# Factors affecting the availability and relevance of technology for wheat producers in Iran: a study of the Agricultural Knowledge and Information System (AKIS)

Seyed Akbar Mirikhoozani

## PROPOSITIONS

1. Small farmers are the main support of the Iranian government. However, the government seeks food self-sufficiency through large farmers (*this dissertation*).

2. Creating conditions for technology use, i.e., creating access to credit, market, irrigation, high external technologies, etc., is a strategy to adapt conditions of farmers to the technology. This requires a large budget and helps large farmers more than small ones. Another strategy is to adapt the technology to farmers' conditions, which is more suitable to small farmers but might not be so effective from a national point of view (*this dissertation*).

3. A more decentralised structure is needed for helping small farmers. Small farmers have diverse needs, which are often difficult to understand by a centralised bureaucracy (*this dissertation*).

4. In order to make claims on the knowledge institutions, and to access the resources necessary for development, farmers need to gain enough power to countervail the power of institutions. A main step forward would be to give farmers active roles in controlling knowledge institutions (*this dissertation*).

5. It is necessary but not sufficient to have a down-stream information flow from research to extension, and from extension to farmers in an Agricultural Knowledge and Information System. An up-stream information flow, from and about farmers to extension and to research, is equally important (*this dissertation*).

6. Lack of responsibility in research, extension, and training in relation to end results, and a lack of accountability to small farmers, are the problems that should be improved to make institutions more responsive to farmers' needs (*this dissertation*).

7. There is a need to train all those who are involved in knowledge processes, such as researchers, extensionists, trainers, and farmers, and those who influence knowledge generation and utilisation, such as policy makers, politicians, managers at all different levels, etc., to acquire a clear understanding that researchers, extensionists, trainers and farmers are all parts of a system (*this dissertation*).

8. Not only knowledge institutions are responsible for adoption of technologies by farmers, but also a wide variety of institutions in charge of the elements of the mix of non-technological factors that affect adoption (*this dissertation*).

9. "In many areas, especially where farmers depend mainly on local resources, modern technologies may not be the first option to improve agriculture. In such areas, better use of local resources and natural processes could make farming more effective and create conditions for efficient, profitable and safe use of modern inputs" (*Reijntjes et al., 1992:xviii*).

10. "One important lesson of recent participatory technology development experience to take into account when developing the research agenda is that farmers living in diverse and variable environments seek out a range of options rather than a package of techniques. They are interested in developing and extending the portfolio of choices available to them, to be used as the climate and other physical conditions allow, or economic opportunity and family circumstances indicate" [*Jiggins, J. & de Zeeuw, H. (1992). Participatory technology development in practice: process and methods. In: farming for the future, Reijntjes, C., et al., (eds.), pp.135-162. London: The Macmillan Press Ltd.*]

11. "A shift to more sustainable forms of agriculture is not a question of the adoption of an innovation. It requires a slow learning process and a change in mentality. The shift forces a grower to go back to basics, in that a new criterion for production is introduced (sustainability in addition to productivity), which requires a new apparatus for making visible (feedback, indicators) where one is and what the consequences of one's actions are" *[Röling, N.G. (1993). Agricultural knowledge and environmental regulation in the Netherlands. Sociologia Ruralis, Vol.33, No.2, pp.261-280].*

12. Sitting and listening to a farmer and learning from him is sometimes much more difficult than speaking and teaching. It needs time, patience, common language, common interest, enthusiasm, a large capacity for experiencing some discomforts such as travelling to remote areas on earth roads, getting mud on one's shoes and clothes, eating and sleeping in places where there are flies around, etc. In other words, it needs a researcher who is willing to live like a farmer.

13. It is not enough for a foreign student like me to be knowledgable and experienced in the topic of study and to enjoy support from various sources to get a Ph.D degree in the Dutch educational system, it is also necessary to develop knowledge and acquire skills in areas such as writing manuscripts, using word processors, data analysis programmes, audio-visual aids, making maps, figures, etc. In addition, the student should learn how to cope with discomforts created by the unstable and unpredictable Dutch weather.

*S.A. Mirikhoozani*
*December 14, 1993*
*Factors affecting the availability and relevance of technology for wheat producers in Iran: a study of the Agricultural Knowledge and Information System*

Factors affecting the availability and relevance of technology for wheat producers in Iran: a study of the Agricultural Knowledge and Information System (AKIS)

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# Factors affecting the availability and relevance of technology for wheat producers in Iran

A study of the Agricultural Knowledge and Information System (AKIS)

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TABLE OF CONTENTS

# FOREWORD

It is of a great importance for Iran to reduce its food imports by promoting local production and upgrading the productivity of small farmers. This has motivated the present author (who has both knowledge and experience in agricultural extension) to pursue this research in order to explore the bottlenecks constraining the achievement of the national objectives and to highlight the points of leverage.

There are three important points concerning the present research which should be mentioned at the very beginning. They give the research a special character. They are as follows.

(1) We have to keep in mind that Iran is in a transitionary process. The socio-political structures at different levels have undergone major changes over the last three decades. These changes, which are still continuing, affect the performance in both the details and the larger context of farming activities.

(2) It is a valuable opportunity for the author to present a great deal of data about post-revolutionary Iran in a single text. The data presented, particularly in the first eight chapters, are necessary to understand the present situation in the country.

(3) The changes have been major and rapid. The resultant discontinuity makes it especially difficult to map the delicate, sensitive and enduring processes affecting personal, professional and structural relations. Furthermore, a general lack of official and academic attention to the importance of statistics and research data adds to the problem.

The present report is made up of eleven chapters. The first eight chapters are introductory and largely descriptive. They lay a foundation for the remaining analytical chapters. The first chapter introduces the country's agriculture briefly. Problems and objectives of the study constitute the theme of the second chapter. The third chapter provides a conceptual framework, introducing the theory and concepts used in the present research. The fourth chapter is devoted to the method and techniques of data collection used at three levels: field, institutional and policy. An introduction to the research area is presented in the fifth chapter. The sixth chapter provides insight into the socio-political context in which farmers operate. More detailed background information on farming activities in Marvdasht district constitutes the theme of the seventh chapter. The institutional context at different levels is the theme of the eighth chapter. The ninth chapter presents and analyses the results of the research at the field level, highlighting the problem of farmers' access to the development mix. The institutional and policy factors related to access to and relevance of technologies are analysed further in the tenth chapter. The eleventh chapter concludes the research and recommends initiatives for the betterment of the situation.

## EXECUTIVE SUMMARY

A combination of socio-economic, cultural and political reasons have led Iran to pursue two important national objectives: self-sufficiency in food and support poor farmers. The chosen operational strategy aims at intensification of agriculture by creating conditions for productivity increase. This has been done by introducing high yielding varieties and high external inputs and by setting up various support institutions, in order to provide access to goods and services and a regulatory structure of laws and incentives.

However, the efforts of the government have not resulted in the achievement of the national objectives. At the national level, two problems remain: the country imports a large amount of food and the production of small farmers is low. At the field level, the continuing existence of yield gaps is the problem.

At the field level, by examining the claims and benefits of the technologies introduced and of the institutional efforts made, the study reveals that farmers, especially small farmers, have difficulty in adopting the technologies. The lack of adoption results from their lack of access to the development mix including the incentive structure, market, inputs, irrigation, relevant technologies, etc. This in turn has its root in institutional and policy factors.

At the institutional level, we observe that the research, extension, training institutions (as the institutions directly involved in providing access to relevant technologies), and farmers, lack synergy amongst their tasks. This results from problems in task differentiation amongst the actors, poor integration between the tasks of the actors and weak or no coordination amongst the actors. Furthermore, the actors lack a conducive environment in which to perform effectively. A number of factors related to policy-making, bureaucratic and political structures, the institutions in charge of providing goods and services for farmers, the black market and the national and international research institutes, further hinder the effective performance of the actors.

At the policy level, the situation is problematic with respect to both general and technology policies. In all, we can say the policy environment is not conducive to the achievement of the stated objectives.

## ACKNOWLEDGEMENTS

In the name of Allah, the merciful, the compassionate

O God, you offer me innumerable gifts that I am not able to express my thanks to you with my defective words. All my thanks to you for keeping me healthy and making me able to seek more knowledge and to learn more.

**********

I wish to express my sincere thanks to Wageningen Agricultural University for providing me the opportunity to pursue this study and offering me all the support needed to actively advance the study. Also, with great appreciation, I thank the Ministry of Agriculture, especially the agricultural extension organisation, and also the Ministry of Culture and Higher Education of the Islamic Republic of Iran, which turned my dream for extending my knowledge into reality by granting me the opportunity and supporting me all the way.

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S.A. Mirikhoozani
Wageningen, August 28th, 1993

# CHAPTER 1

# AGRICULTURE IN IRAN

This chapter aims to introduce Iran's agriculture by providing general information on the present agro-ecological, economical, and socio-political situation in the country. The purpose is to provide the reader with enough information to illustrate the context in which this study is conducted. The present chapter consists of seven sections. It starts with providing some general information about the country as a whole, and moves on to focus on agriculture, rural people, and the national policy on agriculture.

## 1. Geography

Iran, the fourth largest country in Asia, lies between 25 and 40 degrees north latitude, and between 44 and 63 degrees east longitude. It is situated in the southwest of the continent, between the Persian Gulf and the Caspian Sea, and shares its international border of 5,170 kilometres with seven countries: Pakistan, Afghanistan, Turkmenistan, Azerbaijan, Armenia, Turkey and Iraq. The total land area is 1,648,000 square kilometres (164.8 million hectares), which makes it roughly equal to the combined area of France, England, Germany, Italy, Belgium, the Netherlands, and Denmark.

In general, the country is characterised by high plateaus, the edges of which are marked by the Alborz mountain range in the north and the Zagros mountain range to the west (see map 1.1). Approximately 3/4 of the total area consists of mountain ranges, deserts and waste land. There are four natural geographic regions in the country. Of these, the central interior plateau is a barren, 600 to 900 meters high area, largely covered by salt swamps, known as kavir (desert) and partly by salt flats, called dasht (flat surface). There are two large desert ranges in this region which makes the region the least inhabited and unproductive. The second region is the Zagros mountain range that originates in the northwestern part of the country and extends 1,500 kilometres along the Persian Gulf and the Gulf of Oman to join the mountain range in Pakistan. The region has the highest elevation of 3,960 meters and is marked by fertile Azerbaijan in the northwest and the Khuzestan costal plain in the southwest. The Caspian coastal lowlands, which are limited to the south by the Alborz and Talesh mountains, is the third region. The Caspian region is a narrow coastal belt along the southern shores of the Caspian Sea with a width varying between 20 and 90 kilometres. The Alborz range originates in the northwest of the country and extends to Afghanistan along the northern border, with elevations between 2,100 and 3,000 meters. The Alborz consists of parallel ranges that gradually step down towards the Caspian Sea. The fourth region, which is located in elevation between 1,200 meters and 2,750 meters includes the barren ranges and fertile valleys of the eastern mountains along the eastern border.

Out of the several important rivers running through the country, the Karun river is the country's only navigable river, with approximately 160 kilometres of the total 828 kilometres being navigable. The largest volume of water is the Orumieh salt lake, situated in the northwestern part of the country, 145 kilometres long and 48 kilometres wide.

Due to its sub-tropical location, Iran might be expected to exhibit hot summers and warm winters, whereas the country usually experiences cold winters due to its elevation and very hot summers due to lack of rainfall. However, due to the size of the country, there are considerable extremes; from humid to sub-tropical to almost completely dry. Most of the

**Map 1.1. Geographical Map of Iran.**

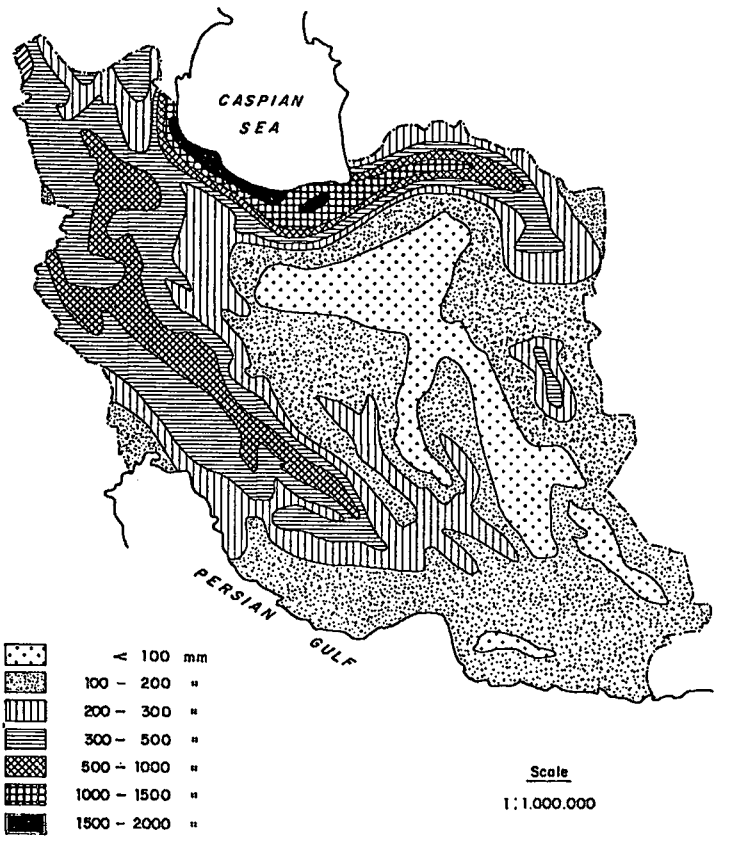

Source: based on Aresvik (1976).

country is arid except for the northwestern and some western parts, as well as the whole Caspian Sea coastal zone. The prevailing winds, which due to their relatively dry nature contribute to the aridity of the most part of the territory, come blowing in from the north.

Rain generally falls between October and May with the highest concentration during the months December to March. Annual rainfall, on a 15-year precipitation data base (1971-1986), varies from an average of 1,120 millimetres in Gilan, a northern province situated in the Caspian region, to an average of 46 millimetres in Yazd, a central province (Farnush *et al.*, 1987). The Caspian region has the highest precipitation of the country due to high moisture captured by the Alborz mountain from the Caspian Sea and from the east-moving, low-pressure cyclones moving over the Near East (See map 1.2). About 1/3 of the total precipitation is in the Caspian region, in which only 10% of the country's arable land is located.

Looking at the precipitation point of view, the country might be divided into seven distinct regions: extremely wet, wet, moderately wet, semi-arid, arid, dry, and almost completely dry (map 1.2). Gilan and some parts of Mazandaran, the two Caspian zone provinces, with 1,500-2,000 millimetres precipitation's range and average annual precipitation of approximately 1,500 millimetres (based on 15-year data), constitutes the extremely wet region. Other parts of the Caspian region, which exhibit a precipitation figure of 1,000-1,500 millimetres, fall into the wet region. The moderately wet as well as semi-arid regions, with 500-1,000 millimetres and 300-500 millimetres precipitation respectively,

**Map 1.2. Annual precipitation in Iran.**

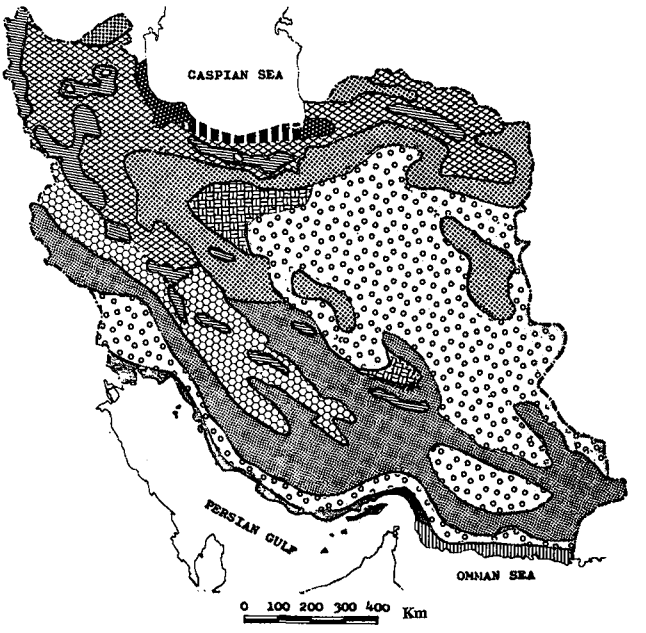



Source: Aresvik (1976).

mostly cover the northwestern, western, and southwestern parts of the country and partially the northeastern part of the country. The arid areas, with 200-300 millimetres of rainfall, are scattered all over the country, the exception being the Caspian coastal belt and the central part. The rest of the country, excluding the central part, with a precipitation figure of 100-200 millimetres, constitutes the dry region. The central region of Iran and some of the southeastern part of the country which embrace desert areas, have less than 100 millimetres of rainfall and fall into almost completely dry region.

Temperatures vary greatly from 27.8 Celsius below freezing point in certain parts of the northwest, to 55.6 Celsius in parts of the desert and the area of the Persian Gulf. The northern and interior parts of the country exhibit an unusual cold climate in the winter for latitude. A mean temperature of 1 Celsius is recorded in the coldest month of the northern plateau. During the cold months frost occurs on most nights. The coldest part of the country

**Map 1.3. Climatic division of Iran.**




Source: Aresvik (1976).

is the northwest, with a mean temperature which falls below the freezing point in January and February. Winter becomes gradually milder as one moves the south. A mean temperature of around 11 Celsius in January is usual on the plain of Khuzestan, in the southwestern part of the country, where mild winters are usual. Map 1.3 provides information on the climatic variations.

When considering the soil, according to Aresvik (1976), Iran's soils can be divided into four physiographic zones: plains and valleys (approximately 18.5% of the total area), plateau (28.5%), Caspian piedmont (0.2%), and dissected slopes and mountains (52.3%).

The main soil types in the plains and valleys are fine and coarse-textured alluvial soils. More than 80% of the soil in the plateau is a brown, chestnut, desert, or sierozem association. In the Caspian piedmont, the dominant soils are associations of brown forest soils. The slopes and mountains are characterised mainly by lithosols, which are calcareous.

Plains, valleys, and plateau, with roughly equal proportions, account for around 3/4 of the country's total agricultural area. Irrigated agriculture is concentrated particularly in

the fine-textured alluvial soils, which cover 46% of the total arable area. In the Caspian littoral, fine-textured alluvial soils constitute 55% of the total cropped soils and brown forest soils 21%.

Salinity, alkalinity, water-logging, steepness of the slopes and high altitude are, in order of importance, the main agricultural limitations of Iranian soils.

The sources and amount of irrigation water available to agriculture depend largely on the amount and distribution of the country's annual precipitation. It is estimated that, on average, from a total 400 billion cubic meter precipitation per year in the country, only around 1/4 in the form of run-off water, together with 40 billion cubic meter as underground water, is potentially available for irrigation purposes, and the rest results in flood, and waste water. From approximately 120 million cubic meter potential irrigation water, 59 billion cubic meters (49%) is available for agriculture. From this, 24% is in the form of run-off water controlled and distributed by dams and irrigation networks that are both modern and traditional; 31% run-off water is extracted by traditional means, and the remaining 45% is underground water (Refahiat *et al.*, 1986).

## 2. Demography

The total population of Iran, was about 49 million in 1986 (ISC, 1992). The population is young with 43.3 % 14 years or younger and 53.4 % between 15 and 64 years of age. The country has a population growth rate of 3.2% (Roqani Zanjani, 1989). The average population density and agricultural density are 27 and 80 persons per square kilometres respectively. The densest population occurs along the Caspian Sea and in the Azerbaijan provinces. The urban population accounts for 54% of the total. Villagers account for approximately 45.5% of the total population, and pastoralists constitute the remaining 0.5%. The rural male:female ratio is 104 men to 100 women. The estimated total, agricultural, and economically active population for various years are shown in table 1.1.

**Table 1.1. Estimated total population, agricultural population, and economy active population of Iran for a number of years (in thousands).**

| | population | | economy active population | | |
|---|---|---|---|---|---|
| year | total | agric. | total | in agric. | %in agric. |
| 1975 | 33,344 | 12,979 | 9,493 | 3,788 | 39.9 |
| 1980 | 38,900 | 13,779 | 11,071 | 4,025 | 36.4 |
| 1985 | 47,621 | 14,580 | 13,200 | 4,148 | 31.4 |
| 1988 | 52,005 | 14,691 | 14,548 | 4,221 | 29.0 |
| 1989 | 53,314 | 14,679 | 15,007 | 4,247 | 28.3 |
| 1990 | 54,607 | 14,644 | 15,469 | 4,267 | 27.6 |

Source: FAO production year book 1990.

The national literacy rate is 62% (6 years and older). The literacy level among the rural and nomadic populations is relatively low--48% for rural people and 18% for nomads (ISC, 1992).

The official religion, which accounts for 98.38% of the total population, is Islam. The minority religions comprise Zoroastrian, Jewish, Christian, and others.

The official national language is Farsi, which is spoken by approximately 83% of the total population. It is used by 73% of rural people (ISC, 1992). There are ten main local languages: Torkaman in the northeast; Gilaky and Mazandarany in the north; Turkish, Armanic and Assuric in the northwest; Kordish and Lory in the west; Arabic in the southwest; and Baluchi in the southeast. Torkish, Armanic, Assuric and Arabic languages are spoken by about 20% of the population, while 26% speak other minority languages. Many different local dialects are spoken.

## 3. Administrative divisions

Iran is divided into 24 provinces (ostan), each divided into several districts (shahrestans). Bakhsh (sub-district) is a division of shahrestan. Each bakhsh is divided into several village-clusters (dehestans). The village (deh) is the smallest administrative unit. In the statistical terminology, deh is categorised as a type of abadi, that is, a populated place with a formal or traditionally known boundary, outside city boundaries, in which some agricultural as well non-agricultural activities are performed. In this way, farms, train stations, coffee houses, etc., can be included as abadi. According to the 1986 census, there are 215 shahrestans, 586 bakhshs, 499 shahrs (cities), and 2,001 dehestans in the country (ISC, 1992). Abadis number up to 103,920; of which only 65,349 (approximately 63%) are inhabited. Villages (dehs), number up to 55,000.

## 4. Economy

Agricultural production activities in Iran originated in ancient times. Its importance is emphasised in the Islamic religion. Imam Sadeq, the sixth holy leader of the Shi'a muslims, said that "**farmers are the treasures of nations**". For many years prior to the early 1960s, agricultural surplus were exported to other countries and there was no food shortage problem. However, in more recent times, the nation has faced food shortages, many of which have their origin in the policies of the government and the monarch (Shah) during his period of rule.

**Table 1.2. Expected annual growth rate of the main crops in the post-revolution first 5-year development plan of Iran (1989-1994), (%).**

| crops | growth rate |
|---|---|
| wheat | 7.9 |
| paddy | 3.2 |
| sugar beets | 6 |
| cotton | 4.8 |
| oil seeds | 13.4 |
| potato | 4.2 |
| onion | 3.9 |
| fodder crops | 8.6 |
| pulses | 7.2 |

Source: APC (1989-a).

During the two decades prior to 1979 revolution, Iran's national economy was, and still is, mostly dependent on oil exports and the consequent in-flow of foreign currency. The fourth development plan (1968-73) projected an economic growth rate of 9% per annum and a 13% growth rate in industry. Emphasis in the fifth plan (1973-78) was placed on the development of heavy and basic industries such as steel, mechanical and electrical industries, and vehicle manufacture, with a projected annual growth rate of 15.3% (Kurian, 1987).

The emphasis given to industrialisation and the low priority of the agricultural sector gradually led to a decline in agricultural production and the need to import a great amount of agricultural produce. For example, Iran imported an annual average of 6% of total wheat consumption during 1961-65 (FAO, 1961-65 year books), while prior to that time the country was self-sufficient in wheat. According to Katouzian (1974), the share of agriculture in national output, excluding oil revenues, fell from around 36% to about 23% during the 1960s. The average rate of increase of agricultural output per capita was most probably about zero or even negative, given a population growth rate of nearly 3% per annum.

This policy was supported by the Shah's 'white revolution', which launched the programme of land reform in 1962. The aim of land reform was to bring social justice and equity for Iranian peasants. However, in fact land reform was a political tool used by the Shah to break down the power of the large landlords and to secure his position.

Following the 1979 revolution, it was believed that national economic development

**Table 1.3. Gross domestic product (GDP) by economic activity in Iran.**

| | share 1970-81 (%) | average annual growth rate 1970-81 (%) | share 1981-84 (%) | expected share 1994 (%) | expected average annual growth rate 1989-94 (%) |
|---|---|---|---|---|---|
| agriculture | 11.0 | 5.2 | 17.5 | 21.0 | 6.1 |
| oil | – | – | – | 9.8 | 8.7 |
| mining | 35.3 | 0.6 | 1.4 | 9.6* | 19.5 |
| manufacturing | 11.8 | 16.1 | 7.6 | * | 14.2 |
| construction | 6.5 | 12.0 | – | 7.2 | 14.5 |
| public utilities | 0.9 | 14.7 | – | 50.0 | 6.7 |
| transport & communications | 3.8 | 17.4 | – | – | – |
| trade & finance | 11.8 | 17.9 | – | – | – |
| public administration & defense | 10.5 | 13.6 | – | – | – |
| other | 8.3 | 16.7 | – | 2.8** | 9.1** |

Note: – not available.
* manufacturing and mining together.
** includes water, electricity, and gas.
Source: based on Latif (1989), IP (1989), and Kurian (1987).

**Table 1.4. Selected indicators of economic and agricultural performance of Iran, countries in Near East region, and countries in all regions in 1980-88 (% change).**

| | total population 1981-88 | agric. labour force 1981-88 | total GDP 1980-86 | agric. GDP 1980-86 | total exports $ value 1981-87 | total imports $ value 1981-87 |
|---|---|---|---|---|---|---|
| Iran: | 2.88 | 0.38 | – | – | 1.71 | -0.84 |
| Near East region: | 2.74 | 0.76 | -1.39 | 3.30 | -10.63 | -1.10 |
| all regions: | 1.99 | 1.34 | 2.60 | 3.79 | -2.56 | 0.47 |

| | agric. production 1981-87 | agric. production 1987-88 | agric. exports $ value 1981-87 | agric. imports $ value 1981-87 | food imports volume 1981-87 |
|---|---|---|---|---|---|
| Iran: | 3.18 | -0.15 | 24.93 | 2.00 | 6.10 |
| Near East region: | 2.22 | 3.18 | 1.51 | 1.27 | 6.75 |
| all regions: | 3.08 | 2.66 | -0.37 | -1.79 | 2.72 |

Note: – not available.
Source: FAO (1989).

policy should be based on agricultural development. There was a shift from industrialisation, which was seen as making the nation increasingly dependent economically and politically,

toward agricultural development as the base for national economy development.

The preliminary development plan (1984-89) of the Islamic government gave priority to the development of the agricultural sector, with a projected average annual growth rate of 7%. The government's long-term objective was to secure economic independence for Iran by achieving self-sufficiency in food and by reducing the dependence on petroleum. The average annual growth of GDP was expected to be 8.9% (7% excluding oil) during the plan period, with an increase of 5.8% (3.9% excluding oil) of rate of GDP per head. The projected growth, share of the agricultural sector in the first 5-year development plan (1989-1994), actual performance, and GDP growth, are given in tables 1.2 through 1.4.

## 5. Agriculture

The land use pattern for the latest year for which data are available (1987) is shown in table 1.5. Total natural rangelands accounts for 90 million hectares. Approximately, 15% of the rangelands and meadows are considered to be rich to fair, 67% poor, and the remaining 18% are very poor and uneconomic rangelands. From 13.4 million hectare of natural forests, approximately 14% is in the northern part of the country (Caspian region) and the rest scattered mainly in the western part. Approximately 10% of the total forests are considered commercially productive forests (Kalantari, 1989-b).

**Table 1.5. Land use in Iran, 1987 (1,000 ha)**

| | |
|---|---|
| total area | 164,800 |
| land area | 163,600 |
| arable & perm. crops | 18,500 |
| arable land | 17,400 |
| perm. crops | 1,100 |
| perm. rangeland | 90,000 |
| forest & wood land | 13,400 |
| other land | 41,700 |

Source: based on FAO production year book 1990; Kalantari (1989-b); and APC (1989-a).

In the past, Iran's natural forests and rangelands were rich and relatively productive. Around thirty years ago, the total forest area was estimated at 18 million hectares. At that time, a total 120 million hectares of natural rangelands could provide enough fodder to feed total grazing livestock (Jahad, 1990-c). However, in recent years, due to a negative relationship between the number of grazing livestock and the production capacity of rangelands, most rangelands are overgrazed. Conversion of natural rangelands into arable land and de-vegetation of the surface land for fuel are additional problems. In 1982, it was estimated that the total rangelands could provide fodder efficiently for only 16% of the livestock population (Refahiat *et al.*, 1986). One third of the total rangelands constitutes the traditional nomadic grazing area (Jahad, 1990-c).

In 1987, from 18.5 million hectare of arable land and permanently cropped land, 8.5 million hectare (46%) including fallow land, were under irrigation, while the remainder including the fallow land was dry-farmed (APC, 1989-a). The usual method of irrigation is by 'qanat', a subterranean system of water conduits which provide water to about three-quarters of the irrigated land (Kurian, 1987). In 1985, around 995,000 hectare (12%) of the irrigated lands were within the command area of modern dams, but due to a lack of completed irrigation channels, only 100,000 hectares are fully serviced by dam irrigation. The efficiency of irrigation water use in fields is low and is estimated at 30% (Refahiat *et al.*, 1986).

About 1/3 of the cultivated land lies fallow in any year, while the remaining is cultivated with a wide variety of crops, mainly wheat, barley, paddy, cotton, oil seeds, maize, potato, onion, pulses, fodder crops including alfalfa, sainfoin and clover, sugar beet, and sugar cane. Also, some tea and tobacco are produced in the country. Tea is grown exclusively in two Caspian region provinces. Approximately, 85% of the total tea cropped

area (31,516 hectares total cropped area in 1985) is located in Gilan and the rest in Mazandaran provinces. Tobacco growing areas are mainly in the northwestern and the southwestern part of the country.

Wheat, covering around 6,194,000 hectares (1985 figure, in Refahiat *et al.*, 1986) throughout the country, constitutes 71% of the total cereal cropped area and 63% of the total main crops. Around 35% of the wheat area is located in irrigated areas and the rest in rain-fed regions. Most wheat is produced in the western part of the country with a 21% share of the total wheat output and 39% of the cropped area. The next is the northwestern part (including East Azerbaijan, West Azerbaijan, and Zanjan provinces) and the southwestern part (including Khuzestan and Fars provinces) of the country, with 18% and 17% share in wheat production respectively. Northeastern (Khurasan province) and northern parts of the country share 12% and 9% of the total wheat production respectively. Wheat and barley, together with pulses covering around 90% of the rain-fed cropped areas, are the most widely used crops in rain-fed agriculture. In 1989, the average production of wheat (the most important crop and staple food) was 955 kg/ha. The figure is 3,665 kg/ha for rice, the second staple food. Figures for a number of produce is shown in table 1.6.

**Table 1.6. Area harvest, yield, and production of selected main crops in Iran (1989).**

| crop | area harvest (1,000 ha) | yield (kg/ha) | production (1,000 MT) |
|---|---|---|---|
| wheat | 5,788 | 955 | 5,525 |
| paddy | 505 | 3,665 | 1,852 |
| sugar beet | 149 | 23,661 | 3,535 |
| barley | 2,519 | 1,096 | 2,750 |
| potatoes | 96 | 13,524 | 1,295 |
| cotton (lint) | 117 | – | – |

Note: – not available.
Source: FAO production year book 1990.

Livestock production forms a major part of agricultural activity. There are about 100 million units of livestock including sheep, goats, cows, buffalos, and camels and about 14,000 modern and semi-modern poultry production units with the potential for production of 483 million units of poultry (meat and egg) (Kalantari, 1989-b). Sheep and goats constitute 63% of the livestock population. Approximately 90% of the livestock belong to rural people and the remainder to nomads (Jahad, 1990-c).

**Table 1.7. Farms and size categories in Iran (1982).**

| | farm | | | size | | |
|---|---|---|---|---|---|---|
| category (ha) | number | % | acc.% | hectare | % | acc.% |
| less than 1 | 863,000 | 32.5 | 32.5 | 306,700 | 2.3 | 2.3 |
| 1 to 2 | 406,400 | 15.3 | 47.8 | 552,700 | 4.2 | 6.5 |
| 2 to 5 | 623,800 | 23.5 | 71.3 | 1,992,400 | 15.2 | 21.7 |
| 5 to 10 | 407,900 | 15.4 | 86.7 | 28,064 | 21.5 | 43.2 |
| 10 to 25 | 298,400 | 11.2 | 97.9 | 4,333,200 | 33.1 | 76.3 |
| 25 to 50 | 41,000 | 1.5 | 99.4 | 1,360,200 | 10.4 | 86.7 |
| 50 to 100 | 11,100 | 0.4 | 99.8 | 718,500 | 5.5 | 92.2 |
| 100 and larger | 4,200 | 0.2 | 100.0 | 1,009,100 | 7.8 | 100.0 |
| total | 2,655,800 | 100.0 | – | 13,079,200 | 100.0 | – |

Source: Zafar Nezhad (1989).

In 1982, there were about 3,150,000 agricultural production units of which about

84.3% (2,655,800) had access to land, while the remainder were not dependent on crop or grazing land (broiler production, bee-keeping, etc.).

The landholding situation is shown in tables 1.7 and 1.8. The tables illustrate two important characteristics of the Iranian agriculture: the dominance of (1) small holding and (2), private land holding. Family farming, fragmentation of land, dispersion of the land plots, and diversity of agro-ecological conditions are the other main attributes of land-holding conditions.

As table 1.7 shows, the average farm size is 4.93 hectares. Approximately 71% of farms, which cover slightly more than 22% of the total agricultural land area are smaller than the average size. Approximately 33% of farms or 2.3% of the total land area, are less than 1 hectare.

Eighty six percent of farms, which embrace 83% of the total land area, are privately owned (table 1.8). Seventy two percent of the privately owned farms are smaller than the average farm size. Three percent of the farms, with 4% of the total land area, are rented farms.

**Table 1.8. Farms and size categories by land use in Iran (1982).**

| | total | | owned | | rented | | owned+rented | | others | |
|---|---|---|---|---|---|---|---|---|---|---|
| category (ha) | farm | size | farm | size | farm | size | farm | size | farm | size |
| less than 1 | 863,000 | 306,700 | 762,400 | 258,400 | 21,600 | 9,500 | 36,700 | 18,600 | 23,800 | 10,300 |
| 1 to 2 | 406,400 | 552,700 | 344,700 | 468,700 | 10,300 | 14,200 | 19,500 | 26,200 | 14,300 | 18,600 |
| 2 to 5 | 623,800 | 1,992,400 | 526,100 | 1,682,500 | 21,200 | 69,700 | 37,900 | 125,200 | 16,600 | 50,000 |
| 5 to 10 | 407,900 | 2,806,400 | 351,300 | 2,432,000 | 9,800 | 64,600 | 21,500 | 141,400 | 9,900 | 63,500 |
| 10 to 25 | 298,400 | 4,333,300 | 255,500 | 3,702,900 | 9,700 | 138,000 | 17,300 | 239,500 | 7,400 | 116,600 |
| 25 to 50 | 41,000 | 1,360,200 | 32,700 | 1,091,400 | 1,700 | 56,600 | 1,800 | 58,700 | 3,100 | 99,600 |
| 50 to 100 | 11,100 | 718,500 | 8,900 | 570,300 | 600 | 39,800 | 500 | 35,100 | 900 | 57,500 |
| 100 and greater | 4,200 | 1,009,100 | 2,900 | 652,000 | 400 | 73,100 | 200 | 64,400 | 600 | 168,200 |
| total | 2,655,800 | 13,079,200 | 2,284,000 | 10,858,200 | 75,300 | 465,500 | 135,400 | 709,000 | 76,500 | 584,300 |

Note: size (ha).
farm (number).
Source: Zafar Nezhad (1989).

Family farming is a characteristic of the Iranian agriculture and gradually became the dominant land tenure system after the 1962 land reform under which 2,297,441 former sharecroppers became the new land owners. The management and cultivation of farms depends heavily on family members, who have limited resources, and respond mainly to local needs.

Agricultural lands are highly fragmented. According to different surveys conducted in different parts of the country, on average, the total number of pieces of land (irrigated as well as rain-fed) possessed by each farmer ranges from 7 to 54, and each piece of land is, on average, approximately 2,000 square meters (Shahbazi, 1989; Safi Zadeh, 1985; and Bakhshudeh and Najafi, 1989).

Large distances between the pieces of land belonging to each farmer, and between each piece and the centre of the village, is typical of the fragmented land-holing pattern. In most cases 2 kilometres from the village centre is the usual distance that a piece of land holds.

## 6. Rural people

Rural people in Iran are classified locally into: rusta'i (villagers) and ashayer (pastoralists, or nomads). Each has its own special way of living, daily activity, customs, etc.

Villagers live in abadis (villages, farms, and populated small locations) throughout the country and are mainly engaged in agricultural production. Some villagers are active in trades, shop-keeping, maintenance, and other types of village occupation.

Pastoralists, who constitute approximately 1% of the rural population, live in tents (at least seasonally), outside any formally structured villages, moving from one site to another, sometimes over distances of 250 kilometres or more. They keep a range of different animals, particularly sheep and goats, for different purposes. There are seven major tribes that have retained a nomadic way of life in whole or in part. They are scattered all over the country except for the northern and the central part.

## 7. National policy and agricultural production

National self-sufficiency in food production and serving poor farmers together constitute the policy for national economic development. In fact, these are the two intermediary objectives of the 1979 revolution. A primary objective of the revolution is to establish a genuine Islamic government, which could govern the nation according to the basic rules of Islam on socio-economic, cultural, and political affairs. Achievement of the two intermediary objectives is socio-economically and politically very important. Zali (1989) points out:

Firstly, according to the Iranian constitution, the government is charged with the goal of alleviating poverty and the establishing of social justice for all. Additionally, it has responsibility for distributing economic opportunities equally among people in different locations in the country, achieving food security through self-sufficiency in main crops, making the best use of national resources such as unused lands, run-off water, forests, etc.

The second reason is the high value added to agricultural products compared to the other sectors of the economy.

The third reason remains the fact that the rural poor are the most deprived people in the country and that there is a need to bring about social justice for them, and to raise their income. In order to slow down the present emigration from the rural areas to the urban, there is a need to improve rural life and to increase rural income, otherwise, rural emigration will add to the problem of urban unemployment and to other socio-economic problems such as crime, inadequate civic services, etc. According to Rasul Of (1989), about 1.8 million people emigrated from the rural areas within a period from 1976 to 1982. This is approximately 9% of the total rural population in 1982 (Latif, 1989).

