy of the high yielding varieties. In other cases, the farmers are compelled to be patient in poor harvest resulting sometimes from undue delay in farming works due to unavailability of purchasing import spare parts of farming machines or sometimes from inability of timely pest-control. The rural cooperatives are operated under the supervision of the authorities concerned, who select the items and sources of goods and materials to be distributed by the cooperatives. In many cases, the cooperatives are suffering from supplying those goods and materials not to meet the farmers' requirements. And the cooperative shops have been losing many cases especially in recent years.

In other fields, the milling factories have not paid any attention to milling yield and mixing rate of broken rice, although the rated milling cost never failed to be collected, and therefore, the farmers have been making dead efforts to selling/encashing their products, whereas the rice merchants have gained a considerable amount of profit by market price operation of rice.

For animal husbandry, the animal breeding system has not been completely established yet in the Area, and the seeds of berseem have not been secured sufficiently for successful fodder cropping. And yet, the feed processing techniques have not been effectively diffused. Only the artificial insemination has been operated by the MOA through veterinary services, but the results are far from satisfaction. Beef is in the market through the sales channel provided by the government-run slaughter houses.

Milk, however, has had no sales channels yet and the cow breeding farmers have peddled directly to consumers. Some farmers are running a large-scale cattle breeding, which has a problem in sufficiency in feeds to face difficulty in expanding the management scale.

The agricultural development in the Project Area shall be based on the combined agriculture with livestock farming, the sound development of which shall be ensured through recomposing the system of (procurement of agri-inputs)-(production)-(marketing)-(processing) with farmers as core of the system, and the successful achievement of such development will require the establishment and enhancement of the regional system for agricultural works.

#### 4.4. Issues on Agricultural Development in the Project Area

As mentioned in the above section 4.3., the agriculture in the Area seems to have come to the stage to require more advanced technology and more sophisticated system for successful farm management, but it is undeniable that there have been many issues still left to be solved for the purpose. Prior to discussing the "Development Plan" in Chapter 5, the relevant issues are referred to hereunder with agricultural aspect as major point and in view of the regional development.

##### 4.4.1. Issues on Resources Allocation

###### (1) Water resources

- 1) Rainfall in the paddy growth period from April to August, including nursery period, is about 177 mm, which occupies only 22% of the annual total and is far below the amount to be required for paddy growth.
- 2) The paddy cropping in the Area, therefore, depends largely upon the snowmelt runoff in the Haraz river, and groundwater is used as the supplemental water sources for cropping.
- 3) The development of groundwater, which has already come to the critical point is regulated in the alluvial fan around Amol area so as to secure the potable water in the Project Area, and the further development of groundwater cannot be expected for agricultural use. And, in the groundwater around the Area, there has been some fossil water found, which was developed by confirming the seawater in the process of alluvial plain formation. Such fossil water cannot be utilized as irrigation water due to high salinity concentration.
- 4) In the Project Area, the other rivers than the Haraz are so unstable in discharge as not to ensure the planned intake of water. Furthermore, mineral water is springing out in the catchment area of the Garma Rud which flows into the Kari Rud. Accordingly, the said runoff water cannot be used for farming in the irrigation period when the electric conductivity of the water rises. The inflow from the Garma Rud is small in comparison with the discharge of the Kari Rud and there will be no problem for farming in the Project Area as a whole. In the catchment area of the Garma Rud, the water quality of this river has become a serious problem for agriculture.

- 5) Although the water resource development is planned by the MOE for the rivers, excepting the Haraz river as mentioned above, the water resources available by development are planned to be used at the outside of the Project Area, and not expected to be used in the Project Area. Contrarily, the water available in the Haraz river system is expected to make supplemental supply to the regions outside the Area.
- 6) Under the situation, the water resources for the Project Area will have to be dependent largely upon the water of the Haraz river in future as well. As part of the development of the Haraz river, the Lar dam was completed but has not been in full operation due to leakage in the reservoir.  
  
When the dam is in full operation, the water allocation will be made by 160 MCM for Teheran municipal water supply, by trans-basin, and the remaining 240 MCM will be released to the Haraz river as irrigation water.
- 7) The water of the Haraz river, although free from quality problems, has a problem in water temperature by 10°C and below at the end of March as snowmelting season. Such low water temperature is a factor to restrict the timely cropping, and has caused about one month delay in paddy planting in high land area in comparing with that in low land area.
- 8) The suspended sediment in the Haraz river in the wet season has caused serious sedimentation in the irrigation canals, which has resulted in heavy burden for operation and maintenance of the canals.
- 9) Taking the aforementioned availability of water resources into consideration, the present irrigation water demand is deemed to be nearly to the limit. Therefore, the maximum allowable cropping area of Amol-3 which requires more water than local varieties is 80% of total paddy fields in the Project Area.
- 10) A comprehensive study of water resource development including the flood control of outside of the Project Area is required for the Babol river, the Garma Rud and the Alesh Rud. The flood control scheme which aims only the benefit of the Project Area will cause serious damages to the surrounding areas.
- 11) As for the problem of rising up of water level of the Caspian Sea, a comprehensive study to search the reason of water level rising is strongly recommended reinforcing the hydrological observation network, and appropriate measure shall be established analysing those results of comprehensive study.

## (2) Land Resources

- 1) There exist about 7,500 ha of the forest and ponds in the Project Area as the land available to development. The development of these kinds of land, however, should be prudently determined after careful study on availability of water resources, environmental conservation, land use plan, inland fisheries, and so forth. Actually, however, the expansion of the cultivable land cannot be expected in future, since the urban area has been sprawling into the rural area.
- 2) In respect to the soils, there are some hindrances caused by ill-drainage of the areas, and since the soils of most of the Area are limy with pH values more than 7.0, such macro or micro elements as phosphate, iron, zinc, etc. are changed from absorbables into unabsorbables to easily cause plants to fall into lack of these elements.
- 3) Since the areal expansion of cropping fields has come almost to the limit, there will be no other way to increase the cropping intensity through effective land use for production increase. The two paddy croppings a year in the Area, however, will be difficult due to meteorological conditions, and the successful development is depending on finding the suitable crops to the Area as second crop for paddy. The effective drainage of the fields in the autumn/winter rainy season will be essential for introduction of the second crops.
- 4) In the coastal sand dune, the farmland should be irrigated by specific methods like a drip irrigation against high permeability of the soils, although some problems rise in its economy.
- 5) According to the above factors, the development of the Project Area is dependent largely upon the qualitative improvement of the soils, mainly made by drainage improvement, and increase in the cropping intensity. It is necessary, therefore, to take measures for successful improvement works of these matters.