A relatively low dependency of the agricultural sector on foreign exchange and on imported complicated high technologies constitutes the fourth reason. Despite many constraints generated by eight years of war (1980-1988 Iran-Iraq war), such as an international embargo and large uncultivated regions in the war zone, uncertainty due to land disputes, and instability of agricultural policies and prices, the agricultural sector is the only sector in the recent years that has continued growing. In the period between 1985-1987, in contrast to the other sectors of the country's economy, which experienced sharp reduction in their output, the agricultural sector's average increase was 8.9%, 10.1%, and 5.2% respectively over the period.

A fifth reason lies in its relation with nature and the natural environment. Soil

protection largely depends on the surface vegetation. Deforestation and also destruction of natural rangelands result in unfavourable environmental changes, which bring problems like expansion of desert, and disasters such as famine and flood. Any investment in agriculture which improves agricultural productivity and at the same time conserves the environment, leads to improvement of people's life and contributes to development of the other sectors of the economy.

The sixth reason is agriculture's positive response to investment. Investment in agriculture has had a relatively higher return compared to the other sectors. Based on the statistics for a period of eighteen years (1965-1983), the investment/production ratio is 2.36 for agriculture and 4.23 for the other sectors of the economy. From the employment point of view, according to the 1986 census, the agricultural labour force in 1986 shows an increase of 22% compared to its figure for 1976, whereas, the figure for the manufacturing sector in the same period is marked by a 5% reduction in the labour force. These increases and reductions were due to the fact that the gross fixed investment for the manufacturing and mining sectors in the period of 1976-1984 (based on the 1974 fixed prices) was 21 times more than that of the agricultural sector. Furthermore, based on the statistics, the required fixed gross investment per person for creation of employment opportunities in agriculture was 35% smaller than that of the public utilities sector. Besides, the marginal job opportunities created by investment in agriculture is noticeable. It is estimated that there would be direct job opportunities for 1.14 persons in the manufacturing and public utilities sectors for each additional employment created in wheat, sugar beet, sugar cane, and wood production.

From the political point of view, self-sufficiency in the main crops (wheat, rice, cotton, sugar beets and sugar cane, oilseeds, pulses, potato, onion, and fodder) and in the animal produce (especially meat, eggs, and milk) is very important from the point of view of both international and national politics. Self-sufficiency is most important in the case of wheat production (the most politically strategic crop and the nation's main staple food) and in the case of cotton and also sugar beet (to keep their respective factories going). Although local production costs more than imported products, in the sense that the government subsidises the imported inputs (chemical fertilisers, pesticides, farm machineries, etc.), local production is encouraged and promoted by the government because of the political reasons involved. A national slogan says "**in a world of inequality of power, a nation which produces its bread is not politically vulnerable to external exploitation**".

The importance attached to agriculture can be demonstrated by the speeches given by the founder of the Islamic Republic (Ayatollah Khomeini) on the occasion of a hot debate to choose whether agricultural or industrial development would be the base for economic development. He emphasised that agricultural development had priority over the development of other sectors and that the latter should serve the former. The government is committed to importing large amounts of necessary inputs, especially chemical fertiliser, in the hope of cutting food imports. One main point here is that, the dependency on imported inputs has been seen less politically harmful than importing food. If the country should experience an international boycott, agriculture production could continue without using modern inputs for a while, but with lower efficiency, whereas cutting imported food brings many political problems immediately.

Keeping farmers active in the agricultural sector, and involving more rural people in agricultural activities (as long as no other opportunities for employment are available) constitutes another reason for importing inputs rather than agricultural produce.

Food self-sufficiency also could be seen by the international community as a measure of the success of the revolutionary government in achieving stability in socio-economic and

political affairs, which adds to the international integrity of the government. In addition, by being self-sufficient in food, the revolutionary state might be seen as a successful political model for others who struggle for political change.

The important issue about food self-sufficiency, is that it should be achieved through poor farmers, who are among the main supporters of the government. They formed the revolutionary movement, supported it and made it succeed. Since the revolution, the poor farmers have socio-economically and politically supported the Islamic state. During the period of the eight-year war (1980-1988), the rural poor were those who sent their sons to the war zone. Also, they fought in the battle fields themselves, contributed agricultural produce to the army's food provisions, formed the village security groups, and marched in huge approval demonstrations for the government whenever it was needed. Therefore, the government can safely rely on them in its political life.

**Box 1.1. The word of God in the holy Qor'an about deprived people:**

**'It was our will to favor those who were oppressed and to make them leader, to bestow on them a noble heritage and give them power in the land' (Sureh: Alqasas, Ayeh: 5-6).**

From the social point of view, serving deprived people is considered prime religious promise made by Islam. According to the holy Qor'an, it is the will of God to lift up the deprived people (see box 1.1).

## CHAPTER 2

## PROBLEMS AND OBJECTIVES

This chapter is devoted to agricultural development problems in Iran and some specific technical causes of these problems. The first part of the chapter describes the constraints in food self-sufficiency, followed by a section on the government's policy options to overcome these constraints. The next section is devoted to describe development problems at the national level and field level. The research problems at the farm, institutional, and the policy levels constitute the theme for the successive section, which will be followed by a final section on the objectives of the study.

### 1. Constraints to food self-sufficiency

There are a number of constraints to food self-sufficiency. They include low productivity; high population growth rate; wastage of agricultural produce (during harvest and also post-harvest); wastage of food, mainly in urban areas and especially in the capital city.

**Table 2.1. Area harvest, yield, and production of wheat in Iran and the yield in developed countries, Market Economy developing countries, and all developing countries.**

| | harvested area (1,000 ha) | yields (kg/ha) | | | | production (1,000 MT) |
|---|---|---|---|---|---|---|
| | country | countries | | | | country |
| year | 1 | 1 | 2 | 3 | 4 | 1 |
| 79-81 | 5,824 | 1,070 | 2,059 | 1,478 | 1,639 | 6,215 |
| 82 | 6,192 | 1,076 | 2,153 | 1,525 | 1,853 | 6,660 |
| 83 | 6,042 | 986 | 2,279 | 1,447 | 1,969 | 5,956 |
| 84 | 5,800 | 948 | 2,345 | 1,525 | 2,074 | 5,500 |
| 85 | 5,978 | 1,108 | 2,297 | 1,545 | 2,058 | 6,626 |
| 86 | 6,405 | 1,183 | 2,474 | 1,682 | 2,194 | 7,577 |
| 87 | 6,591 | 1,153 | 2,461 | 1,725 | 2,127 | 7,600 |
| 88 | 6,147 | 1,182 | 2,424 | 1,860 | 2,200 | 7,265 |
| 89 | 5,788 | 955 | 2,531 | 1,603 | 2,235 | 5,525 |

Note: 1 Iran.
2 developed countries.
3 Market Economy developing countries (region C).
4 all developing countries.
Source: FAO production year books 1984-1990.

Tables 2.1 to 2.3 present figures for annual area harvested, yield and production of three main crops (wheat, paddy, and sugar beet, respectively) in Iran during the decade following the revolution. These tables also show the yield of these products for all developed countries, Market Economy (ME) developing countries in region C (including Iran, see FAO for definition), and for all developing countries. The production of most crops are relatively low. In the period between 1979-81 (the base year) and 1989, the figures for Iran show (table

**Table 2.2. Area harvest, yield, and production of paddy in Iran and the yield in developed countries, Market Economy developing countries, and all developing countries.**

| | harvested area (1,000 ha) | yields (kg/ha) | | | | production (1,000 MT) |
|---|---|---|---|---|---|---|
| | country | | | countries | | country |
| year | 1 | 1 | 2 | 3 | 4 | 1 |
| 79-81 | 433 | 3,336 | 5,247 | 3,996 | 2,670 | 1,446 |
| 82 | 483 | 3,322 | 5,317 | 3,974 | 2,907 | 1,605 |
| 83 | 429 | 2,831 | 5,290 | 3,840 | 3,067 | 1,216 |
| 84 | 485 | 3,299 | 5,703 | 3,853 | 3,146 | 1,600 |
| 85 | 480 | 3,698 | 5,793 | 4,167 | 3,190 | 1,775 |
| 86 | 489 | 3,738 | 5,960 | 4,193 | 3,170 | 1,828 |
| 87 | 527 | 3,422 | 5,784 | 4,036 | 3,224 | 1,803 |
| 88 | 465 | 3,051 | 5,668 | 3,922 | 3,290 | 1,419 |
| 89 | 505 | 3,665 | 5,824 | 4,360 | 3,417 | 1,852 |

Note: 1 Iran.
2 developed countries.
3 Market Economy developing countries (region C).
4 all developing countries.
Source: FAO production year books 1984-1990.

**Table 2.3. Area harvest, yield, and production of sugar beets in Iran and the yield in developed countries, Market Economy developing countries, and all developing countries.**

| | harvested area (1,000 ha) | yields (kg/ha) | | | | production (1,000 MT) |
|---|---|---|---|---|---|---|
| | country | | | countries | | country |
| year | 1 | 1 | 2 | 3 | 4 | 1 |
| 79-81 | 157 | 23,256 | 31,282 | 27,399 | 22,419 | 3,654 |
| 82 | 177 | 23,370 | 33,157 | 30,585 | 24,864 | 4,146 |
| 83 | 168 | 21,672 | 31,855 | 31,331 | 25,838 | 3,650 |
| 84 | 153 | 21,503 | 34,803 | 28,929 | 25,141 | 3,290 |
| 85 | 190 | 21,667 | 34,268 | 27,686 | 23,607 | 3,900 |
| 86 | 210 | 22,381 | 34,440 | 27,896 | 24,805 | 4,700 |
| 87 | 172 | 25,973 | 36,058 | 31,141 | 26,698 | 4,456 |
| 88 | 147 | 23,476 | 35,361 | 32,401 | 25,668 | 3,554 |
| 89 | 149 | 23,661 | 37,915 | 29,505 | 25,295 | 3,535 |

Note: 1 Iran.
2 developed countries.
3 Market Economy developing countries (region C).
4 all developing countries.
Source: FAO production year books 1984-1990.

2.1) that the average yield of wheat is approximately 1,100 kg per hectare. Comparing this figure with those of other countries, the yield is far below that of developed countries (54% less), about 33% below the yield of ME developing countries in region C, and about 47%

less than the figure for all developing countries. The same problem is, more or less, associated with the paddy production (table 2.2). The average yield of paddy for the country in the period between 1979-81 and 1989 was 3,374 kg per hectare. It is 40% less than that of developed countries and 16% less than that of ME developing countries (region C), but slightly above the figure for all the developing countries. Iran's average yield of sugar beets in the same period is less than that of the developed, developing ME countries (region C), and developing countries by 33%, 22%, and 8%, respectively.

Livestock production and dairying have also experienced the same problem as crops. The weight of beef carcass, for instance, has been stagnant at 90 kg per animal during 1979-1989 (table 2.4). This figure is far less than the average carcass weight for developed countries (about 100% less), and 12% and 43% below that of ME developing (region C) and developing countries, respectively. During the period of 1971-89, Iran's average yield of cow's milk is not only less than 1/4 of the figure for developed countries, but it is also 4% lower than Iran's production figure for 1979-81 (table 2.5).

**Table 2.4. Weight of beef carcass in Iran, developed countries, Market Economy developing countries, and all developing countries (kg/animal).**

| | 79-81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 |
|---|---|---|---|---|---|---|---|---|---|
| Iran: | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| developed: | 219 | 218 | 222 | 223 | 288 | 233 | 235 | 241 | 243 |
| developing ME: | 102 | 99 | 102 | 101 | 102 | 99 | 99 | 109 | 109 |
| all developing: | 157 | 159 | 158 | 158 | 158 | 159 | 158 | 164 | 164 |

Source: FAO production year books 1984-1990.

**Table 2.5. Yield of cow milk (whole and fresh) in Iran, developed countries, Market Economy developing countries, and all developing countries (kg/animal).**

| | 79-81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 |
|---|---|---|---|---|---|---|---|---|---|
| Iran: | 776 | 777 | 717 | 717 | 723 | 723 | 750 | 750 | 750 |
| developed: | 3,153 | 3,204 | 3,321 | 3,338 | 3,388 | 3,497 | 3,480 | 3,551 | 3,582 |
| developing ME: | 618 | 646 | 627 | 598 | 633 | 639 | 643 | 651 | 646 |
| all developing: | 679 | 691 | 692 | 722 | 740 | 741 | 754 | 776 | 799 |

Source: FAO production year books 1984-1990.

In general, production is not high enough to fill the gap between food production and consumption. The population growth rate is high; currently at 3.2% per year. (The gross population growth rate including growth caused by immigrants from other countries, according to Roqani Zanjani, 1989, is 3.9%).

On the other hand, consumption and also waste of produce is high. Although the annual production increase of 5.6% of paddy in the period between 1979-81 and 1989 is

relatively high and fortunate, it is not common to most other main crops. Besides, the production increase is mainly due to growth of area cropped. The annual average yield increases are 1.9% and 0.5% of paddy and sugar beets respectively, and a decreases of -0.9% for wheat. The waste of agricultural produce during harvest and post-harvest is about 24% of the total produce (Kalantari, 1989-a). Based on this figure, considering a total potential production of 43.7 million MT (metric tons) per year (Yunesi, 1989), the total loss would be 10.5 million MT per year. This is a disaster for the country and one that costs too much. In 1987, despite the reduction in oil revenue due to fall of oil prices, the country spent US$ 2.25 billion on food imports, which accounts for approximately 1/3 of the total revenue from oil exports in 1986. The waste in agricultural produce is due to an insufficient number of harvest machines, lack of appropriate storage facilities and insufficient food processing factories.

Waste of food in everyday meals, mainly in urban areas, also adds to the problem. The amount of waste food which is thrown away is large. It is a disaster in a religious society such as Iran, where religious beliefs discourage people in wasting 'God bestows'. In the present climate of austerity and emphasis on puritanical way of life, the link has been made by Iran's leaders between agricultural production and the waste of food. The target is to reduce the waste of food amongst wealthy families. No figures are calculated. Thus, the real extent of problem is unknown, but if we assume that the average waste of food per capita is 3 kg per year (it is the least estimation), we would come up with 21,000 MT of food waste per year for the capital city which has a population of 7 million. (The figure 3 kg is based on the author's own knowledge of consumption pattern in urban areas.) The reduction of waste of food is, from the social as well as the economical points of view, such an important issue that the problem was criticised several times by the president in the Friday Congregation Prayer in the capital city.

## 2. Policy options

There are a number of options available to the government to solve the problem of low production. These can be (1) expansion of cultivated area; (2) intensification of agriculture; (3) provision of facilities to prevent waste of agricultural produce during the harvest and post-harvest period; (4) reduction of the population growth rate; (5) educating the nation to waste less food; (6) introduction of a food consumption pattern, which could give the most nutritional diet per unit consumed.

Although the idea of population control is not religiously restricted and people had adopted contraceptive practices long time before the 1979 revolution, many people, especially less educated families, are not committed to, and not interested in responding to any population control plan. One reason might be the inconsistency in the religious leaders' interpretation of the religious law and regulations either about population control or use of contraceptive technologies to meet the family needs. Another reason might be related to the rationalisation of people in having many children. Having a large families implies to many people, more support in elderly age, reducing the risk of being left with no children in the case of loss of a child (e.g., mass death of young people during the 1980-88 Iran-Iraq war), availability of more family labour (especially in rural areas). Population control, however, has caught the government's attention recently and a campaign employing mass media has been started to clear the ground for further action. The target for the average annual growth rate of population given in the post-revolution first 5-year development plan (1989-1994) is 3%. The long term objective is to reduce the figure to 2.3% by the year 2012 (IP, 1989).

Regarding the two last approaches (educating the nation to waste less food and introducing a national food consumption pattern), they constitute the minor contributors to the national food self-sufficiency compared to the three first approaches (expansion of cultivated area, intensification of agriculture and preventing post-harvest losses). The last three options can be considered as complementary approaches to the first three. Expansion of cultivated area, intensification of agriculture and post-harvest loss prevention, therefore, are the main political options (for the time being).

Agricultural expansion is limited by the fact that the country's arable lands have increased by only 4% in 1987 compared to 1979 (APC, 1989-a), mainly due to the limitation of fertile lands and irrigation water. Although, according to Iran's Minister of agriculture (Kalantari, 1989-b), there are 34.3 million hectare of potentially good and moderate land available for reclamation, and also around half of the potential irrigation water, it is not possible to make use of these resources in the near future. There is a need for a long term programme for the reclamation of land and for the construction of modern dams and irrigation channels, and also huge investment to achieve the objective.

Furthermore, experience has shown that agricultural expansion has been associated with some negative and unpleasant side effects such as destruction of natural rangelands and forests. The problem of destruction of natural rangelands (which is discussed in more detail in chapter 5) has resulted in social and economic problems. Most of the affected rangelands have been abandoned shortly after the farmers realised that they could not get the economical return they had expected. The abandoned lands have become degraded further by being exposed to rain and wind without any vegetation on the surface. This has caused a very serious problem of soil erosion, which according to Ardeshiri (1989), is equivalent to washing 1,000-1,500 tons of soil per square kilometre away, annually, from a million square kilometres of the affected area throughout the country. As well as needing huge investment for revitalisation, the destroyed rangelands and forest lands contribute to the problem of accumulation of massive soil deposition in the reservoirs of modern dams. From the social point of view, disputes between the nomads and those who have converted the rangelands to arable lands is another problem. Since about 1/3 of the total rangelands in the country is grazed by the nomads' animals (Jahad, 1990-c), destruction of the rangelands affects the nomads seriously. For these reasons, the government has no serious plans for the expansion of agriculture at this time.

The other choices are to intensify agriculture, and to prevent post-harvest losses. These could be secured by (1) creating a broad spectrum of conditions for agricultural productivity increase and post-harvest loss control, including high yielding varieties and (2) providing the low input technologies which might be relevant in present conditions for some farmers.

From the two strategies for intensification, it seems that Iran's government has opted for creating conditions for agricultural productivity increase.

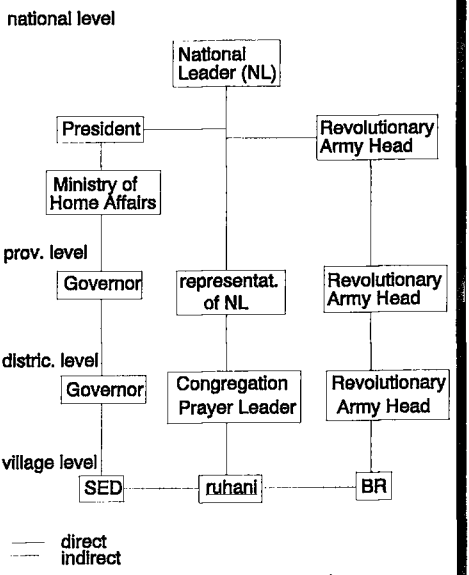
## 3. Development problems

The intensification strategy had necessarily to be operationalised by taking into account the needs of small and poor farmers, with whose help the revolution was built. On the eve of the revolution, small and poor farmers were the most deprived segment of the Iranian population, and the most needy people, for whom the revolutionary government had to take fast and fundamental measures in order to improve their miserable lives. Helping the small and poor was one theme, but another was that the revolutionary government, for

political reasons, had to take quick measures for food security. These two matters together, made the government decide to introduce multi-dimensional reform. Four major measures have been taken by the government in agriculture: firstly, improvement of rural infrastructure; secondly, making the government's bureaucracy in the agricultural sector more effective; thirdly, distribution of land amongst landless and small farmers; and fourthly, intensive technical change by means of introduction of high yielding varieties with high external inputs, together with support measures.

A radical change in the village political system, which is discussed fully in chapter 6 (also see chart 2.1), was amongst the prior concerns of the revolutionary state. The old political structure was replaced with a new one in which the village religious leader (ruhani) is the most important actor. The old institutions, such as the village head (kadkhoda), village equity courts, village council, and others, were abolished. A totally new Islamic council (showray-e eslami-e deh, the SED) whose members were revolutionary-minded and religious villagers was created. A para-military organisation of volunteer peasants (basij-e rusta, the BR) was the instrument used by the state to safeguard the revolution against any threat in the rural areas. The ruhani together with the SED and BR made up a political structure to safeguard the interests of the small and poor villagers against any threat from the ex-landlords and from any others who were generally known as counter-revolutionary groups.

Chart 2.1. The lines of authority and relationships between the village revolutionary institutions.




Source: author: illustrative purposes only.

Two different measures were applied in the government's agricultural bureaucracy. Firstly, the jahad-e sazandegi, the JS (reconstruction crusade organisation) in June 1979 was created, a few months after the revolution. The second effort was the re-organisation of the Ministry of Agriculture, the MA, to change its role from a repressive instrument of the old bureaucratic state to an organisational arm of the post-revolutionary government (Farazmand, 1989). The JS organisation was one of several revolutionary organisations established parallel to the old ones, in order to facilitate governmental services which had been disrupted by the malfunctioning of organisations affected by the radical changes in the political system. At that particular period of time, the MA was seen as incapable of serving the mass of the rural poor. Therefore, the creation of a suitable organisation to take care of the needs of the small and poor farmers was inevitable. The main objective for the establishment of the JS organisation was to improve rural people's lives by enhancing their living conditions; to help poor farmers to perform their farm activities by provision of necessary inputs, machinery services, credit, and veterinary services; to mobilise the mass of urban people to help small farmers harvest their crops; and to spread revolutionary ideas amongst rural people (SJSF, 1990). The responsibility of improving rural

infrastructure, was placed on the shoulder of the JS organisation.

The re-organisation of the MA was operationalised by the establishment of the agricultural service centres (MKKD) at the village level in the early 1980. The MKKD is the core element in the plan for re-organisation of the MA. All services for farmers should be available at the village level in order to facilitate agricultural productivity. In the new setting, the MA was provided with two arms to facilitate its services for farmers (Farazmand, 1989; MA, 1982). Extension together with research and training constituted the scientific arm of the MA. The cooperative arm was the union of rural cooperatives which included a variety of cooperative organisations responsible for the provision of inputs, credit, marketing, etc. Separate research institutes under the MA came together to form a single organisation. Extension from the MA was re-organised and positioned as the advisory branch in the village-based MKKD and as a single-purpose (educational job) extension. A more decentralised decision-making and administrative authority was given to the MKKD. Each MKKD at the village level was required to prepare its annual work plan in close consultation with the village councils. The re-organisation of the MA is explained in more detail in chapter 8.

In addition to the structural change introduced into the agricultural bureaucracy, the revolutionary state injected new spirit to the MA by replacing administrative elites with revolutionary religious staff loyal to the state (see Farazmand, 1989), and by employing new cadre, mostly selected from among those who had served the JS organisation (this information is based on the author's experience and on the field data). Another basic move was the emergence of the anjoman-e eslami (the Islamic staff council), whose members were religious and loyal revolutionary staff. These councils were acted as control instruments for the revolutionary state and as guardians of the benefits of poor people.

In addition, soon after the revolution, cleansing committees for filtering staff members who were deemed to be disloyal were established in all old public organisations, including the MA. These committees were assigned to investigate on the previous, and also the recent political activities of staff members, and decide on the future status of the convicted staff within the organisations.

In 1983, realising the inability of the MA to deal with the needs of the mass of small farmers, and the need to give the JS organisation a more active role in agriculture, the government decided to give a more stable position to the JS organisation. This was implemented by re-organising the JS organisation into a new ministry called the Ministry of jahad-e sazandegi (MJS). A detailed description of the organisation of the MJS and the MA is given in chapter 8.

The post-revolution land reform was to provide the landless and small farmers with more opportunity to remain in the rural areas by distributing lands amongst them. The reform brought another revolutionary organisation into agriculture (the HVZ). Besides of its land distribution job, the HVZ is mainly responsible for supporting the new land receivers, organised into groups of about 10 persons, by providing necessary inputs, credit, and machinery services. Although, as described in detail in chapter 6, the post-revolution land reform has created various socio-economic and political problems, and despite its limited scope compared to the pre-revolution land reform, it has provided 233,000 landless and poor villagers with agricultural lands (Jahad, 1990-d).

Introduction of new high yielding varieties and high external inputs into agriculture has been considered of great importance in technical change. In this respect, the release by research of fifty two improved varieties of wheat, barley, maize, paddy, cotton and other oilseeds, pulses, and vegetables is a significant breakthrough (APC, 1989-b). Nine improved

varieties have been introduced for wheat. The 'Wheat Impact Programme' (TATG), under which wheat producers in irrigated areas are provided with a technical package, and promoted through incentive mechanisms, is the programme for improving the wheat yield.

Additionally, the government has carried out some intensive efforts to provide inputs, credit, farm machineries, etc. According to table 2.6, in the period 1979-88, there has been annual increases of 17% in investment (in real value) in imported chemical fertilisers, and 6% in imported pesticides. In addition, there has been an annual increase of 48% in imported tractors. In the first six years following the revolution, compared with the same number of years just before the revolution, these investments resulted in increases of 145%, 120%, and 161% on imported chemical fertilisers, agro-chemicals, and tractors, respectively (Roqani Zanjani ,1989). Furthermore, in 1982, there was an increase of 172% in government subsidies paid for cereal production, of which the largest portion was wheat. The subsidies on cereal production, according to Arabi Zanjani (1990), have been increased by 61% annually since the revolution. Also, in the first nine years of the post-revolution period, there has been an annual increase of 18% in the credit granted to farmers. The number of village-based branches of the agricultural bank increased from 226 to 325 (Qasemi, 1989). Furthermore, farmers have been exempted from paying income tax. Crop insurance has been available to cover sugar beets and cotton since 1985, and has been extended in 1988 to include wheat, paddy and soya (Janan Sefat, 1990).

**Table 2.6. Iran's import of chemical fertilisers and pesticides (100,000 $), and tractors (numbers).**

| | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
|---|---|---|---|---|---|---|---|---|---|---|
| fert. | 1,104 | 2,153 | 4,082 | 3,403 | 3,643 | 4,021 | 2,781 | 2,608 | 2,320 | 2,739 |
| pestic. | 962 | 794 | 850 | 1,000 | 1,330 | 1,864 | 339 | 473 | 1,486 | 879 |
| tract. | 2,450 | 2,750 | 6,150 | 5,700 | 4,800 | 4,200 | 9,200 | 780 | 3,300 | 2,580 |

**Note: figures for chemical fertilisers and pesticides are rounded to nearest values.**
**Source: FAO trade year books 1984-1990.**

All these efforts are reinforced by implementation of a mechanism of ideology-push, i.e., using religious structures to persuade farmers to produce more. Agricultural practices carry a holy meaning in Islam. It is believed by muslims that almost all prophets, from the first to the last, were involved in agriculture for their livelihood. In addition, agricultural activities were practised as a means for livelihood by the earliest holy Shi'i leaders in Islam. By using religious structures at different levels, but specially at the village level, the government tries to stimulate farmers' religious emotions in order to make them increase their production. At the village level, the holiness of agriculture and sayings from the prophet and from the holy leaders on this matter are amongst the most important issues raised in Mosques during friday congregation prayers and during other religious events. Also the messages from the national religious leaders on the necessity of making the Islamic nation self-sufficient in food have been publicised using different means at the village level. The MJS, the village religious leader (ruhani), and other revolutionary institutions, have all, in a harmonious way, tried to stimulate farmers to increase their production.

One important move towards persuading the farmers to use certain technologies,

which to some farmers are perceived as religiously immoral ones (such as artificial insemination of cows) was to publicise the proclamations of the national religious authorities on such matters. According to the proclamation made by the highest religious authority in the country (Ayatollah Khomeini) at the time, the Islamic religion is one in which science is highly acknowledged. He stated that Islam is in favour of science and scientific methods and use of modern techniques to discover unknown phenomena and to cure problems.

Although his proclamations on a particular matter might not be concurrent with those of other great religious leaders (great ayatollahs) (since each religious leader has his own interpretation on Islamic laws) Ayatollah Khomeini as the head of the state and the supreme religious authority in the country opened a new opportunity for his followers to use modern technologies. In addition, the religious permissions on social issues released by Ayatollah Khomeini based on the Islamic doctrine of zarurat, levelled-off many problems which emerged after the revolution. The Islamic doctrine of zarurat (the primary ruling of Islam may temporarily be waived in exigencies or conditions of overriding necessity) was applied to broad societal issues and broad questions of social justice. Traditionally, the doctrine has been applied to personal cases, where individual affairs could be affected (e.g., the forbidden meats in the muslim religion, such as pork, and animals that have died of natural causes are allowed to be eaten at a time of extreme starvation). Application of the doctrine to social issues, according to Ayatollah Khomeini, is permitted if the goodwill of muslim society demands for it. The only authorities who could define the conditions for application of the zarurat doctrine are the great ayatollahs. After the revolution many socio-economic and political problems have been remedied using the zarurat doctrine permitted by Ayatollah Khomeini, of which the 1981 Land Reform Act, is an example.

By putting every piece of related information together, one might conclude that everything is available for the farmers to increase their production. However, the reality is different. There are two problems existing at the national and farm levels: high food import and yield gaps.

**Table 2.7. Iran's import of wheat (wheat + flour, wheat equivalent), rice, sugar (raw equivalent), and meat (fresh + chilled + frozen) (all in 1,000 MT).**

| | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
|---|---|---|---|---|---|---|---|---|---|---|
| wheat: | 1,200 | 1,341 | 1,620 | 1,770 | 2,688 | 2,622 | 2,193 | 1,960 | 3,626 | 2,834 |
| rice: | 440 | 402 | 587 | 432 | 622 | 588 | 539 | 493 | 808 | 209 |
| sugar: | 746 | 412 | 652 | 866 | 310 | 612 | 473 | 396 | 397 | 251 |
| meat: | 82 | 177 | 237 | 254 | 276 | 230 | 228 | 176 | 138 | 136 |

Note: figures are rounded to nearest values.
Source: FAO trade year books 1981-1990.

## 3.1. High food import

The problem at the national level is that the country is importing large amounts of food and agricultural raw materials for industry. In the industry sector, the sugar, textile and plant oil factories are suffering from insufficient raw materials (sugar beets, cotton lint, cotton and other oil seeds) and their consequent under-utilisation is a problem.

According to figures (table 2.7), import of wheat has more than doubled in 1988 (2,834,000 MT) compared to 1979 (1,200,000 MT), with the highest figure in 1987 (3,626,000 MT) and with an annual increase rate of 14%. The figures for imported rice (the second staple food) and sugar for the period of 1979-1988 (table 2.7), show annual increases of 2.5% and 0.5%, respectively. The data for importation of meat (in total) is also given in the table 2.7. Although meat importation has decreased by 50% from 276,000 MT (the peak value in 1983) to 136,200 MT (1988), the 1988 figure is far above (about twofold) that of the 1979 figure (82,100 MT). Moreover, its annual increase rate is 11%. Overall, Iran has been highly dependent on imported food ever since the revolution.

### 3.2. Yield gaps

The gap between yield obtained in research stations and the actual yield of farmers, and the gap between the yield of the 'best producers' (farmers whose yields are the highest among their counterparts) and of others, is a problem at the farm level. Different varieties of wheat, paddy, sugar beets, etc., which have been reportedly introduced through research, yield differently at research stations and at farmers' level. During 1989, the yield of three improved wheat varieties, namely rowshan, azadi, and qods used by the 'best producers', accounted for 61% of the yield obtained in research stations (Tavakkoli and Teymur Pur, 1989; Angaji, 1990). A comparison between the average yields of the main crops in the country and those of the 'best producers' reveals the fact that production by the majority of farmers is low. As shown in tables 2.1 to 2.3, during 1989, the yields of three most important main crops namely wheat, paddy, and sugar beets were approximately 1 ton/ha, 3.7 ton/ha, and 23.6 ton/ha, respectively, whereas, in 1990, in the case of the 'best producers', the figures for the same crops were 6.7 ton/ha (9.4 ton/ha for the irrigated wheat and 4 ton/ha for the rain-fed wheat), 11.2 ton/ha, and 92 ton/ha, respectively (Ahun Manesh, 1990).

These yield gaps are explained by Gomez (1985) as follows: (1) the experiment station technology is not applicable to the farmers' field (gap between research station yields and potential farm yields); (2) high-yielding variety is not profitable for farmers to adopt (gap between the potential farm yield and economic farm yield); and (3), high-yielding and high-profit variety is not adopted by farmers (gap between economic farm yield and actual farm yield). The difference between the economic farm yield and the actual farm yield is the yield gap which is of critical importance and which could be narrowed by solving production problems. The gap between yields of 'best producers' and that of the rest of farmers, which could represent the critical gap between economic farm yield and actual farm yield, can be explained by the fact that the social, economical and physical conditions of the two categories of farmers are different. Resource-poor farmers experience many more constraints in their conditions than the resource-rich ones.

Evidently, from the large gaps between the yields of different categories of farmers, one could conclude that in the Iran's context not all farmers equally benefit from the same introduced technology. Depending on their condition, some benefit more than others.

## 4. Research problems

Low production and large yield gaps between different categories of farmers implies the existence of some constraints at the village and farm levels. The constraints cause problems which prevent farmers from increasing their production. What these constraints are,

and where the points of leverage are located, call for further study. The range of possible investigation problems is, however, broad and could be associated with any of the socio-economic, political, and technical aspects of the development.

For the purpose of this study, there has been a deliberate selection of problems associated with the technical aspect of development. The study focuses on technical innovation in order to examine the role of technology, farmers' organisation, and the whole functioning of the knowledge network.

Although the other aspects of development are important, the technical aspect has been chosen for various reasons. The importance attached to technology in the intensification strategy is the main reason. Technology is considered by the government as the key element in agricultural development in the country. According to a 1988 speech given by Ayatollah Khomeini, the development of science and scientific research is the most important factor on which the efforts for self-sufficiency and reconstruction of the country should be based (Yazdi Samadi, 1989). The importance of scientific research in all aspects of development is emphasised by many politicians and scientists in the country (Musavi, 1989; Kalantari, 1989-b; Yazdi Samadi, 1989; Ruzi Talab, 1989). Thus, it seems logical to approach the research problem from the technology and technical innovation angle.

The investigation problems related to technology and technical innovation could be classified, according to their level of aggregation, into three categories of problems: farm, institutional, and the policy levels. The problems are to be assessed from the farmers' point of view. What farmers perceive of the technologies, and of the policies and institutional services related to technologies are the main concern of this study. The study focuses on the availability and relevance of technologies for raising productivity by farmers, and on the associated supporting and constraining factors at the institutional and policy levels. Given the limitations, which will be discussed further on in this chapter, the scope of the institutional and policy levels will be limited to the agricultural knowledge system and to technology policy.

### 4.1. Farm level

Technology needs to meet certain requirements if it should be of any help to solve farmers' problems. Technology needs to be relevant to the farmers' socio-economic conditions and to their farms' physical circumstances. In addition, it needs to be available physically, economically, and in informational terms. Here, the scope of the study is limited to technology from the point of view of appropriateness and availability at the farm level.

The main constraints to relevance and availability of technology at the farm level can be as follows: (1) farmers are very heterogenous with respect to access to the necessary resources (land, capital, labour, water, etc.); (2) lands are mainly small, fragmented and with many physical differences; (3) ecological and geographical conditions are highly different from place to place (even within a district as well as in a sub-district); (4) farming systems are different with respect to the pattern of cultivation (e.g., cropping mix and seeding mix), type of crop, the way of watering, etc.

Relevance and availability are relative concepts. A relevant and available technology for one farmer might not necessarily be the same for another one. Since the population of farmers is usually not a homogenous one (on the contrary, is composed of many types of farmers who differ from the socio-economic and agro-ecologic points of view), the same technology cannot be fruitful for all. For this reason, technology should aim at those farmers whose conditions are more or less similar. This calls for segmentation of farmers' population

based on certain variables in order to target the extension offering.

Segmentation should break down a heterogenous population into groups in such a way that variation in relevant variables is maximised between the categories and minimised within them (Röling 1988). Variables for segmentation are diverse and could be selected among those suggested in different present literatures. One variable can be 'early adoption' (see Rogers, 1983 for the definition). Farmers are different with respect to their responses to a particular technology. Early adopters are those who find the technology suitable for their conditions. In other words, the access to the development mix is provided for them to use the technology. Styles of farming, as 'a valid structure of relations between producers, objects of labour, and means (Van der Ploeg, 1990), could be the other. Different styles of farming are consequent of diversity of socio-economic, and agro-ecological conditions facing farmers.

Diversity of conditions facing farmers implies the need for generating and making available technologies appropriate for each category of farmers, according to the specific condition facing the category. A farm related research question, is: to what extent the technologies are appropriate and available for categories of farmers. Therefore, at the farm level, the research pinpoints the appropriateness and availability of technologies for different categories of farmers, especially including the small and poor ones.

### 4.2. Institutional level

The constraints at the institutional level can be the malfunctioning of institutional services. There is a broad range of institutions, dealing with technical innovations. The institutions can be categorised into three groups: knowledge-based institutions (research, extension, and education/training), supportive institutions (input delivery, credit system, etc.), and regulatory institutions (marketing, incentive structure, etc.). From a broad spectrum of possible institutional constraints, this study will focus on constraints to technology adoption. In this respect, research, extension, and education/training as the three main knowledge institutions, and as the main contributors to technology development, will constitute the study domain at the institutional level. Here, the research encompasses all institutions involved in agricultural research activities, including technology development (e.g., seed multiplication), and the extension encompasses all extension institutions in agriculture. What would prevent research and extension from generating quality output in order to meet requirements for appropriate technologies, is the main concern for this study. The main problems can be due to (1) lack of monitoring and evaluation in research, extension, and education/training; (2) lack of use of information from farmers and about farmers in research, extension, education/training planning; (3) lack of effective demand from farmers; (4) lack of effective coordination between research, extension, and education/training, and also between institutions for research and between institutions for extension; (5) lack of sufficient necessary resources (human, financial and physical), lack of services (education and training) and lack of support (reward and incentives) in research and extension, in order to carry out their tasks.

### 4.3. Policy level

Constraints at the policy level can be ineffective policies. The constraints can be as follows: (1) lack of clarity in development strategy, which generate conflict between different institutions involved; (2) conflicting goals between politicians, policy makers, bosses,

researchers, extensionists and farmers, which makes it difficult to decide on an appropriate policy on technology development; (3) lack of clarity as to what takes priority in research, extension, and education/training, which causes waste of scarce resources; (4) ineffective policies such as price policy, in order to motivate farmers to increase their production; (5) wrong use of policy instruments; etc. For the purpose of being consistent with the research strategy at the farm and institutional levels, the study will focus on constraints to technology policy affecting the appropriateness and availability of technologies for farmers.

The research problem, therefore, is to find out (1) at the farm level, the relevance and availability of technologies for different categories of farmers, and, based on that, (2) the associated factors, at the institutional and policy levels, with special emphasis on knowledge system institutions and technology policy.

## 5. Contributions of the study

The contribution of this research is twofold: to contribute to the national objectives and to the scientific body of knowledge.

### 5.1. Contribution to national objectives

The aim of this study is to contribute to the clarification of the situation concerning knowledge generation-utilisation in Iran. With respect to Iran and to the present study, there are several important issues worth mentioning.

Iran is a unique country with a dual character in the sense that religious and technical factors are employed simultaneously in an effort to increase agricultural productivity. Typically, when one speaks of religion, one expects the exclusion of science and modern techniques. Likewise, when speaking of scientific development and modern findings, one ignores religion. In other words, each subject, i.e., religion and science, is dealt with exclusively and isolated from each other. Usually, in modern thinking, religion is considered as a constraint to development, and as an obstacle to scientific innovations. Similarly, religious people interpret science and scientific approaches as contrary to religious beliefs. The history of mankind is full of conflicts between people of religion and science documented by such as Russell (1978-reprint), Barbour (1966), and others. The unity of these two in one context and the support from religion given to science is a phenomenon which is well worth studying.

Another important issue here is the existence of two different governmental bureaucracy structures serving agriculture. A revolutionary structure staffed by relatively young, rural background, ideologically-motivated, and low to lower middle class people emerged after the revolution. The old pre-revolution structure, with relatively experienced and specialised staff, whose administrative elites are the only staff that has been replaced since the revolution, is inherited from the previous regime. The former, as one could expect, focuses on the rural poor in order to increase their productivity, as the basis on which the revolution is built. More production through support to relatively large and well-off farmers is promoted by the latter. How these two different structures work in one context to accomplish national objectives is a core aspect of this study.

The disparity of objectives of state and farmers constitutes another important issue. Farmers usually take their own needs into consideration at the time of deciding what crop to cultivate. They consume part of their produce and sell the surplus for earning cash to afford household goods. Therefore, they like to produce those crops which are desirable for

local consumption and profitable for the market. Politicians, however, think in a broader sense and take into account the national needs. They are more concerned with food security for the nation, which is politically important. They are interested to increase the productivity of a few main crops as staple foods. The important issue here is to increase the coincidence of objectives of state and farmers.

However, the analysis of these issues by means of atomistic approaches, in which each phenomenon is dealt with exclusively and in isolation, cannot do justice to the complexity. Instead, they need a comprehensive approach, an analysis of the different elements involved and their interwoven relations. In this respect, the application of a perspective such as knowledge and information system (KIS) theory to analyse the knowledge processes involved in the phenomenon (which is described in more detail in chapter 3), is a promising one. Agricultural Knowledge and Information System (AKIS) theory has been developed as an approach to the analysis, design and management of knowledge systems and knowledge processes at the Department of Communication and Innovation Studies, Agricultural University, Wageningen, the Netherlands. In this approach, the traditional view of development of agricultural knowledge, i.e., research generates, extension transfers and farmers utilising the knowledge, is replaced by an approach which assigns the role of generator-user of knowledge to all components of the system. In other words, all components of AKIS, including farmers, are involved in all processes of knowledge (Röling, 1992-c). Based on their particular needs and situations, all components can be anywhere on the generation-utilisation continuum any particular moment of time.

Looking at the Iran's situation through the eyes of the AKIS theory and comparing it with theoretical implications, the researcher contributes towards improvement of the Iranian AKIS and the system's management.

## 5.2 An empirical study of AKIS theory

Each practical work is based on some theoretical understanding. Theory in return needs to appreciate real circumstances to provide practice with the necessary conceptual framework in order to guide reality. Therefore, empirical study contributes to theory development and methodology in its specific domain. By conducting this study in Iran's situation, whose religious revolution engenders its uniqueness, the researcher could contribute to more understanding of knowledge generation-use in agriculture.

## 5.3. Clarification to relevance and availability

The relevance and availability of technology are necessary but not sufficient conditions. There are others which constitute the context for the technology. The nature of the context (it is explained in chapter 3) is equally important. The context includes market, policy, infrastructure, laws and incentives. A technology which is claimed to be relevant and available for farmers should be examined in its existing context. If the context for technology use is not available for a particular category of farmers, the technology is, in fact, not relevant to them. In other words, relevance and availability are context dependent concepts. This demands giving relevance and availability issues a broader perspective than is usually applied. If, for instance, an appropriate seed is introduced, it needs a market, storage facilities, transportation facilities, etc., in order to work well. By reviewing the present Iran's strategy for intensification of agriculture and examining its outcomes against the stated objectives, the study could generate lessons for the success, or otherwise failure, of the

strategy.

### 5.4. Implication of influence of political structure on AKIS' performance

The nature of the political context affects the AKIS' performance (Wagemans 1990). This hypothesis assumes a relatively more effective performance for institutions in a less centralised system, where the upward information flow is smooth. In other words, the AKIS' effectiveness decreases as one goes from a less centralised political system, which allows a good amount of upward flow of information from the farm level to research, to a more centralised one, which emphasises the downward flow of information. Examining this hypothesis in revolutionary Iran, whose political attributes as well as its AKIS are rather unique due to its religious revolution, the researcher could provide an empirical base for theory development and further research.

# CHAPTER 3

# CONCEPTUAL FRAMEWORK

Composed of two sections, this chapter aims at development of a diagnostic framework for analysing the research problem. The first section deals with the problem at farm level and highlights the relevance and availability of technology for farmers. In the second section, the chapter presents theory and concepts of Agricultural Knowledge and Information System (AKIS), underpinning the perspective for analysing the research problem at institutional and policy levels.

Before mentioning technology and its access and relevance, one important point must be clear. In Iran, as in many other countries, technology plays a very important role in the development of agriculture. This has made the government invest substantially in technology development in terms of creating and expanding knowledge institutions. But research, extension, and training is based on a linear model of generation and utilisation of knowledge (transfer of technology model, TOT). As such, the TOT perspective forms the starting point of the discussions, rather than other perspectives (see Röling, 1992-a).

## 1. Agricultural development and technological change

In many developing countries, governments try to achieve a domestic production of staple food sufficient to meet the increasing domestic demands at reasonable prices without depending on other countries. One main strategy is to advance agriculture by creating the conditions for utilisation, including High Yielding Varieties (HYVs).

The HYVs and associated technologies (the so-called Green Revolution package) have produced high impacts on the production of a few food crops such as wheat, maize, and rice, in a number of countries, specially in Asia and South America. The most popular example for the success of the Green Revolution is the case of India in which the yield of wheat tripled during the period between 1961 and 1980 (Glaeser, 1987). The pre-requisite for this type of development is to create infrastructural conditions such as access to HYVs, markets, inputs, production resources, modern irrigation facilities, credit, etc., for farmers in relatively uniform environments. Wherever such access is provided, the technologies have created significant improvements in production, both for resource-rich and resource poor farmers (see, e.g., Hazell and Ramasamy (1991) for India, Hossain (1988) for Bangladesh, and Röling (1992-b) for Turkey). The problems of inequity, marginalisation of resource-poor farmers (RPFs), soil degradation, environmental pollution, etc. (see e.g., Conway and Barbier, 1990; Glaeser, 1987; Nair, 1979; Reijntjes *et al.*, 1992; Röling 1992-a; Shiva, 1991; Stavis, 1974) received less attention during the Green Revolution years.

### 1.1. Technology, relevance, and availability

Rogers (1983) defines technology as "**a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving desired outcomes.**" Technology has two components: (1) a hardware aspect (a material or physical object) and (2) a software aspect (information base for the physical object). Technology in its traditional perspective is equated with applied science. From a different perspective, technology is, as Röling and Engel (1991-b) define, "**a human survival mechanism.**" According to this

definition, technology not only encompasses the outcome of the scientific research, which is universally known as science-based technology, but also all the efforts made by farmers in order to adapt the technology into their farm environment, as well as those technologies that are invented locally. This last type of technology can be called locally developed technology. Our main focus in this research is on science-based technologies.

The use of science-based technology in agricultural development of countries in which self-sufficiency constitutes a national objective, is considered very important. In these countries, technology constitutes one important element (if not the primary one) of the development mix. To this end, governments establish research, extension, and training institutions, and extend them to provide services for a wide variety of agricultural activities.

One problem with the developed technologies can be a lack of adoption by the majority of farmers. Lack of adoption can be attributed to a lack of relevance of the technologies to the various conditions the farmers face, and/or lack of access to a mix of development conditions. Technology is only one element of the development mix (Haverkort and Röling, 1984). The conditions can be clustered into three groups: (1) access to the services of research, extension, and education; (2) services for credit, input provision, processing and storage of agricultural produce, marketing, transport, roads, water utilisation, soil improvement, seed multiplication; and (3) legislation and other regulations that facilitate development such as land tenure, land use, land reform, cooperatives, quality control, marketing regulation, tax or subsidy systems, etc. Unless the development mix is properly set up, technology alone cannot be effective. The impact of knowledge institutions can be high when the mix of development conditions is assembled properly. Chambers and Ghildyal (1985) illustrate the situation of access to the development mix by RRFs (Resource Rich Farmers) and RPFs (Resource Poor Farmers) as two extremes of categories of farmers on the rich-poor continuum. Generally speaking, RPFs have relatively poor access to the development mix compared to RRFs (see table 3.1).

**Table 3.1. Typical contrasts of access to a mix of development conditions for resource-rich farmers (RRFs) and resource-poor farmers (RPFs), (not all apply all the time, but most apply most of the time).**

| | RRFs | RPFs |
|---|---|---|
| access to seeds, fertilisers, pesticides and other purchased inputs | high, reliable | low, unreliable |
| access to credit when needed | good access | poor access and seasonal shortages of cash when most needed |
| irrigation, where facilities exist | controlled by farmer or by others on whom he can rely | controlled by others, less reliable |
| prices | lower than RPFs for inputs, higher than RPFs for outputs | higher than RRFs for inputs, lower than RRFs for outputs |

Source: Chambers and Ghildyal (1985).

Each category of farmers adopts according to the extent to which access to the development mix is made available. In practice, farmers often experience overwhelming problems with respect to the development mix. Lack of markets; low prices; insufficient

Table 3.2. Typical contrasts in agro-ecologic and socio-economic conditions of research experiment station, farms belonging to resource-rich farmers (RRFs), and farms belonging to resource-poor farmers (RPFs). (Not all apply all the time, but most apply most of the time).

| | research experiment station | RRFs' farms | RPFs' farms |
|---|---|---|---|
| topography | flat or sometimes terraced | flat or sometimes terraced | often undulating and sloping |
| soils | deep, fertile, no constraints | deep, fertile, no constraints | shallow, infertile, often severe constraints |
| macro and micro nutrient deficiency | rare, remediable | occasional | quite common |
| plot size and nature | large, square, small bounds | large, small bounds | small, irregular, bounds larger where present |
| hazards | nil or few | few, usually controllable | more common: floods, droughts, animals grazing crops, etc. |
| irrigation | usually available | usually available | often non-existent |
| size of management unit | large, contiguous | large or medium contiguous | small, often scattered and fragmented |
| diseases, pests, and weeds. | controlled | controlled | crops vulnerable to infestation |
| seeds used | high quality | purchased high quality | own seed |
| labour | unlimited, no constraint | hired, few constraint | family, constraining at seasonal peaks |
| priority for food production | neutral | low | high |

Source: Chambers and Ghildyal (1985).

credit; inadequate farm infrastructure such as roads, storage houses, electricity, irrigation water, etc.; are common problems that prevent farmers from adopting technologies. The above discussion illustrates that access to the development mix should be considered, rather than relevance and availability of technology only. Adoption is largely determined by the extent to which technology satisfies the immediate needs of farmers, concurs with their available human, physical, and financial resources, fits into the socio-cultural conditions that face the farmers, is accessible, and is accommodated in the context of a mix of other development conditions.

Relevance of and access to technology for farmers come under scrutiny whenever the technology is not adopted despite the provision of access to other development conditions. In this respect, examination of claims and benefits of a technology can reveal the extent to which the technology is relevant and the access to it is provided.

In reality, farmers perform in diverse agro-ecologic and socio-economic conditions.

A particular technology might have limited scope across the range of conditions as a whole.

Lack of relevance of technology can be attributed to dissimilarity of the conditions in which the technology is generated with those in which it should work. The technology is generated in research stations under controlled conditions. Thus, it is relevant for those farmers whose conditions are similar to those of the research station. Chambers and Ghildyal (1985) illustrate the differences and similarities of conditions between the research station, RRFs, and RPFs (see table 3.2). As the table shows, RRFs are those whose conditions are more similar to conditions of the research station. This similarity allows the RRFs to use the technologies. On the other hand, the dissimilarity of conditions between RPFs and the research station prevents the RPFs from adopting. This explains why the results of on-station research do not benefit RPFs as much as they do for RRFs, and why we need a special research responsive to the particular needs of the RPFs.

One approach to generating relevant technology for each category of farmers is to aim the extension offering towards the satisfaction and needs of the category. This requires the assessment of the needs prior to any action. This is the base for farming system research (FSR), an approach which is based upon what could be called a kind of marketing research, i.e., a research to investigate the needs and conditions of target clients, prior to any other steps for technology development. In the following, a brief introduction to FSR will be presented. For more detail information on FSR, readers can refer to, e.g., Collinson (1987), Fresco (1988), Merrill Sands *et al.*, (1991), and others.

## 1.2. Farming System Research (FSR)

FSR is an interdisciplinary process which, according to Collinson (1987), complements the traditional research approach. It aims to (1) identify the results of technical research most relevant to the local farming systems; (2) test and adapt the results in the context of local systems through on-farm experiments; and (3), identify and allocate priorities to unsolved technical problems that limit productivity in local farming systems. Farmers operating similar systems in fairly homogeneous local circumstances are grouped into the same target categories. The categories are further divided into recommendation domains whenever there are minor but important variations in local circumstances. Recommendation domains are thus farmers and areas of sufficiently similar farming systems for any one recommendation to be relevant to all members of the recommendation domain.

One promising feature of FSR is on-farm client-oriented research which, according to Merrill Sands *et al.*, (1991), has been developed as a means for linking research more closely with its clients, specially RPFs. It tests the results of on-station research in farmers' conditions, and provides an opportunity for the researchers to detect any imperfection that limits their effectiveness, and to take action for improvement. The on-farm experimentation phase of FSR includes farmers' assessment of research results as a practical approach to technology evaluation.

FSR theory and practice to date demonstrate that examining claims and benefits of science-based technologies from the eyes of farmers provides rigorous insight and reliable data for shaping technologies to farmers' conditions and thus improving the rate of uptake. A FSR diagnostic model (Collinson, 1987) can be used as a guide for testing the claims and benefits. The model emphasises a comprehensive study of the natural, economic and cultural circumstances of target farmers beginning with an informal reconnaissance study. An informal survey, which gives insight into farmers' resource allocation and management strategies, deepens understanding further and, where appropriate, may be used to develop

farmer contacts for collaborative on-farm experimentations. It is a basic premise that the system is the outcome of farmers' response to their environment (including the institutional service aspects, socio-economic and religious values and structures, agro-ecologic conditions, economy, status, class, age, gender, etc.)

## 2. The effect of institutional and policy support to relevance and availability of technology

The relevance and availability of technology for farmers is affected by various factors related to institutional and policy support. Any search for lack of relevance and unavailability necessarily needs to deal with related institutions and policies.

The various institutions involved in efforts to persuade farmers to adopt technologies differ in the services they provide. Among them, knowledge institutions (research, extension, education/training) are directly responsible for generating technology and providing access for farmers. Thus, any problem with technology concerning relevance and availability can be related to malfunction in the knowledge institutions. Relevance and availability of technology requires knowledge institutions that can effectively perform their tasks.

One unfruitful consideration in knowledge generation and utilisation is to regard knowledge institutions and farmers as isolated entities, with research having the responsibility for generating knowledge and extension for transferring it. Farmers play their own roles as users of knowledge, but in the TOT model farmers are seen as passive recipients of the science-based knowledge generated by research. This restrains researchers from learning from and about farmers.

An alternative approach in extension is to look at research, extension, education/training, farmers, and any others involved in knowledge generation and utilisation, as an articulated whole. In this way, researchers, extensionists, trainers, farmers, etc., constitute actors who potentially work synergically together to generate and utilise knowledge. This broad perspective is based upon systems thinking.

### 2.1. Systems and Systems thinking

The concept of system can be applied to various phenomena. Systems can be goal-seeking like machines, engineering designs, etc., which are commonly known as 'hard systems', or those with no fixed purposes such as human activity systems, called 'soft systems' (Checkland, 1981, 1985). The former systems have clear purposes to achieve, and are limited by fixed boundaries. The latter systems have no clear defined purposes, and boundaries. If there is any purpose, it is the result of management efforts to create consensus among the human actors (Röling and Engel, 1991-a). Defining boundaries for soft systems is, in contrast to hard systems, arbitrary and is based on the agreement of actors to distinguish between the system and the environment.

The main advantage of systems thinking is that it gives a better understanding of the phenomenon under study by providing a comprehensive perspective for explaining cause-effect relations. The emphasis is placed on the combined efforts of the system's constituents, rather than on efforts of individual elements. Looking at a phenomenon as a whole, system thinking places the emphasis on properties that emerge from the interaction of its elements.

For more detailed information on theories and concepts of systems, readers can refer to, e.g., Buckley (1976), Checkland (1985), Engel (1990), Engel *et al.*, (1990), Hurtubise (1984), Kaimowitz *et al.*, (1990), Röling (1992-c), Röling and Engel (1991-a, and 1991-b).

## 2.2. Agricultural Knowledge and Information System (AKIS) as a diagnostic framework

Röling (1992-c) defines AKIS as:

> **"the articulated set of actors, networks and/or organisations, expected or managed to work synergically to support knowledge processes which improve the correspondence between knowledge and environment, and/or the control provided through technology use in a given domain of human activity."**

The concept of AKIS gives a broad perspective for looking at knowledge processes such as anticipation, generation, transformation, transmission, storage, diffusion and utilisation (see Röling and Engel, 1991-b, for the processes) in the complex phenomenon called agriculture. In the AKIS perspective, the traditional view on development of agricultural knowledge (i.e., research generates, extension transfers and farmers utilise knowledge) is replaced by a view that assigns a new role of generator-user of knowledge to all actors involved. In this view, farmers are no longer seen as passive students of extensionists and mere utilisers of knowledge, but "**active generators of knowledge in their own right, and integrators of knowledge and information from a large number of sources, including their own experiences**" (Engel, 1990).

The main contribution of the system is to improve the goodness-of-fit between knowledge and practice. In practice, knowledge is not only used by farmers, but also by the other actors of the system in order to cope with their different problems, and to achieve their objectives. The extent to which knowledge can meet the actors' needs determines the effectiveness of the system. For more on AKIS theory and its concepts, readers can refer to Engel (1990), Engel *et al.*, (1990), Röling (1992-c), Röling and Engel (1991-a and 1991-b).

The AKIS theory can be used as a diagnostic framework to analyse the performance of research, extension, and education institutions, and farmers and other actors involved in knowledge processes. The performance can be measured by the extent to which the institutions provide access to relevant information and technology for farmers. To be effective, actors of AKIS ideally inter-connect with each other to form an articulated whole that potentially works synergically. Synergy is a phenomenon generated when the combined efforts of actors is more than the sum of the individual effort. Synergy implies task differentiation between actors and integration among the tasks. This requires coordination among the actors.

To use the AKIS perspective as a diagnostic framework, one can assume a knowledge and information system for the domain under the study. The other assumption is to draw the boundary for the system to include the related actors whose presence can be considered important for the performance of the system.

### *2.2.1. Synergy in the system*

To probe the state of synergy in AKIS, we can examine task differentiation, integration, and coordination amongst the actors. For each, a number of attributes can be placed under scrutiny. The following describes the attributes.

Using the transfer of technology (TOT) perspective, Engel (1990) defines task differentiation as: the division of labour between different components of the system acting

on the science-practice continuum. The continuum, as Mc Dermott (1987) illustrates, starts from basic/strategic research, continues with technology generation, testing, adaptation, integration, dissemination, diffusion, and ends with adoption. The level of differentiation depends on the level of complexity of the system. As the environment becomes more diverse or unknown, this level must increase (Kaimowitz *et al.*, 1990). Lack of a clear task differentiation leaves gaps between the tasks. This hinders the actors' performance. An effective task differentiation ensures task performance by each actor, and prevents harmful overlaps and redundancies among the tasks. In investigating the situation of task differentiation, we can use variables such as types of tasks performed by actors, the specialised task of each actor, the extent to which the tasks are performed effectively, complementarity of the tasks, and problems which create gaps (if any) between the tasks.

Task differentiation between actors is a necessary, but not sufficient condition to make an effective AKIS. The other condition is to link the tasks together effectively. As a result of task differentiation, actors can become isolated unless special measures are taken to bring them together. Integration between the tasks of actors ensures the complementarity of the tasks. Integration facilitates interaction. The interaction results in interchange of resources and ideas. The level of integration depends on the level of interchanging resources between elements, the frequency of interchange, and the importance that each actor attaches to the resources for achieving agreed-upon objectives. For the interchange, actors link together by linkage mechanisms, formal, with officially designed patterns and/or informal, that are based on personal relations. Furthermore, links can be functional, or institutional. Integration analysis is the examination of linkages between actors, which searches for the existence of any linkage, the kinds of linkage (formal and/or informal) and linkage mechanisms (joint projects, committees, visit, etc.) between actors, the kind of exchange between the actors (information, skills, human resource, financial resource, etc.), the frequency of use of the linkages, and the importance each actor attaches to the linkages for the system as a whole. Additionally, the reasons for (lack of) frequent use of linkages are important. These can reveal the state of linking amongst the constituent actors and the cause(s) for any malfunction (if any) that limit the actors from making effective linkages.

The two requirements mentioned above (task differentiation and integration amongst the tasks of actors) cannot make the system work effectively without satisfaction of a third requirement, coordination among the tasks of actors. Röling and Engel (1991-a) have discovered two default options as constraining problems for an effective AKIS performance, which occur in the absence of an effective coordination force. The first default is for AKIS to serve those who need help least. Unless special measures are taken, information tends to accumulate where it is already available. The weak tendency of the constituent actors to cooperate is the second default. Although the actors may come together by integration arrangements, there is no guarantee that they cooperate with each other in the absence of effective pressures. Lack of effective coordinating pressure, as Kaimowitz (1991) points out, leads the constituent actors to fulfil their own social and political needs rather than those of clients. This reduces the effectiveness of the actors. The pressure can be exerted by a number of elements located both inside and outside of the system, working to make the system tick. These influential elements are known as 'prime movers' (Engel *et al.*, 1990), acting as coordinators to make the actors work cooperatively. The prime movers can be among farmers and farmers' organisations, consumers, managers, policy makers, and politicians. In measuring the state of coordination in the system, a number of parameters can be used. These include (1) the main driving force for coordination of the system, (2) the mechanisms for coordination, and (3) reason(s) for (in)effective coordinating pressures. With regard to

driving forces for AKIS, Engel *et al.*, (1990) suggest five different AKIS configurations: policy driven, user driven, technology driven, industry driven, and donor driven. Each can work to enhance coordination among actors.

### *2.2.2. The effect of the context on the performance of the AKIS*

AKIS performs in a context in which several factors affect its effectiveness (provision of access to relevant technology for farmers) and impact (adoption of technology by farmers). Röling (1990) highlights four sets of sources of such effects for AKIS. These include (1) policy environment, which formulates laws and creates incentives that influence agriculture performance; (2) political and bureaucratic structures through which interest groups influence the system; (3) structural conditions, such as markets, inputs, the resource base, infrastructure, and the structure of farming; and (4) the external sector, comprising donor agencies, international agricultural research centres, and/or commercial firms. A conducive environment facilitates effective system performance.

In analysing the effect of factors from the outside of AKIS on the effectiveness and impact of the system, a number of attributes related to each factor can be examined. The following displays the important attributes for exploration.

(Factor 1): The role of policy in coordination was discussed earlier. Here, other functions of the policy environment can be set out for investigation. Two types of policies can be examined: general policies and technology policies. The attributes for exploring the effect of general policies can be the kind of existing policies affecting agriculture; the extent to which policies are clear, appropriate, and available for farmers; and whether they correspond to national objectives. Technology policies affect knowledge generation-utilisation processes, and consequently affect technology development and use. Thus, the extent to which (1) the priorities of knowledge institutions correspond to those of farmers; (2) the policy is appropriate to meet local-specific needs; and (3), national priorities correspond to local priorities, show the situation of technology policies.

(Factor 2): Wagemans (1990) suggests that an effective AKIS needs to perform in a decentralised political environment in which the up-ward information flow is smooth. Therefore, the state of decentralisation of the political and bureaucratic structure can reveal the kind of effect the structure has on the system. Decentralisation of the structure can be investigated from the point of view of planning, decision-making, and management functions (Rondinelli, 1987).

(Factor 3): Effective linkage among the constituent actors of AKIS and the actors responsible for providing access to the development mix for farmers is, according to Röling (1990), a vital need for the system. Thus, the study of integration between actors can reveal the impact of the system. For studying the integration, one can examine the existence of linkage, kind of links, the frequency of use of the linkages, the importance assigned to the linkages, and reason(s) for (lack of) effective linkages.

(Factor 4): The effect of the fourth set of factors (donor, international research centre, etc.) would come up by examining the importance of each factor for the priority setting, resource base, work load of the constituent institutions, etc. Each of the parameters affect the performance of the related institutions.

# CHAPTER 4

# RESEARCH METHODOLOGY

This chapter is devoted to explaining the research methodology used in the study as well as the techniques for data collection. The first section describes the perspective used to conduct the research followed by a section to introduce the research area. The farm level analysis constitutes the theme for discussion in the next section. This section is divided into two parts: the first part shows a picture from the reconnaissance phase of the research and of data collection methods. The second part describes the more in-depth research, the method of in-depth data collection, the sampling frame for the survey, the selected research areas, and the instruments used for data collection. The last two sections describe methods and techniques used to analyse the institutional and the policy levels.

## 1. The research method: perspectives

The choice of research method normally depends on the nature of the research problem. From the three basic methods of empirical social research, i.e. experimental, quantitative-descriptive, and exploratory (Tripodi *et al.*, 1973), the researcher applied mainly the exploratory method and to a lesser extent with the quantitative-descriptive method. This choice follows the nature of the study. The researcher had no control over salient variables in the study as required in the case of the experimental method. Furthermore, since the main aim of this study is to articulate concepts and to contribute to hypotheses development, it is more fruitful to use the exploratory method rather than the quantitative-descriptive. The latter approach was employed whenever a need for quantitative data arose. The important issue here is to get acquainted with the system as much as possible, bearing in mind the limitation of time and budget.

For the purpose of a research on AKIS, the research method must be responsive to the following situations: (1) formal as well as informal information flows within the system, (2) information from and about formal and informal institutions in the system, (3) formal as well as informal links, relationships and interrelations between various actors/groups/organisation in the system.

In order to become acquainted with different situations and conditions of each sub-system (research, extension, training, farmers, etc.) of the AKIS, there is a need for as much qualitative data as to be sufficient for drawing a comprehensive picture of each sub-system. In this respect, and following the guidelines provided by the systems perspective, the research began by forming a broad view of the situation. It narrowed down gradually to a specific domain to give deeper insight. A reconnaissance phase and a following in-depth study was conducted at all the three levels of study: the farm, institutions, and policy. The reconnaissance phase, as its nature demanded, was predominantly qualitative research. The qualitative data then provided a useful guideline for research in the following more specific phase.

Taking into account the time and resource limitations, the researcher limited the scope of the research area to only one district. The objective was to select a place with diverse conditions.

Furthermore, as many different agricultural activities could be found in any district,

which could not be analysed by a single study, it was logical to limit the scope of the research to a certain activity only. Therefore, within the district, the study focused on the knowledge and information system for a single crop. Given the socio-economic and political importance that wheat has, this crop was accordingly selected as a focus for study.

At the farm level, after a reconnaissance exploratory phase, as the first part of the study in that level, a more in-depth data collection was conducted by focusing on wheat to give more insight into the district's farming system. In order to give a representative character to the study on wheat, a relatively more quantitative research was conducted in the second part of the study at the farm level. Although the method used here was a survey, the flexibility of the method to qualitative data through open-ended interviews made it a qualitative survey. This method, as Somers (1991) has suggested, bore aspects of both qualitative and quantitative research in the sense that it afforded a broader perspective to the problem and its results, while at the same time it accounted for the individual interpretation of the respondents.

At the institutional and policy levels, research started from a broad review of institutional and policy issues at the operational, regional, and the national levels, and then narrowed down to knowledge and information institutions and to technology policies.

## 2. Research area

The area chosen for the field study is a district called Marvdasht, situated in the southern province of Fars (see map 5.1 in chapter 5). This particular district was chosen purposefully for several reasons. In addition to the researcher's own enthusiasm for selecting the district, which was built up from his past experience in the region, the existence of a combination of socio-economic, political, agro-ecological, physical, and technical factors affecting the agriculture was influential. The following are the main reasons. (1) Fars province has been one of the important bread baskets of the country. For a number of years, it has received the honour of being the top province in the country in purchasing wheat from the farmers. The district's contribution to wheat production is high. Its share of contributions to the purchased wheat in the province is 25-27 percent annually. (2) Marvdasht is one of the earliest districts in which the village-cluster agricultural service centres (MKKDs) were established. The MKKDs constitute the core elements in the post-revolution plan for re-organisation of the Ministry of Agriculture. There are 10 such local MKKDs, whose services cover the whole district. (3) The Ministry of jahad-e sazandegi (MJS) is present in the district through its three village-cluster service centres. (4) A college of agriculture, part of the Shiraz University (DKS) is situated some 20 kilometres from the border of the district. The college has an experimental station in the district. A number of socio-economic and technical studies on the district's agriculture have been conducted by the researchers of the college. (5) The provincial agricultural research centre of the Ministry of Agriculture (MTKF) and its experimental farm are located in a nearby district (Shiraz), in a place some 10 kilometres from the border of the district. (6) Furthermore, the experimental farm of the MJS is situated in a place near the MTKF. (7) There are two training centres of the Ministry of Agriculture, located in two different parts of the district, providing institutional training for the staff and for farmers, and giving vocational training to rural youth. (8) Since the pre-revolution era, the district has received services from rural cooperative societies and from farm corporations. (9) The district is the host for the second largest, as well as the best organised, cooperative of combine harvester owners in the country. The cooperative serves the district's own farmers as well as others from all over the Fars province and several other neighbouring

provinces. The district has 403 combine harvester machines (SBBF, 1990-c), which account for about 14% of the total combine harvester machines in the country (Angaji, 1990; Nejat Pur, 1986). (10) Modern network of irrigation channels under the dorudzan dam irrigates a large part of the district. The network has provided the opportunity for some farmers to cultivate paddy, a profitable cash crop. Some land reclamation has been conducted in areas under the irrigation network. (11) Different improved irrigation methods such as sprinkler irrigation, furrow irrigation, etc., together with the traditional method (qarqabi) operate in the district. (12) Large agricultural industries (milk pasteurisation, state and private agro-businesses, food processing factories, etc.) and other industries (petroleum refinery, petro-chemical complexes and their related small industries, etc.) are operating in the district as well as in the nearby district (Shiraz). These industries provide some off-farm jobs for the rural people. (13) The national Wheat Impact Programme (TATG), on which the government has focused to increase the productivity of irrigated wheat, is implemented in the district. (14) Prior to the 1979 revolution, Marvdasht district was one of the selected districts to receive intensive measures for agricultural production, through a project known as qotb-e keshavarzi (the pole of agriculture). In this respect, some improvements in the district's agriculture had taken place already prior to the revolution. (15) The post-revolution land disputes amongst the peasants as well as the land seizure, were among the most vigourous and problematic in the province and in the country. (16) The district's agricultural lands are highly fragmented. And last, but not least, (17) the agro-ecological conditions of the district and the socio-economic circumstances of the farmers are as diverse, as they are in the country as a whole.

For the numerous reasons mentioned above, the researcher found Marvdasht district a suitable place to conduct his study. Although there have been many efforts to improve agriculture in the form of development projects, on-farm as well as off-farm employment opportunities, modern irrigation, marketing, etc., productivity has not increased as much as might be expected. Although the district cannot, for the reasons given in 1-16 above, be classified as backward or poor, there are many resource-poor farmers, providing excellent opportunity for examining the extent to which the AKIS serves them well, or at all. Although, according to ASID (1989), in 1988-1989, the district's average yield of irrigated wheat was 3.2 tons per hectare (which is the same amount that was expected under the TATG programme) it is still far behind the economical farm yield (see Gomez (1985) for explanation on different yield gaps). According to Angaji (1990), the potential for maximum productivity is 10.5 tons per hectare for the qods variety. Furthermore, the yield of the rain-fed wheat in the district is only one ton per hectare, which reflects its undeveloped state. Searching for the reasons why, despite the presence of all intensive efforts, the district's agriculture has not been fully developed, the researcher suggests some improvements in agriculture nationwide.

## 3. Analysing the farm level situation

The practical study was started in October 1990 and lasted seven successive months. Data collection at the farm level started in November 1990. During this period, most farmers had already finished their time-consuming farming practices. They had already prepared their lands and sowed them, and were willing to meet anybody who was eager to ask them to sit down for a few hours and talk about their farming activities and problems. As mentioned, the farm level analysis is composed of two parts: exploratory research and a more quantitative study.

### 3.1. The exploratory research at the farm level

This part of the study was designed to explore the pattern of farming in the Marvdasht district. Getting acquainted with the situation, ensuring that not too many data are collected, as well as ensuring that no useful data are overlooked, was the first element which came into the author's mind at the reconnaissance stage. The author's background knowledge of the Fars province contributes considerable strength to the research, but also carries some danger of bias. On the one hand, it is a noble task to ground the research on the result of the process of change. On the other hand, no one can be free of the biases and assumptions of a particular kind of upbringing and position in society. The author has found provoking and fruitful to be a pioneer to test his own assumption and understanding against the results of an academic study. The objectives were, first to refresh his past knowledge on the local conditions; secondly, to analyse them in their entirety; and thirdly, to get acquainted with the socio-economic, political, and technical changes that have occurred in the area during the recent years.

The author examined qualitative data from various sources including farmers. A wide variety of methods was used for the data collection, including visiting farms, discussing with farmers, attending group discussions, attending seminars, and searching in available archives, reports, etc. 30 farmers and 16 key informants other than farmers (extensionists, local religious leaders and local teachers) were consulted on various issues related to the farming systems (such as the situation of the farm households, cropping and livestock subsystems, the interaction between the components of the farming system, opportunities, constraints and problems).

The farmers interviewed were of different socio-economic status. An open discussion method was used to collect data from the farmers. The discussions took place at the farmers' houses and at the farms. Each farmer, depending on his socio-economic conditions and on his farm's physical circumstances, contributed to the researcher's knowledge by introducing different ways of looking at the farming system. This revealed the diversity of conditions that farmers had experienced in their strategies for survival. Furthermore, the different goals farmers sought to accomplish were acknowledged.

Two different types of group discussion were conducted, one with farmers groups, and one with staff groups. These group discussions showed their usefulness by asking the farm level actors to participate in problem definition. Farmers and extensionists revealed different problems constraining the district's agriculture. Some institutional problems were also revealed in these discussions which were noted for the purpose of later institutional analysis.

Three agricultural events were attended, of which two were nationwide and the other a provincial one. The national events included a seminar on the 'Wheat Impact Programme', and the annual ceremony for the 'best producers' in the country. The former brought together general agricultural directors, heads of research and extension departments as well as the specialists on wheat from all provinces to discuss problems and constraints to the programme. The latter honoured the 'best producers' and the 'best extensionists' from different provinces, i.e., those who have contributed to food self-sufficiency increasing the productivity of the agriculture in their areas. The 'best producers' were attending various seminars, mass media interviews, parliament discussion sessions, and visiting top socio-political authorities (including the national leader, the president and the head of judiciary system). At the same time, a parallel ceremonial programme was arranged in provincial centres. In the provincial ceremonies, producers whose yields were higher than the rest of

the farmers in the province were honoured. For a period of one week a wide variety of issues concerning agriculture were on the agenda for discussion at national and provincial levels.

The third event was a seminar in the Fars province, which brought together a number of successful farmers from all over the province. These farmers obtained yields higher than six metric tons per hectare of wheat. The seminar was of a special importance, because the top farmers raised various problems facing their farming systems. There were critiques as well as comments from farmers on different aspects of wheat production.

All these events together with available reports, statistics, and written articles on various aspects of the agriculture provided the qualitative data necessary for appreciating the agricultural context.

### 3.2. The quantitative survey

The reconnaissance phase of the field analysis yielded four different groups of problems which have been constraining the district's agriculture. First, there exist various problems concerning agricultural development. These are considered as constraints to productivity increase. Secondly, in various technical aspects, the farmers have experienced different constraints to the development of their farming systems. Thirdly, a large proportion of the farming population have been failing to make full use of modern technologies. They had to adapt the technologies to their conditions when using them. Fourthly, small farmers have been failing to use the modern technologies.

Based on the findings of the first part of the field analysis, the quantitative survey (as the second phase of the research at the farm level) was conducted to document these four areas in more detail. Wheat production (as the domain of the most important staple food) was purposefully chosen for a survey of the situation of farmers in four village-cluster agricultural service centres (MKKDs) areas. The four randomly selected areas were serviced by Ramjerd MKKD (located in the Ramjerd 1 village-cluster), Khafrak-e Sofla MKKD (located in the Naqsh-e Rostam village-cluster), Khobriz MKKD (located in the Khobriz village-cluster), and Sa'adat Shahr MKKD (located in the Kamin village-cluster). In total, 5,523 farmers (with access to land) live in these four areas. They account for roughly one third of the total farmers (with access to land) in the district. Farmers involved in specialised activities such as bee-keeping, mushroom production, poultry production, etc., and also the state agri-businesses and state farms, were not included in this study.

The sampling frame was constructed using the available list of farmers kept by each of the four MKKDs. The accuracy of these lists was ensured by cross checking them with the available list of farmers from each village authenticated by the respective village council. The completeness of the lists was also guaranteed by the fact that all farmers had been referring to the MKKDs for subsidised chemical fertiliser. Each farmer had to refer to the respective MKKD in the area in order to obtain the subsidised chemical fertilisers for wheat production. The prices of chemical fertilisers on the black market were several times more than in the MKKDs. For this particular reason, none of the farmers missed the opportunity to obtain the subsidised chemical fertilisers from the MKKDs. Therefore, the available list of fertiliser receivers in each of the four MKKDs, constituted the sampling frame for the study.

Using a random procedure, in each area, 2% of the farmers were selected. In total, 118 farmers out of a population of 5,523 farmers were selected as sample. During the survey, twelve farmers were excluded from the selected sample due to death, migration to urban area, passing the land to others, or absence at the time of survey. The final sample

consisted of a total 106 farmers, who lived in 64 villages. The distribution of selected farmers in the four areas, the non-respondents, the final sample, and the number of villages accommodating the sample farmers are illustrated in table 4.1.