## (3) Labour Resources

- 1) At present, the paddy mono-culture in the Area has brought about a considerably large seasonal fluctuation of the labour demand. The census made in 1355 shows that the unemployment rate for working age group covering from 15 to 55 years old was 8.7% on the national average, while 35.8% in Amol Shahrestan and as high as 61.7% in Babol Shahrestan. The paddy mono-culture areas have been destined to show such labour trend in sluggish time of the farming works.



- 2) In the busy time, contrarily, the labour shortage has been serious; in particular, the transplanting and harvesting works have been carried out in highly depending upon the hired labour power not only from the Project Area but the outside regions. The farmers, thus, have been forced to pay unreasonably high wages for the hired labour.
- 3) The younger generation of the farmers has shown recently the tendency to avoid the concentrated hard works in paddy cropping and to turn to the semi-skillful works in the processing/manufacturing factories or transportation business. Such a tendency, however, suggests that the agriculture in the Area will be supported by the aged and result in productivity reduction.
- 4) The labour opportunity for non-agricultural sector is extremely rare in the Project Area, and the farm mechanization for peak-cut of the extremely concentrated labour demand or alleviation of heavy labour in the farming works may result in turning present potential unemployment into actual existence as well as may result in crisis to amplify the discharge of the younger generation to the urban area.
- 5) With the aforesaid contrastive problems and high population increasing rate, the Project Area is essentially required not only to increase the agricultural production but also to strengthen the agri-related industries and services to increase the labour opportunity.

#### 4.4.2. Issues on the Physical Conditions

Besides the aforesaid issues on water resources and land resources, the physical condition also causes such problems as large fluctuation of temperature and irregular distribution of rainfall. These problems are discussed as follows:

- 1) In the Project Area, the average temperature is 14.1°C and the minimum mean temperature is 8.9°C in April. And in May, the transplanting season, the minimum mean temperature is 13.4°C, and sometimes the low temperature with rainfall lasts for a considerable days to cause hindrance of paddy growth and decrease in yield.
- 2) In the growth period of paddy, the effective rainfall is not so much, and contrarily, for the late maturing varieties like Amol-3, the farming works are hindered when a comparatively heavy rainfall takes place in September, the harvesting season. In the years when the rainfall comes earlier in autumn, the paddy will be prevented from ripening completely due to shortage in sunshine, resulting in lodging easily.

- 3) Low temperature and rainfall in autumn and winter have hindered paddy from two croppings a year and restrict the suitable crops as second crops.
- 4) Such natural conditions provide a limit for the paddy cropping in terms of the timely cultivation, and the improved farming practice should be applied for overcoming the unfavourable physical conditions. Presently, the vinyl sheet-covered nursery beds are encouraged to protect seedlings from low temperature and have been diffused from the high land fields as well as at the low and middle land fields which need earlier sowing. A new improved variety as Haraz has also been under development for replacing the existing Amol-3 which is late-matured variety although high-yielding. The utmost effort should be made further for improving the farming practice and crop varieties.

#### 4.4.3. Issues on Socio-economic Conditions

The followings show the issues on the socio-economic conditions excepting labour resources.

- 1) With the Land Reform promoted in 1340s, most of the arable land in the Project Area was segmented and given to the farmers, but the segmentation of the farmland into small pieces under the specified acreage has been prohibited by the clause 19 in the Land Reform Law. In other respect, the Law stipulates that the selling and buying of the farm land is available only among the farmers. However, there are no records available on transfer of the land possession right for illegal land business for a quarter of a century due to keeping the matter in secret.
- 2) On the other hand, there are some illegal land reclamation observed even in the nationalized forest. Furthermore, as for the government-owned land given to the agri-business mentioned in the above para. 1.4.2.(2), the actual situation of the land after the abolishment of agri-business is not clear.
- 3) The water allocation has been made according to the vested water right before nationalization of the water resources, although some revisions are made on such vested right. Furthermore the relationship between amount of water available and existing cropping acreage is not necessarily clarified, and the facilities for water diversion have not been provided yet effectively. The water diversion, therefore, has been made mainly by experience.

- 4) Every issue as above might become hindrances for developing the Project Area although resolved on the case-by-case basis up to now without causing so serious problems.
- 5) The unspecified land right, for instance, will become a problem for land consolidation works requiring exchange and replotting of land as well as for fair distribution of water. And ambiguity of administrative boundaries would bring about difficulty in organizing the related farmers.

The cadastral maps, therefore, should be prepared and replotting of farmland should be carried out according to the said maps so as to make a sound development of the regional community of the Project Area in future.

#### 4.4.4. Issues on Cropping and Farm Management

##### (1) Paddy

- 1) Paddy cropping is premising the flowing irrigation under plot-to-plot irrigation in the Project Area. However, paddy needs different water requirement by its growing stages. It is necessary to control irrigation and drainage not only for satisfying water requirement but also for carrying out proper cropping management.
- 2) Although the high yielding varieties have been successfully bred and extended, the local varieties other than Tarom are also still cultivated in considerable large area in the Project Area. Research and extension on these varieties are not sufficient to gain higher yield from them.
- 3) The farmers use own-produced seeds except when introducing new varieties. In case of using own-produced seeds for many years, it will cause mixture of other varieties and seeds themselves will be deteriorated on quality such as original character and disease tolerance.
- 4) The farmers pay less attention to raising healthy seedlings and the cropping technique remains at the level of following traditional manner.
- 5) Although considering the difference on soil fertility by land, fertilizer application differs much by farmer on amount even for same variety and in same area. And, it is also necessary to reconsider to use DAP in top-dressing.
- 6) Potassic fertilizer is not dosed at all in the Project Area. Although the soil is considered to contain certain potassium or to be supplied with potassium naturally, it is necessary to examine physico-chemistry of the soil and fertilizer dosing and to clarify whether potassium is

necessary or not after completing well drainage by land improvement from a long term viewpoint.