**Table 4.1. Distribution of sample farmers in the quantitative survey.**

| randomly selected MKKD | total abadis under MKKD | total farmers served by MKKD* | randomly selected farmers | non-respond. | final sample | number of villages accommod. sample |
|---|---|---|---|---|---|---|
| Ramjerd | 64 | 2,100 | 44 | 5 | 39 | 25 |
| Khafrak-e Sofla | 17 | 1,530 | 33 | 3 | 30 | 13 |
| Khobriz | 54 | 650 | 14 | 1 | 13 | 11 |
| Sa'adat Shahr | 41 | 1,243 | 27 | 3 | 24 | 15 |
| total | 176 | 5,523 | 118 | 12 | 106 | 64 |

Note: * the figures exclusively include farmers who have access to land.
Source: author's survey.

Based on the data gathered in the reconnaissance study, a questionnaire was designed to interview the sample farmers, incorporating comments received from a number of people including social researchers, extension scientists from universities, and local extensionists. The interview schedule was finalised after some adjustments were made based on the results of pre-test interviews.

An important feature of the questionnaire was that the questions probed the situation of wheat production in the context of the whole farming system. A part of the questionnaire concerned general data on the farm households (composition, division of domestic and agricultural labour, off-farm jobs, budgets, etc.), cropping system (size of farms, size of different plots, various crops, cultural practices, etc.) and livestock sub-system (types of livestock, the quantity and quality, feed, products, etc.).

The interview questions were open-ended. The questions provided an opportunity for the farmers to respond as fully as they wished following each question. A section in the questionnaire gathered general data on the characteristics of the interviewee such as farmers' age, education status, social activities, etc.

During the interviews, a note taking method was used to put down the farmers' responses to the questionnaire. This method was preferred over using a tape recorder to create a free discussion atmosphere, and to avoid any discomfort for the farmers. Some people, especially rural people, do not like to be taped while talking. The field notes were transferred onto code sheets which were later used in the SPSS PC$^+$ data analysis programme.

The problem of dispersed villages in the four areas and the long distances between them, given the time constraint for the study, made the researcher appreciate assistance from three colleagues. Two of them were agricultural officers from the district agricultural service centre and one was from the planning and statistics department of the provincial agricultural headquarters. The familiarity of these people with the district and their critical capacities in dealing with problems in agriculture was the main reason for their selection. Prior to the field survey, the purpose of the study and the way it should be conducted were discussed with the

group in several training sessions. During the field survey the researcher frequently brought together the interviewers in discussion sessions, in order to discuss and solve any problems which had emerged during the interviews due to any unpredicted factors. It was a useful way to learn from each other in conducting the interviews.

For the interviews, only the heads of the farm households were interviewed. The heads of the households were exclusively male. Social reasons prevented the researcher from interviewing women and children. Although it is not prohibited religiously to speak to the female members of the households, it is unfavourable behaviour socially. Furthermore, as a way of paying respect to the senior members of the society, people are required to speak to the heads of the households and not to the juniors. Thus, only the heads of the households can be interviewed.

The main focus of the questionnaire was on a technical package comprising several technologies introduced by the 'Wheat Impact Programme' (TATG). The package included the use of improved seeds, reduction of application rate of seeds and chemical fertilisers, use of herbicides in weed control, use of fungicides for seed treatment, and improvement of the way farmers prepare their lands.

The technology package was chosen in order to examine the relevance and availability of its component technologies for different categories of farmers, including the small farmers. The claims and benefits of technologies (as variables for testing the relevance and availability of technologies) were examined, for example, in terms of labour management within a farm system which is, of course, influenced by social priorities (such as the time spent on family affairs), cultural affairs (such as the taste of agricultural product), religious concerns and economic calculations (cost of technology and associated inputs, labour, additional income, etc.). Concerning the availability of the technologies, the physical, economical, and informational availability were the variables examined. The results are discussed in chapter 9.

The farm level analysis built a base on which the next two phases of the study, i.e. institutional and policy analysis, were established.

## 4. Institutional analysis

Based on the farmers' problem-defining responses to questions on the relevance and availability of technologies, a wide variety of institutions involved in providing access to services for the farmers were identified.

The first step in analysing the institutional situation was to conduct exploratory research to assess information about different institutions involved at the national, district and village-cluster levels, their components, relationships and the linkages between the components, and also between the institutions and their environment. In addition to a wide variety of available reports, statistics, documents, mandates, etc., three other sources were employed to gather information on institutional services: personal discussions, seminars, and the researcher's past experiences.

Regarding data collection from the institutions personnel, informal discussion sessions with both seniors and juniors were held. The researcher's past relationships (formal as well as informal) with a number of people at the institutional level facilitated the process of data collection, providing access to information easily and quickly.

The seminars at the national and provincial levels comprised the other valuable source of information. In these seminars, a wide variety of institutional problems concerning different services for farmers were pinpointed.

The reconnaissance phase of the institutional analysis was underpinned by the researcher's past experience. Several years of managerial posts at both the provincial and national levels helped the researcher to get acquainted with the present situation at this level, and helped him to delineate the problematic situation from the systems perspective for later analysis.

In total 73 people from different organisations including rural cooperatives, water department, agricultural bank, MKKDs, research, extension and training institutions, the religious structure, the governor, administration, etc., were consulted on different institutional services. Of these, 59 persons were appointed as specific informants who contributed data on the attributes of the knowledge institutions at the national, provincial, and district levels). These informants included seniors and juniors from research, extension and training institutions from different ministries and organisations.

### 4.1. Analysis of synergy between the components of the AKIS

The AKIS perspective was used as a diagnostic framework to analyse the synergy between the district's research, extension, training and farmers. At this stage of the research, the AKIS was treated as an abstract representative of the situation in the district. Thus, it is a purely abstract representation.

Three attributes of the AKIS were examined as an indication of synergy in the system: task differentiation amongst the actors, integration among the tasks of the actors and coordination among the actors. For analysing task differentiation, clarity of tasks in the science-practice continuum (Mc Dermott, 1987), gaps between the various tasks and overlapping of the tasks were examined. In integration analysis, the research probed linkages among the actors. In this respect, different attributes of the linkages were examined. These included the type of linkage, frequency of use, the importance of the linkage for the whole system, etc. For coordination analysis, the research examined the existence and effectiveness of coordinating pressure(s) on the actors, sources of influence, and coordination mechanism(s).

A methodology in analysing AKIS is RAAKS methodology, an approach to Rapid Appraisal of Agricultural Knowledge Systems (Engel *et al.*, 1990). Amongst other things, the authors have claimed that the methodology facilitates maximum use of the findings from agricultural knowledge system research. The application of the whole RAAKS methodology in analysing synergy amongst different actors was not appropriate in the sense that the method emphasises a team approach for successful results. Since the research was designed to be conducted by the present researcher, the primary condition for application of the RAAKS methodology was not available. None the less, certain aspects of RAAKS methodology were found useful for analysing the research data as will be seen in chapter 10.

A checklist proposed by Nestel (1989) was found to be a useful instrument in gathering data for evaluating the research and extension sub-systems. According to Nestel, using a checklist can optimise the benefits of evaluation by defining the context of evaluation from the outset. In this part of the study, checklists were used to collect data from members of the knowledge institutions. For the researchers, extensionists and trainers at the district and provincial levels and their supervisors, subject matter specialist the checklist included sections on organisational changes, planning and decision-making, mode of coordination, link and linkage mechanism, supervision, etc. For the field level extensionists, a section in the checklist dealt with extension systems, communication approaches, sources of technical information, education and training, etc. Some general data such as personal and academic

background of staff members (e.g., age, education, rank, responsibility, and information regarding different activities, etc.,) were assessed by searching through available statistics and administration documents.

In analysing the data, a matrix of connections proposed by Van Beek (1988, 1991) was found to be useful. The matrix of connections exhibits the different connections in the various combinations of frequency and importance among various elements in the system. The matrix summarises the collected data in order to examine the existence, frequency, and importance of linkages between the system's actors. Chapter 10 presents the results of the institutional analysis.

## 5. Analysing the policy level situation

Based on the farm level analysis, the policy situation was examined from the farmers' point of view. The study at this level aimed to reveal if the farmers' views on claims and benefits of the policies correspond to those expressed by the policy makers.

The procedure for analysing policy level was again to move from a more general explorative study to a more specific and in-depth analysis. In the explorative phase of the study, general agricultural policies were examined with respect to characteristics such as clarity of policies, correspondence of policies to the national objectives, coincidence of goals of policy makers and farmers, etc. Different sources were employed to gather information. These included written materials (official documents, annual reports, parliament records, planning manifests, etc.), parliamentary debates on governmental manifestos, mass media interviews, conferences, and pre-session speeches in the friday congregation prayer. A number of high-ranking officials from different ministries involved in agriculture were consulted as direct informants in this part of the study. In addition to the above sources, the previously mentioned seminars were useful sources of information on policy issues.

The explorative study formed the basis for the more specific study of technology policy. Characteristics such as correspondence between the priorities of knowledge institutions and farmers with respect to technologies, appropriateness of policies for farmers, correspondence between the national and local priorities for the knowledge institutions were studied. The result of this part of the study is presented in chapter 10.

# CHAPTER 5

# MARVDASHT DISTRICT

This chapter aims at introducing the context in which the present research is conducted. This introductory chapter is vital and an indispensable part of the study in the sense that it illustrates the diversity of the situations facing the farmers. Much of the information in this chapter, as well as chapters 6 and 7, has not been previously documented or brought together in one text.

The chapter contains nine sections. The first and second sections introduce the Marvdasht district from a historical and a geographical point of view respectively. This will be followed by two other sections that give statistics on population demography, and on administrative divisions of the district. The fifth section presents statistics on communication facilities. Description of the district's economy falls under the next section. The seventh section introduces the district's agriculture, followed by an inventory of the development projects implemented in the district. The final section discusses the environmental problems facing the district.

## 1. Some historical background

Historically, Marvdasht is a rich district, constituting one of the oldest inhabited territories of the country with a historical background that goes back to the time of Cyrus, the king of Persia in 553 B.C. Several monuments from those ancient times remain in the district, of which the tomb of Cyrus in Pasargad and the site of Persepolis (the palace of Dariush, an Achaemenid King who ruled in 521 B.C.) are the most important. The former is located in the northeast of the district, some 105 kilometres to Marvdasht city (the district's centre), and the latter is at a distance of a few kilometres to the east of the city.

Furthermore, history indicates that agriculture has always played an important role in the district's economy. During ancient times, farmers constituted a large population clustered in the barzegaran class who supplied food for the royalty and other classes, including priests, the army, and scientists. Realising the important role that the district could play in providing food, kings and rulers tried to develop the district's agriculture. It was the importance of the agriculture that made the rulers build several dams for irrigation. These dams are still used. Of these, the most important is the band-e amir, which was built some 700 years ago by azad al-dowleh-e deilami. Contemporary history highlights the special attention that the governments of modern Iran have paid to the district.

In total, two farm corporations called Ariamehr and Dariush-e Kabir have been established in the district (for detailed information on farm corporations in the country, their functions, and activities, readers can refer to chapter 6). The former was established in 1964, the first in Fars province. The corporation was situated at shams abad village, close to Persepolis, some seven kilometres from the district's centre. A total of 1,540 hectares was managed by the corporation (DS, 1969). The latter farm corporation came into existence in 1969. Five villages in the Ramjerd 2 village-cluster were under the corporation (MLR&RC, 1969). The corporations were mainly established to consolidate small plots and to prevent the further fragmentation of land after the land reform. After

the 1979 revolution, due to socio-political reasons these two corporations together with many other farm corporations throughout the country, were disbanded.

In 1966, it was decided to construct a dam in the district (the dorudzan dam). The dam was built on the kor river in a close distance to dorudzan village, some 60 kilometres to the northwest of the district's centre. The construction of the dam changed the face of the district in the sense that it increased the district's irrigation capacity, and enabled a large number of farmers to grow paddy on their farms. Before the construction of the dam, only some 7,000 hectares of land in two adjacent districts (Marvdasht and Sepidan) were irrigated by the river. In 1972, after the construction of the dam, some 72,000 hectares of agricultural land received water via a network of 552 kilometres of irrigation channels.

In 1975, the Qotb-e Keshavarzi Law was passed to increase the efficiency of scarce resources, especially water. According to the law, in territories under modern irrigation installations, the Ministry of Agriculture had to prepare comprehensive plans for agricultural development of the territories, and the farmers had to cultivate according to the cultivation plans of the Ministry. Also, the exchange of small plots within territories for consolidation of land was a basic element emphasised by the Qotb-e Keshavarzi Law. Furthermore, farmers who had received land under the Land Reform Act, and those farmers whose land was smaller than 10 hectares, had to form farm corporations, or production cooperations. The law compelled non-compliant farmers to sell their land to the government for redistribution. The law prohibited the farmers from fragmenting their plots below a certain size. Marvdasht district was amongst twenty territories throughout the country in which the law was supposed to be implemented. However, due to the opposition of farmers, the law was stopped by the government at an early stage of implementation. Fearing to lose their ownership title on lands, and to find themselves restricted in decision making, the farmers opposed the law and showed no interest in the formation of corporations. Although it was not implemented, the law attracted the attention of politicians and the public to the district and its need for development.

After the 1979 revolution, realising the high potential of the district's contribution to national objectives, the new government paid special attention to the development of the district. Marvdasht was amongst the first few districts throughout the country in which the re-organisation of the Ministry of Agriculture (MA) materialised. In 1980, ten agricultural service centres at village-cluster level (MKKD) were established to provide farmers with different services close to farm level.

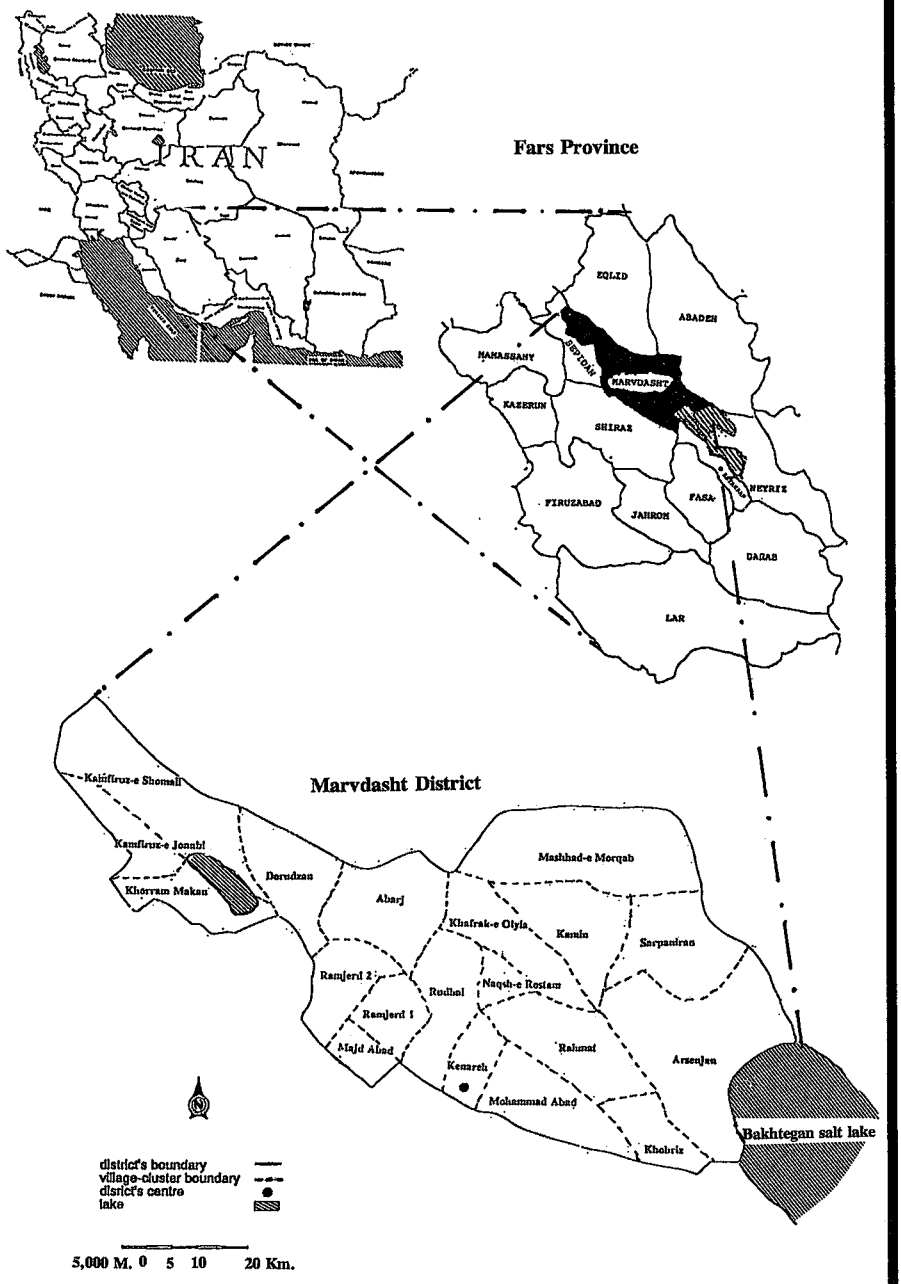
## 2. Geography

Due to a lack of a single statistical centre that could give comprehensive official statistics on the district's geography, the writer borrowed from a combination of sources including ISC, 1989-b; JS, 1983; MA, 1974; Nejat Pur, 1986; SMAF, 1989 and 1979; and STK, 1984. The following gives a brief description of the district's location, topography, climate, precipitation, soil, and hydrology.

### 2.1. Location and size

Marvdasht district is one of fourteen districts of Fars, a southern province, situated in the central part of the province. As map 5.1 shows, the district shares a border with five districts: Eqlid to the north, Abadeh to the north and east, Neyriz to the southeast,

**Map 5.1. Location and administrative divisions of Marvdasht district.**



Shiraz to the south, and Sepidan to the west and northwest.

The district has a total land area of 6,454 square kilometres (645,400 hectares), and has a mountainous plateau topography with an average elevation of 1,600 metres above sea level. The highest point is 2,200 metres.

## 2.2. Climate

Except for the northern and northwestern parts of the district, which have a very cold winter and a cool summer, the other parts are relatively warm. The district's temperature reaches a maximum of 38 degrees Celsius in mordad (23 of July to 22 of August) and a minimum of -5 degrees in dey (22 of December to 20 of January), about 16 degrees annually. On average, the district's humidity is 48%, and the annual evaporation rate is 1,700 millimetres. A northwestern frosty wind blows twice a year, damaging farms. The first frost comes in the first half of October, and the second around mid-April. The freezing period is 52 days in total, scattered in five consecutive months: 5 days in aban, 18 days in azar, 16 days in dey, 11 days in bahman, and 2 days in esfand (within a period from 23 of October to 20 of March). Generally speaking, on the basis of statistical data on the climatic changes and temperature-humidity figures, and the existence of 150 to 200 dry days per year, the district is characterised by a special warm and dry mediterranean climate (MA, 1974). Considering the existence of both humid-cold seasons and long-dry-warm seasons, we can classify the climate as humid-semi-dry (xeric aridic).

Annually, based on 11-year data from 1974-1975 to 1984-1985, on average, the district receives 320 millimetres of precipitation. Ninety nine percent of rain falls during November-May with the heaviest recorded in January.

## 2.3. Soils

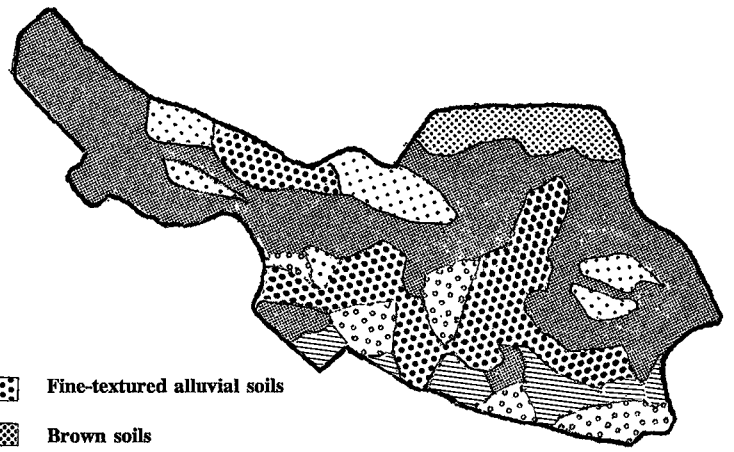
Except for the area under the dorudzan dam in which the soil is analysed in detail, soils in the other parts of the district have been analysed only basically. In general, according to Soil Map of Iran (Dewan and Famouri, 1964), the district's soils include: (1) fine-textured alluvial soils, (2) coarse-textured alluvial and colluvial soils and regosols, (3) brown and chestnut soils (*Calcareous lithosols*), (4) saline alluvial soils and (5) solonchak and solonetz soils (see map 5.2).

Typically, being the most naturally fertile with great potential for agricultural production, the fine-textured alluvial soils comprise sandy-to-clay loams derived from mixed parent materials, dominantly limestone in origin. All of these soils are low in available phosphate, but high in calcium and exchangeable potassium. The permeability ranges from poor to good. Although the soils are free from salt, they may have slight salinity in certain areas. These soils are mainly found in the central part of the district stretching to the western, southern and eastern parts. A small area in the north also has these types of soils.

The coarse-textured alluvial and colluvial soils and regosols (known as colluvial soils and soils of coalescing alluvial fans) are found in limited areas dispersed in the eastern, north, northwestern and western parts of the district. These soils are usually occurring on slopes of 2 to 5 percent, but also on steeper or more gentle slopes. Containing lime in the form of powder or deposited on gravels, these soils have been

built up by material carried by flood waters from the mountains. These soils are not saline except when the sediments are from calcareous marls, saliferous and gypsiferous. The soils show an excessive internal drainage and normally good to excessive external drainage. Containing too much gravel, and given a low moisture-holding capacity and being infertile, coarse-textured alluvial and colluvial soils are not of great use in agricultural development.

**Map 5.2. Soils of Marvdasht district.**




**Source: Dewan and Famouri (1964).**

The brown and chestnut soils are medium-deep to very deep and moderately permeable. They have very low available phosphorus and organic matter, but are usually high in exchangeable potassium. A mixture of these soils are found in large areas in the eastern, northeastern and northwestern parts, and in limited areas in the western and central parts of the district. The northeastern part of the district has brown soils.

The saline alluvial soils comprise medium texture sandy-to-clay loams on the surface. The subsoil usually has a layer of clay, which is sometimes very fine. These soils are characterised by the salinity which ranges from slight to moderate (in some cases the salinity is severe). The natural drainage is imperfect to poor. Internal drainage and the permeability is slow to very slow. These soils are found in small parts of the west and southeast of the district.

Being saline and alkaline, the solonchak and solonetz soils (*Halomorphic* soils) are either poorly drained, or have been developed under poor drainage conditions. The solonchak soils containing large quantities of soluble salts, are characterised by poor

organic matter, and have a lightly crusted granular structure. Solonetz soils are created from partial leaching and alkalisation of solonchak soils. These soils are found in limited areas scattered in western, southern, and southeastern parts of the district.

## 2.4. Soil problems

The district's agricultural land is limited by a combination of salinity, alkalinity and water-logging problems. Salinity and alkalinity problems can be found in most parts of the district, while water-logging is mainly in the area under the dorudzan dam.

A large part of the salinity and alkalinity problems is related to water or the scarcity of it. Salt concentration in the parent material from which the soils are formed is high. Because of the scarcity of rainfall and insufficient irrigation, the salts are not leached out of the soils. In some cases the salinity is so high that no crop can survive. Furthermore, in some areas the soils are not highly salty until they are irrigated. The salinity problem is caused by the irrigation. The surface and ground water in most areas contains salts. The surface water picks up salts as it flows over the surface or percolates through the soil. As a result, the surface water becomes increasingly more salty as it flows over soils from the main source to the reservoirs or to the fields. This water adds salts to the already saline soils and increases the amount of salt even further.

The salinity problem in some parts of Arsenjan and Khobriz village-clusters near to the bakhtegan salt lake (located at the corner of the southeast of the district) is more related to the initial uniform salting received from the lake. These areas were, at one time, part of the lake.

Concerning salinity and alkalinity of the soils, the area under the dorudzan dam is divided into 12 zones ranging from nil to a high degree of salinity and alkalinity (SAMF, 1980). Approximately, 20% of the land has saline and alkali soils. Of the area limited by salinity and alkalinity problems, approximately 30% is waste land due to a high concentration of salt and a high degree of pH. One point to notice is that these data are based on a detailed soil studies conducted during 1973-1974. Since then there might have been some changes in the composition of the soils due to different factors.

A large part of the area under the dorudzan dam is characterised by a shallow plateau with a 5/10,000 slope, level in some parts. The soil is heavy, due to a high proportion of clay. The characteristics of the soil together with low permeability of the surface layer, and a shallow slope results in poor natural drainage. For this reason, some 24,000 hectares of land under the dam need sub-surface drainage systems (SAMF, 1980). A large volume of seepage from irrigation channels and other water courses together with inevitable deep percolation waste associated with the application of irrigation water to soils in paddy fields has raised the water table throughout the area and caused water-logging in some parts.

## 2.5. Irrigation sources

The sources of both surface and sub-surface water include the network of irrigation channels of the dorudzan dam, rivers, springs, tube wells, qanats (the subterranean water channel), and last, but not least, rain. Rain plays a very important role in the district's agriculture due to water shortage. Usually, the district's farmers wait for rain, hoping to get their crops irrigated by rain, at least for the first watering. In this way, they can save money and labour.

One important source of irrigation is the kor river, which irrigates a large part of the district, and ends up in the bakhtegan salt lake. The dorudzan storage dam (with a 760 MCM storage capacity) is constructed on this river. The dam stores water for irrigation of some 58,000 hectares of land in the district (approximately 40% of the total district's agricultural land and 80% of the total agricultural land under the dam). The network covers a large part of the district including Ramjerd 1, Ramjerd 2, Rudbal, Naqsh-e Rostam and Rahmat village-clusters. In addition to the dorudzan dam, there are a few traditional dams left over from the past, which are still in use for irrigation purposes. The other main river is the sivand, which irrigates a large part of the northeast District.

Another main source of irrigation is qanat, a traditional underground channel that runs a long way, sometimes more than 10 kilometres. It has many vertical inspection wells distributed along side the channel, each 50 to 100 metres interval. The conduit accumulates water from a vast area along its path from the origin to the end opening where the water can be used for drinking or irrigation.

In 1982, some 130 qanats out of a total 230 (57%) were active. Also, a combination of 1,259 tube wells (deep, semi-deep, and shallow), 81 permanent rivers, 11 seasonal rivers, and a total 173 permanent as well as seasonal springs were at the disposal of the district's farmers (JS, 1983).

## 3. Administrative divisions

At the time of data collection (1990), a new administrative division for the district was in the process of implementation. The old arrangement divided the district into three sub-districts (bakhshs) and 10 village-clusters (dehestans). The division limited the district to 488 locations (abadis) including villages (dehs), dependent and independent farms, and clusters of residences and working places (not necessarily having anything to do with agriculture). The new setting, increased the sub-districts to 4, and the village-clusters to 19. Following the change, the district included 517 locations. The 29 new locations added to the district were detached from Sepidan district. The new sub-districts include Markazi (central), Sa'adat Abad, Arsenjan, and Kamfiruz. Map 5.1 shows the location of the district, and displays the village-clusters in detail.

Of the village-clusters, 2 are located in Arsenjan sub-district, 3 in Sa'adat Abad, 11 in Markazi, and the remaining in Kamfiruz (see table 5.1). Each village-cluster is composed of a number of locations. According to SBBF (1991), of the total 517 locations, 372 (72%) are permanently inhabited, and 107 (21%) are permanently left abandoned. The remaining 7% of the locations are either inhabited for the main part of a year, or uninhabited altogether. In total, 393 locations exist in which life activities are going on permanently or for the main part of the year.

Approximately, 33% of the inhabited locations accommodates populations of less than 100 persons, and 38% houses between 100 to 1,000. Only 2 locations (0.5%) hold a population of more than 5,000 persons (ISC, 1989-a).

Of the total locations, approximately 60% are villages (dehs), whereas the remaining are farms, clusters of residences, and working places. As table 5.1 shows, of the villages, 51% is situated in Markazi sub-district, 21% in Arsenjan, 17% in Kamfiruz, and the remaining in Sa'adat Abad.

## 4. Demography

According to the 1986 census (SBBF, 1991), the district accommodates a population of 289,878 clustered into 52,495 khanvars or households (a khanvar is a unit used in the Iranian statistical system for expressing population in smaller units). A khanvar comprises people who live together in the same residential units. In addition, the group of people should share the living expenses, and eat together. Also, a khanvar can include only one person. According to this definition, a khanvar can be of three forms: (1) one-person, (2) a group of people who have family relations (consanguineous, and/or through marriage) with each other, and (3) a group of people who have no family relations, but may have some reasons to stay together.

**Table 5.1. Distribution of rural khanvars and rural population by sub-district, village-cluster, location and village in Marvdasht district (1986).**

| sub-districts (bakhshs) | village-clusters (dehestans) | total locations (abadis) | total villages (dehs) | inhabited abadis | rural khanvar | rural population |
|---|---|---|---|---|---|---|
| Arsenjan: | | | | | | |
| Arsenjan | | 62 | 19 | 38 | 1,280 | 7,144 |
| Khohrtz | | 54 | 45 | 49 | 2,114 | 11,679 |
| -total (Arsenjan): | 2 | 116 | 64 | 87 | 3,394 | 18,823 |
| Sa'adat Abad: | | | | | | |
| Sar Pantran | | 25 | 14 | 17 | 394 | 2,109 |
| Kamin | | 36 | 13 | 27 | 896 | 4,937 |
| Mashhad-e Morqab | | 17 | 6 | 8 | 1,442 | 8,300 |
| -total (Sa'adat Abad): | 3 | 78 | 33 | 52 | 2,732 | 15,346 |
| Markazi: | | | | | | |
| Aharj | | 37 | 23 | 33 | 1,694 | 9,873 |
| Mohammad Abad | | 23 | 12 | 18 | 1,496 | 8,370 |
| Naqsh-e Rostam | | 13 | 10 | 11 | 2,172 | 12,140 |
| Khafrak-e Olya | | 30 | 9 | 16 | 2,860 | 14,066 |
| Ramjerd No.1 | | 24 | 14 | 17 | 1,531 | 8,979 |
| Ramjerd No.2 | | 32 | 26 | 29 | 2,102 | 12,464 |
| Dorudzan | | 18 | 13 | 15 | 2,093 | 11,059 |
| Rahmat | | 37 | 18 | 25 | 1,552 | 8,588 |
| Kenareh | | 20 | 10 | 13 | 3,323 | 17,776 |
| Majd Abad | | 10 | 10 | 10 | 1,205 | 7,395 |
| Rudbal | | 17 | 11 | 15 | 2,037 | 11,132 |
| -total (Markazi): | 11 | 261 | 156 | 202 | 22,065 | 121,742 |
| Kamfiruz: | | | | | | |
| Khorram Makan | | 21 | 17 | 19 | 1,216 | 7,786 |
| Kamfiruz-e Jonubi | | 18 | 16 | 16 | 1,503 | 8,824 |
| Kamfiruz-e Shomali | | 23 | 17 | 17 | 1,609 | 9,063 |
| -total (Kamfiruz): | 3 | 62 | 50 | 52 | 4,328 | 25,673 |
| Total (Marvdasht): | 19 | 517 | 303 | 393 | 32,519 | 181,584 |

Note: 1- figures for total abadis and total dehs include permanent inhabited, permanent abandoned, and occasionally inhabited.
2- inhabited abadis include both permanently and occasionally inhabited.
Source: SBBF (1991).

The average size of khanvar in the district is five, and the majority of khanvars hold 5 members. Of the total khanvars, approximately 2/3 (32,519 khanvars) are rural

with an average size of 5.6 members. Unfortunately, there are no detailed data on the composition of khanvars and of families (single, extended, etc.,) available. The distribution of the rural population and rural khanvars by sub-district, village-cluster, location, and village is tabulated in table 5.1.

The population density of the district is 49 persons per square kilometres. The figure is some 1.7 times the figure for the whole country. The most concentrated areas are located in the central parts of the district.

Of the total population, 61.9% live in the rural areas, and 37.9% in urban centres. The remaining 0.2% are nomads with no fixed location, moving around seasonally, within the district and outside the district (ISC, 1989-b).

The district's population is young, approximately 50% are under 15 years of age. Some 11% of the population fall between 15 to 19 years, 16% between 20 to 29 years, and 21% between 30 to 63 years. Only a small part of the population comprises people of 64 years and older (2.2%). In this respect, the rural population has, more or less, the same characteristic as described for the total population.

Approximately 51% of the total population of the district is male. The male:female ratio is 106 men to 100 women. The same sex composition is true for the rural population. Of the total male and female populations, 63% (93,005 persons) and 62% (88,579 persons) live in rural areas respectively (SBBF, 1991).

Of the total population, 99.7% speaks Farsi (the national language). Islam is the dominant religion in the district. Some 99.72% of the population is Muslim, and the rest comprises Zoroastrian, Jewish, Christian, and others. In the rural areas, the Moslem population reaches a figure of 99.75%. Approximately 48% of the locations has a mosque, and a quarter accommodates ruhani (a Moslem clergy man).

From the point of view of literacy, the district shows a figure close to the national literacy rate. Out of the population of 6 years and older, 61.5% is literate compared to 62% nationally. Analysis of the literacy rate shows a higher rate for the urban areas, approximately 79% for men and 60% for women. The figure is 70% and 43% for the district's rural men and rural women respectively.

One main effort of the post-revolution government has been the extension of educational services for rural people. This came in the form of establishment of new schools and introducing a special programme for adult education. Educational services are provided for the rural children at three levels: elementary, secondary, and diploma. The formal education starts for children at age 6, and takes 12 years to complete. Elementary schools teach the children for the first five years, secondary schools for the second four years, and high schools for the last three years. However, the rural children still lack sufficient educational services. Of the total inhabited locations (abadis), 72% has an elementary school, 15% is provided with secondary school, and only 1% has a higher school (SBBF, 1991). Furthermore, only 1/4 of the locations have an instructor for adult education. Based on the 1986 census, district-wide, out of the population of people of 6 to 24 years of age, 51.4% is studying at school. This figure is 58.4% and 47.3% in the urban and rural areas respectively (excluding nomads). For nomads, the rate is relatively low, approximately 27% of youths of age 6 to 24 go to school.

The schooling rate of the total population is relatively higher amongst children of 6 to 10 years of age. This category accounts for approximately 88% of the students, while the category of 11 to 14 and 15 to 24 years of age constitute 68% and 14% respectively. Unfortunately, there is no official statistic that could give data on schooling rate of male and female.

At the time of census (1986), from the total population, some 83.1% lived in their place of birth (ISC, 1989-a). The analysis of statistical data on the movement of the district's people within the district shows that 8.7% of the population have emigrated from rural areas to urban areas, 2.5% have moved from urban areas to some other urban areas, 4% from rural areas to some other rural areas, and 1% have immigrated from urban areas to rural areas. In a 10-year period (1976-1986), some 13,000 people have immigrated to the district, of which 30% has gone to the rural areas (ISC, 1989-b). Approximately, 51% of the immigrants are male. Of the total immigrants, 54% come from the other districts of Fars province, 29% from other provinces, 9% from abroad, and the rest is unidentified. Unfortunately, there are no data available on emigration of the rural people to the outside of the district within that period of time.

## 5. Communication facilities

According to the 1986 census (SBBF, 1991), 14 abadis (locations) out of a total of 393 inhabited abadis of the district have a telephone. This provides access to telephone for only 14% of the total rural population. The telephone lines are not private, but public telephones located in central villages. Telegraph facilities are available in only 9 central abadis, which provide access for 16% of the total rural population. In total, 45 abadis (11%) have access to post offices. These abadis accommodate 26% of the total rural people. Only 7% of the total rural population have access to newspaper. These people are in 5 abadis (1% of the total abadis).

Access roads are relatively well extended in the district, connecting some 99% of the abadis to each other and to the district's centre. Of a total network of 543 kilometres of road in the district, 36% are in the rural areas. Of the total 197 kilometres of rural road, 18% are tarmac, 3% well constructed earth roads, and the remaining 79% ordinary earth roads. Approximately, 22% of the abadis have tarmac roads, 48.4% are with well constructed earth roads, and 28.5% with ordinary earth roads. One abadi is accessible only by boat, and 3 abadis (1%) by means of animal transport.

Not all the abadis have public vehicles. Only in approximately 50% of the abadis are public vehicles available. This provides access for some 78% of the total rural population. However, 22% of the rural population accommodated in remote and small abadis remain without any public vehicles. In other words, given the scarcity of private vehicles in the rural areas and the well extended access roads, the population of some 50% of the abadis have difficulty reaching important places like the agricultural service centres (MKKDs), the district's centre, etc.

## 6. Economy

Three main sectors of the district's economy include, in the order of importance, agriculture, service provision, and manufacturing. According to the 1986 census (ISC, 1989-b), these three sectors accommodate an active population of 58,652 (10 years and older). Out of this labour force, approximately 64% are in rural areas, 35.75% in urban areas, and the remaining 0.25% are nomads. Of the rural labour force, 94% are male.

The district is a high potential agricultural area. From the wheat production point of view, the district holds an important position, being considered as the bread basket of the province. Each year it contributes some 25-27 percent to the total amount of wheat purchased by the provincial cereal organisation. In 1990, according to the district's rural

cooperative organisation (Mosleh, the manager of the organisation interviewed in 1990), a total 130,000 tons of wheat were purchased from the district's farmers. This accounts for 27% of the total purchased wheat in the province. Furthermore, the agriculture is the host for a large part of the labour force. Approximately 40% (22,820 persons) of the total labour force are active in agriculture. Out of this population, approximately 90% are rural, 9% urban, and the remaining are nomads.

The other two sectors of the economy (service provision and manufacturing) accommodate 33% and 27% of the labour force respectively. In the rural areas, the distribution of the labour force amongst the three economy sectors gives more weight to agriculture, indicating that 56% of the labour force work in agriculture, and the rest in service provision and manufacturing (22% each).

A number of factories and manufacturing assemblies (both state-run and private) are situated in the district, and in the nearby Shiraz district, which provide off-farm employment opportunities for the rural people. The factories can be grouped into two broad categories: (1) large factories with some connections to agriculture, and (2) factories with little, or hardly any, relation to agriculture. The former includes petro-chemical assembly (manufactures chemical fertilisers), milk pasteurisation factory (situated at Shiraz district, close to the border of the Marvdasht district), sugar beets refinery, and meat industry. These factories are state-run businesses. A number of small private businesses like feed production, cheese production, small agri-businesses, food processing units, grain drying assemblies, leather and wool processing factories, carpet weaving, machinery spare part manufacturing, and others, are operating in the district. The other factories include: the state-run petroleum refinery complex (situated in close distance to the milk pasteurisation assembly), and a number of small businesses active in rock cutting, surface mining, ceramic manufacturing, petroleum by-products and others (some of them are situated in the nearby Shiraz district).