- 7) Transplanting is practised by random planting in the Area. The random planting has problems of uniformed growth of paddy and on effective farm management from a viewpoint of planting density.
- 8) The survey, forecast and timely control have not been practised yet successfully for pest control.
- 9) There is a considerable difference in yield in the same varieties in the same area. The major reason seems to be the absence of the organical pest control system in the Area.
- 10) Paddy transplanting and harvesting raise the labour demand to the peak; however, there has been no effective mechanized farming system established yet to meet the requirement.
- 11) Post-harvest treatment method and technology are still at a low level. And there have not been any adequate counter-measures taken yet for milling yield resulting from broken rice/powdered rice by over-drying. On the other hand, the farmers themselves have paid little attention to these problems.
- 12) More technology-intensive farming should be introduced for unit yield increase. The careful studies should be made on seed multiplication method, precise puddling, appropriate density of transplanting, thorough weed control, timely irrigation, soils problem, selection of varieties amount of fertilizers, soil improvement by drainage, etc.
- 13) Increase in cropping acreage of Amol-3 should be determined after careful study of the existing water resources available to such expansion of Amol-3 cropping.

## (2) Upland Crops

- 1) The adequate cropping acreage of upland crops should be ensured to meet the demand of the Project Area. A careful study should be made on selection of suitable varieties, most economical cropping patterns, establishment of marketing system in the Area together with efficient system to supply seeds, chemicals and fertilizers, and so forth.
- 2) A careful study, research and experiment for upland crops as second crops of paddy should be made and the results should be successfully diffused among farmers.

- 3) Since the agriculture in the Project Area has been promoted generally in centering around the paddy cropping, the research, experiment and extension works have been considerably delayed on upland crops. And these problems should be restudies thoroughly from the viewpoints of expanding labour opportunity and securing it throughout the year.

(3) Tree Crops

- 1) Citrus fruits have been introduced remarkably, but there are not a few cases observed that the citrus trees are grown in the excessively moistured land and yet, the pest control has been practised insufficiently only.
- 2) The tree crops improvement should be restudied from the viewpoints of the crop suitability to the soils as well as the upland crop improvement.

4.4.5. Issues on Animal Husbandry

(1) Cattle

- 1) The productivity of local species in milk and meat is very low because of long calving interval of about 24 months and low calving rate.
- 2) The mortality rate is high due to malnourishment caused by disproportion in nutrients intake and shortage of forages, and resulting from animal diseases, especially parasites.
- 3) Improvement of breeding by artificial insemination and introduction of berseem as second crop have been endeavoured to improve and solve the aforesaid problems. For the purposes of stable supply of feeds and improvement of animal health control including veterinary services and prevention of epidemics, improvement of facilities and equipments are necessary.
- 4) Improvement in marketing system such as milk collecting and processing is also necessary to promote milk cow breeding.

(2) Sheep and Goats

- 1) Sheep and goats are bred generally in the coastal area in a small-scale and at the mountainous area in summer, and stubble grazing in the paddy field by scores of sheep and goats are observed but in any case nutritive conditions are notably poor.

- 2) Judging from the absolute shortage of forage resources and feeding situation which compete with cow breeding, it is considered difficult to develop sheep and goat breeding in the Project Area in the future.

### (3) Poultry

- 1) The industrial poultry farms have been increased in number but the production cost is high because of using expensive imported feeds, and furthermore, chick production can not meet the demand.
- 2) Low productivity of local poultry.
- 3) It is necessary to study carefully poultry industry to clarify which is more profitable industrial farm or yard breeding in farm households as side job.

### 4) Forage Resources

It is considered that the major constraint in animal husbandry in the Project Area is difficulty in securing feed resources; therefore, it will be necessary to introduce forage crops as second crop in paddy fields and to study suitable and efficient utilization method of agricultural by-products such as rice straw, chaffs and the like. In other respect, based on the results of experiments on those matters, it is needed to make improvement of facilities' size and to strengthen extension services.

## 4.4.6. Issues on Agricultural Infrastructures

### (1) Irrigation Facilities

- 1) A thorough study on the water balance of the beneficial area in the Haraz river basin should be made including the existing Lar dam and other related facilities, and a prudent consideration should be given to surplus water allocation to the peripheral areas from the viewpoint of effective operation of the facilities. It is proposed as a plan that the observation network should be provided for the discharges of those rivers of Alesh, Haraz, Babol, Talar and other small rivers in the Area, and the facilities should be operated rationally through the concentrated control of the network.
- 2) In the case that no water allocation is made from the Haraz river system to the peripheral areas, it does not need to construct the headworks across the Haraz river, but in the case contrary to the above, the headworks should be provided.

- 3) The water distribution in the Project Area, which has been made in experience of the mirab, is not always carried out appropriately to cause the water shortage in the middle and low lands. Appropriate water distribution requires to prepare the precise irrigation system maps, elaborate water distribution plan based on the maps, and construction/improvement of necessary intake/diversion facilities.
- 4) While the present irrigation in the Project Area has maintained a rather high efficiency by recycle water use and plot-to-plot irrigation method, there are some inconveniences arisen in delay in water supply to the downstream fields, untimely water supply to mixed cropping district to cause hindrances for harvesting of early matured paddy. Therefore, a careful study will be required on the both aspects of farm management and facilities so as to secure the most effective and efficient water resource utilization.
- 5) The existing canals are in the state of the natural water ways having irregular cross-sections. Under the conditions, the maintenance cost becomes high for removing weeds and sedimentation. Since such maintenance works have been practised by beneficiary farmers' voluntary labour, this matter is not considered as a serious problem at present. But when the through-the-year farming works come to be practised, this may become a serious problem. As for removal of sedimentation, a careful study should be made on possibility to provide a settling basin closely to the diversion point at the Kari Rud.
- 6) There are more than 200 ponds dotted (water surface area: about 3,800 ha in total) in the Project Area. Most of ponds, although playing a role of regulating ponds for irrigation water supply, are covered thickly with weed and shallow in water; consequently the irrigable areas commanded by these ponds are small in acreage as compared with their water surface area. The effective utilization of these ponds should be thoroughly studied including the environmental preservation problem.