An important source of income for the rural families is handcraft. In this respect, weaving of carpets, rugs, and gelim (short-napped coarse carpet); wool spinning; tailoring and knitting; matting and basket making; and lastly making by-products such as cheese, batter, jam, etc., are the main activities. In 1986, some 6,480 weaving units for carpets and other kinds of tapestry, and some 464 units for other handcrafts, and for making by-product were active in the district (SBBF, 1991).

## 7. Agriculture

Crop production, gardening, livestock production, poultry, and bee-keeping are the main agricultural activities in the district. Additionally, a small part of the population is dependent on forestry, fishery, and hunting for living. These activities make approximately 22,820 khanvars involved of which 90% (20,531 khanvars) are rural (ISC, 1989-b).

Some 18,169 khanvars (56% of the total rural khanvars and 80% of the khanvars active in agriculture) have access to land. Of these khanvars, approximately 75% (13,698 khanvars) either owned their land before the 1962 Land Reform Act or have received them under the Land Reform Act (Marvdasht MKKS, 1993). The remainder either received land under the post-revolutionary Land Reform Act or purchased part of other people's land.

However, data on classification of the lands by size are not available. The records on lands distributed by the pre-revolution land reform organisation do not distinguish

between the district lands and the lands belonging to the Shiraz district (a neighbouring district), due to the unity of the two districts at the time of implementation of the Land Reform Act. Furthermore, the post-revolution land reform organisation has no such classification records on the lands distributed by the organisation.

In 1986, livestock production, crop production, and gardening were exercised in 91%, 90%, and 41% of the populated locations (abadis) respectively (SBBF, 1991), while the other two activities (poultry and bee-keeping) were practised in 25% and 9% of the locations respectively.

## 7.1. Crop production and gardening

The district accommodates some 11% of the total agricultural land of the province (SBBF, 1990-c). In 1988, the district's total agricultural land (arable and permanent crops) added up to some 169,300 hectares (approximately 26% of the total area of the district) of which 86% was irrigated. Approximately, 96% of the total land was devoted to annual crops, and the rest to perennial crops (see table 5.2).

Table 5.2. Land use in Marvdasht district, 1988 (hectares).

| | |
|---|---|
| total area | 645,400 |
| arable and perm. crops | 169,300 |
| arable | 162,900 |
| perm. crops | 6,400 |
| natural rangelands | 433,000 |
| forests | 33,000 |
| other land | 10,100 |

Source: ISC (1989-b), SBBF (1990-c) and STK (1984).

Concerning the land tenure, the land is divided into three groups: privately owned, jointly owned, and rented. Approximately, 2/3 of the land is privately owned of which 86% falls into irrigated areas, and the rest into rain-fed areas.

In 1988, out of a total 162,900 hectares used for annual crops (both irrigated and rain-fed), 85% fell into irrigated areas. Each year, some land is set aside for fallow (as will be explained in chapter 7, the fallow is short and is done occasionally). In 1988, approximately 82% (133,981 hectares) were under cultivation (both irrigated and rain-fed), and the rest was left fallow.

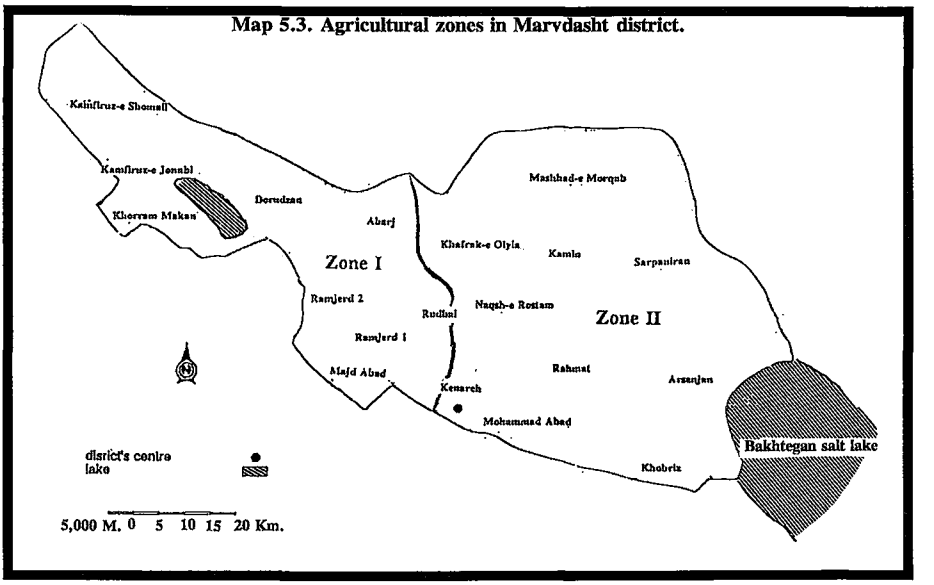
Table 5.3. Cultivated area, yield, and total production of the main crops in Marvdasht district (1988).

| crop | cultivated area (ha) | yield (MT/ha) | production (MT) |
|---|---|---|---|
| wheat | 62,818 | 3.8 | 239,839 |
| barley | 49,791 | 3.2 | 158,979 |
| paddy | 7,716 | 3.8 | 28,958 |
| alfalfa, sainfoin, and clover | 5,368 | 6.3 | 33,642 |
| sugar beets | 4,268 | 31.0 | 132,437 |
| maize (silage) | 3,211 | 19.7 | 63,343 |
| maize (grain) | 1,918 | 7.2 | 13,842 |
| tomato | 1,676 | 21.0 | 35,502 |
| beans | 890 | 1.0 | 860 |
| melon | 685 | 11.0 | 7,703 |
| egg plant | 586 | 8.5 | 4,990 |
| cucumber | 502 | 6.9 | 3,453 |
| water melon | 492 | 31.0 | 15,133 |

Note: 1- figures for wheat, barley, and beans include both irrigated and rain-fed crops.
Source: SBBF (1990-c).

A wide variety of crops is grown in the district. The main crops include wheat, barley, paddy, sugar beets, alfalfa, sainfoin, clover, maize (silage and grain), tomatoes, pulses (especially beans), melons, egg plants, cucumbers, and water melons. Potato and onion are not important, only small areas (160 hectares of potato and 8 hectares of onion), mainly in the central part of the district are under the crops. Table 5.3 illustrates the cultivated area, yields, and total production of

Map 5.3. Agricultural zones in Marvdasht district.




the main crops.

Concerning the production of the main crops, the district is divided into two agricultural zones. The first zone (Zone I, see map 5.3) includes the area in which paddy fields are situated, comprising 9 village-clusters out of the total 19 village-clusters. This zone is composed of the northwestern, western and some central parts of the district. The zone includes the watershed for the kor river and the area under the dorudzan dam. The total area of the zone is slightly larger than one third of the total area of the district. In addition to paddy, the other main crops cultivated in Zone I, include wheat, barley, alfalfa, clover, sainfoin, pulses (especially beans and peas) and a wide variety of vegetables. The rest of the areas falls into Zone II. The main crops cultivated in Zone II include wheat, barley, sugar beets, maize (green and grain), alfalfa, sainfoin, clover, beans, tomatoes, melons, vegetables, etc. An inventory of the crops grown in the district will be presented in chapter 7.

Approximately, 14% of the wheat cropped area of the province is situated at the district. Of the wheat cropped area, approximately 95% is irrigated (SBBF, 1990-c). In 1988, a total 62,818 hectares of wheat accounted for some 37% of the district's total agricultural land. Table 5.4 illustrates the wheat cropped area in a number of years.

Table 5.4. Cultivated area of wheat in a period between 1981-1982 and 1985-1986 in Marvdasht district (hectare).

| | 1981-82 | 1982-83 | 1983-84 | 1984-85 | 1985-86 |
|---|---|---|---|---|---|
| irrigated | 52,000 | 54,400 | 44,000 | 50,000 | 56,500 |
| rain-fed | 3,600 | 3,800 | 780 | 1,500 | 1,800 |
| total | 55,600 | 58,200 | 44,780 | 51,500 | 58,300 |

Source: Nejat Pur (1986).

A variety of perennial crops is grown on a total area of 6,400 hectares. Out of the land under the perennial crops, some 96% falls into irrigated areas. The fruit trees are grown on a land area of 5,672 hectares of which 97% is located in irrigated

areas. The fruit trees include pomegranate, grapes, almond, walnut, fig, apples, pears, peaches, mulberry, apricot, and quince. Table 5.5 illustrates the area and production of some selected fruit trees. The main non-fruit trees found in the district's orchards include aspen, willow, and pine.

Table 5.5. Cultivated area and total production of selected fruit trees in Marvdasht district (1988).

| | pomegranate | grapes | almond | walnut | fig |
|---|---|---|---|---|---|
| area (ha): | 1,433 | 735 | 330 | 132 | 7 |
| production (MT): | 6,957 | 2,824 | 843 | 237 | 10 |

Source: SBBF (1990-c).

## 7.2. Livestock production, poultry and bee-keeping

Sheep, goat, cow, and buffalo, are the main livestock being kept by the farmers as sources of milk and red meat. The use of livestock for draught power is less common in the district due to a wide adoption of farm machinery by the farmers. According to the SBBF (1990-c), some 389,634 sheep and lamb, 225,755 goats and kid, 29,836 cows and calves and 35 buffalos and calves exist in the district. Out of the cow population, approximately, 55% are indigenous, 12% imported, and the rest a mixture. Furthermore, some other livestock such as horse, mule, and donkey are raised by the rural people for transportation and delivery of goods. The population of these livestock comprises 144 horses, 254 mules, and 7,398 donkeys (SBBF, 1990-a).

It is a custom in the rural areas that each rural household keeps a number of livestock at the backyard of the residential units. The type, quantity, and quality of the livestock depends on the economical and social situations facing the people. On a larger scale, three types of livestock production systems can be distinguished in the district: (1) seasonal intra district as well as inter-district transit (pastoral), (2) settled farming, and (3) commercial enterprises.

Seasonal moving units belong to nomads, and move from one place to another, searching for new grazing areas. The livestock flocks raised by these units comprise mainly sheep and goat. The cattle population accounts for a small part of the whole livestock population. The flocks are grazed on natural rangelands and on farms' residues. Traditionally, farmers let the nomads graze their flocks on harvested lands, usually free of charge. Farmers do this in exchange with the livestock's leftover that manures the land. Some farmers charge the flock owners a small fee.

In the settled farming, livestock production goes side by side with crop production. Though the latter is the main activity, the former plays an important part in the whole farming systems. The farmers keep flocks of sheep and goat, and a few cows as extra sources of income. In this type of the livestock production system, two different feeding systems are used. During the winter, the livestock are kept and fed in stables. During the other seasons, the livestock graze on farm residues and communal rangelands.

The commercial enterprises are specialised units in livestock production, and produce for market. Although these units might be involved in crop production to produce fodder to feed their livestock, they focus predominantly on livestock production. In 1988, according to SBBF (1990-c), 8 milk production units with 160 cows, 1 unit for beef production with 200 calves and 12 sheep production units with a capacity of 4,300 sheep were active in the district. These enterprises are operating on the basis of permits given by the state veterinary organisation under the Ministry of jahad-e sazandegi.

A special form of commercial dairy production, which does not fit into the above category, is found in a village called kenareh situated at the Kenareh village-cluster. The village economy is mainly based on cow milk production. In the village, each household keeps a few high yielding imported and cross-bred cows. Cows are kept in stables situated at the corner of the backyards. The farm households produce for market, but unlike the commercial enterprises, they do not operate on the basis of permits from the veterinary organisation. The village is known for its dairy products and the reproduction of crossbreed calves.

Poultry and bee-keeping are the other two important agricultural activities in the district. In addition to a large number of birds such as chicken, duck, and goose kept by the rural households, some others are raised by specialised poultry production units. In 1988, some 252 units for broiler production with 1.9 million birds and 3 units for egg production with 55,000 birds were active in the district (SBBF, 1990-c).

Bee-keeping is a hobby for some farmers and gardeners, and constitutes the main source of income for the district's professional bee-keepers. The bee-keepers travel around with their bee hives, and cross the district and several other neighbouring districts. The hives are of two types: traditional and improved. In total, the district's bee hives number 2,470 of which only 29% is improved. The improved hives produce more than twice the amount of honey produced in the traditional ones. On average, the improved hives produce 14 killogrammes of honey per year.

### 7.3. Rangelands and forests

A wide variety of vegetation is found in the district's natural rangelands. Of these, the most important are Liquorice (*Glycyrrhiza glabra*), Camel Thorns (*Alhagi camelorum*), Sanginary and other types from the *Achillea millefolium* family, Canada Thistle and other types from the *Cirsium arvense* family, and others. In swampy areas, special vegetation such as lettuce (*Lactuca orientalis*), Perennial Rye Grass (*Lolium perenne*), and Bermuda Grass (*Cynodon dactylon*) are found. Saline areas are covered by different types of vegetation from *Salsola* family.

A small part of the north and the northwest of the district is covered by forest trees. In addition, in some other parts, there are rampant forest areas. The forests consist of a wide variety of trees, of which the most important are pine, walnut, and ever-green cypress.

In 1988, the district's total natural rangelands added up to some 433,000 hectares (SBBF, 1990-c). This is approximately 2.6 times the district's total agricultural lands (arable and permanent crops). It is estimated that the total forest adds up to some 33,000 hectares (STK, 1984). Until recently, the rangelands and forests covered a much wider area. Since destruction has reduced the size dramatically (a detailed information is presented in the section on environmental issues).

The district's rangelands can be classified into three groups based on the potential for hay production, and on the quality and intensity of the vegetation. In 1988, from a total of 433,000 hectares of rangelands, only 20% were classified as being rich. The remaining were moderate and poor (40% each).

## 7.4. Access to goods and services

Except for vegetables, tomatoes, and jaliz (cucumbers, water melons, etc.,), the improved seed varieties for other crops are produced, or intermediated, by the MTKF research (provincial research centre). The seeds for vegetables and jaliz are normally imported. The intermediary role of the MTKF research is to control the quality of those seeds produced in the other research centres, and introduced into the district. Some farmers still use local varieties.

Improved seeds for wheat and barley are multiplied by an organisation in charge of TATM projects (STN&B) under the technical supervision of seed section of the MTKF research. The TATM projects are aimed at provision and distribution of seeds and saplings amongst farmers. The STN&B organisation perform its tasks through contract farmers. For maize, the hybrid seeds are delivered from moqan research station, situated in East Azarbaijan, a northwestern province. Improved rice varieties are delivered from research stations in paddy areas of the country, northern provinces (Gilan and Mazandaran). The district's MKKDs act as distribution agent for the STN&B. Farmers have to refer to the related MKKD to purchase improved seeds at subsidised prices. However, although 10 MKKDs are active in different parts of the district (see map 8.1 in chapter 8), some farmers in remote areas have difficulty to reach the centres. The Ramjerd MKKD, for instance, which provides services for farmers in four village-clusters, is situated in a distance of 30 kilometres to farmers in some part of Dorudzan village-cluster.

The provision of seeds for sugar beets is the responsibility of the district's sugar beet refinery factory, which is situated in Marvdasht city, the centre of the district. Using a commodity approach, the factory provides extension services and a wide range of machinery services for the contract farmers ranging from sowing to harvesting. Moreover, the factory provides some incentive for farmers. As an example, the cost of delivery of produce to the factory is subsidised.

Provision of agro-chemicals is the responsibility of the provincial agro-chemical provision organisation (SHPKTS). Agro-chemicals are distributed in the district by different organisations including STR (rural cooperative organisation), MKKDs, and private shops.

Four types of chemical fertilisers are distributed in the district. These include Urea [CO (NH2)2], Di-ammonium phosphate (DAP) [(NH4)2 HPO4], Triple super phosphate [Ca (H2PO4)2], and Ammonium Nitrate (NH4 NO3). Application of the last two fertilisers is less common. Distribution of chemical fertilisers falls under the district STR. The STR distributes fertilisers amongst farmers through rural consumer shops.

Other chemicals such as pesticides are distributed amongst farmers by MKKDs, STR, and by the private sector. The private chemical shops are located in the district's centre, and in the three other cities of the district.

Irrigation water for areas under the dorudzan network of irrigation channels is controlled by the water department. Each year, farmers have to apply for water and pay their fees in advance. The fee is equivalent to a percentage of harvested crops under the network. In 1990, for wheat, paddy, and other main crops the fee was equivalent to 3% of harvested crops. The procedure for calculation of the fee is to estimate the yield of each crop yearly. Based on the estimation, and on the cropped areas, the total production of farmers is calculated.

The usual way for farmers of a village to get water is to apply together. Since each channel passes through several villages it is practically not possible to release water into

channels for a few farmers or even for farmers of a few villages. For this reason, all the farmers of an area in which a channel runs have to pay their water fees before they can receive any water. However, this makes the situation difficult when some farmers delay in paying their fees. This results in a delay in the release of water into the channels and raises complaints from farmers. One role of the water department is to control a quota set on the area cultivation for paddy farms in the area. This is due to the scarcity of water, and the need for allocation of some water enough for the irrigation of wheat crops. Also, there is a need to leave enough water in the river (the kor river) for the lower areas situated in the nearby Shiraz district where farmers cultivate paddy. For this reason, each farmer is limited to only 0.4 hectare of paddy farm. Any excess is fined. However, given the lack of proper control exerted by the water department, many farmers disregard the regulation and cultivate more than the allowed amount.

In 1988, the farm mechanical power in the district came out of 1,584 tractors of various types and power (some 13% of the total tractors of the province), 403 combine harvesters, 1,780 tillers, and a large number of other farm machinery (SBBF, 1990-c). This gives a ratio of tractor:farmer (with access to land) of 1:11. The machines are mainly imported. Four different types of imported tractors with different HP, and one 75-HP home-made (assembled in Tabriz, situated in the northwestern part of the country), are found in the district.

The large stock of combine harvesters is not only used to harvest the district's crops, but also to give service to the other districts of the province, and to several neighbouring provinces. The owners of the combine harvesters are members of the district's combine harvester cooperative. A large number of the machines are owned by people living in two adjacent villages (zangi abad and dowlat abad) in Naqsh-e Rostam village-cluster, some 15 kilometres to the northeast of the district's centre. The villages are centres for determining the price of the harvest.

Tractors and other farm machinery are supplied by the provincial farm machinery organisation (BTMKF). The machinery is sold by credit offered by the agricultural bank (the BK). The BTMKF introduces the applicants to the BK for loan. The BK gives long term loans (up to 15-year duration) up to 100% of the cost of machinery.

## 7.5. Marketing

The centre of the district (Marvdasht city) plays an important role in the marketing of agriculture produce. Except for wheat, which is a state monopoly, and for sugar beets which is cultivated by contract farmers for the district's sugar beets refinery, the other crops and also animal products and by-products find their way to the Marvdasht city market. It is there where agricultural produce is shipped to Shiraz city (the centre of the province, some 30 kilometre to the southwest of Marvdasht city) and to other major cities, even directly to the capital city. The Marvdasht city market is the centre where the price of the produce is determined. Large middle-men control the market. The middle-men purchase the produce beforehand, even before the crops are cultivated. They pay a large part of the money at the time of making a contract with the farmers. This way of purchasing is called salaf khari (paying in advance). Salaf khari is mainly used for purchasing jaliz crops such as water melons, cucumbers, etc. (different types of crops are described in chapter 7). Purchasing in advance is always accompanied by low prices. The price is set by the middle-men based on many factors such as the anticipation of any future supply-demand relation, various costs, and others. Middle-men pay the lowest

possible price to farmers. For this reason, the market prices are always several times that of farm gate prices. In other words, middle-men earn more money from produce than farmers. There are several reasons why farmers sell their produce to middle-men. One reason is that the pre-paid procedure (salaf khari) used by middle-men provides cash for farmers at the time when they urgently need it. Farmers lack sufficient funds at the time of cultivation. The credit given by the rural cooperatives is limited (see chapters 8 and 9) compared to what farmers need. Additionally, the credit is devoted to the cultivation of wheat and other main crops. Cultivation of Jaliz (water melons, cucumbers, etc.,) do not qualify the farmers for receiving credit. In addition to salaf khari, the middle-men provide farmers with easy receiving-paying credit. It means that, unlike the procedure for borrowing money from the agricultural bank, the procedure is based on informal and long lasting relations between the middle-men and farmers. This makes things easier for farmers. It does not require farmers to provide collateral for the money they borrow. If anything is needed as security, it is a written contract signed by the farmer, the middle-man and the village elders (rish safids). The elders are respected people whose word is accepted by people of their communities. All these incentives together with the inability of the rural cooperative organisation (STR) to deal with marketing of the produce make the farmers sell their produce to middle-men in advance.

In addition to the major middle-men based in the district's centre, some other middle-men who work as agents for the major middle-men or perform independently are active in villages. These middle-men often make trips to several villages by small trucks and collect small quantities of farm surplus and households produce such as handcrafts, vegetables, etc. Usually, rural households grow some vegetables on their backyard and sell the surplus to the mobile collectors.

Marvdasht city is an important place that provides access to household goods for rural people who live in the nearby villages. Although rural consumer shops of the rural cooperatives provide access to some household goods for their members, they do not sell every item needed by the households. The people who live in remote distance from the district's centre make a trip to the major cities within the district or to the cities in nearby districts.

One important market in the district is hand-made carpets. Normally, the raw material for carpet is provided by middle-men. The carpet-weavers either work as paid workers for the middle-men, or share the carpet. The carpets are then shipped by the middle-men to the Shiraz city market or to other important markets of the country.

Three other major markets, which demand or supply produce, include the meat industry (a state-run agri-industry business, MSGF), the milk pasteurisation factory (also, a state-run business), and the kenareh village. District-wide, the MSGF is active in purchasing livestock and maize (the silage green maize). The MSGF, which is situated at about 7 kilometres from the northwest of Marvdasht city, acts as intermediary between the national meat organisation (under the Ministry of jahad-e sazandegi) and rural people. It purchases calves, sheep, and goats for the meat organisation; slaughters; and ships them to different places throughout the country. It also purchases a large quantity of maize (green) yearly, and makes silos to feed the livestock raised within the organisation. The milk pasteurisation factory (KSPF) is located in the nearby district (Shiraz), some 12 kilometres to the southwest of the district's centre. It purchases milk from farmers through several milk collection units throughout the district. Also, some milk producers, whose units are large and produce enough to fill a small deposit tank, take their milk directly to the factory. The price paid by the factory is slightly lower than the market

price. To compete with the market, the factory provides the contractors with supplementary feeds in subsidised prices, and facilitates for materials and other necessities. The kenareh village acts as a centre for supplying cross-bred milk cows and calves. The village is known for good quality calf production. Each rural household keeps a few calves, and supplies the surplus to market.

The local market (village market) is also important. Farmers trade their produce for what they need. Transaction in both cash and kind is practised in local markets. One important commodity traded in local markets is wheat grains. The grains are mainly used as seeds and for bread. Farmers who produce good quality grains are locally known. These farmers keep some grains as seeds for their own use and for the market. Some farmers purchase seeds from the local market for some reasons such as the need for changing their seed variety, insufficient seed quantity at their disposal, etc. Rural people who are not farmers, and farmers whose grains are not enough to feed the family, purchase grains locally. In cases where new varieties have unfavourable tastes, some farm households purchase grains to mix with their own produce in order to make the taste favourable. The other uses of wheat grain is for feeding livestock and making concentrated poultry feed. The other important commodities which are traded at local markets, are barley, rice, maize, meat, milk, and dairy products.

## 8. Development projects

In 1987, the total development budget for implementing local projects in the district (comprising budget for development of different sectors of the economy) was about 14 million US dollars, which accounted for approximately 10% of the development budget of the province (SBBF, 1990-a). Of the budget, approximately 34% was devoted to the agricultural development, comprising development budgets for the two organisations involved in the district's agricultural development (the district agricultural service centre (MKKS) and the JS department). One point about the district's agricultural development projects is that, during 1987, the old arrangement for task differentiation between the Ministries of Agriculture (the MA) and jahad-e sazandegi (the MJS) was effective. Thus, the development projects concerning crop production in rain-fed areas and on crops such as alfalfa, maize, sainfoin, etc. (which can be used as fodder), were all under the district's JS department, and those regarding crop production in irrigated farms (except for what I mentioned as crops used as fodder), and forestry and rangelands were implemented by the district's MKKS.

The 1987 total local projects implemented in the district's agriculture numbered to 23 of which 14 projects were in the MKKS and the rest in the JS department. The projects of the MKKS included: (1) land levelling, (2) improving traditional irrigation channels, (3) introducing furrow irrigation, (4) improving traditional stables, (5) increasing the capacity of rangelands to keep rain from running downhill by different methods, (6) provision of technical information on crop production, (7) introducing improved seed varieties for crop production, (8) introducing improved seed varieties for the rangelands, (9) management improvement, (10) introducing new farm machinery to farmers, (11) establishment of new veterinary posts in the district, and three projects concerning the forestry and natural rangelands. The latter three projects concerned with plantation of forest trees, improvement of the natural rangelands, and structural improvement of the water basin in the dorudzan area. The projects implemented by the JS department included (1) introducing improved wheat seeds to rain-fed areas, (2) sifting

the wheat seeds, (3) wheat and barley seed treatment against fungi, (4) introducing chemical fertilisers to rain-fed areas, (5) weed control, (6) increasing the capacity of rain-fed farms to keep rain from running by using special techniques, (7) introducing techniques for increasing the capacity of soil to keep moisture, (8) introducing seeding machines to rain-fed areas, and (9) promoting the cultivation of alfalfa, maize, and other crops used as fodder amongst farmers.

In addition to the local projects, a number of other projects financed and implemented at the provincial level are in the district. Of these, a project for the extension of the draining system by adding some 200 kilometres of surface drain-channels and sub-surface drain-pipes to the existing drainage, and cementation of the irrigation channels by the provincial water organisation (SMAF) is the most important.

## 9. Environmental issues

Several issues are important in the district environmentally: (1) the destruction of natural enemies of pests due to the excessive use of pesticides, (2) a dramatic decrease in the ground water table in some parts of the district due to the excessive water extraction, (3) a severe soil erosion and an overgrazing problem due to the destruction of natural rangelands and forests, (4) water pollution due to the excessive use of chemical fertilisers and (5) deterioration of agricultural lands in some parts of the district due to a water-logging problem [this problem was explained in section 2 (the district's geography) under the soil problems].

Prior to the recent wide use of pesticides in the district's agriculture, the main approach for pest control was to maintain a natural balance between pests and their enemies (parasites and predators). This method was practised for hundreds of years. The introduction of pesticides changed the situation dramatically. The application of pesticides disturbed the natural balance for the pests. The excessive use of pesticides resulted in the destruction of the parasites and predators. Following several years of spraying, the pests became resistant to the chemicals. This led to the outbreak of the pests. The recent outbreak of the Sunn pest in the district is an example. As will be explained in chapter 7, given the intensity of the Sunn pest problem, every year the government sprays on tens of thousand hectares to protect the wheat crops.

The access to various types of water pumps has enabled the farmers to extract ground water individually. Having access to the pumps, each farmer extracts as much water as he wishes. Given the limited capacity of the ground water resource, this resulted in an unusual decrease in water levels. This problem threatens some areas in the northeastern, eastern, and southeastern parts of the district. The problem of the excessive use of water is intensified by some farmers who use several wells dug very close to each other without acquiring a water permit. Given a lack of effective control from the water department, these farmers extract much more water than permitted. In the distant past, when the water pumps were not available, the main source of irrigation was qanat (the subterranean system of water conduit). Each qanat irrigated a wide area under several villages. Each farmer had a limited amount of water at his disposal based upon his water right. The water rights were defined traditionally based upon several factors such as the irrigation capacity of qanat, the total area under the qanat, etc. Thus, there was a regulated system of using the water which prevented farmers from extracting excessively.

A large scale of clearing natural rangelands and forests has resulted in a serious problem of soil erosion. Furthermore, it has limited the grazing areas which causes an

overgrazing problem. There are several contributing reasons for the clearing the lands. Of importance are (1) the need to increase the arable lands, (2) local needs for fuel and timber, and (3) greediness of some people.

Farmers who, once upon a time, cultivated their plots in a limited way, by using animal draught implements, now have access to tractors and other farm machinery. The introduction of the farm machinery has enabled the farmers to expand their activities. Due to the limitation of agricultural lands and the need of some rural households for increasing their farms, and given a lack of effective measures for the protection of the natural resources, some people cleared the rangelands and forests encroachingly. Immediately after the 1979 revolution, and given a general disruption of law and order in the country, some rural people took over the rangelands and forests, the national resources protected against any encroachment. The people cleared the lands to convert them to arable lands. Large parts of these lands were situated on very steep hill sides. Furthermore, the use of the lands was largely restricted by problems such as stones, poor soil, etc. All of these required a huge investment for improvement. Thus, it was very costly for the people to improve the lands before cultivating them. Lacking sufficient funds, the people cultivated the lands without any improvement. This resulted in a very low economic return for the lands. For this reason, some people left the lands abandoned, and some others continued to use the lands as a marginal source of income.

Furthermore, to a lesser degree, the increasing demand for fire wood and timber contributed to the destruction. Lacking access to fuel for heating and cooking, some rural households used the vegetation and trees. Trees are also used as timber, due to unavailability of pre-fabricated steel poles in rural areas. This demand was increased as a result of a high population growth rate in the years following the 1979 revolution.

A greedy demand to property was also an important contributing factor for the destruction. Taking advantage of the anarchial situation, some people wanted to get extra land in their possession, not for cultivating but for reserving as a wealth convertible to cash in future. These people cleared the rangelands and forests, and in the course of time sold the lands to others unofficially.

It is estimated that some 150,000 hectares of the natural rangelands and forests is affected by the destruction. Of these lands, approximately, 30% is still used for agriculture and the remaining are left abandoned. Due to the steepness, and given an inadequate surface vegetation, the abandoned lands have become vulnerable to erosion. This has been a major problem for the dorudzan dam. Each year, a large mass of soil is washed away by rain, and deposited in the dam's reservoir. Although some measures such as persuading the rural people to recover the lands and introducing land care techniques have been taken by the forestry and rangelands organisation (SJM), the problem still exists due to the size of the affected rangelands.

The soil erosion is not the only problem created by the destruction, but is also a serious problem of overgrazing. The reduction of the size of the rangelands limited the grazing area for the livestock population. This resulted in a large stocking rate for the existing rangelands. The rangelands graze a total population of some 650,000 livestock. This gives a stocking rate of approximately 1.5 animal per hectare. Since some 40% of the rangelands is poor with a very little capacity to support livestock, the livestock population graze on a small part of the rangelands that is rich (some 86,600 hectares) and on some 173,200 hectares of moderate rangelands. This gives a stocking rate of 2.5 animal per hectare. However, in practice, there is a much larger stocking rate for the rangelands. This is because, at the grazing time, the rich rangelands are the first chosen

by the livestock producers to be grazed. The whole livestock population start to graze the rich rangelands and gradually move to the moderate rangelands. Given a limited effort taken to improve the rangelands, this means that the rich rangelands feed an excessive livestock population, and will become exhausted and poor in the course of time.

Water pollution is a serious problem in the district. The use of chemical fertilisers in the agriculture is a wide spread practice amongst the farmers. Most farmers use chemical fertilisers excessively. The rate of application is amazing, in some cases farmers use successively more than three times the recommended amount. The excess fertiliser is washed away from the soil, resulting in pollution of ground and surface water.

# CHAPTER 6

# VILLAGE SYSTEM

The village is the socio-politic context in which farmers perform. A village system is composed of farmers and others who, in their multiple relationships with each other and with natural and agricultural resources, affect the farming systems. Changes in social and political structures in a village affect the related farming systems, facilitating, or constraining them.

In this chapter the focus is on the socio-political factors affecting farming activities in Marvdasht district. The understanding of these factors facilitates the understanding of the material presented in the analytical chapters (chapters 9 through 11).

The chapter is composed of six sections. The first section describes the most recent socio-political changes in the country. The second section introduces the historical background of Land Reform Acts in the country. The third and fourth sections illustrate the water utilisation and the present land tenure respectively. The fifth section describes the political structure at village level. The last section presents politics at higher levels.

## 1. Soico-political changes in Iranian rural societies

Two main events in recent Iranian socio-political history which brought significant changes into the urban as well as rural societies, are the 1962 land reform and the 1979 Islamic revolution. The former was, in fact, an instrument for loosening the power of large absentee landlords and strengthening the state. The objective of the latter was fundamental changes in socio-economic and cultural aspects of the nation's life and targeting the poor, especially the rural poor, through radical changes in political system. For studying changes in the Iranian rural societies, we can review them in two distinct periods: (1) prior to the 1979 revolution and (2) the post-revolution period.

### 1.1. Prior to the 1979 revolution

Just before the 1962 land reform, large landlords whose lands accounted for more than half of the total arable land of the country constituted the core of Iran's dominant class because of their economic and political power as well as their social status (Safi Zadeh, 1985). Furthermore, they owned and controlled water sources such as qanats (the underground conduits), springs, etc.

Peasants were grouped into two large categories: nasaq-holding farmers (those who had a right for cultivation of the surface of land, but did not own it) and khosh neshins (those who had neither land nor the right to cultivate any land). These two categories accounted for about 50% and 40% of the rural population respectively (Farazmand, 1989). The nasaq-holding farmers worked in collective groups called bonehs and were related to the landlord through his representative (mobasher). Mobasher was assisted by kadkhoda (the village headman).

The efforts in rural development in the 1950s first led to the creation of village council, the first formal rural organisation. In 1956 a constitution of village council (anjoman-e deh) was ordered, which acted as a decision-making body in village

developments' affairs. The council together with kadkhoda had to plan and organise the village public works.

The elimination of large absentee landlordism (bozorg maleki), which resulted in disappearance of large landlords and their representatives, was a significant change brought into the rural socio-political structure by the 1962 reform. The nasaq-holding farmers received land. In the early 1960s, to provide the new land owners with assistance and necessary services to manage their agricultural and financial problems, the government established rural cooperative societies and agricultural bank. The role of the middle-man and the money lender became relatively less important by the introduction of these two organisations. The development corps, which were composed of literacy corps, health corps and extension and rural development corps and also the village court (for facilitating the jurisdiction affairs of the rural inhabitants) and cultural house (as a means to mobilise rural people to participate in development activities) were introduced in the 1960s. Two other rural organisations, which mainly established to consolidate lands among the new land owners and to prevent further fragmentation of land, were farm corporations and production cooperatives. In the former, which was initiated in 1968, the members gave the corporations complete and permanent use of their land, which was operated as a single unit. In exchange, the owners were given as many shares in the organisation as were consistent with their previous rights of ownership. The membership for farmers was compulsory if at least 51% of farmers in the region agreed with the creation of farm corporation. In the latter, which emerged in 1971, on contrary, the members could keep the ownership of their land and the right to use it within the global cultivation pattern of the cooperative. The last organisation introduced in the rural socio-political structure in the 1970s was the political party cell of the one party system of the country.

### 1.2. The post-revolution era

With the radical changes in the Iranian political system in 1979 all socio-economic and political institutions related to the old regime underwent serious changes. Regarding the political institutions, different approaches were employed simultaneously. A number of political institutions were totally dissolved, while other cases, old organisations were replaced by revolutionary ones. A number of new revolutionary institutions were created which have been working in parallel to the old ones. The disbandment of the village equity court, cultural house, development corps, political party cell and the elimination of the kadkhoda were all the outcomes resulted from the post-revolution changes in the village political system. These institutions were primarily seen as bases from which the old regime tried to control the rural people and to secure its power. Furthermore, the majority of farm corporations and production cooperatives were disbanded in less than two years following the revolution. Box 6.1 highlights the situation of these two organisations in the aftermath of the revolution.

Other important changes which were considered as attributes of the revolution, were the emergence of the village Islamic council (showray-e eslami-e deh, the SED) and the establishment of the village security group (basij-e rusta, the BR). The old village council was replaced by the former which was made up with relatively younger and politically more active villagers. The latter was a voluntary organisation of rural people which was established to take care of village security affairs related to the revolution.

**Box 6.1. Crisis in farm corporations and production cooperatives.**

With a general disruption in the socio-politic structure of the country in the aftermath of the revolution, farm corporations and production cooperatives were severely disturbed. Properties of these organisations were looted by villagers or destroyed. Only 5 farm corporations out of 93 and 19 production cooperatives out of 39 have been kept in operation by their members (Kalantari, 1989). The reason for the disbandment of the majority of the organisations is rooted in socio-economic and political problems (Zafar Nezhad, 1989). A general lack of effective and efficient management, compulsory membership and the heterogeneity of the farmers made it impossible for the organisations to continue. Small farmers were not happy at having some large farmers among themselves. Large farmers did not participate directly in the organisations' activities and still got their share of output by hiring others to do the job on their behalf. Furthermore, they could influence the organisations through their powerful socio-economic bases.

In studying the reason why more farm corporations were disbanded than production cooperatives, we see that the dissatisfaction of the members at having their ownership rights converted to shares was, among others, a significant factor. The substitution reduced the owners' control over the land by limiting their decisions on the allocation of land, use of techniques and type of crops. Everything had to be done according to the comprehensive cultivation plan of the organisations. In production cooperatives, members could retain their ownership rights and cultivate their own land. Furthermore, unlike farm corporations, production cooperatives were based on collective farming. The familiarity of the members with the collective farming which was practised in the traditional land tenure system (sharecropping) was an important factor for building up interest for the members to keep the cooperatives working.

One important change which took place in the relation between peasants and the institutions of the previous ruling regime, was with respect to the role of the gendarmerie. The gendarmerie was, at one time, a coercive power of the state but became less effective in the maintenance of law and order in the face of the problem of land seizures immediately after the revolution. Box 6.2 gives more detailed information.

**Box 6.2. Crisis in the gendarmerie.**

Prior to the revolution, the gendarmerie was the sole coercive power of the state in rural areas and in charge of prevention of disturbance and maintenance security. After the revolution, given a substantial loss of power of all institutions related to the previous regime, especially military institutions, the gendarmerie became less effective in performing its duties. This weakness resulted in a considerable change in the peasants' attitude towards the gendarmerie. The gendarmerie was not seen by rural people as a coercive power any longer and was ignored. Furthermore, there was a fear among the personnel of the gendarmerie of being executed. A number of high-ranking commanders loyal to the pervious regime had been executed by angry mobs at the time of the revolution and by revolutionary committees. The gendarmerie feared that a rural inhabitant injured or killed during a confrontation would lead to more confrontations with angry mobs. Given the atmosphere at the time of the revolution, any confrontation could lead to an accusation that the gendarmerie was loyal to the previous regime. Acting cautiously, the gendarmerie took a passive stand and let the revolutionary committees to take action to deal with disputes, especially land disputes.