(2) Drainage Facilities

- 1) The Project Area provides the irrigation systems in concurrent use for drainage in presumption of the paddy mono-culture in the Area, and the canals exclusively used for drainage can be found only in the downstream of the Area. Taking into consideration the effects of drainage on soil improvement and introduction of the second crops, an essential study should be made on providing the drainage canal system for the middle and low land areas.

- 2) The drainage plan should be made in paying a careful attention to avoid a large scale modification to the existing irrigation system as well as to maintain the considerably high irrigation efficiency at present even after implementation of drainage works.
- 3) The surplus water in the Project Area has been drained into the Caspian Sea after flowing through the sand dune areas. Since there is a sufficient difference in elevation between the Project Area and the Caspian Sea surface, the river mouth closure by sedimentation has not been observed therearound. But flying sands have caused some sediments in the courses of the drainage ditches with small discharges. And it is required to take proper countermeasures for such sediment.

### (3) Farm Roads

- 1) The existing roads linking villages are rather densely provided, but in many places, large-size farming machines have been prevented from passing through and yet the maintenance works for the roads have not been rendered satisfactorily.
- 2) There are only a few farm roads found in the field with less than 2.0m wide. Under the situation, the power tillers have accessed to the working fields in crossing through the other fields and the agri-chemicals have been sprayed with shoulder type sprayers for pest-control.
- 3) Although the proposed land consolidation will provide the farm roads at the on-farm level, the consolidation of the village roads is considered as the premise for the successful introduction of the farm mechanization in future.

### (4) Land Consolidation

- 1) The farmland readjustment carried out in the Area at present is a mere farm plot expansion, and provision of farm roads and irrigation/drainage facilities has not been taken into consideration.
- 2) Although the farmers have interest and expectation in execution of the land consolidation, it is essentially required to make dead and time-consuming efforts for having a consent with farmers concerned about land losses, replotting, exchange of lands, allocation of construction costs, etc. On top of the above, a prudent study should be made on the utilization of the farmers' own funds for these works.



- 3) There are no design standards available to paddy field land consolidation, and few experts in the line are available in the country.

#### 4.4.7. Issues on Farmers' Organization

Almost of all the farmers in the Area have been the members of the rural cooperatives because the Land Reform Law stipulates that every farmer shall become a member of the rural cooperatives. But, for much better utilization of the existing cooperatives as farmers' own organization in the future regional development, the following matters should be restudied carefully.

- 1) There is a considerable difference in the number of the member farmers among cooperatives.
- 2) Some cooperatives are not composed of villages in neighbourhood each other, and such cooperatives will face inconvenience for carrying out the cooperative farming works.
- 3) Most of the activities stipulated in the Articles of the cooperatives have not been performed actually. This may be affected largely by the policy of the Central Organization of the Cooperatives.
- 4) Now is the time to give training and development of the core personnel of the Cooperatives (including the staffs in the Central Organization as well) again and to expand the field of the cooperatives' activities for revitalization of the organization.

#### 4.4.8. Issues on Promotion of Rural Industries

Although there are a variety of industries operated in the Project Area, many of them have not studied carefully the local conditions and the economic feasibility. The rural industries have been encouraged inevitably so as to secure the employment opportunity in the Project Area. The further encouragement, however, requires to study the following problems carefully.

- 1) The policy for the rural industry development is executed unsteadily. As far as the industries should have permission from authorities concerned on their operation, the authorities should take necessary measures for supply of materials and other requirements for their successful operation, once operation is authorized.
- 2) For industries which depend the raw materials supply upon the regions outside the Area, the detailed study should be made on the local conditions. And it is desirable, in principle, that the industries to be operative with

materials available within the Area. At present, however, it is regrettable that the study on this matter has not been advanced yet. The General Department of Industries as an authorization agency for industries, and the General Department of Agriculture should take the necessary countermeasures in full cooperation with other related organizations and agencies.

#### 4.4.9. Issues on Agricultural Administration and Supporting Services

##### (1) Agricultural Administration

- 1) There is a certain imbalance observed between the technological improvement and administrative staffing in quality and quantity. In particular, the shortage in the staff is critical in the field of agricultural infrastructure improvement works.
- 2) An organical disunification is observed, to some extent even in the terminal parts as the residual symptom of the division and reunification of the organization between 1340s and 1350s. However, this problem will be solved by the Agricultural, Rural and Tribal Service Center.
- 3) Administrative coordination has not been successfully made between technological aspect and rural society aspect; especially, the coordination and cooperation should be enhanced between the cooperatives as farmers' organization and other organizations.
- 4) The Water Law stipulates that the water conveyance shall be made under the control of the MOE, while the water distribution under the control of the MOA. Ambiguity, however, in definition of Conveyance and Distribution has caused disorder in the water management with responsibility limit unclarified. Furthermore, such disorder in water management may become a problem in the agricultural infrastructure improvement works in the future. Under the circumstances, the limit of responsibility for conveyance and distribution should be defined as their commanding acreages.
- 5) An elaborate study should be made on the new effective and functional organization on the basis of the existing organizations so as to ensure the successful development of this Project and smooth operation and maintenance services of the facilities in the future.

(2) Agricultural Research and Experiment

- 1) Survey and research on infrastructural works of irrigation/drainage, soil improvement, land consolidation, etc, together with the statistic analysis of their results are a little behind the progress of the farming practice.
- 2) The socio-economic study has not been made sufficiently on agriculture and rural community. Besides, the classification and arrangement of the various statistics are made insufficiently both in quantity and quality.