The present village social system is composed of farmers, labourers (khosh neshins), ruhani (clergyman), trader, artisans and a number of people who are involved in miscellaneous jobs providing services through grocery shops, barber shops, the village bath, etc.

Following the revolution, key political actors like the ex-village headman (kadkhoda), the ex-members of village equity court, political party cell and village council lost their socio-political power. In addition, their social life became difficult. They faced strong critique from politically active villagers about their past performance and relations with the old regime.

Money lenders also faced socio-economic problems. They lost their economic basis and became hated men socially. Money lending which involves charging interest rates is prohibited religiously, and brings imprisonment to the people involved. Muslims are not allowed to be involved in any contract based on reba (usury). Instead, people are encouraged to lend money to each other with nothing in return except the will of god. The prohibition made it impossible for the money lender to continue. To fill in the gap created by the elimination of the money lender, the government supported the rural cooperative organisation (STR). The STR continued to provide access to short term credit for farmers. Social life also became difficult for the money lender. He had to live in a society in which people who, at one time had found themselves exploited by being charged high interest rates, and had gained socio-political power. The villagers disliked and distrusted the money lender. This made him vulnerable socio-politically.

Due to their past performance, the ex-landlords also are seen by the villagers as oppressors whose cruelty and crimes made many peasants suffer. They are so abhorred socially that the rural people talk about them in abusive language. They rarely appear in the villages which, at one time, belonged to them.

A component of the social system who became a fortunate person and gained political power is the clergyman (ruhani). He is the man whose extended communication network with different outside influential political sources has enabled him to play an important role in the village politic. This is explained further in the section on political structure.

Another significant change was in the position of the middle-man. After the revolution, the government tried to limit middle-men by supporting rural cooperative organisation (STR) to play more active roles in marketing. However, although middle-men were limited in wheat trade due to the monopolisation of the wheat market by the state, they did not lose their important role in marketing. They continued to play the main role in marketing of crops other than wheat. In addition, following the start of the Iran-Iraq war in 1980, they became involved in redistribution of rationed commodities which leaked from the formal distribution network. This was a profitable job for the middle-men, enabling them to accumulate windfall profits within a limited period, further securing their economic base.

## 2. Land reform

Iran's agriculture has been affected by two land reforms. The first and the major reform was started in 1962 and implemented in three stages. The second reform had a relatively limited scope. It was launched in 1980, a year after the revolution.

## 2.1. The 1962 land reform

Before the reform, arable land of the country was held as: private land, state domains, crown estates and waqf (religious endowment) land. Most of the private land was in the hands of large absentee landlords who constituted a small proportion of the private land holding population.

The reform put an end to the ancient large absentee landlordism (bozorg maleki). The main type of land holding had been a kind of provisional land ownership called tuyul (Amid, 1990). In the tuyul system, land or its revenue was granted to various people including government officials, officers, etc., by the rulers. These grants were made for various purposes including provisioning of troops, instead of salary, as gift, etc., and were effective as long as the rulers wished. The grants might be withdrawn and given to new people at any time. The tuyul system continued to be the main type of land holding until the early twentieth century when it was abolished but, prior to its abolition, a lot of these lands were usurped and converted into private property whenever the central government lost its power (Amid, 1990). Many ex-tuyul-holders thus became large landlords. The landlords who possessed a number of villages (sometimes tens of villages) leased out their lands to others for a share in produce or fixed rent.

The state domains and crown estates constituted a large part of the total holding. In fact, the monarch (Shah) and the government, according to Kurian (1987), owned about 2,100 villages and 1,800 villages respectively and were the largest landlords in the country. These lands were mainly the result of conquest, dynastic inheritance, and confiscation (Amid, 1990). The sale of these lands was started before the reform. However, a large part of the land was sold to large landlords which added to their already large holding. Waqf lands constituted another large part of land holdings. These lands were endowed in perpetuity for different religious purposes

On the eve of the 1962 reform, about 60% of the cultivated land was owned by people, who resided in the cities and numbered only a fraction of 1% compared to the rural population (Aresvik, 1976). These lands together with the state domain and crown estates and waqf land accounted for more than 80% of the total cultivated land (Amid, 1990). More than 10% of land belonged to medium and small land owners.

Under the first phase (launched in 1962), all lands over one village in an area were sold to the peasants who were organised into cooperatives. Under the second phase (begun in 1965) all lands in excess of a maximum, varying as to soil fertility between 30 and 150 hectares, were redistributed. If the land was under mechanised cultivation the ceiling was raised to 500 hectares. The third phase (begun in 1967) emphasised consolidation of fragmented holdings and mechanisation. Waqf lands were exempted from the reform, but crown lands and state lands (khaleseh) were similarly distributed. The costs of redistribution were financed by the Agricultural Band.

In total, lands of 32,007 villages which accounted for 53% of all villages were redistributed amongst peasants during the three phases (Amid, 1990). Some 1,938,547 families, which accounted for 92% of eligible families, benefitted from the reform. For more information about the 1962 reform, readers can refer to, for example, Amid (1990) and Karshenas (1990).

However, although a large majority of farmers became owners as a result of the implementation of the reform, a significant part of the land was still in the hands of large and medium land owners. According to Amid (1990), these land owners were very few in number but owned almost half of the agricultural land, while small farmers who added up to about 2 millions owned the other half.

## 2.2. The post-revolution land reform

In 1980, following widespread land disputes in rural areas, there was an attempt by the revolutionary government to redistribute land between khosh neshins (agricultural labourers) and small farmers. The land disputes disrupted law and order in rural areas and resulted in many abrupt confrontations between peasants and the land owners. The land disputes resulted from land seizures in the aftermath of the revolution. The problem arose when peasants started to occupy lands belonging to the royal family and land owners who had connections with the old regime and who had escaped from the country just before the revolution, or immediately after it. The peasants claimed that their lands were taken forcefully by the crown family and its associated families long ago to establish agri-business farms. Thus, they acted directly to get their lands back.

As time passed on, the seizure spread, and peasants took over the ex-landlords' exempted lands. The peasants claimed that they and their ancestors had served the ex-landlords for long time before the land reform and were treated unfairly by the landlords. They were treated also unfairly in the implementation of the reform. Thus, justifying the seizure as a compensation for many years of service to the landlords, they assumed a right to take some part of the land. After some time, the ownership right of small holders was also threatened. In some cases, ex-landlords threatened the peasants by trying to re-assume the lands transferred to the peasants by the land reform.

In total, some 850,000 hectares were seized (Jahad, 1990-d), of which more than 44% were seized by peasants and nearly 56% by revolutionary organisations (Bakhash, 1989). Later, the lands seized by the revolutionary organisations were transferred to peasants.

In 1980, in order to settle the land disputes by arbitration and to redistribute land amongst peasants, the government established 'seven-man council' (hei'at-e haft nafareh-e vagozari-e zamin, HVZ). The other function of the HVZ was to evaluate and determine the loan eligibility of the land receivers. Four categories of land were subject to the law of redistribution: (1) waste land (mavat) which became state property; (2) requisitioned agricultural lands which became subject to the order of the Islamic Courts and under the jurisdiction of the state. These lands previously belonged to the crown family and also to land owners or corporations associated with the previous regime; (3) lands that were previously under cultivation by owners or corporations but left uncultivated. The law gave priority to the rightful owners of these lands to cultivate, and only if they failed to do so, was the land to be transferred to qualified peasants; and (4), the lands under cultivation in excess of the limit set by the law. The extent of land ownership was to be determined according to the local custom (orf-e mahal) of land holding. Orf-e mahal for land holding was defined as the amount of land required for the annual subsistence of a farm family. According to the land reform law, ownership could not exceed three times that of the orf-e mahal in each place. If the owner was not personally engaged in agricultural activities, the extent of possession could not exceed twice that of the orf-e mahal. Anything in excess of the limit was subject to redistribution.

However, the land disputes were not solved but increased substantially after the establishment of the HVZ. One major contributing factor was that peasants were worried lest the land owners keep the best part of their lands for themselves and sell to the peasants the poorest part. They wanted to avoid the things which happened during the implementation of the 1962 reform. Given the lack of law and order in rural areas due to the problems faced by the gendarmerie, peasants started to seize the lands which were

identified as the best lands. In some cases, land seizure was promoted by left-wing groups (Bakhash, 1989). Some stimulation to seizure were also given by members of the HVZ's investigation groups who had sympathy with leftist groups. Further stimulation came from those members of the HVZ investigation groups who had past conflicts with the land owners.

Many socio-economic and political problems were created by the land seizures affecting the whole of agriculture. The disturbance to law and order and the inefficiency of cultivation after the seizure were important factors in the decline in output.

Land seizure is prohibited religiously. According to Islam, prayer in an usurped land is not accepted by God [this issue is acknowledged with no exception by great ayatollahs (the high religious authorities)]. However, there are different interpretations amongst clergymen of the Islamic laws, including those regarding property rights. This makes the situation complicated. To some clergymen, on one extreme, people can own as much land as they wish and can do anything with the land as they want. In a case of usurpation, the usurper should be punished and the land should be returned to the true owner. To other clergymen, on the other extreme, there is a limitation to the size of holding. Furthermore, they believe that the ownership right is good as long as the owner cultivates the land. If the land is left uncultivated continuously for several years without any acceptable reason, the ownership right shall lapse, and the abandoned land be redistributed amongst those who need it. Lack of a single uniform interpretation has created problems. The advocates of both ideas have substantial political power to influence the implementation of the law. Relying on the assertions made concerning unconditional land holding, former land owners started to show their dissatisfaction by making propaganda against the state and quarrelling with the new occupants. The land owners claimed that, firstly, the redistribution was a forceful and unfair action that mercilessly took their possessions. Secondly, the redistribution rewarded usurpers who they expected to be punished. Thirdly, the official price set for the lands was negligible compared to the market price. Fourthly, the occupants were permitted to cultivate the lands until they were transferred to them officially. The price for rent set by the government was about 1/10 of the real market price.

The seized lands did not yield in the hands of the occupants as they did for the owners. It was simply because the occupants did not invest in the lands due to the uncertainty involved. The occupants were not certain if they would receive the lands. Furthermore, they did not have access to the same facilities such as farm machinery, credit, etc., as the owners had. For example, ploughing was the only land preparation practice carried out by the occupants, resulting in low productivity of lands which were, at one time, the most productive. Given the size of the land affected, the economic loss due to low productivity was substantial.

The implementation of the law was temporarily halted less than one year after its initiation due to the socio-political problems described above. Thereafter, the HVZ was appointed to redistribute other lands [e.g., the waste land (mavat)]. Cultivation of the disputed lands was permitted by the occupants by a decree issued by the supreme judicial council. The disputed lands came to be known as 'temporary cultivated lands'. The decree was renewed year after year until 1986. In late 1986, the parliament passed a law for redistributing the 'temporary cultivated lands' amongst the occupants within a 5-year period. The HVZ was assigned to investigate the qualifications of the occupants. The occupants were required to be landless or small holder, lack sufficient income and reside in the locality. It was found that some of the occupants were not qualified. Some of them

possessed more lands than required or owned a combine harvester, transportation vehicle, shop, etc, and earned sufficient income to make an alternative living. In other words, these people took over the lands not because they were really in need but, among other factors, perhaps because of greed. According to the HVZ's 1990 report, a total of 1,315,000 hectares were distributed among 233,000 landless and small farmers (Jahad, 1990-d). More about the post-revolution reform and land disputes can be found in, for example, Bakhash (1989), Haghayeghi (1990) and Safi Zadeh (1985).

## 3. Water utilisation

Most recent changes have been imposed on successive reforms which already to a considerable extent had introduced discontinuity and destabilised relationships and patterns of resource use (for further background, see appendix I).

It is important to understand that, notwithstanding radical changes in the formal allocation of resources, underlying structures and relationships persist into the present. Among the most important of these continuing patterns, is the allocation of water based on the boneh system. The allocation of water from sources such as qanats, springs and rivers still follows the traditional water rights. Each farmer has a few-hour water in each water cycle.

## 4. Land tenure system

At present, there are various land tenure systems remained from the pre-revolution era including family farming, tenancy, sharecropping and large scale farming.

Following the 1962 reform and the abolition of landlordism, the former systems of land tenure were disbanded. Family farming became the dominant land tenure pattern throughout the country. The new owners who received land under the reform cultivated using their family labour. Tenancy and sharecropping systems of tenure were also persisted. Sharecropping in its traditional form disappeared and new forms emerged in limited areas. In these systems, landowners leased out their lands to farmers and received some share from the output. Unlike the traditional sharecropping, in the new forms farmers do not hold any right of cultivation. The owners leased out the lands to any farmers they wanted. The land was cultivated on a limited time contract, for example, six months or one year. The contract might not be extended by the landowners after the termination. These forms of sharecropping were not confined to large farmers. Small farmers who left their villages and worked in urban areas also leased out their lands (Amid, 1990). The most popular sharecropping was the 'half-half'. In this system, the landowner provided land and water and paid half of the expenditure for seeds, fertilisers and other agro-chemicals and farm machinery. The output was divided equally between the two parties. Table 6.1 illustrates the share of landowners and farmers in provision of production factors and in the output in three different types of sharing.

In addition to family farming and sharecropping, large scale farming was a feature of the post-reform land tenure. Large mechanised farms were formed by the state and by the private sector. The government started to establish large agri-businesses in lands under modern dams. These agri-business were involved in crop and livestock production and processing agricultural products into ready-made foods (for example tomato paste industry) The ex-landlords started to mechanise their farms. They also established some

private agri-businesses in their exempted lands. Other forms of large scale farming were farm corporations and production cooperatives.

**Table 6.1. The share of landowners and farmers in provision of production factors and in the output in new forms of sharecropping after the 1962 land reform.**

| types of sharing: | type A | | type B | | type C | |
|---|---|---|---|---|---|---|
| | landowner | farmer | landowner | farmer | landowner | farmer |
| production factors: | | | | | | |
| land | ** | – | ** | – | ** | – |
| water | ** | – | ** | – | ** | – |
| labour | – | ** | – | ** | – | ** |
| machinery | * | * | – | ** | – | ** |
| seeds & agro-chemicals | * | * | – | ** | – | ** |
| output: | 1/2 | 1/2 | 1/4 | 3/4 | 1/3 | 2/3 |

Note: ** whole share
* half share
– no share
Source: Zafar Nezhad (1989).

In addition to what we explained above, the present systems include also collective cropping in lands transferred to farmers by the HVZ (the post-revolution land redistribution organisation). To promote the use of collective working in agriculture, the government supports collective groups. Farmers who receive land from the HVZ are required to work in groups of about 10 members. The land is transferred to the group in mosha' (shared). All members have to work personally to cultivate the group's land together, following a comprehensive plan in which the consolidation of plots, crop rotation and fallow, cultivation of main crops and collective working in cultivation and harvest are emphasised. Each group is headed by a member called sar goruh. Sar goruh is responsible for coordinating the group, and communicating with officials to solve the group's problems. According to HVZ (1990), some 12,000 collective groups accommodating 97,000 farm families are active throughout the country.

## 5. Political structure at village level

Relationships amongst members of the village community are governed by informality. Family ties, kinship relations and long established norms and values influence the every day life of villagers through informal rules rather than formal codes and regulations (Safi Zadeh, 1985). Any problem which seems to be a potential threat to the solidarity of the community is resolved by enforcing informal socio-political rules. A formal structure also exists, based on codes and regulations, in addition to the informal political structure at the village level.

## 5.1. Role of elders

The institution of village elder is the most important informal influence in rural areas. The elders are prestigious people whom villagers consult and are also frequently consulted by outsiders who are involved in development projects.

The prestige of the elders has a religious basis closely related to their being seen as practical Muslims. In Islam elders are respected. The more commitment to religion the elders have, the more prestigious they are. These people spend most of their time in the mosque and have close relations with the village ruhani.

The male elder is locally called rish safid (the white beard). This term confers a social prestige and makes others pay him respect. The name reflects two very important attributes of the elders: knowledge and expertise. However, despite the important role that the female elders play in various family affairs, women elders have no specific name in the village community. For simplicity's sake, we call all elders (irrespective of their gender) rish safids (RSs).

The RS is consulted by family members for advice on, for example, marriage or divorce. In meetings, ceremonies, etc., the RS is paid especial attention and is offered the best food, and place, and is listened to very attentively. The male elder is held to be superior to the female elder. It is he whose say is determinant. The female elder is consulted more on female-related issues. The RS is the arbiter within the family and the community.

However, the scope of the influence of the RS is limited to the local area. Beyond the village boundary, the RS is less influential, except for those who have an external source of influence.

## 5.2. Formal political structure at village level

At the village level, the institution of showray-e eslami-e deh (SED, the village Islamic council), basij-e rusta (BR, the village security group) and ruhani (the clergyman) comprise the formal political structure. In some cases, there is no distinction between the formal political structure and village elders in the sense that the same people are part of both structures. For example, a village elder can be a member of the BR group and, at the same time, he may function as a village councillor.

### *5.2.1. The village council (SED)*

After the revolution, new village councils were formed by politically active villagers, organised by the various revolutionary agencies involved in rural activities. In some cases, village councils emerged spontaneously but were seen by the government as opposition groups serving political objectives. Thus, these councils were disapproved, which stimulated confrontation between the villagers and the government. After severe conflicts which lasted several months and cost a lot in terms of lives and money, the government decided to extend its control over the SEDs. The responsibility for the SEDs was given to two revolutionary organisations: the Ministry of jahad-e sazandegi (MJS, the reconstruction crusade Ministry) and the Ministry of sepah-e pasdaran (the revolutionary army). These two organisations were put in charge of supervising the existing SEDs and organising new ones where necessary. At the present, the SEDs fall under the Home Affairs Ministry.

Some 33,000 SEDs, covering about 40,000 villages are active throughout the country (Jahad, 1990-a). According to its constitution, the SED is in charge of planning for village social development. Its other functions are to act as a consultant to development organisations, to communicate between villagers and officials, to facilitate the implementation of social projects, to organise the villagers for collective work and to endorse requests from farmers for subsidised commodities.

At the beginning, the SED acted as a channel for distributing rationed goods amongst rural people. In the aftermath of the revolution, given the general disruption of the country's economy which resulted in a sharp decrease in the supply of commodities, the government launched a programme for rationing a wide range of commodities including food, household goods, and construction materials. With using help from the SEDs, the MJS distributed the commodities to the rural areas. After a few years, the responsibility was given to the rural cooperative organisation (STR), and the SED became free to perform other jobs.

The SEDs' members are required to participate in educational and training courses organised by the MJS. The main themes of the courses are development of the knowledge, skills and leadership of the members concerning development activities, preaching to the members on religious laws and regulations, and propagating revolutionary spirit amongst them. As part of the educational programme, the MJS publishes a monthly magazine named salehin-e rusta (the pious villagers) with a 40,000 circulation distributed amongst the SEDs members.

As a revolutionary organisation, the SED has close contact with other revolutionary organisations both outside the village (e.g., the land redistribution organisation, HVZ) and within the village [e.g., security group (BR) and the ruhani].

### *5.2.2. The village security group (BR)*

The BR is a para-military organisation composed of rural volunteers, and controlled by the district revolutionary army. The original idea was to safeguard the revolution against any threat, especially from some ex-landlords and counter-revolution groups, by giving an active role to rural people. Later, the BR became an important base from which the government tried to encourage rural people to join the battle fields during the 8-year war (the 1980-1988 Iran-Iraq war).

The BR volunteers are from different age, educational and professional backgrounds, but one common attribute is their poverty; the BR is an organisation of the rural poor, which is, ideologically and socially, prestigious for the people to join.

### *5.2.3. The village ruhani*

The most influential part of the present political structure is the institution of ruhani (the clergyman). The concept of ruhani means spiritual leader. Thus, the ruhani is seen as a leader whose principal function is to preach to people and guide them, to elevate their morality. Islam has set rules and regulations which should govern the every day life of people. The most important of other functions of the ruhani are the introduction of Islamic socio-economic codes, execution of marriage contracts and keeping an eye on socio-political matters.

Before the revolution, ruhaniun (the plural of ruhani) were limited to their preaching task and were prevented by the old regime from participating in political

activities, though they propagated political messages implicitly at private preaching sessions. Following the revolution, the situation changed dramatically, ruhaniun gained political authority and extended their power to all important sectors (e.g., authority in the armed forces is constitutionally in the hands of ruhaniun). The revolution resulted in the establishment of a government which has a dual character: it is both secular and religious (Farazmand, 1989). One of the most important political slogans in the country, repeated frequently, highlights this duality. 'Politics and religion are both parts of a single unit, and there is no distinction between these two in the state.'

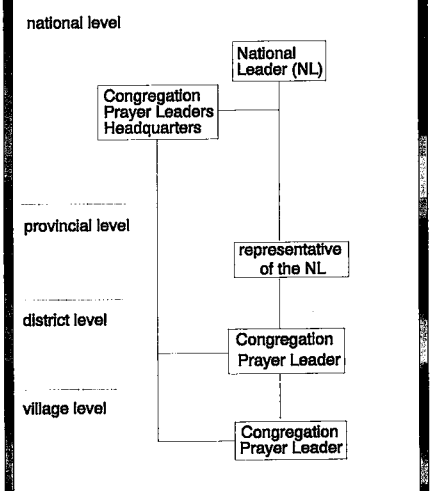
The political authority of ruhaniun originates from a fundamental belief held by Shi'a Muslims that the society (ummat) must be ruled by a faqih. The governorship of faqih is called velayat-e faqih. Faqih is a person who possesses the highest religious knowledge, personal qualities, and statesmanship, and enjoys the support of the majority of the people (Frazmand, 1989). According to the constitution, the faqih is rahbar (the national leader), the highest, supreme authority in the country. The approval and dismissal of high-ranking authorities such as the President and the heads of the judiciary and parliament, and religious leaders of friday congregation prayer are all in the hands of the leader. He is also the chief commander of the armed forces. The national leader's power and authority extend to all bureaucratic and military organisations at the national level and to the lower levels through a hierarchical system. At the bottom of the hierarchy are the emam-e jama'ats (the leaders of every-day congregation prayers). The national leader's authority reaches the bottom of the hierarchy through his provincial representative (nemayandeh-e vali-e faqih) and the district friday congregation prayer Leader (emam-e jom'eh-e shahrestan, EJS) (see chart 6.1).

The village ruhani is an emam-e jama'at who preaches to the villagers and leads the prayers in the mosque. Administratively, he is under the district leader of the friday congregation prayer (the EJS). The EJS is a ruhani with a higher political power than the village ruhani. He is responsible for preaching to people and leading the friday congregation prayer at the district centre. Box 6.3 illustrates the concept of the friday congregation prayer (namaz-e jom'eh, NJ).

The village ruhani influences events within and outside the village as well via four other channels: (1) the village council (SED), (2) the village security group (BR), (3) the village elders (rish safids, RSs) and (4) the clerical system.

The ruhani thus potentially influences agricultural and social development projects and political events at the village level. The members of the SED and the BR also are active in the village mosque attend the congregation prayers. After the congregation, an informal discussi9on about various socio-economic and politic matters related to village and outside

Chart 6.1. Structure of the clerical hierarchy.




Source: author: illustrative purposes only.

**Box 6.3. The friday congregation prayer**

The friday congregation prayer (namaz-e jom'eh, NJ) has a very important place in Islamic Iran. It is emphasised greatly in Islam as a means for strengthening the solidarity among muslims and encouraging brotherhood amongst them. According to Islamic law, except for those who have an excuse (such as illness or disablement), men must attend the congregation. Women are free to choose to go. The NJ is led by an emam-e jom'eh (EJS) who is a high-ranking ruhani appointed by the national headquarters of congregation prayer leaders which is directly under the national leader.

In each district, only one NJ is performed, usually in the main mosque located at the district's centre. The NJ is for all the inhabitants within the district. It begins at noon at the time of the mid-day prayer. It is preceded by two speeches: the preliminary and the main speeches. The preliminary speech is given by high-ranking officials including politicians and managers, while the main speech is given by the EJS. The main speech is divided into two parts. In the first part, the EJS preaches on moral and religious issues. The second part is devoted to socio-politic and economic issues which are important at the local as well as at the national and international levels.

Customarily, people sit on the ground in rows facing the EJS at the time of the sermon and the speeches. Men sit in front and women at the back. The first few rows are reserved for high-ranking ruhaniun (clergymen), officials, army commanders and special guests. Ordinary people sit behind.

When a high-ranking official comes to visit the district he might be invited to give a speech to the congregation. Local authorities are also invited to speak. The speeches are broadcasted live by local radio. The speeches of the NJ of the capital city are transmitted to all corners of the country by both radio and TV.

of the village brings the ruhani and the people together. In this way, the ruhani contribute to the collective decision making concerning development projects.

In addition to exerting direct influence on villagers, the ruhani has indirect influence through the RSs. As was stated, most of the RSs' time is spent in the village mosque. When an important issue is raised, the ruhani discusses the issue with the RS who plays an intermediary role to connect the ruhani to the villagers.

The village ruhani uses an interconnected political network to communicate with development organisations. Communication is direct with the revolutionary organisations and indirect through the SED. In cases where the Ministry of Agriculture (MA) is in charge of development projects, the ruhani uses the clerical system to influence the MA.

Some ruhaniun are involved in farming activities. They usually operate small holdings, though some have large lands inherited or purchased before the 1962 land reform (see Amid, 1990). In this case, the ruhani plays two roles: farmer and religious leader. As a farmer, the ruhani enjoys good contact with extensionists. The agricultural extension organisation (STK) tries to use these ruhaniun as leader farmers who can help other farmers by providing technical information to them. As an example, successful ruhani-farmers who achieve high yields are honoured during the ceremonies held for 'the best producers'.

## 5.3. The functioning of the political structure at village level

The ruhani, the SED's members and the BR's members are closely related to each other. When a problem arises at the village level, these people are the authorities who take action. At the very beginning following the revolution, these people played a very

important role in settling political problems. At the time of land seizure, given the loss of power of the gendarmerie, the BR was the only state representative in the rural areas which could maintain law and order, though it favoured the people who seized the lands. Although nowadays the situation has calmed down, some villagers who themselves are members of the BR, or have relatives who work in the BR, try to influence political matters at the village level in favour of themselves.

When villagers have a request which is not satisfied by the MA, they may refer to the ruhani for help. The ruhani try to respond with the help of the SED and revolutionary organisations such as the MJS and the HVZ. In cases where the village level efforts are not effective, he sends the villagers to a higher clerical authority (the EJS) who can influence the MA at the district level.

Villagers may ask for help in solving problems related to the MA organisations directly from the MJS and the HVZ. Given a lack of formal linkage, The MJS and HVZ cannot influence the MA organisations directly. Instead, they may ask the district's leader of the friday congregation (EJS), the district's governor, or the higher authorities to exert pressure on the MA organisations.

## 6. Politics at higher levels

The EJS is reached at his office which is usually located at his house. The EJS meets people on a daily basis according to a time table. The usual way to visit him is to make an appointment at his office on arrival. Sometimes villagers discuss their problems with the EJS when they surrender their religious due [khoms and zakat (taxes on income and belongings)]. The EJSs are intermediary persons for collecting the religious dues from people and forwarding the money to the provincial representative of the faqih (the national leader).

In cases where villagers' requests are not fulfilled by the appropriate development organisation, the EJS writes a note requesting the organisation to take action. Given a lack of any formal linkage between the EJS and the MA at the district level, the request has no legal basis. In order to influence the organisations, the EJS may use his political power criticising the defaulting organisation at the friday congregation prayer. The organisations often fulfil the requests to avoid political problems. Another option for the EJS is to criticise the district's governor over the performance of the organisations. The governor will take action if the situation is politically seen as disturbing.

Given the sensitivity of his security mandate, the governor is less accessible to farmers compared to the EJS. Villagers refer to the governor's office only for problems within his mandate, such as protests against officials, the shortage of fuel during the cultivation season and conflicts between neighbouring villagers.

Villagers may visit other political actors at higher levels if they cannot solve their problems at the district level, such as the provincial representative of the national leader and the parliamentary representatives. The parliamentary representatives often come to their local areas to visit the people. They are also accessible at the parliament. People may go and visit them on a weekly basis according to a time table. The parliamentary representative can influence different development organisations through the mother organisation. Parliamentary representatives are mostly from poor families, often with a rural background, and with several years of working experience in revolutionary organisations.

# CHAPTER 7

# FARMING SYSTEM

This chapter explores farming activities in Marvdasht district. It is important to understand various farm-related factors at different levels which affect the farmers' performance before we discuss our research findings. Our exploration concerns three levels: farm, field and crop.

The present chapter has three sections. The first section describes the farming at the farm level. The second and third sections are devoted to description of the field and crop levels respectively.

## 1. Farm level

At the farm level, the study concerns the interaction between farm household, crop production and livestock production. The farm household is the centre point in farming activities, providing labour and management for crop and livestock production. In the following, farm households and their characteristics are introduced, followed by an analysis of the synergy between the household and crop and livestock production. A detailed description of crops and the relation between crop and livestock production follows.

### 1.1. Farm household

One important point which should be mentioned at the very beginning is that, although Iranian farming has been a subject of numerous studies, the farm household (as a whole) and the effect of intra as well as the inter-household relationships have been ignored. Most studies concern the analysis of the various characteristics of heads of farm households. This has resulted in neglect of the role of the other members of households in decision making and in implementation of farm decisions. Furthermore, the studies focus most on the economic aspects of rural life. The effect of social relationships within and between households on farming activities has been less well studied

The average size of the district's rural household is 5.6 members. There are no official data on the composition of households. We draw on the data gathered during interviews with farmers. Most households comprise man, wife, two or three children and elders. Approximately 43% of the sample households (N=106) accommodate one old member, while 32% have two old members. The elders are predominantly relatives of the husband. It seems that the elders prefer to stay with their married sons. Polygamy is not common; only 2% of the households interviewed were polygamous.

#### *1.1.1. Farming objectives*

The farm households differ concerning the farming objectives pursued by them principally with respect to socio-economic, cultural, and political benefits. Each farm household pursues a certain objective, or a combination of objectives in farming, but in general, there are three main categories of farmers.

(1) The majority of farmers produce for subsistence and for sale. They consume part of their produce and market the surplus. The satisfaction of the subsistence needs of the household is the priority. Thus, the type of crops, seed varieties, the allocation of time and production factors to each farm activity, all depend, first on the subsistence needs of the farm households, and secondly on market opportunities.

(2) A small number of farmers are commercialised and produce mainly for the market. Thus, their farming system is affected primarily by market considerations. They select those crops which are the most profitable irrespective of whether the crops are favoured by members of their households. They allocate their best plots to these crops and select the best seeds (irrespective of taste and other food preference characteristics), and invest most time, management and capital to the production of the crops. The household satisfies its needs mainly from the market.

There is also a third category (3): for whom, to a lesser degree, other objectives are involved, such as the protection of one's own interest in an uncertain socio-economic environment. A small number of farmers cultivate mainly to keep their holdings being taken over by others. These farmers usually live some distance from their lands and have other sources of income than agriculture to secure their livelihood. For these farmers, farming is a marginal source of income. Some are farmers who live in urban areas and who regard their holdings not as a means for farming but as a deposited capital which can be converted to cash when the market prices for land is high. This is the case, for example, for farms located in suburbs and which can satisfy the increasing urban demand for land. Or, if the land is left abandoned it can be taken by the government for redistribution or by individuals. The owners of these farms thus cultivate, but give little attention to farming.

### *1.1.2. Household food consumption*

The per capita consumption of wheat is different in the two agricultural zones (map 5.3 in chapter 5 shows the zones). The per capita consumption in Zone II is 180 kg. In Zone II, wheat is the main staple food consumed mainly as bread and forms an important part of the diet of farm households. It is eaten together with almost all other types of dishes. Table 7.1 gives the share of various foods in daily caloric intake of an average Iranian rural household. Although the data given are for the country as a whole, they give some idea about the situation in the district.

In Zone I (with paddy farms), the per capita consumption of wheat per year is 100 kg. The difference of the consumption of wheat in the two zones is due to the contribution of rice to the diet in Zone I. Rice is an expensive food compared to wheat. The 1990-1991 official price for wheat is 100 Iranian Rials per kilogramme of grain (equivalent to 1.28 US dollar), while the price for subsidised rice (sold at the rural cooperative shops on surrender of coupon) is 1.8 times that of wheat. Subsidised rice is available only in areas where paddy is not grown and is limited to the amount of rice needed by a rural

**Table 7.1 The daily caloric intake of an average Iranian rural household in 1988 (in percentage).**

| food | (%) |
|---|---|
| bread | 55.6 |
| rice | 9.4 |
| fat | 7.4 |
| sugar | 5.7 |
| pulses | 4.9 |
| red meat | 4.8 |
| potato | 1.3 |
| vegetables | 1.2 |
| fruit | 1.2 |
| fowl | 0.4 |
| fish | 0.2 |
| other | 7.9 |
| total | 100.0 |

Source: Janan Sefat (1992).

household. The market price for rice is more than four times the subsidised price. (It is largely the expensiveness of rice in the market which prevents the household in the Zone II from purchasing). In Zone I, each household is allowed to cultivate 0.4 hectare of paddy (the limit set by the provincial water organisation).

Rice is served with a wide variety of stews composed of various farm produce, especially red meat (in order of importance, lamb, goats and beef), white meat (fowls), potato and vegetables (parsley, carrot, etc.). On average, a farm household in the Zone I consumes 672 kilogramme of rice per year (120 kg per year per capita). In the Zone II, given the limitations explained above, farm households consume only 360 kg of rice per year (or 65 kg per capita).

The other ingredients of the diet in both zones include pulses, eggs, tomato, and dairy products. Fish is a luxury food, consumed on special occasions. The direct use of milk is not very popular: milk is used in the form of cheese, yoghurt, butter, and cooking oil. The preference is, in order of importance, for milk from sheep, goats, and cows.

A small quantity of barley is used in the diet, limited to the occasional preparation of barley soup and bread. Prior to the 1962 land reform, barley was more important part of the diet. At that time, given the low productivity of wheat [with a yield of 790 kg/ha, see Amid (1990:42)], households had to use barley for bread. Nowadays, with the improvements in wheat yields and preference for the taste of wheat, only a few farm households use barley bread.

### *1.1.3. Land acquisition*

According to Islamic property rights, both men and women have a right to property and to decide what they want to do with their belongings. Land is transferred from one person to others based upon the Islamic law of inheritance that, with some exceptions, gives two parts of land to a male person and one part to a female. As an example, if a person has two sons and two daughters, his or her land is divided into six parts after his/her death. The law qualifies three groups of people to inherit. The first group includes parents and children. If the child heir dies first, grand children inherit. The second group is composed of grand parents (both paternal and maternal) and brothers and sisters. In case of the brother and sister dying, the nephew and niece inherit. The third group comprises uncles and aunts (both paternal and maternal). In the case where the uncle and aunt die first, cousins inherit.

While, it is important to own a piece of land, it is equally important to have the right to decide about it. However, despite the rule, women seem to be restricted by their husband from deciding freely about what they want to do with their property. The land belonging to a women is usually considered as part of the whole land at the disposal of the farm household and is cultivated by the husband.

### *1.1.4. Household budget*

Tables 7.2 and 7.3 give a rough estimation of annual cash expenditure and cash income of farm households. Two points are important about the tables. First, the figures for cash expenditure, and cash income from off-farm jobs, are as expressed by the farmers who were interviewed during the field work. Often, farmers are reluctant to give exact figures. None the less, the totals obtained in the author's survey are in line with the data in government statistics and other reports. Secondly, the figures are averaged. In

other words, the figures are for farm households with 5.6 members holding 8.7 hectares (7.8 and 9.5 hectares in the Zone I and the Zone II respectively) and producing crops that yield the same as shown in table 5.3 (in chapter 5).

As table 7.2 shows, the main part of the cash expenditure of the households in both zones is on non-food items, comprising 81% and 67% of household expenditure in Zones I and II respectively. The reason for the relatively low expenditure on food items in both zones is that farmers are mainly self provisioning. The small amount of cash spent on wheat in both zones and rice in the Zone I is for grinding and husking. The main cause for the higher food expenditure in Zone II is the expenditure on rice, which comprises about 41% of total food expenditure.

As table 7.3 shows, the main part of household income is generated from agricultural activities, forming 65% and 63% of the total income in Zones I and II

**Table 7.2. An estimation of annual cash expenditure for the living costs of an average farm household in Marvdasht district (1989-1990). (The figures are in Iranian Rials. In Iran, exchange rate: 78 Rials=1 US dollar) (N=106).**

| | Zone I (paddy areas) | | Zone II (other areas) | |
|---|---|---|---|---|
| | (1,000 R) | % of total | (1,000 R) | % of total |
| 1. food expenditure[1]: | | | | |
| -wheat | 6 | | 10 | |
| -rice | 10 | | 64 | |
| -cooking oil | 18 | | 19 | |
| -sugar and sweets | 10.8 | | 13 | |
| -tea | 20 | | 23 | |
| -spices and other food additives | 12.7 | | 7.5 | |
| -miscellaneous foods[2] | 22 | | 18.7 | |
| total food | 99.5 | 19 | 155.2 | 33 |
| 2. tobacco, cigarette, matches, etc. | 29 | | 23 | |
| 3. clothing | 115 | | 73 | |
| 4. school expenses | 7.5 | | 7.5 | |
| 5. medical and sanitation costs | 12 | | 13 | |
| 6. household goods | 109.5 | | 78 | |
| 7. house maintenance and utilities | 18 | | 12 | |
| 8. social obligations (gifts, travel, etc.) | 100 | | 95 | |
| 9. miscellaneous | 33 | | 17 | |
| subtotal | 424 | 81 | 318.5 | 67 |
| total cash expenditure (1,000 Rials) | 523.5 | | 473.7 | |

Note: 1- the cash spent on wheat in both zones is for grinding and on rice in the Zone I is for husking.
2- miscellaneous foods include potato, pulses, canned foods, snacks, vegetables, fruits, etc.

Source: author's survey.

respectively. Handcrafts are the most important source of off-farm income, generating 14% and 16% of the total cash income in Zones I and II respectively.

The cash income for households in the Zone I and the Zone II are respectively 1.96 and 1.74 times the national figures (see ISC, 1992). However, such a direct comparison of the data on the cash expenditure is not valid because the national figures include the cost of food consumed by self provisioning households.

Saving is high in both Zones. Households in the Zone I save 2.4 times what they spend. The figure is 2.3 for the household in the Zone II. The households in both zones keep some cash as liquid asset used for purchasing the necessary inputs for the next cultivation season. Part is used for expanding agricultural and non-agricultural activities. Those who own shops in the village may expand their businesses. Furthermore, farmers often reinvest some part of the earnings on their farms by constructing storage, adding livestock, etc.

However, not all categories of farmers are in the same economic situation. Approximately 58% of the district's farmers have six hectares and less (Bakhshudeh and Najafi, 1989). These farmers earn less than the average, but their expenditure remains, more or less, the same, squeezing their savings capacity.

**Table 7.3. An estimation of annual cash income of an average farm household in Marvdasht district (1989-1990). (The figures are in Iranian Rials. In Iran, exchange rate: 78 Rials=1 US dollar) (N=106).**

| source/sale of | Zone I (1,000 R) | Zone I % of total | Zone II (1,000 R) | Zone II % of total |
|---|---|---|---|---|
| 1. agriculture[1]: | | | | |
| -wheat | 667.2 | | 660 | |
| -barley | 140.4 | | 152.4 | |
| -paddy | 256 | | - | |
| -other[2] | 94.4 | | 183.6 | |
| total agriculture: | 1,158.0 | 65 | 996.0 | 63 |
| 2. off-farm: | | | | |
| wages/remittan. | 205.2 | 11.5 | 190 | 12 |
| hand crafts | 256 | 14 | 247 | 16 |
| miscellaneous[3] | 164.5 | 9 | 145 | 9 |
| subtotal: | 625.7 | 35 | 582 | 37 |
| total cash income (1,000 Rials) | 1,783.7 | | 1,578 | |

Note: 1- net income from agriculture.
2- includes (depending on the zone) sugar beets, maize, pulses (especially beans and peas), alfalfa, sainfoin, clover and also livestock products.
3- service provision (retailing, machinery services, maintenance services, etc.)
Source: author's survey

### *1.1.5. The division of labour*

The district's rural women play an important role in the farm household economy. In addition to their tasks as wives and mothers within the households, the rural women share various responsibilities of the farm.

Traditionally, domestic work such as cooking, baking, cleaning, laundry, child minding, mending clothes and food processing such as, and especially, dairy products for subsistence and market, are exclusively done by women and female children. Pounding, fetching water and collecting fire wood which once consumed much time and effort by the female members of farm households, nowadays are easier. Most farm households use the small diesel or electric grinding mills located in the villages for example. However, if grinding is done by the farm household, the responsibility still falls on the women and female children. Furthermore, approximately 74% of farm households have access to piped drinking water (ISC, 1989-b). In most cases the outlet pipes are located inside the backyard of the houses which saves time in fetching water. When fetching water from a distant source is necessary, women and female children take care of the job. Moreover, the availability of compressed natural gas and kerosene in most abadis makes it unnecessary for most farm households to collect fire wood. According to the ISC (1989-b), some 80% of farm households use natural gas for cooking. For heating, some 92% of the households use kerosene. Only 11% and 6% of the farm households use fire-wood for cooking and heating respectively. If it is necessary, the task of collecting firewood falls on the male children, though in some cases, women and female children assist the boys.

Table 7.4. Percentage of distribution of domestic labour within farm households in Marvdasht district (N=106).

| | W | Wg | G | Gw |
|---|---|---|---|---|
| collecting herbs | 12 | 16 | 42 | 30 |
| cooking | 78 | 19 | 3 | – |
| baking | 100 | – | – | – |
| cleaning | 41 | 29 | 12 | 18 |
| laundry | 50 | 5 | 12 | 33 |
| child minding | 11 | 59 | 9 | 21 |
| mending clothes | 65 | 15 | 7 | 13 |
| processing food | 67 | 12 | 6 | 15 |

| Code: | Woman | Girl |
|---|---|---|
| main responsibility | W | G |
| assistance from | w | g |

Source: author's survey.

Table 7.5. Estimated time spent on domestic work by female members of farm household in Marvdasht district (N=106).

| | average time spent per day (minutes) | percentage of households by occasion | | | |
|---|---|---|---|---|---|
| | | daily | weekly | biweekly | occasionally |
| cooking | 45 | 100 | – | – | – |
| baking | 45 | – | 87 | 13 | – |
| cleaning | 40 | 87 | 9 | – | 4 |
| laundry | 40 | – | 73 | 17 | 10 |
| food processing | 30 | – | – | – | 100 |

Source: author's survey.

Baking is predominantly done collectively. For baking, once a week, or biweekly, two or three neighbours get together and spend the whole day assisting each other. The bread is baked very thin (a few millimetres thick), using rudimentary tools and a traditional mud-cemented oven dug in the ground. The bread can be preserved for a long time.

Producing dairy products (butter, cheese, etc.) for subsistence and sale is part of food processing and a time consuming activity. There is a good market for cooking oil, butter, cheese, churned sour milk, etc., both in the urban areas and the suburbs. The methods used for production of dairy products are traditional and simple, but time consuming and cumbersome. In producing butter, for instance, a woman has to spend a lot of time to separate the butter from the milk. The procedure is that the milk is first processed into yoghurt. The yoghurt is mixed with some water to form a thin liquid. The liquid is poured into a especial skin-made swinging container. The container has to be shaken very hard for a long time to force the liquid to yield the butter. For making cooking oil, the butter has to be melted and the oil separated from the solids.

As shown in table 7.4, the responsibility for most domestic work falls on the women and female children. On average, a women together with her female children spends approximately 3 hours per day on domestic work (see table 7.5).

Traditionally, the responsibility for farm activities are divided between farm household members. Transplantation of paddy seedlings, hand weeding, hand thinning, hand harvesting, picking fruits, feeding and milking livestock and helping in calving and lambing are the activities in which the rural women and female children take part. Table 7.6 illustrates the division of agricultural labour by gender.

**Table 7.6. Percentage distribution of agricultural labour in farm household by gender in Marvdasht district (N=106)[1].**

| | W | Wm | Wg | G | M | Mw | Mb | B | GB | others[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| land preparation | – | – | – | – | 14 | 6 | 5 | 6 | – | 69 |
| sowing & manuring | – | – | – | – | 9 | – | 39 | – | – | 52 |
| transplanting | 3 | 7 | 5 | – | 19 | 46 | 6 | 12 | – | 2 |
| weeding | 5 | 3 | 3 | 1 | 43 | 10 | 22 | – | – | 13 |
| thinning | 7 | 12 | 10 | 2 | 7 | 35 | 7 | 3 | 5 | 12 |
| irrigating | – | – | – | – | 56 | 13 | 5 | – | – | 26 |
| harvesting | – | – | – | – | 18 | 11 | 4 | – | – | 67 |
| collecting straw | – | – | – | – | 17 | – | 30 | 11 | – | 42 |
| picking fruits | 8 | 6 | 3 | 2 | 33 | 24 | 17 | 7 | – | – |
| feeding livestock | 47 | 5 | 14 | 9 | 12 | – | 1 | 5 | 7 | – |
| milking livestock | 60 | 6 | 15 | 12 | 4 | – | – | 3 | – | – |
| helping in calving & lambing | 54 | 34 | 5 | – | 4 | – | – | – | – | 3 |

| code: | Man | Woman | Boy | Girl |
|---|---|---|---|---|
| main responsibility | M | W | B | G |
| assistance from | m | w | b | g |

Note: 1- in the case of paddy, the total farmers interviewed number 39.
2- includes contractors, other labourers than family, etc.
Source: author's survey.

As shown in table 7.6, women and children take part in most agricultural activities. However, they do not appear in official statistics as agriculturally active. Out of the rural population recorded as holding jobs in agriculture (10 years and older), only approximately 1% (212 persons) is female (SBBF, 1991). The official statistics take into account only those females who are the heads of the farm households. The unpaid responsibilities of rural women are not recorded. According to the Statistical Centre (ISC, 1989-b), formally only four groups of people can be considered as agriculturally active: (1) those who have permanent jobs, (2) those who work occasionally, provided that they work two days during the past seven days prior to the day of census taking, (3) those who have seasonal jobs, (4) those attending training courses, military service, etc. As it is clear, none of these groups covers the situation of rural women and children.

### *1.1.6. Sources of income for farm households*

The introduction of tractors as part of the mechanisation programme changed Iranian agriculture dramatically. Before this, animal draft and manpower were the main sources of power used in agriculture. In 1962, at the time of the land reform, there were about 6,000 tractors in the whole country (Amid 1990). This number had increased by about eight times by 1977. These tractors and other farm machinery (e.g., combine harvester) were used mainly by large farmers (Amid, 1990). After the 1979 revolution, the trend continued, and increased. With an annual average sale of 20,000 tractors (compared to 8,000 tractors in the pre-revolution era), the use of tractors during years following the revolution, increased by 161% between 1979-1985 (Roqani Zanjani, 1989). The main aim of the government has been to provide access to farm machinery for small farmers.

One major change in agriculture associated with the introduction of tractors concerns the demand for labour. The majority of the holdings are family farms run by the family labour. The use of tractors enabled farmers to cultivate with a fewer labourers, the surplus largely moving to urban areas, seeking job opportunities. Farmers also saved time and became involved in activities other than farming, for additional income.

These activities range from activities related to agriculture, such as working as a labourer for other farmers, to activities related to other sectors of the economy, such as working in a factory. The pattern of activities is differentiated by gender, some jobs are the concern of men, other jobs involve women and female children. Women are mainly involved in jobs related to the household and at a close distance to the houses. It is less common to see a woman work as a labourer in farms belonging to the other households or in factories.

Table 7.7 illustrates the distribution of farm households by various off-farm activities. One important source of income for farm households is handcraft made by women and girls. Many farm households (67%) are active in this respect. Carpet weaving is the most important hand craft activity. Carpets are often woven based upon contracts with carpet middle-men. The middle-men provide the necessary materials. In the distant past, the carpet-weaving households received unspun wool for making a carpet. Nowadays, the wool is ready-spun, purchased at the market. The middle-men take the carpets to large carpet shops in cities or sell them directly to consumers. The carpet-weaving units are often located inside the houses. Depending on the availability of labour, the size of carpet, etc., each weaving unit accommodates a few wooden weaving frames.

Each weaving frame is used by one or more young girls, often supervised by an experienced woman.

Involvement in service provision in rural areas is another type of off-farm job, ranging from retailing to transporting. Some 10% of the farm households interviewed are active in retailing household commodities and farm products. The households keep small shops, usually located at the corner of the backyard of the houses. The shops are used mainly by women or children. The provision of the commodities is the responsibility of men. Many different sorts of household goods, grains, dairy products, etc., are sold in these shops.

**Table 7.7. Distribution of farm households by type of off-farm jobs in Marvdasht district (in percentage, N=106).**

| Off-farm activity | farm households number | (%)[1] |
|---|---|---|
| hand craft | 71 | 67 |
| service provision: | | |
| -shop | 11 | 10 |
| -tool making, maintenance, etc. | 15 | 14 |
| -farm mach. services | 18 | 17 |
| -miscellaneous[2] | 24 | 23 |
| labour: | | |
| -other farms | 6 | 6 |
| -factories | 17 | 16 |
| -urban areas | 13 | 12 |
| -miscellaneous[3] | 16 | 15 |

Note: 1- due to the involvement of the same farm households in more than one activity, the percentage values exceed to the total of 100%.
2- transportation, grinding, etc.
3- garden keeping, office serving, etc.
Source: author's survey.

Some members of the farm households are artisans and produce different sorts of implements for farm and household use. Others are specialised in maintaining farm machinery and household equipment. These miscellaneous jobs are sources of off-farm income for about 14% of the farm households in the author's survey. Furthermore, some 17% of the households provide machinery services for other farmers. The services range from ploughing to harvesting. These farmers keep machinery like tractor, tiller, thresher, and combine harvester and various types of farm implements (plough, harrow disk, trailer, etc.). The services are provided by hired drivers, or provided directly either by the owners of the machines or by their sons. Some 23% of the households surveyed are active in services such as providing transportation, grinding, etc.

A wide variety of labouring jobs are performed by the farm households. Despite the labour surplus, there is a good demand for skilled labourers. Labouring on farms belonging to other households is done by some 6% of the farmers, mostly small farmers. Given the limitation of the land, only one crop at a time can be cultivated. During the period between the time of sowing and harvesting plenty of time is available for other work and for earning some extra cash. In addition to wage work, farmers may enter into a reciprocal labour-sharing agreement, whereby one farmer works for another in the understanding that he can call on the others' help when he in turn needs extra labour. Those farmers who share a piece of land often enter into such agreement.

Some 16% of household members (predominantly men) work in different factories located in their area. When the incentives are very strong they may go to areas farther away. Large factories such as the petro-chemical assembly, petroleum refinery complex, meat industry, etc., demand a large amount of labour all year round, providing an

opportunity for some farmers and many male rural youngsters who look for off-farm jobs. Since these factories also offer seasonal jobs, it is convenient for some farmers to join the temporary labour force. Some miscellaneous jobs such as gardening for others, guarding places and offices, etc. are performed by 15% of the households' members in the author's survey. Finally, working in urban areas is a means chosen by some people to earn extra cash. Since this approach has consequences for both the rural and urban economies, it will be discussed under section 1.1.7 in more detail.

### *1.1.7. Migration of farm household members*

Several small and large cities in the Fars province (especially Marvdasht city, the centre of the district and Shiraz city, the centre of the province) are the main places attracting rural migrants, though some migrants have chosen to go much further, for example to the capital city.

Migration achieves several objectives, such as increased income and satisfaction of social needs such as access to better services in health, education, social welfare. The migrant population is made up predominantly of farm male youngsters. The lack of access to productive resources, especially land, is the most important motivating force, conditioned by limited job opportunities in rural areas and the existence of strong incentives in the urban areas. The application of the law of inheritance results in increasing land fragmentation. Furthermore, the water rights go to the heirs. The land fragmentation reduces the chance to inherit enough land to make a living, forcing youths to look for jobs other than farming. The limited job opportunities in the rural areas as a consequence of the mechanisation of agriculture also pushes youngsters to leave the villages and look for work in urban areas. Later, when they inherit land, they may sell or rent it out to others, preferably to the other members of their family, and invest the money in the city markets. The availability of a wide range of relatively well-paid, labour-intensive jobs in the urban areas such as the distribution of consumer goods, construction projects, etc., encourages youngsters to migrate. However, the migration also creates socio-economic problems in the urban areas. A miserable life for the migrants, pressure on the public spending for construction of public facilities, etc., are some of the adverse outcomes.

The migration of the youngsters may be viewed as a solution for some of the economic problems facing farm households. The migrants send part of their income to the households as a family obligation. Furthermore, the migration reduces the pressure on agricultural land. If, instead of migrating, the youngsters stay with their families they have to work on the family farm. While in theory the impact of additional labour depends on whether the productivity of the additional labour unit is sufficient to cover the cost of consumption, or not, and only where productivity is low, do households have to increase the area or intensity cropping by decreasing the fallow area or fallow interval, in the prevailing conditions of Iran, additional-family members tend to depress both income and consumption.

From another perspective, the migration limits the rural economy, leading to abandoned villages. In the period between two consecutive agricultural censuses (1976-1986) the abandoned abadis (villages, farms, etc.) of the district increased from 3.3% to 23.8% (ISC, 1989-a and 1982). In other words, in 1986, about one fourth of the total abadis were left abandoned. Of course, not all of the inhabitants of the abandoned abadis migrated to urban areas but, based on the national figures which show a drop of 7.5% in

the rural population in the period of 1979-1986 (ISC, 1992 and Rasul Of, 1989), most of them did. Some of the inhabitants have moved to other abadis within the district (intra district migration) and some have built new abadis [e.g., by residing in their farms (the statistics in the same period show that there was an increase of 44% in the number of the total abadis in the district)].

### 1.2. Synergy between the household and crop and livestock production

Many farm households keep a flock of small ruminants for subsistence and the market. The livestock graze on farm residues and on natural rangelands. Furthermore, crops such as barley, alfalfa, clover, sainfoin, and maize are cultivated as livestock feed. Maize (grain) comprises the main part of poultry feed. In other words, the output of the crop production provides inputs to livestock production, but only a little output from livestock goes to crop production. The use of livestock manure and animal traction in crop production is not common. As will be shown in the following chapters, the majority of farmers apply chemical fertiliser to restore soil fertility. Only occasionally are small quantities of dung applied for manuring. Furthermore, the direct manuring by livestock (releasing dung while grazing on crop residues) is increasingly threatened by burning of residue. The introduction of tractors and other farm machinery has reduced the use of animal traction in agriculture dramatically and limited it to remote areas.

The output of the farm household which becomes the input to the crop and livestock production includes management and labour. In both the Zones I and II, households devote a considerable amount of time to crop production, but little to livestock production. The return of crop production to the household both in terms of economic value and family needs is much higher than that of livestock production. The inputs to the farm household includes crops and livestock products which are consumed by the household, or sold at the market.

## 2. Field level

Crop production in Marvdasht district is an extensive type of cultivation based on crop rotation and fallow. Crops are grown in sequence and part of the land is set aside as fallow. Different types of garden (farm garden, river side garden, homestead garden) are cultivated more intensively.

Changes in agriculture in general, and in crop production in particular, have occurred during the past few decades in the country as a whole, and in the district in particular. These changes resulted from socio-economic and political changes in the country. To understand these changes and to sketch the present situation, we trace back crop production to the period before 1979. The year 1979 is selected as a reference point due to the important socio-economic, cultural and political changes set in motion by the revolution. The period before the 1979 revolution is also marked by socio-economic and political changes accompanied by the 1962 land reform. These changes affected crop production remarkably. For this reason, we review the pre-revolution situation in two distinct periods: (1) prior to the 1962 land reform and (2) between the land reform and the 1979 revolution.

## 2.1. The pre-land reform crop production

Prior to the 1962 land reform, an important feature of the crop production was a systematic fallow of 15 to 20 months cycle in a 3-year cultivation cycle. Hardly any externally-purchased input was used, and no fertiliser of any kind was applied on 83% of the land under cultivation of annual crops (Mahdavy, 1965 in Amid, 1990). Livestock dung was used for fuel rather than for manuring. Thus, fallowing was the main procedure for restoration of soil fertility.

**Table 7.8. A 3-year cultivation cycle prior to the 1962 land reform.**

| | 1st year | 2nd year | 3rd year |
|---|---|---|---|
| wheat | A | B | C |
| peas | B | C | A |
| fallow | C | A | B |

Source: Safi Nezhad (1989).

The arable lands of each village were divided into three parts, one part was devoted to cultivation of shatvi crops (wheat and barley), another part to bahareh crops (e.g., sugar beets, pulses, etc.), and the rest to fallow (Safi Nezhad, 1989) (for description of shatvi and bahareh crops refer to the third section of this chapter). For simplicity, we call these three parts A, B and C (see table 7.8). At the beginning of each agricultural year (late August), each part was divided amongst the village's sharecroppers according to the traditional pattern. Each year, the utilisation of each part was changed systematically (see tables 7.8, 7.9, and figure 7.1).

This system of cultivation was limited by the shortage of water. Each village had access to a certain amount of water supplied mainly by qanats and springs. In some cases, several villages shared the same source of water. There was a correlation between the amount of water available and the fallow size and the fallow length. When for any reason a village received extra water (e.g., by extending a qanat's conduits), soil fertility was restored by applying livestock dung, and then cultivated more intensively by shortening the cultivation cycle from 3 years to 2 years (Safi Nezhad, 1989), consequently cutting the fallow length by half (see table 7.10).

**Table 7.9. Cultivation and fallow lengths in a 3-year cultivation cycle prior to the 1962 land reform.**

| | length (month) |
|---|---|
| wheat | 11 |
| peas | 5 |
| fallow | 20 |
| total | 36 |

Source: Safi Nezhad (1989).

Following the harvest of wheat in June-July, the arable lands of village were divided into two parts (A and B). In late October of the first year, plot A was cultivated with wheat, while the other plot was fallow. In the next February, the plot B was cropped with peas. In the next agricultural year, the two parts were substituted for each other. On the following August, after the peas harvest, plot B was manured by applying some livestock dung and prepared for wheat production in late October. At this time, plot A, was set aside for fallow, and then cultivated with peas in the following February. In this way, as shown in table 7.10 and figure 7.2, the 2-year cultivation cycle consisted of 9 months of wheat production, 5 months of peas production and 10 months fallow.

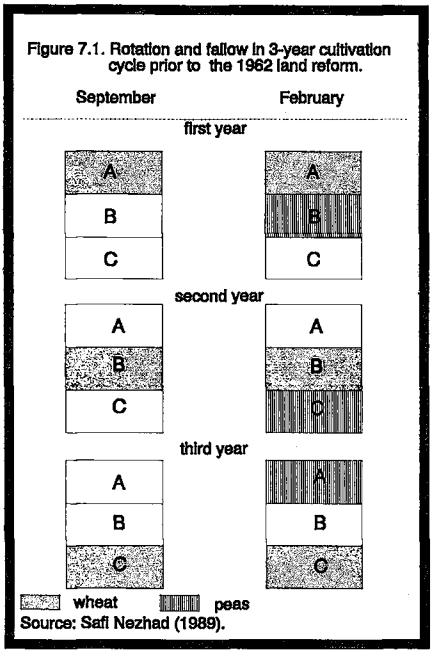


Figure 7.1. Rotation and fallow in 3-year cultivation cycle prior to the 1962 land reform.
Source: Safi Nezhad (1989).

Table 7.10. Cultivation and fallow lengths in a 2-year cultivation cycle.

| | length (month) |
|---|---|
| wheat | 9 |
| peas | 5 |
| fallow | 10 |
| total | 24 |

Source: Safi Nezhad (1989).

## 2.2. Crop production in the period between 1962 and 1979

After the 1962 land reform, absentee landlordism was abolished and the sharecropping system disbanded. These major changes, together with the implementation of a series of development projects by the government such as the construction of modern dams, mechanisation of agriculture and introduction of chemical fertiliser, altered Iranian agricultural production dramatically.

Three important changes occurred in the Marvdasht district's agriculture: (1) the fallow area became limited and the interim period between planting crops became shorter; (2) farmers started to use chemical fertilisers for restoration of soil fertility; and (3), paddy, as a cash crop and staple food swept into a large area in the northwestern and western parts of the district.

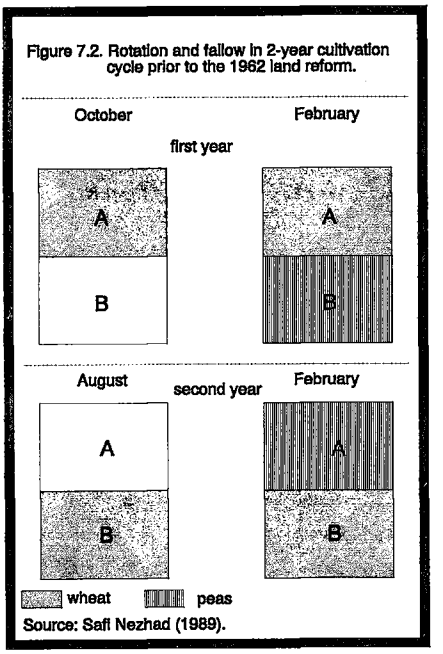


Figure 7.2. Rotation and fallow in 2-year cultivation cycle prior to the 1962 land reform.
Source: Safi Nezhad (1989).

A bimodal system which accommodated both large and small farmers emerged (Amid, 1990). The ex-sharecroppers became owners of land and water but faced several problems. The most constraining problem was the limited size of their holdings. While, on average, an Iranian farmer has to have about 7 hectares to be able to support his

family, more than 50% of all former sharecroppers received holdings which were less than 2 hectares (Amid, 1990). Furthermore, holdings were scattered and the soils were poor. For example, an area which had been sharecropped in fact was made up of 11 hectares of 54 very small plots, with both irrigated and rain-fed fields (on average each plot was 2,040 square meters) (Shahbazi, 1989). Ex-landlords reserved the best plots of land (in terms of soil fertility, access to road and to water resources) for themselves and sold to the former sharecroppers the poorest lands. In addition, controlling water sources, the ex-landlords received a larger proportion of water or changed the water cycle for their own benefit (Amid, 1990).

The government attempted to lessen the adverse effect of the land fragmentation by establishing farm corporations and production cooperatives. Two farm corporations (Ariamehr and Dariush-e Kabir) were established in the district. The construction of the dorudzan dam and the introduction of water pumps (as part of a plan for mechanisation of agriculture) helped to ameliorate the water shortage problem. The dam enabled farmers in roughly one third of the district, the northwestern and western parts of the district to cultivate paddy, a crop used for subsistence and for market. Prior to the construction of the dam, only small areas along-side the kor river were cultivated with paddy. Paddy became a crop grown in sequence with wheat. The introduction of paddy resulted in a higher income for the rice farmers, but also created some problems including the rise of the water table in a large area watered by the dam and water-logging in some areas, competition of paddy and wheat for water and land preparation for wheat following the harvest of paddy. Furthermore, the use of chemical fertilisers was encouraged by extensionists to restore soil fertility.

However, despite the government's efforts to help small farmers, small farmers continued living under miserable conditions. The large farmers substituted food crops by cash crops. By mechanising their farms, adopting improved techniques and using high yielding varieties, they advanced their production and produced large surplus that filled the market. This produced large returns for the large farmers but forced down prices. On the other hand, small farmers continued to use traditional methods of production which resulted in low productivity. The low productivity, together with a rise in prices of other commodities compared to food crops, forced the small farmers to use their lands more intensively in order to retain their purchasing power in the market. Given the limitation of lands, the small farmers were unable to set part of their land fallow in a systematic way as they did before. They cultivated their entire land. Furthermore, the interim period between planting crops gradually became shorter (from at least 8 months to only 2 months) as a result of the habit of cultivating wheat consecutively for several years on the same plot.

In total, the wheat crop is irrigated six times. The fifth and the sixth waters (dan ab and marg ab respectively) which are conducted onto the fields in April and May respectively are the most problematic. Mid-April is exactly the time at which farmers sow the paddy nurseries and May is the time for transplanting the paddy seedlings. This overlap of the watering times for wheat and paddy causes a problem. Due to the limitation of water, and given a much higher economic return for paddy, farmers devote the last two water for wheat to paddy . This prevents the wheat crop from developing in a normal manner at the crucial stage of growth (the grain development stage). As a result, wheat becomes weak, and produces small and wrinkled grains.

It is more time consuming and costly to prepare a plot cultivated previously with paddy than a plot cropped with wheat. The soils become compacted due to the total

submersion of the fields for a few months. This changes the structure of the soils. Furthermore, the costs and time further increase when farmers try to prepare a plot with wet soils shortly after the paddy harvest (some farmers cultivate a late wheat crop (korpeh) on the same plot that was cropped with paddy shortly after the harvest).

## 2.3. Post-revolution changes in crop production

Crop production after 1979 is marked by three important issues: (1) the continuation of cultivating intensively by limiting the fallow size and shortening the interim period by small farmers, (2) insecurity for large farmers which adversely affected the fallow size and the interim period and (3), introduction of maize as a cash crop.

After the 1979 revolution, the government launched a land distribution programme. However, compared to the 1962 land reform, the post-revolution land reform redistributed a very limited amount of land amongst landless people and small farmers (see chapter 6). It reduced the number of small farmers owning 5 hectares and less from 64% in 1974 to 60% in 1982 (Rasul Of, 1989). Thus, the redistribution of land did not solve basically the problem of smallness of holdings. The majority of farmers were still holding lands smaller than the size required for supporting their families. Furthermore, the redistributed lands did not yield as well as expected. Except for disputed lands which had been part of mechanised farms belonging to large farmers, the other lands were (mavat) characterised by infertile soils and sandy or stony surfaces. The improvement of these lands needed management skills, time and money.

During the period in which the re-assigned lands were under the process of transfer, the land reform permitted the occupants to cultivate the land temporarily until they were transferred formally. However, the lands yielded much lower in the hands of small farmers than when they were cultivated under the management of the original owners (large farmers), because the small farmers were uncertain if they would receive the lands. By 1989 (a decade after the land seizure problem), only one fourth of the land had been formally transferred (Jahad, 1990-d). Given the uncertainty involved, the small farmers were reluctant to invest in the lands. They used them consecutively without proper management and investment. This lowered the yields dramatically. Furthermore, the disbandment of the majority of the farm corporations and production cooperatives resulted in the re-fragmentation of the lands which had been consolidated.

The smallness and low productivity together with a sharp rise in prices of household goods resulting from a general inflation in the country's economy (especially during the 1980-1988 Iran-Iraq war) resulted in a lower purchasing power for the small farmers. This has added to the pressure to cultivate more intensively by limiting fallow size and reducing interim period. Some farmers cultivate their entire land with wheat for several consecutive years. The interim period is limited to a few months, depending on the climate [from mid-June/mid-July (the period for wheat harvest) to early-September/late-October (the period for the next wheat cultivation)].

Another important feature of post-revolution farming is the limitation of the fallow size and reduction of interim period in the large farms. Prior to the revolution, large farmers set aside part of their lands as fallow. The interim period varied, based on the crops grown in sequence with wheat and barley, from 5 months (if paddy was cultivated in sequence) to 9 months (if sugar beets were cultivated in sequence).

After the revolution, given the anxiety resulting from land seizure problems, large farmers have been reluctant to set aside fallow. Any uncultivated land could be taken over

by small farmers and landless rural people by force. Thus, trying to prevent others from occupying the lands by force, large farmers eliminated fallow. Furthermore, since there was a possibility of encroachment at the time between the harvest of the first crop of two consecutively cultivated crops and the cultivation of the second, they tried to shorten the interim period between planting.

In the past, maize was grown in limited areas of the district for local consumption eaten on the cob. The introduction of maize as a cash crop grown in sequence with wheat, and its widespread adoption, came about as the result of a policy aimed at strengthening links between crop and livestock production and reducing the existing high stocking rate on natural rangelands. Improved varieties (IVs) of maize were introduced to the district in 1981. The early IVs were of the green type (silage maize), which had an important market in the Fars meat industry (a state-run agri-business located in the district). Later, some varieties were introduced for grain production. There are a number of drying assemblies active in the district which purchase maize and transport it to more distant markets. At first [when maize production was under the Ministry of Agriculture (MA)], the crop was cultivated by large farmers. Given a limited availability of improved seeds, the promotion of cultivation in mechanised farms with favourable conditions (flat and consolidated plots, good access to water, etc.,) and a large-farmer bias, the Ministry distributed the seeds first amongst large farmers. Later, when the MJS (Ministry of jahad-e sazandegi) took over the responsibility, maize production was promoted among small farmers. However, this lasted only a few years before, once again, the responsibility fell back on the MA. Although, under a pressure exerted by the MJS, the MA distributes improved seeds amongst small farmers, distribution is limited. The main part of the stock is distributed amongst large farmers who have regular contact with the Ministry.

## 2.4. Characteristics of fields

Fields are of two types: irrigated and rain-fed. Each type has its own variations based on different topography, soils, etc. On each type of field, a number of crops are grown. Wheat, barley, and cereals are grown in both field types, while paddy, sugar beets and maize occur only on irrigated fields. The rain-fed cropping is not very important in the district. The area under rain-fed crops accounts only for 14 % of the total arable land.

Plots are small and dispersed. According to a study on the fragmentation and size of the district's lands conducted in 1986-1987, approximately 58% of the district's farmers have 6 hectares and less (Bakhshudeh and Najafi, 1989). Furthermore, the holdings of 60% of the farmers are composed of more than 3 pieces. On average, each farmer has 6.7 plots dispersed in different areas. Farmers whose holdings are 6 hectares and less and have more than 3 plots at their disposal account for 35% of the total farming population. This gives an average of approximately 1 hectare for each plot.

As stated earlier, the problem of small size and the fragmentation of land was perpetuated by the pre-1962 land reform, when the land allocated to each farmer (saheb-e nasaq) was composed of several dispersed plots of different size and quality. At that time, each saheb-e nasaq (the holder of cultivation right) had a right (nasaq) to cultivate village land, but seldom was entitled to any specific holding in the village (Amid, 1990). Traditionally, cultivation rights were hereditary, but seldom alienable. The right was usually inherited by one of the able sons, usually the eldest one. In this way, the

subdivision of cultivation rights, and thus holdings, which might be resulted from implementation of the Islamic law of inheritance was avoided.

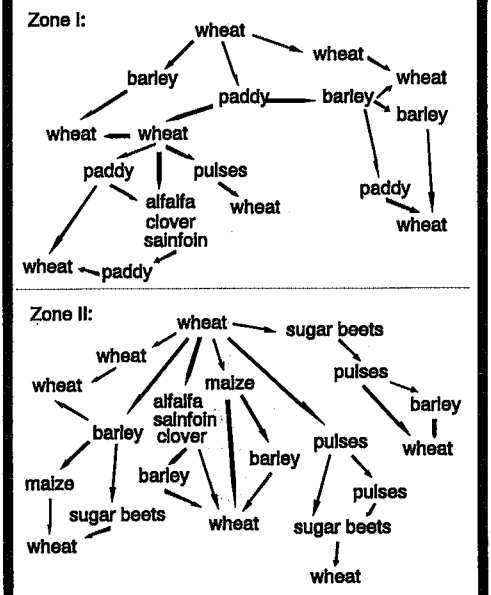
The application of the Islamic law of inheritance added to the problem. To overcome this problem, the government launched several programmes for land consolidation, of which the establishment of farm corporations and production cooperatives were the most important (in the district two farm corporations were established only). According to the rules governing these organisations, the death of a member did not affect the right of the organisations to use the lands. If the new owners decided to withdraw from the organisations, they had to sell their lands to the other members, or to those who wanted to be a member of the organisations. This prevented the lands from being further fragmented. However, the large proportion of the arable land of the district fell outside the jurisdiction of farm corporations, and the revolution put an end to both farm corporations in the district.

Two subsequent major efforts have been made by the government to consolidate land and check fragmentation in the district: (1) facilitating new farm organisations; and (2), organising new land owners, who have received land under the post-revolution land reform law, into small collective groups, whereby the small plots of individual farmers are consolidated to form a large plot.

## 2.5. Crop sequences

Wheat appears in both irrigated and rain-fed fields and in both agricultural zones, dominating all the other crops in hectarage. Figure 7.3 illustrates the main crops cultivated in sequence with wheat in the two zones (minor crops and also main crops where cultivation is limited, are not shown). All these crops are grown in sole stands. As shown, there is a wide variety of sequential patterns. All the patterns start and end with wheat. In Zone I (the paddy area), the main crops cultivated in sequence with wheat include paddy, barley, pulses (especially beans and peas), alfalfa, sainfoin and clover. In this zone, maize cultivation is limited. In Zone II, the main sequential crops for wheat are sugar beets, maize, barley, pulses, alfalfa, sainfoin and clover.

Figure 7. 3. Selected main crops grown in sequence with wheat in Marvdasht district.




Source: Nejat Pur (1986), author's field notes .

Millet and sesame are also used in the sequence in both agricultural zones, but they appear only occasionally and in limited areas. Due to their minor importance, millet and sesame are not shown in figure 7.3.

In both zones, there are some farmers which cultivate wheat consecutively for several years, mainly in order to produce sufficient food for home consumption.

**Table 7.11. The crop calendar of Marvdasht district for the main agricultural operations for selected main crops.[1]**

| | wheat | barley | paddy | sugar beets | maize (green) | maize (grain) | pulses |
|---|---|---|---|---|---|---|---|
| Aug. | | | | | | | |
| Sep. | $sow_F$[2] | | $harvest_S$ | | $harvest_F$ | $harvest_S$ | |
| Oct. | sow | $sow_S$ | | $harvest_F$ | | | |
| Nov. | sow[3] | $sow_S$ | | $harvest_S$ | | | |
| Dec. | sow[3] | | | harvest[4] | | | |
| Jan. | $sow_S$[4] | | | $sow_S$ | | | |
| Feb. | top dress | weed | | sow | | | $sow_S$ |
| Mar. | weed | top dress | | $sow_S$ | | | |
| Apr. | | | $sow_M$ | thin&weed | | | weed |
| May | | $harvest_M$ | $transplant_S$ | | $sow_S$ | $sow_S$ | |
| June | $harvest_M$ | $harvest_M$ | weed | | top dress | top dress | |
| July | $harvest_M$ | | | | weed | weed | harvest |

Note: 1- dates of land preparation and basal dressing are not shown because they occur shortly before sowing.
2- early sowing date (results in a kalar crop).
3- late sowing date (results in a korpeh crop).
4- very unusual sowing date.
F: starts/ends at the first half of month.
S: starts/ends at the second half of month.
M: starts/ends at the middle of month

Source: author's field notes.

## 2.6. The crop calender

The agricultural year starts in late August when farmers start to prepare their lands for cultivation of shatvi crops (wheat and barley). Land preparation and application of basal dressing are carried out shortly before sowing.

Wheat is sown from early September, which results in an early crop (kalar), to December, which results in a late crop (korpeh). In very unusual cases, the sowing is done in January. The sowing date for barley is late October, extending to late November. The bahareh crops (sugar beets, paddy, maize and pulses) are sown in a period ranging from late January for sugar beets to late May for maize. The sowing of paddy nurseries starts in mid-April, and the transplantation of seedlings occurs in late May.

Shatvi crops are harvested from mid-May to mid-July. The harvesting dates for bahareh crops range from July for pulses to late November for sugar beets. In very unusual cases, the harvest of sugar beets extends to December.

As shown in table 7.11, the busiest times in general for farmers (irrespective of the zones) are three periods. The first period is September in which the sowing of wheat and the harvest of sugar beets, paddy, and maize occur. The second period is February in which top dressing of wheat, weeding of barley and sowing of sugar beets and pulses occur. The third period starts in May and ends in June and accommodates the sowing dates for maize and the harvesting dates for wheat and barley. The transplantation of paddy seedlings as well as weeding, and top dressing of maize are also done in this period of time.

Tables 7.12 and 7.13 illustrate the busiest times for two crop combinations (for example). For wheat-barley-paddy-pulses, the busiest times are February and May through July, while for wheat-barley-sugarbeets-pulses, are October through November and February through March. As the tables show, the precise timing of the peak periods of activity vary according to the particular crop combination and sequence followed in

any particular year. This is an important finding: the potential combination of crops and crop sequences is quite large and complex (as figure 7.3 shows). No one standard

**Table 7.12. The crop calendar: wheat-barley-paddy-pulses.[1]**

| | wheat | barley | paddy | pulses |
|---|---|---|---|---|
| Aug. | | | | |
| Sep. | $sow_F$[2] | | $harvest_S$ | |
| Oct. | sow | $sow_S$ | | |
| Nov. | sow[3] | $sow_S$ | | |
| Dec. | sow[3] | | | |
| Jan. | $sow_S$[4] | | | |
| Feb. | top dress | weed | | $sow_S$ |
| Mar. | weed | top dress | | |
| Apr. | | | $sow_M$ | weed |
| May | | $harvest_M$ | $transplant_S$ | |
| June | $harvest_M$ | $harvest_M$ | weed | |
| July | $harvest_M$ | | | harvest |

Note: 1- dates of land preparation and basal dressing are not shown because they occur shortly before sowing.
2- early sowing date (results in a kalar crop).
3- late sowing date (results in a korpeh crop).
4- very unusual sowing date.
F: starts/ends at the first half of month.
S: starts/ends at the second half of month.
M: starts/ends at the middle of month
Source: author's field notes.