(3) Agricultural Extension Services

- 1) The extension services, although rather well established institutionally, have some limitation in their substantial activities due to budgetary problem.
- 2) In Amol Shahrestan, only 15 extension experts and crew cover all the area and among them, especially, only two are living in the rural area to serve for the farmers. The extension services unrooting in the rural life are not expected to give substantial effects on the practical farming.
- 3) The extension services should correspond to the change of the technological and socio-economical requirements, but at present, the appropriate countermeasures have not been taken yet for the purpose.

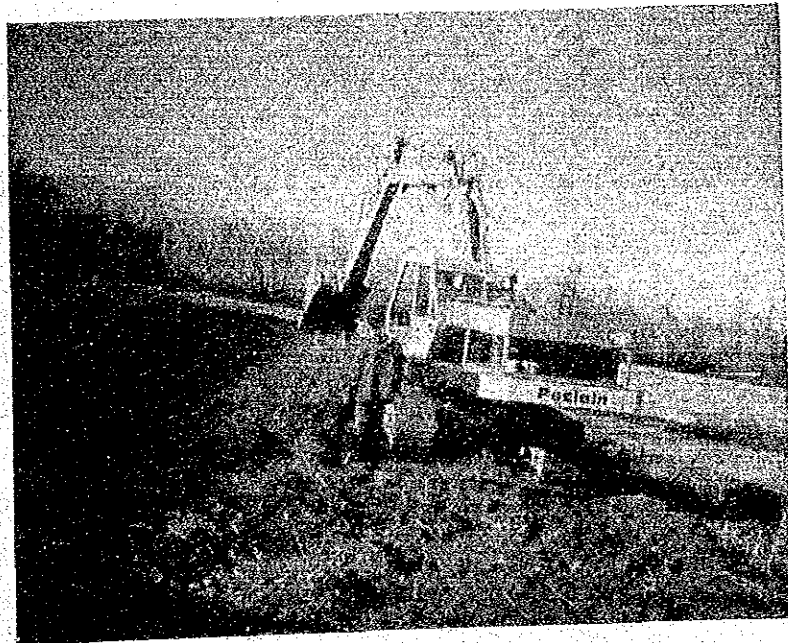
(4) Agricultural Financing

The Agriculture Bank has been serving for agricultural crediting for farmers, and besides the above, the Ostan Bank is in a position institutionally to give credit to the farmers when their purposes for crediting are acceptable. But recently, the agricultural credit is in a trend of decrease.

The Agriculture Bank majors to give loans to the farmers, having a little power to absorb the fund money. The Project Area seems to have a considerably large capacity of capital supply, but it will be necessary to provide the ability to absorb the amount of fund money from farmers.

## CHAPTER 5.

### DEVELOPMENT PLAN





## CHAPTER 5. DEVELOPMENT PLAN

### 5.1. The Principle of Development Plan

#### 5.1.1. The Status of Agriculture in the Regional Development

In the Project Area, there is not any factor for providing drastic impact on the development of the region such as utilizable mineral resources and/or vast un-cultivated arable land which will promise rapid increase of agricultural production. On the other hand, as explained in the para. 1.3.2 above, the rate of population growth is still very high, and the ratio of farming population is considerably high as explained in the para. 1.3.3. Therefore the development of Project Area have to be based on the agriculture without any other choice, and the regional development will be proceeded in such form as improvement of agricultural and social basis to pursue the direction of agricultural development explained in the Section 4.3 above.

Meanwhile, the introduction of advanced technology in agriculture can not avoid the problem of occurrence of surplus labour due to mechanization of farming practice beside of increase of productivity. In case the agriculture is simply supported from political points of view neglecting the effort of rationalization of production, the expected choice will be either increase of financial pressure to the government or poverty of consumer's home budget due to increase of price of agricultural products, and the change of policy on agriculture at the time will cause the poverty of rural area. The present paddy-cultivation in Iran, though, is supported with the increase of yield/ha based on the effort of improvement of cultivation practice and the policy of high rice price, but it ought to appraise that the economical base of paddy cultivation in Iran is rather weak. In case that the cutting-down of the home produced rice price of extraordinary expensive is attempted by means of importation of cheap foreign produced rice, the damage to the paddy cultivation farmer will be *too serious* under the present farm management and/or marketing system, and such attempt will possibly cause the sudden drop of production of rice and increase of farmers who give up farming.

The regional development based on the agriculture which depend on the limited land resource, is always accompanying 2 faced factors of increase of production with stabilization of production cost by mean of introduction of advanced technology and rationalization of production practice on one face, and occurrence of surplus labour on the other. In case there are some industries which can absorb the surplus labour, the problem will not be serious, but the promotion of industries in the Project Area is also considered rather limited.

### 5.1.2. Basic Considerations of Development

Taking into account the problems mentioned in the above paragraph as well as the mooted points in the Section 4.4 above, the potentiality of development of the Project Area shall be searched, but the basic considerations of development will be as below:

- (1) The increase of rice production shall have the highest priority in the development under such understanding that the position of rice is neither a local food nor a food of taste as it was in a quarter century ago in Iran, but the rice is a semi-staple food nowadays.
- (2) As the method to achieve the increase of rice production, the increase of yield/ha by means of application of intensive farming practice shall be endeavored considering the limited land resource and existence of potential surplus labour despite of seasonal labour shortage at present.
- (3) Considering that the present situation of the income of farming family is mostly depending on the paddy cultivation, the stabilization of production cost of rice as nearly to the international market price of rice as possible shall be necessary by decreasing the ratio of dependency on paddy cultivation. To achieve such target, through-the-year workable system shall be applied by increasing the cropping intensity as much as possible.
- (4) To absorb the surplus labour which will be increased due to the mechanization of farming practice within the Project Area as far as possible, the expansion of employment opportunity by means of moderating the difference between rural and urban areas for promotion of rural industries, reinforcement of social services and other measurements shall be considered.

In accordance with the aforementioned basic considerations, the possibility of development of the Project Area is studied in this Chapter from the three directions of Improvement of Agricultural Basis (Land Improvement), of Farm Management Practice (Agricultural Production Increase) and of Rural Infrastructures (Rural Life Environmental Improvement).

## 5.2. Land Improvement Scheme

The subjects of the land improvement scheme are 1) to remove the obstructive factors, 2) to improve the facilities for levelling up their standard to necessary level and 3) to provide the necessary facilities to develop the potential resources, for progressing the equipmental agriculture and increasing the productivity in the Project Area.

For that, at first, it is necessary to grasp the needs exactly and properly. Subsequently, economical justification has to be examined on the degree of satisfaction of social needs and the required cost. Since the social needs will predictively change qualitatively and quantitatively, the works should conform to those changes as much as possible.

From above points of view, the land improvement scheme has to be established.

### 5.2.1. Improvement Targets

The final picture of Land Improvement will be well arranged farm shape with well controlled irrigation and drainage system as well as sufficient farm road networks to ease the farming activities and to rise up land utilization. For these, following improvement targets are set up, taking into consideration the problems concerning to the agricultural development in the Project Area.

#### - Drainage Improvement Targets

Drainage improvement targets are set up to mechanize the paddy rice farming and to introduce second crops by means of providing the terminal and the main drainage networks.

#### - Irrigation Improvement Targets

Irrigation improvement targets are set up to provide the intakes and the division works for proper water distribution to use the limited water resources efficiently, to provide the settling basins to mitigate the labour for maintenance, to improve the abbandans and the canals as necessary. Though, a drastic measure such as realignment of the existing main irrigation canals are not necessary, the intakes of the small secondary irrigation canals are to be positively unified.

#### - Terminal Improvement Targets

Terminal improvement targets are set up to increase the farming performance by mechanization of paddy rice farming, to manage irrigation and drainage properly and to introduce second crops by means of the land consolidation. The land consolidation will be performed by each 110 ha as standard.



- Reclamation  
Reclamation of the abandoned and the forest will not be considered due to limitation of the water resources. When marginal water resources are occurred due to decrease of irrigation demand by urbanization of farmland and other changes, the reclamation may be considered.

#### 5.2.2. Drainage Improvement

##### (1) The Matters to be Considered on the Drainage Improvement

For establishing the drainage improvement scheme, the following are to be considered:

- to keep the present high irrigation efficiency also in future to save water resources.
- not to change present water management system drastically.
- scheme to be acceptable by farmers, that is, the effects of the drainage improvement to be appreciated by farmers.
- retarding basin to be provided to reduce the surface drainage rate, without severe restrictions on future land use.
- dual usage of the present main irrigation canals as main drainage canals is not acceptable except in the low land, because most of main irrigation canals are flowing on the higher relief formed by the sedimentation and the villages are restricting the enlargement of these canals.
- separate drainage of the high land is not considered due to severe effects on the springs and the present water management system cutting the present irrigation networks, because the separate drainage route will be selected along the tail of high land to the Haraz river. Application of separate drainage into the Babol river is not easy, because the Babol river has a severe problem on its flow capacity during flood.

##### (2) Causes, Restrictions and Countermeasures

Though the causes of poor drainage are mentioned in the above section 4.4, the restrictions and the countermeasures are summarized as follows:

	Causes	Restrictions	Countermeasures
a)	Rainfalls in early autumn (August - September)	...Restriction on harvesting	... Provision of drainage canals.
b)	Rainfalls from autumn to winter.	.. Restriction on second crop introduction due to ill-drainage in the middle and the low lands.	Control of the sub-surface groundwater as well as drainage canal provision.
c)	Floods from the Babol river, the Alesh Rud, the Garma Rud and the Karan Rud.	... Restriction on the second crops.	... Provision of comprehensive flood control.
e)	Irrigation-cum-drainage system.	... Restriction on drainage capacity.	Increase of drainage rate keeping high irrigation efficiency as well.
f)	Plot-to-plot irrigation system.	... Restriction due to deep inundation and low drainability.	... To separate drainage from irrigation at terminal level where ground slope is insufficient.
g)	Enclosing by the coastal sand dunes.	... Restriction on the drainage channels.	... Unification of the channels or transform to the culverts.
h)	Rising of the Caspian sea level.	...No restriction at present.	... Provisionally expecting to rise to the recorded highest level EL-25.3 PDG.

Among above matters, careful further studies are greatly necessary on items c) and h).

### (3) Drainage Improvement Measures

Drainage improvement measures are to be considered separately on the area drainage and the terminal drainage.

It is difficult to separate exactly the drainage effects by the area drainage and the terminal drainage. Separation of the effects will need further quantitative study on drainage including the effects by flood control and protection. Since this study is not examining the flood control, the effect of flood control can not be estimated. Besides, the effect of the flood protection from the Babol river and the Garma Rud which is studied in this study is counted in the effect by the area drainage.

The criteria of effect allocation on drainage are qualitatively as mentioned below for this study:

#### Effects Allocation Criteria of Drainage

<u>Drainage Effect</u>	<u>Reason on Allocation</u>	<u>Terminal Drainage</u>	<u>Area Drainage</u>
Dissolution of inundation to paddy	Dissolution of inundation during paddy growing. The areas effected: 2Rd, 3Rd	50%	50%
Mechanization	Since improvement of soil bearing capacity depends mainly on the terminal drainage, all effects on mechanization in the middle and low land come into the terminal drainage	100%	0%
Second crop introduction	For introducing the second crops, sub-surface groundwater control is essential. Sub-surface groundwater control depends mainly on the terminal drainage particularly on the tile drainage. However, the area drainage plays very important role on surface drainage during heavy rainfall. Therefore, the allocation will be 7 on the terminal drainage and 3 on the area drainage.	70%	30%

Note: Detailed computation is presented in Table E.1.9. in Appendix E.1.

#### 1) Terminal Drainage

Terminal drainage will be implemented within the works of land consolidation by each 110 ha as standard and the terminal drainage ditches will be provided at an interval of 200 m to 400 m. It aims to drain the ponding water and the excess rain during harvesting time to make paddy fields in dried condition and to lower the subsurface

groundwater level for introduction of the second crops. In the middle and low land, the terminal drainage will be separated from irrigation.

Since the most severe drainage is required in the second crop season because of draining the heavy rainfall and the sub-surface groundwater, design criteria of the terminal drainage are made to satisfy the drainage in this period. Berseem which is proposed as a main second crop grows well in the heavy soils and is supposed to grow even under the high sub-surface groundwater because of short main roots of about 25 cm.

Consequently, the criteria of the terminal drainage are set up as follows:

#### The Terminal Drainage Criteria

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Surface drainage	:	to drain the probable 1/10 year daily rainfall (130 mm) within a day.
Sub-surface groundwater	:	to be maintained below 20 cm from the ground surface.
Depth of the drain ditches:		1.2 meters in the middle and the low lands.

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Above surface drainage is equivalent to the rate of 15 lit/sec/ha. On the other hand, no tile drainage may be required when the terminal drain ditches are provided at each 200 m interval in the areas where the soils have high hydraulic conductivity of about  $K = 1 \times 10^{-2}$  cm/sec as discussed in the Section E.1.2.3 of Appendix E.1. The common hydraulic conductivity is, however, estimated at about  $K = 5 \times 10^{-3}$  cm/sec in the middle and low land, accordingly the tile drainage is proposed as a rule at 50% of the land considering the land use for the second crops. The standard interval of tile drains will be 60 m considering the permeability in the area. As a countermeasure to the increase of percolation due to introduction of tile drainage, it is necessary to provide the check structures in the terminal drain ditches as necessity to control the drainage water level during irrigation period.

The terminal drainage will be implemented within the works of land consolidation after completion of the area drainage in the middle and low land. The following effects are expected by the terminal drainage.

Table 5.2.1. The Effects by the Terminal Drainage

(Unit; ha)

Effects	Haraz Left Bank Drainage Area			
	High Land	Middle Land	Low Land	Total
Dissolution of Inundation to Paddy	0	400	2,615	3,015
Mechanization	0	8,930	9,020	17,950
Second Crop Introduction	2,350	5,280	5,030	12,660
	Haraz Right Bank Drainage Area			
Dissolution of Inundation to Paddy	0	4,450	5,610	10,060
Mechanization	0	18,160	12,080	30,240
Second Crop Introduction	1,820	11,630	6,440	19,890
	Whole Project Area			
Dissolution of Inundation to Paddy	0	4,850	8,225	13,075
Mechanization	0	27,090	21,100	48,190
Second Crop Introduction	4,170	16,910	11,470	32,550

Note: Details are shown in Table E.1.9 of Appendix E.1.

## 2) Area Drainage

The area drainage will be the areal drainage network to drain the excess water from the terminal drainage immediately into the Caspian Sea. The area drainage will be provided for draining the areas more than 110 ha and will have the effects on the dissolution of 50% of inundation and the introduction of the second crops in 30% of the middle and the low land.

### (a) The Floods to the Project Area

The area drainage should be established considering not only the inner excess water but also the floods into the Project Area. As studying the floods in Appendix A.2.4, the major floods are the overtoppings from the Babol river, inflow from the Kari Rud mainly caused by the flood of the Garma Rud, and overflow of the Alesh Rud which mostly occur from autumn to winter. The floods of the Haraz river occur in different period from the above rivers, because the floods of the Haraz river are caused by the snowmelt from May to June.

The Babol river and the Garma Rud have a possibility on flood control as a function of those dams which are proposed for water resource development of the two rivers. On the other hand, the Alesh Rud should also be studied on the flood control as well as the water resource development.

The plan should be established to avoid the intrusion of floods into the Project Area as much as possible. The countermeasures to the floods are summarized as follows:

Table 5.2.2. The Countermeasures to the Floods

Floods		Area Damaged	Countermeasures
<b>Haraz River</b>			
Flood Period	: Irrigation Period	Inundation in the middle and the low land, but the damages are not serious due to spreading in large area.	Flood mitigation by the Lar dam (118 cms) as well as controlling the flood intrusion by the intake to be installed at the heads of the secondary irrigation canals.
D.A.	: 4,086 sq.km		
Recorded Max	: 311 cms		
Probable 1/10yrs	: 208 cms		
Non-damage	: 150 cms		
Flood Intrusion	: 5.01 MCM		
<b>Babol River</b>			
Flood period	: Non-irrigation Period	Kari Rud Command	Flood protection dike of 20.5 km in length is proposed on the left bank of the Babol river. When without the dike, though the excess water can be drained within one day, floods will cause the damages on the agricultural infrastructures and the second crops on the courses of floods.
D.A.	: 1,430 sq.km	Paddy Fields	
Recorded Max	: 700 cms	Uplands/Orchards	
Probable 1/10yrs	: 370 cms	Villages	
Non-damage	: 300 cms	Fallow Land	
Flood Intrusion	: 6.05 MCM	Abbandans	
		<u>Total</u>	
<b>Kari Rud</b>			
Flood Period	: Non-irrigation Period	Kari Rud Command	Floods are to be released to the floodway through the waste way at Zahed Koila village. The area drainage will be able to drain the flood intrusion as estimated.
D.A.	: 120 sq.km	Paddy Fields	
Flood Intrusion	: 0.79 MCM	Uplands / Orchards	
		Villages	
		Fallow Land	
		Abbandans	
		<u>Total</u>	
<b>Alesh Rud</b>			
Flood Period	: Non-irrigation Period	Haraz Left Bank Command	River training will take the cost not corresponding to the benefit. River training should be studied together with the possibility of multi-purpose dam. In this study, introduction of the second crops is not proposed in the areas flood by the Alesh Rud.
D.A.	: 312 sq.km	Paddy Fields	
Flood Intrusion	: Not clear	Forest	
		Villages	
		Abbandans	
		<u>Total</u>	

The careful further studies are necessary on the above countermeasures except for the Haraz river to establish the comprehensive flood control plan as well as water resource development plan. The flood protection dike on the left bank of the Babol river will need to assess the effects to the villages along the river and Babolsar locating in the lower reaches of the river.

(b) The Area Drainage

Taking into consideration the matters mentioned in the para. 5.2.2.(1) and the countermeasures to the floods, the area drainage is proposed as follows:

- The area drainage will drain the excess water from the terminal drainage having 110 ha of standard acreage.
- The main drainage canals will be provided in the middle and the low land. No provisions are proposed in the high land.
- The main drainage canals will be operated as the irrigation-cum-drainage system to maintain the high irrigation efficiency during irrigation period, and as the exclusive drainage system during non-irrigation period.
- The main drainage canals will be provided to link the abbandans to reuse the return flows through abbandans during irrigation period, and to use the abbandans and the depressed paddy fields as the retarding basins during non-irrigation period.
- The main drainage canals will be newly constructed as a rule in the middle land. On the other hand, the existing canals will be also utilized in the low land.
- It is proposed to unity the small drainage channels crossing the sand dunes along the coast.
- The main drainage canals are to be excavated from the low land to the middle land. The terminal drainage will follow the construction of the main drainage canals.
- The maintenance roads (width : 4 m) are to be provided along the main drainage canals to reinforce the road network in the area.

The proposed network of the area drainage is shown in Exhibit 5.2.1. The major features of the area drainage are summarized as follows;

Table 5.2.3. The Major features of the Area Drainage

Features	Haraz Left Bank Drainage Area			Haraz Right Bank Drainage Area			Total
	Middle Low		Total	Middle Low		Total	
	Land	Land		Land	Land		
Length of the Main Drainage (km)	80.4	111.0	191.4	159.1	160.2	319.3	510.7
Surface Drainage Rate (mm/hr)	3.6	3.6	-	3.5	2.3	-	-
Retarding Basins *1) (ha)	1,130	1,150	2,280	1,540	2,280	4,420	6,700
Ratio of Retarding Basins *2) (%)	12.7	12.7	12.7	8.5	23.8	14.6	13.9

Note: Facilities are detailed in the para. 5.5.7.

\*1) The area of depressed paddy fields used as the retarding basins.

\*2) The ratio of the retarding basin (\*1) to the whole paddy fields.

The expected effects by the area drainage is summarized as follows:

Table 5.2.4. The Effects by the Area Drainage

Effects	Haraz Left Bank Drainage Area				Haraz Right Bank Drainage Area			
	High	Middle	Low	Total	High	Middle	Low	Total
	Land	Land	Land		Land	Land	Land	
Dissolution of Inundation to Paddy	0	400	2,615	3,015	0	4,450	5,610	10,600
Second Crop Introduction	1,010	2,260	2,150	5,420	780	4,980	2,760	8,520

Effects	Whole Project Area			
	High	Middle	Low	Total
	Land	Land	Land	
Dissolution of Inundation to Paddy	0	4,850	8,225	13,075
Second Crop introduction	1,790	7,240	4,910	13,940

Note: ref. para.E.1.2.9 in Appendix E.1.

Note:

Although the high land will not have the main drainage canal, many of those canals passing through the high land will be improved as irrigation-cum-drainage canal at the low and middle land, therefore, the discharge capacity of canals at the high land will be increased and, accordingly, the control of inundated water will become easier.



### 5.2.3. Irrigation Improvement

#### (1) The Matters to be Considered on the Irrigation Improvement

For establishing the irrigation improvement scheme, the following are to be considered as well as matters mentioned in the para. 5.2.2. (1).

- The present irrigation facilities are being effectively operated in their own ways.
- The water release from the Lar dam will be limited within 240 MCM to the Project Area. The water resources are to be utilized effectively within this limitation.

#### (2) The Countermeasures to the Problems on Irrigation

Though the problems on irrigation are described in the Section 4.4, the followings are the countermeasures to them;

<u>Problems</u>	<u>Countermeasures</u>
a) Water allocation including the adjacent areas.	The water allocation has to be established considering the comprehensive evaluation and the water balance of the water resources by the basin. For this purpose, the observation networks of hydrology and meteorology shall be reinforced taking the future water management and operation systems into consideration. The water allocation, however, is not examined in this study.
b) Present irrigation demand almost reaching the upper limit.	Establishing the optimum land use and water use limiting the area of Amol-3 at 80% taking the limitation of water into account.
c) Abolishment of the abbandans.	Abbandans remain so that the water resources are not to be reduced.
d) Improper water distribution.	Clarifying the existing irrigation network and establishing the irrigation plan taking the irrigation area, cropping ratio by variety and cropping pattern into consideration. And, changing the present water management to the quantitative water management under the observation network proposed in a) providing the intakes and the division works as well as improving the canals as necessity.

Problems	Countermeasures
e) Low temperature of the Haraz river flow.	Since rice planting is delayed due to low temperature in the high land, the water warming facilities have to be introduced taking the cold resistance into consideration. When hastening the planting, the water resources can be used efficiently, because runoff water in early flood period becomes useful. It will be also important subject to research the varieties having cold resistance.
f) Maintenance of the irrigation facilities.	Realignment of the main irrigation canals is not recommended taking the affections to the existing water management organization, the present efficiency of the existing facilities and the cost-benefit into consideration. Consequently, sedimentation should be mitigated as well as improvement proposed in d).
g) Plot-to-plot irrigation.	Separate irrigation and drainage system should be introduced at terminal level in the middle and low land, taking the drainability of paddy fields and the promiscuously planting by different varieties into consideration. The return flow shall be reused in the downstream irrigation system returning through the area drainage.
h) Definition of the terminal area.	The terminal area is to be 110 ha as standard and water management shall be achieved quantitatively as recommended in d).
i) Managements of water right and water distribution.	These managements are recommended to be taken over by the MOA.

### (3) Improvement of the Irrigation Facilities

On the above consideration, the irrigation improvement is summarized as follows. Proposed locations of the facilities are shown in Exhibit 5.2.1.