**Table 7.13. The crop calendar: wheat-barley-sugarbeets-pulses.[1]**

| | wheat | barley | sugar beets | pulses |
|---|---|---|---|---|
| Aug. | | | | |
| Sep. | $sow_F$[2] | | | |
| Oct. | sow | $sow_S$ | $harvest_F$ | |
| Nov. | sow[3] | $sow_S$ | $harvest_S$ | |
| Dec. | sow[3] | | $harvest_4$ | |
| Jan. | $sow_S$[4] | | $sow_S$ | |
| Feb. | top dress | weed | sow | $sow_S$ |
| Mar. | weed | top dress | $sow_S$ | |
| Apr. | | | thin&weed | weed |
| May | | $harvest_M$ | | |
| June | $harvest_M$ | $harvest_M$ | | |
| July | $harvest_M$ | | | harvest |

Note: 1- dates of land preparation and basal dressing are not shown because they occur shortly before sowing.
2- early sowing date (results in a kalar crop).
3- late sowing date (results in a korpeh crop).
4- very unusual sowing date.
F: starts/ends at the first half of month.
S: starts/ends at the second half of month.
M: starts/ends at the middle of month
Source: author's field notes.

extension message will be relevant to all farmers at any one time. The Training and Visit extension system, for example, with its standardised fortnightly extension methods, would be problematic in this context. The complexity also has research implications: for example, recommendations for fertiliser application should take account of the type and quantity of fertiliser used in the pervious crop cycle.

## 2.7. Irrigation methods

The main irrigation method used by the district's farmers to irrigate shatvi crops and gardens is qarqabi, a method practised for hundreds of years. In this method, farmers submerge each plot totally in water, constructing small rectangular basins called karts. In new gardens which accommodate young saplings, some farmers grow vegetables and other crops between the saplings in the karts. This method is also used in wheat production, and is discussed in more detail in the third section (crop level analysis) of this chapter.

The use of qarqabi irrigation method is discouraged by extensionists due to its inefficiency and creation of soil problems. The submersion of land over a wide area increases the evaporation rate. Furthermore, due to the total submersion, the topsoil becomes very hard after each irrigation. Moreover, there is a need for allocation of a lot of land for the construction of irrigation ditches. Each plot, depending on size and topography, accommodates a number of main and secondary ditches.

The problem of inefficiency of the qarqabi method led extensionists to introduce improved irrigation methods in crop production such as sprinkler and furrow irrigation. Although different types of sprinkler irrigation were introduced into the district several decades ago, nowadays the use of sprinkler is uncommon. It is used only in state and research farms. The use of sprinkler irrigation is limited by various socio-economic as well as physical factors, such as traditional water rights, fragmentation of plots, limited plot size, and the high cost of installation and operation of the system. [Furrow irrigation, recommended for cultivation of shatvi crops, is described in detail in the third section.] In gardening, the recommended irrigation method is called qolam dar gardeshi (QDG). In the QDG method, trees are watered via small basins made around the tree trunks. The water is led to the basins through a network of channels. A healthy way of watering, better water management and better weed control are the main features of this particular method. In the QDG method, direct contact between the tree trunk and the water is avoided by the construction of an earth boundary around the trunk. Thus minimising the spread of water-borne diseases. Furthermore, the use of irrigation channels limits weed growth to the side walls of channels, and reduces water loss.

## 2.8. Weeds, pests and diseases

A wide variety of weeds, pests and diseases threatens the district's crops. Common weeds include 68 different types of weeds from 27 weed families (MTKF, 1957). These families include *Amaranthaceae*, *Chenopodiaceae*, *Portulacaceae*, *Caryophyllaceae*, *Polygonaceae*, *Ranunculaceae*, *Malvaceae*, *Resedaceae*, *Fumariaceae*, *Cruciferae*, *Capparidaceae*, *Papaveraceae*, *Euphorbiaceae*, *Zygophyllaceae*, *Geraniaceae*, *Leguminosae*, *Plantaginaceae*, *Convolvulaceae*, *Rubiaceae*, *Solanaceae*, *Orobanchaceae*, *Compositae*, *Labiatae*, *Gramineae*, *Liliaceae*, and *Amaryllidaceae*. More detailed

information on specific weeds of wheat is introduced in section 3, which also provides information on the most problematic pests and diseases of wheat.

## 2.9. Contribution of small ruminants

Livestock play an important role in rural life, providing meat and milk. Furthermore, they are assets reserved for time of indigence. They also produce wool, hair, skin, dung, etc., which are used in different ways in the rural economy.

As mentioned earlier, three types of livestock production systems are active in the district: pastoral, small farming and commercial enterprises. Pastoral units (ashayer) move within the district as well as across the district's boundary to take advantage of seasonal grazing. Small farmers have small flocks of small ruminants which are raised on farms or in the backyard. Commercial units are managed by specialised commercial livestock producers (galleh dars) who raise large flocks of livestock for market. In this study our focus is on small scale livestock production.

Sheep (goosfand) and goats (boz) are kept by small farmers for meat and milk. These animals are kept in small stables (usually located on the corner of backyards) in winter and fed with straw, barley and dried alfalfa and other stuff. Hardly any concentrated feed stuff are purchased. A package of feed per a day for one goosfand is composed of 500 grams barley, 300 grams dried alfalfa and 300 grams straw. Alfalfa and straw are mixed together.

In other seasons, the flock is sent out to graze on natural rangelands and on crop residue. In each village a few shepherds are available to be hired by the villagers, to look after all the village livestock. When the size of flock reaches a certain limit villagers may hire additional shepherds. In a good year (when rainfall is sufficient for the rangelands to

**Photo 7.1. Livestock play an important role in small scale farming.**

have dense vegetation), the shepherd takes the flocks out early morning and brings them back to the village in late afternoon to be milked. The animals are then kept by the individual households in stables. On following morning, the livestock are picked up by the shepherd for another day's grazing. When rangelands are poor, the flocks are taken to more remote areas. If a rangeland with dense vegetation is found the flock stays a few days before it is returned back to village. Following the harvest, flocks are grazed on crop residue.

The flow of resources from crop production to livestock production is relatively smooth during winter. In the other seasons, problems arise. Small scale livestock production is limited by two main problems: burning of crop residues and overgrazing of natural rangelands. [The former is discussed in section on wheat production (in weed control subsection). The latter was explained in chapter 5.] Since the main feedstuff for livestock is obtained through grazing on rangelands and crop residue, any problem with rangelands and residues can interrupt livestock production severely.

## 3. Crop level analysis: wheat

In this section, the focus of the study is on wheat production. It describes wheat as the main crop dominating all others, the interaction between wheat and crops grown in sequence with it, and various factors at the farm and field levels which affect wheat production.

### 3.1. Crops grown in the district

A wide variety of crops are grown in the district. Table 5.3 (in chapter 5) presented the main crops of the district. In addition to wheat, barley, paddy, alfalfa, sainfoin, clover, sugar beets, maize, tomato, beans, melon, egg plant, cucumber and water melon occupy the largest areas. The minor crops include potato, onion, squash, millet, sesame and a wide variety of root-vegetables (e.g., carrot) and leafy vegetables (e.g., lettuce). Crops are customarily divided into two broad categories: shatvi (winter crops) and bahareh (spring crops).

Shatvi is a local term given to the crops which are cultivated in autumn (and in unusual cases in early winter). Depending on the climate, shatvi crops remain about 8 to 11 months in the fields, and are harvested at the end of spring, or in early summer. Wheat (gandom) and barley (jow) are two main shatvi crops.

Bahareh crops are cultivated from late January to mid May, and are harvested in a period between July and late November. The bahareh crops are divided into two groups: seyfi and pulses. Paddy (shaltuk), sugar beets (choqondar-e qand), maize (zorat) are the important crops from the former group. The seyfi crops are divided into several subgroups. A sub-group of seyfi is called jaliz (some rural people call it lateh). Crops such as melon (kharbozeh), water melon (hendavaneh), cucumber (khiar) and egg plants (badenjan) all fall into this sub-group. Another sub-group of seyfi is sabzijat (vegetables) including carrot (havij), onion (piaz), leafy vegetables (lettuce, spinage, parsley, spearmint, etc.), etc. Tomato (gojeh farangi) is also a crop from the seyfi group. Pulses group comprises beans (lubia), peas (nokhod), lentil (adas) and vetch (mash).

## 3.2. Wheat crop

In the following, a series of activities related to wheat production is explained. The description starts by introducing wheat varieties and continues by giving some information on cultural practices, pests and diseases.

### *3.2.1. Wheat varieties*

Although some farmers still use local wheat seeds, the use of improved varieties is widespread among the district's farmers due to the higher yields produced by the improved seeds. Six types of improved varieties (IVs) and four types of local varieties (LVs) are used by the farmers. The IVs include rowshan, omid, adl, bayat, azadi, and gods. The LVs are known as 'Jovenjani', 'reza khani', 'kal heidary' and 'sahl abadi'. A combination of two or more local seeds mixed together and applied in a single plot is called hoshvar. All the improved varieties are recommended for cultivation in irrigated fields. No improved variety has been released for dry farming. Table 7.14 summarises a number of characteristics of wheat varieties used in the district.

The rowshan is a variety characterised a long stem, early harvest, relatively resistant to vers (wind layering), but sensitive to rusts. It was the first improved variety that reached the district's farmers in 1965. The variety is recommended for areas with mild climate. The range of planting time is very wide (early October and late March) [Mahluji *et al.*, 1984 and Pezhumand (a MTKF researcher interviewed in 1990)]. However, the variety yields lower with late planting.

Shortly after, the omid variety was released from the karaj research station (a station near Teheran), and was introduced to the district's farmers after being retested by MTKF research. The variety is long stem, resistant to grain fall problems, but sensitive to

Table 7.14. Classification of wheat seeds grown in Marvdasht district' (1990-1991).

| variety | improved/ local[2] | field type[3] | stem height | suscept-ibility[4] | resis-tance[4] | range of yield (MT/ha)[5] | water requi-rment |
|---|---|---|---|---|---|---|---|
| rowshan | IV | I | long | R | V,F | 4-6 | medium |
| omid | IV | I | long | R,V | G | 4-5 | medium |
| adl | IV | I | long | R | F,G,V | 4-5 | high |
| bayat | IV | I | medium | F | R,V,G | 4-6 | medium |
| azadi | IV | I | medium | R[6] | V,G,F,R[6] | 3-5 | high |
| gods | IV | I | medium | R[7] | R[7],G | 5-8 | high |
| jovenjani | LV | I,RF | medium | F | R,V,G | 2-3 | low |
| reza khani | LV | I,RF | long | V,R | F,G | 3-4 | low |
| kal heidary | LV | I,RF | medium | R | F,G | 1-3 | low |
| sahl abadi | LV | I,RF | long | V,F | R,G | 1-3 | low |

Note: 1. the characteristics of the improved varieties are those given by the research centre, while the characteristics of the local varieties have been assessed by farmers, during author's survey.
2. IV: improved variety, LV: local variety.
3. I: irrigated, RF: rain-fed.
4. R: rust, V: vers (wind layering), F: frost, G: grain fall.
5. local seed yield using chemical fertilisers.
6. azadi variety is relatively susceptible to black rust, but is resistant to yellow and brown rust. However, the resistance to yellow rust is, as will be shown in chapter 9, a false claim.
7. gods variety is susceptible to yellow rust, but is resistant to brown and black rust.

Source: Mahluji et al (1984) and author's field notes.

rusts and vers. The omid variety is suitable for places with a cold winter and mild summer. The planting time ranges from late September to early November (*ibid.*).

The adl is crossbred from rowshan released from the zarqan research station in 1975. In 1977, the variety became popular, and was spread throughout the district. This long-stem, early-harvest variety (the height is a little shorter than rowshan) yields 4 to 5 MT/ha, and is recommended for areas with a cold climate. It is planted in a period between early October and early November. The main problems limiting this variety include vers (by both wind and rain) and yellow rust (*ibid.*).

The bayat variety, a Mexican hybrid, yields 4-6 MT/ha, and is characterised as medium stem, early harvest, resistant to vers and to various rusts but sensitive to frost. It was originally produced and developed in the darab research station for farmers in the Darab district (a warm area in the Fars province). The variety was released in 1980. Later, the variety was recommended by the MTKF research to Marvdasht district farmers as a suitable seed for the warm areas. The planting time ranges from early November to early December (*ibid.*).

The azadi variety, crossbred from local and Mexican seeds, was introduced to the area in 1984. This variety is medium stem, suitable for areas with a mild to cold climate. The planting date is limited to one month (early October to early November). It yields 3-5 MT/ha. Resistance to yellow and brown rust and to frost, grain fall and vers are the main advantages of this variety (*ibid.*). However, shortly after its introduction, the seed was found to be vulnerable to yellow rust. The extent of contamination of the azadi crops by the disease was very large. In 1985, almost 100% of the azadi crops, which accounted for 70% of the wheat cropped area in the district, was contaminated by the disease (Nejat Pur, 1986). Furthermore, the problem of grain-fall is unexpectedly high. The grain falls easily with a blow of wind and during the harvest.

The latest variety introduced to the area is qods. Qods, a cross of rowshan, is a medium-stem, thick-trunk variety, suitable for areas with cold to mild climate with strong winds, and is resistant to brown and black rust. It is vulnerable to yellow rust, but not as much as the azadi variety. The planting time recommended is from late October to late November. The seed yields 5-8 MT/ha (TNB, 1989). The qods variety was recommended by the MTKF research in 1988 to replace the azadi variety. The main issues about this variety are its high water requirement and low tillering capacity.

An important feature of all local seeds is their low water requirement, which makes them suitable to be used on both irrigated and rain-fed fields. Reza khani and kal heidary seeds are resistant to frost. They are mainly used in the cold areas of the district. Farmers avoid planting these varieties in the warm areas because the seeds yield taller plants which are vulnerable to wind and rain layering. As table 7.14 shows, the yields of local seeds range from 1 to 4 MT/ha. The higher yields are obtained when using chemical fertilisers.

Some farmers use more than one seed variety. Typically, four varietal patterns are found: (1) different improved varieties applied to different plots; (2) different local seeds applied to different plots; (3) different local seeds applied to the same plot (hoshvar); and (4), local seeds and improved varieties applied to different plots. There are various reasons for this diversity. One reason is that farmers test varieties preferred to find out their adaptability to the local conditions. Another reason is unavailability of right variety. By applying different varieties, farmers lessen the risk of crop loss. Furthermore, some farmers do not like the taste of some varieties they cultivate and/or do not favour a

variety because of low straw production that limits the livestock production. Or they cultivate different plots for different purposes (subsistence and market).

Seeds are selected by farmers based upon several factors. One factor is related to the adaptability of seeds to agro-ecologic conditions affecting the farms. The selected seeds should survive under the constraints over which farmers have no control, such as frost, disease, drought, and grain fall. Economic return also influences the selection of seeds. A higher yield results in a higher economic return. Furthermore, the side benefits (e.g., the amount of straw produced by a crop) can act as an incentive. Another factor is the seed characteristics in relation to the socio-cultural conditions. A seed variety that demands too much labour may not be considered as a suitable seed for those farmers who use family labour. Furthermore, farmers like to cultivate seeds that have preferred taste and which produce the preferred colour for bread, or which score high in terms of ease of baking. The importance of these factors makes farmers carefully study the characteristics of each seed before they make their selection.

Several options are available for farmers in terms of seed provision. One option is to purchase seed from the village-cluster agricultural service centres (MKKDs). In this case, each farmer can purchase a limited amount of improved seed once during four years. After each harvest, farmers are expected to retain some grain as seed. According to MTKF research, improved seeds keep their genetic characteristics for several consecutive years. However, given unfavourable storage conditions, the research centre limits the time for use to 4 years. The other option is to purchase seeds locally. Farmers whose seeds are of a good quality are known locally. However, unlike the seeds purchased from the MKKDs, locally purchased seeds are not sifted, and hence they are accompanied with weed seeds, broken seeds, etc. Farmers are advised to sift any locally purchased seeds before planting.

The 1990 prices of seeds at the MKKDs was 145 Iranian Rials (in 1990, in Iran, 78R was equivalent to 1 US$) per kilogramme of grain. Locally purchased seeds were a little cheaper (110 Iranian Rials per kilogramme of grain).

### 3.2.2. *Fallowing*

As mentioned earlier, due to intensive cultivation (in the case of small farmers) and social problems, particularly insecurity of cultivation rights (in the case of large farmers), fallow and also the interim period between planting crops are limited. For most farmers, fallow is not the main means for restoring soil fertility any longer. Instead, both large and small farmers use chemical fertilisers. Most of them use chemical fertiliser excessively. The reason for the excessive use of fertilisers is a dramatic decrease in soil fertility following the intensive use of the land. The reduction of fallow and over-reliance on chemical fertiliser in turn have given rise to a major weed problem.

### 3.2.3. *Field selection*

Prior to the 1962 land reform, the majority of farmers cultivated jointly in sharecropping groups and fields were selected by a village committee. Nowadays, fields are selected by individual farmers based on several factors, of which the distance to water source and village centre, access to roads and the availability of labour are the most important. Since the plots belonging to each farmer are dispersed over a wide area, the farmer has to travel a long way, sometimes several kilometres, to reach his plots. This

affects adversely the regular care of the crops (e.g., weeding, top dressing, controlling pests, etc.), especially when labour is scarce.

### *3.2.4. Land preparation*

Land preparation in irrigated areas is done shortly before sowing in late August. Depending on the economic situation and on the availability of water and farm machinery, farmers use a number of practices for land preparation. Some farmers who own farm machinery carry out the maximum recommended operations. Others carry out only the basic practices such as ploughing and harrowing, and the quality of work is debatable. Furthermore, the use of machinery and the allocation of time and labour for land preparation depend on the type of irrigation methods used by farmers. The improved irrigation method (furrow irrigation) recommended by extensionists requires more time and the use of farm machinery, compared to the traditional method (qarqabi).

The preparation of land is normally done by ploughing once or twice followed by harrowing (disk ploughing). A 20 to 30 centimetre tillage turns over the earth together with weeds, and make the plot ready for harrowing, but, given the compaction of soils, most farmers prefer a deep (30 centimetres) plough. (The soils are compacted due to a range of factors such as the excessive use of chemical fertilisers, cultivating paddy in sequence with wheat, etc.) The disk is applied immediately after the plough to break down the earth chunks into smaller pieces. The use of a land leveller is less common due to the extra cost of the machinery. In cases where a land leveller is used, both the standard-type device and locally-made tractor-driven wooden or metallic devices are used. The use of tractors and other mechanical sources of power is normal in the district. They have saved time and labour. Except in some remote areas in the district, animal draught power is not used any more.

In some cases, where water and also farm machinery are scarce, and farmers experience time constraints in the preparation of their plots, land preparation implements are not used. In these cases, farmers sow their undisturbed plots and apply a plough, and/or a harrow disk to cover the seeds with a layer of earth.

To prepare a plot previously cropped with sugar beets, farmers use only a harrow disk before they sow. These farmers believe that the soil is disturbed enough at the time of harvest of sugar beets, and that requires no ploughing.

One problem arises whenever farmers want to prepare the land for wheat immediately after the harvest of paddy. Paddy is harvested in late September, while wheat is sown, at most, in late October. There is a little time in-between the harvest of paddy and the sowing date for wheat. This means farmers hurry to prepare their lands. At the time of ploughing for wheat, the plots are still wet and muddy due to the moisture remaining from paddy cultivation. Large chunks of earth are thrown up by the ploughing; the chunks become hard and cannot be broken down by the harrow disks. The chunks act as barriers for seed germination, resulting in crop loss.

In rain-fed areas, a constraint in land preparation is the steepness of some plots. Due to the steepness of the plots, tractors cannot work properly across the slope so farmers plough down the slope, increasing the possibility of soil erosion.

### *3.2.5. Seed treatment*

Before sowing, farmers treat the seeds with fungicides. The black fungi (*Ustilaginales*) are well known problems in the district. The traditional way of safeguarding the crop against fungi is to use several different local seeds in the same plot. This method is locally called hoshvar. Hoshvar is a multi-purpose practice. Farmers use this method not only to lessen the risk of fungi, but also for protecting their crops from other diseases and hazards. Each seed is resistant to a particular hazard. By application of a mix of seeds the risk of overall crop loss is lessened.

### *3.2.6. Sowing dates*

In the cold areas of the district, farmers start to sow wheat in early September, shortly after they finish land preparation. In the rest of the district, normally the sowing is done in the period between late September and late December. In very unusual cases, in the warmer areas, the sowing date may be postponed to as late as January. But, more typically, in the warm areas, most farmers sow in October. If the sowing is done earlier than this, it is called kalar (early sown). Since the growing period of a kalar wheat is longer than usual, the crop makes a dense population of wheat plants. To improve tillering, farmers graze livestock on the crops a few times in spring.

When the sowing is done between November and December the crop is called korpeh (late sown). This occurs where wheat is cultivated immediately after the harvest of paddy. Usually, the time for late sowing corresponds to the onset of rain. The late sowing is normally done in a wet plot following a rainfall. Normally, a korpeh wheat yields less than usual, because the length of growth is shorter than usual. Furthermore, since the korpeh crop encounters cold at the time when seeds start to germinate, there is a greater danger of crop loss. For this reason, farmers use more seeds in korpeh than usual to lessen the risk of losing the crop.

### *3.2.7. Sowing techniques*

In the distant past, given the use of primitive tools which sometimes could not effectively work in land preparation, farmers first irrigated their plots and then sowed, ploughed, and used a plank to level the soil when it was still wet. Farmers call this method nam kari. Nowadays, given the wide adoption of the tractor-driven plough, the traditional method is less common. It is applied only when the soil is very hard and cannot be ploughed easily with the available tools. The normal way of preparing land is to plough while the land is dry. This is called khoshkeh kari (sowing on dry soil). In khoshkeh kari, the recommended practice is to irrigate plots once during fallow. This is a practice for weed control, to stimulate weeds to germinate and then to eliminate them during land preparation. This practice is limited by two factors: (1) limitation of fallow and (2) shortage of water.

Although sowing is mainly done by machine, the traditional way (manual broadcasting) still plays an important role. In manual broadcasting, each farmer sows 2 to 3 hectares per a day, usually with assistance from others. They form a row and start to broadcast, moving from one end of the plot to the other. Each person throws the seeds to several metres distance on both sides and in the front while walking in a straight line. By experience, farmers spread seeds evenly.

The seed machines are centrifugal (spinner) broadcasters powered by tractors. The machines were, in fact, first recommended for the application of chemical fertilisers. For this reason, the machines are known as fertiliser broadcasters locally. Later, lacking drilling seed machines, farmers started to use the spinner machines for the application of seeds too.

The amount of seed used for sowing depends on several factors which are discussed in chapter 9. Farmers apply much more than the recommended amount for each improved variety.

Following the application of seeds, farmers apply a harrow disk to cover the seeds with a layer of earth. If the qarqabi method of irrigation is used, farmers start to construct earth boundaries to form karts (the plot subdivisions) and to make water ditches. For furrow irrigation, farmers construct the main and the secondary (regulatory) water ditches.

### *3.2.8. Manuring*

The use of livestock dung is less common than formerly, largely due to the high cost in terms of the price of dung, delivery and labour. Small farmers keep only a few small ruminants which produce a small quantity of dung, only sufficient for restoration of soil fertility in homestead gardens. If these farmers want to apply dung on their main plots they have to buy it from commercialised livestock producers or farmers who keep a large flock of livestock. However, the cost of purchasing, delivery and application is too high for most small farmers. Instead, they use chemical fertiliser, but whenever farmers find their soils have become very hard they may purchase some manure to improve their soils.

Some farmers who let livestock graze the harvested plots believe that the soil fertility is restored by the contribution of the dung released during grazing, so that there is no need for extra manuring. Some other farmers prevent any livestock from grazing on residue. They believe that the dung contains weed seeds.

In the past, dung was mainly used as fuel. Cattle dung is a rich source of energy if burnt. Nowadays this usage is uncommon and limited to some rural areas where the access to other types of fuel, especially natural gas and kerosine, is not provided. Given the fact that the country has its own source of oil, kerosene and natural gas are cheap sources of energy and available in most parts of the country. Piped natural gas is limited to the areas through which the pipes pass to reach the refinery assemblies or the ports. Compressed gas (available in portable cylinders) is sold in most rural areas by shopkeepers who work for the gas retailing corporations. The provision of kerosene is the responsibility of the rural cooperative consumer shops.

The use of chemical fertiliser is widespread amongst the district's farmers. Even those farmers who use local varieties apply chemical fertilisers to their plots. Some farmers use much more than recommended. In addition to inefficiency, the excessive use of chemical fertilisers has created problems such as soil compaction due to cation exchange that results in clay dispersion, illuviation and coating, and pollution of ground and surface water and is nowadays one of the main challenging issues confronting extensionists. The adjustment of the application rate of chemical fertiliser is now one of the main targets of the extension department.

The application of basal dressing fertiliser (kud-e zir pash) precedes sowing, because farmers want to give the soil a chance to receive some nutrition before

accommodating seeds. It is practically impossible to apply fertiliser to a wet plot if a machine is used, whereas, if the fertiliser is applied first, and then rain falls, the soil receives the nutrition emitted from the fertiliser.

Usually, farmers apply DAP (Di-ammonium phosphate) fertiliser as a basal dressing and Urea fertiliser as a top dressing (kud-e sarak). Some farmers mix the DAP with half the amount of the total Urea that they intend to apply. The other portion is given to the crop later as a top dressing. The amount of application varies from one individual farmer to another and depends on several factors (e.g., use of leguminous crops in crop rotation, the fallow length, access to chemical fertiliser, etc.). A more detailed information is presented in chapter 9.

Farmers start application of top dressing in late February. The top dressing is usually done manually except on plots sown by drilling machines, where the seeds are planted in rows.

The 1990 subsidised prices of the DAP and Urea fertilisers were approximately 20 and 11 Iranian Rials per kilogramme (0.26 US$ and 0.14 US$) respectively, while the black market prices were 4 times the subsidised prices for both types of fertiliser.

### *3.2.9. Irrigation*

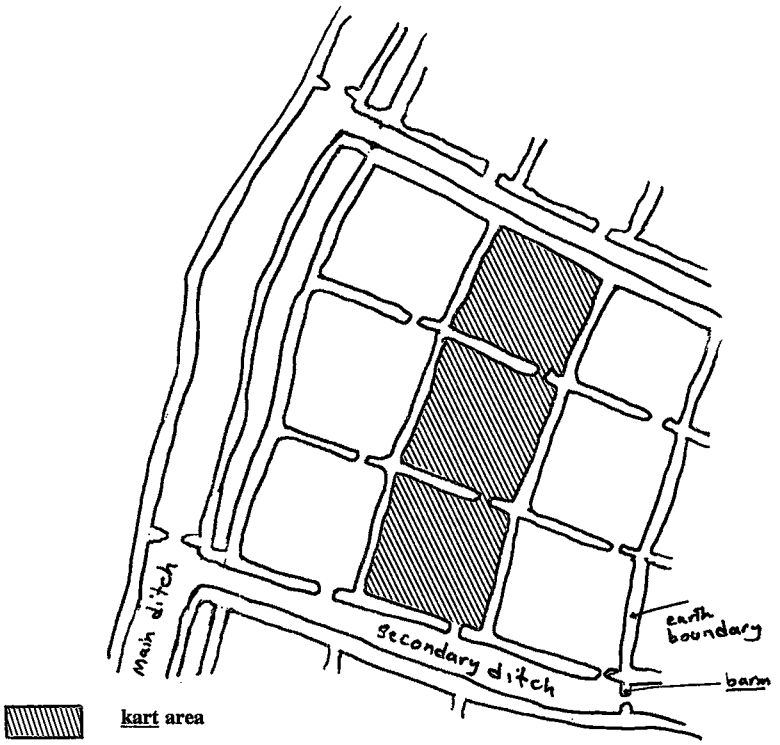
Due to the semi-arid and warm climate, crops need regular irrigation. It is especially important to give the wheat crop as much water as it needs. However, farmers are limited by a number of factors such as the amount of water to which they have access, the irrigation cycle, the time of each watering period, etc. All these conditions are defined according to water rights (explained in chapter 6 and appendix I). The importance of water to farmers can be understood from the local terms that have been applied to the different times of irrigation. Each name carries an important message related to the crop and to the environmental factors affecting the crop. In wheat cultivation, seven different names are used by farmers to label the 5-6 times (excluding the pre-plough water) that wheat is irrigated. The pre-plough water is called khish ab (the plough water), that makes the ploughing easy. After the kish ab, the crop is irrigated three times in winter and 2-3 times in spring. Khak ab (the earth water) is the name given to the first water following the sowing (that runs on the earth to cover the seeds). Farmers start to irrigate wheat for the first time in late October. (In the cold areas, this water goes to the crops one month earlier.) The second water is called pey ab (the basis water), that makes the plants grow up. Pey ab goes to the crop in late December. When sufficient rain falls this irrigation may be skipped. The crop receives yakh ab (the ice water) as the third water in early March. The name here implies that the irrigation is carried out in a cold climate. At this time, there is a big possibility of frost. For this reason, the farmers have to be very careful about the frost and to irrigate when the possibility of having a frost is minimum. (When sufficient rain falls, this watering may by skipped.) The time for the fourth irrigation comes in early April. At this time, the crop is at the stage of crown development. Due to the importance of the water in the development of wheat crowns, this water is called khush ab (the crown water). In late April, the fifth water, called dan ab (the grain water), goes to the crop. This water is very important for the development of grains. If for some reason the crop receives insufficient dan ab, the yield is small and wrinkled. The sixth water, which is normally the last one, is called marg ab (the death water). The name here implies that the water is the last one that goes to the crop before the harvest. Sometimes when the water is insufficient, one irrigation (and sometimes two

irrigations) is skipped. Usually, in this case, the marg ab is skipped, and the dan ab becomes the last irrigation. In total, a volume of 5,500 cubic metres per hectare goes to wheat crops (SKOF, 1980).

### *3.2.9.1. The traditional irrigation method*

The size of the kart depends on different factors including the topography of land, characteristics of soil and the amount of inlet water in each irrigation cycle. The steeper the land, the smaller is the size of each kart. This is to prevent the water from going down slope very fast. If the water goes very fast it washes away soils together with inputs. Also, high soil permeability requires small kart. In cases where the inlet water is limited, small kart can maintain the water level quickly.

**Figure 7.2. karts in the traditional irrigation method (qarqabi).**




**Source: author's sketch, 1990.**

Construction of the kart comes right after the application of the harrow disk and following the application of basal dressing fertilisers and seeds. Then farmers start to divide the plots into karts (see figure 7.2 and photo 7.2), by dividing the plot into rectangular segments, each of 5 metres wide by 10 to 20 meters long. This is done by making earth boundaries around each segment. Each segment is called kart, and is

subdivided into smaller units by earth barriers. The earth barriers are set each 5 to 6 metres along the length of the kart. The earth barriers function as obstacles for maintaining the water level as high as possible in the karts. In large plots, the karts are relatively larger. A large plot, for instance a plot of three hectares of 300 by 100 metres, first is divided into smaller sections, each of one hectare. A one hectare section of 100 by 100 metres is called vabor. Each vabor is, further subdivided by earth separators into karts of 5 to 6 metres wide by 100 metres long. The separators are of a varying height and width. Depending on the location of the separators, and on the function, the separators range from 20 to 40 centimetres in height and 20 to 30 centimetres in width. The separators next to the water ditches, especially the main ditch, are typically, taller and wider than the others. Following the construction of karts, the main ditch and sub-ditches are built. The ditches are made of earth constructed by using a metallic ditching device. In some parts of the district, the construction of ditches for irrigation is done by hand. In each ditch, an earth barrier called barm is set each 30 metres along the ditch. Barm function as an obstacle in ditches to deviate and guide water from the ditches to the karts.

The type of kart just explained is used for cultivation of wheat and barley, fodder crops (alfalfa, sainfoin, etc.,) and some leafy vegetables like parsley, and paddy. For paddy, the earth boundaries are taller. Karts are used also in gardening, but tomato, and for jaliz (e.g., water melon), the kart pattern is somewhat different; a number of high ridges are built and seeds are planted on the top or side walls of the ridges.

*3.2.9.2. Improved irrigation method*

In cultivation of sugar beets and in maize production, the usual method of irrigation is furrow irrigation. [This method is emphasised by the Wheat Impact Programme.] In furrow irrigation, after the application of a land leveller, a furrower is used. The use of a land leveller is very important because it flattens the plots evenly. Farmers are advised to make their plots as smooth as possible and the furrows are made by the same drilling machines which sow the seed and apply the fertilisers. Since farmers lack access to this special machine, they first apply chemical fertilisers and sow, and then apply a harrow disk to bury the inputs with a layer of earth. The application of furrower comes right after the harrowing. The last step to take is to construct the main and also the secondary (regulatory) irrigation ditches. Photo 7.3 shows a field prepared for furrow irrigation.

However, most farmers experience problems meeting these conditions for successful furrow irrigation requires lands that are flat with a shallow gradient, allocation of sufficient time for careful irrigation, and the use of siphon tubes. One constraint for furrow irrigation is related to water rights for farmers. Farmers have a limited time for irrigation. The majority of farmers share a common source of irrigation water. Each farmer gets the water according to his traditional water right. The amount of water that each farmer has at his disposal traditionally, and also his turn of the watering cycle, are defined by water rights. So, each farmer has a certain amount of water, which should be used in a certain period of time. Farmers have to be careful not to lose their watering time.

However, there are a number of factors, which make farmers hurry to irrigate their plots. One problem is that, normally, plots are fragmented. To irrigate the plots, farmers have to use a long irrigation ditch. Since ditches are made of earth, a large part of water goes waste by penetrating into soils and by running off through holes made by rats. Given

a limited amount of water and a limited time for irrigation, farmers have to hurry to irrigate their plots as quickly as possible before the watering time is terminated.

**Photo 7.2. A field prepared for the qarqabi irrigation method.**

**Photo 7.3. A field prepared for the furrow irrigation method.**

Although irrigation by means of siphon tube in furrow irrigation is a complementary recommended technique, the use of this device is not common. The limitation of the watering times and unavailability of siphon tubes are the main constraints. Normally, furrow irrigation takes too much time and the use of siphon makes the process much longer. Farmers have to change the position of the tubes and make them run many times. This is not concurrent with the conditions facing the farmers.

One variation of furrow irrigation used by some farmers is to make furrows inside each traditional kart. In fact, the variation is a combination of the qarqabi and furrow methods. This method is used mainly by those farmers whose lands are steep. By keeping earth boundaries around the kart the water is prevented from going to the other parts of the land before it irrigates entirely the first part. Another variation of the furrow method is one in which two earth barriers are constructed each 10 metres, or more, along the length of the plot. This method is, mainly used by those whose lands are relatively less steep over the length, but inclined toward one side. The earth barriers here function to prevent water from going to the side.

### *3.2.10. Weed control*

The usual time for weeding is within a range of 15 days starting from the beginning of March, though in some cases it stretches longer. Both grassy weeds and broad leaved weeds are present in the district's wheat farms. According to Nejat Pur (1986), in the agricultural year 1985-1986, the damage to the district's wheat crops caused by different weeds was very serious; in some cases 90% of a wheat farm were affected. The most damaging weeds include Barley weed (*Hordeum ceniculatum*), Pig weed (*Amaranthus*), Camelthorn (*Alhagi camelorum*), Bedstraw (*Galium tricorne*), Canada thistle (*Cirsium arvense*), Centaurea (*Centaurea depressa*), Lambsquarters (*Chenopodium album*), and Darnel (*Lolium temulentum*).

At present, weed control is done in six different ways. Of these, four methods are practices for preventing weeds from germinating, while the other two eliminate weeds after they germinate. Regarding the preventive practices, the methods include (1) firing crop residue; (2) setting land aside for fallow; (3) applying too much seed; and (4), stimulating weeds to germinate by irrigating the land and ploughing. (The fourth practice was described earlier.) The elimination methods include: (1) using herbicides and (2) hand weeding. The first three methods (burning crop residue, fallowing, and excessive use of seed) and the hand weeding are traditional methods developed in the past. The use of pesticides and elimination of weeds during land preparation are new methods and recommended by extensionists. Mechanical weeding (using cultivator machines) is not common due to scarcity of the machine. Only state farms (agri-businesses, research farms, etc.) use this method.

Farmers may use one or a combination of methods. Farmers may try to destroy weed seeds by putting fire to the crop residue, believing that the crop residue always accommodates weed seeds remaining from the preceding crop. However, burning crop residue destroys soil micro-organisms. Furthermore, it brings conflict between farmers and nomads. Customarily, farmers let local nomads graze their livestock on farm residue, sometimes for money. This long lasting custom is threatened by burning crop residues. This makes some nomads angry, and creates conflicts between the land owner and nomads. Moreover, the fire may cause damage to neighbouring farms. For these reasons, the practice is discouraged by extensionists. But farmers who favour this method believe

that, besides the destruction of weed seeds and diseased grain seeds, this method solves several other problems. The application of the plough to a plot covered by residue is difficult. Because the particles of straw are so smooth, the plough slides over the surface of soils, reducing the quality of the work. Another problem is that if farmers let nomads graze livestock on the crop residue, they have to wait a long time before the land is cleared by the livestock. This is a problem for farmers who want to prepare their plots for a new wheat crop immediately after the harvest of the old wheat. An additional problem is that some farmers may have cropped seyfi (e.g., sugar beets) in the other plots next to the harvested wheat plots and fearing that the livestock may graze on the green tops, farmers burn the residues to discourage nomads from grazing their livestock on the wheat stubble.

With respect to setting aside land for fallow and hand weeding, these practices are now uncommon. Hand weeding is a time consuming practice. Furthermore, it bears a high labour cost, especially in large farms. Only in small plots, some farmers may use the method, with the help of women and children. Plots with a few weed may be weeded manually. If weeds are all over the place then farmers may use herbicides.

Applying too much seed as a method for weed control is quite popular among farmers. In order to make the crop strong enough to compete with weeds, farmers sow very intensively. The popularity of this method is mainly due to the fact that the method is a multi-purpose method. The elimination of weeds is not the only objective pursued by farmers in applying excessive seeds. The other benefits are to compensate for crop losses due to pests and several other dangers. These are explained in chapter 9 in more detail.

Chemical weed control is done in two ways: (1) aerial and (2) terrestrial. Aerial spraying is used when the extent of contamination is large and where the physical condition of the lands is appropriate for flying. The requests for aerial spraying are collected a while before spraying by the MKKDs and then are sent to the provincial Plant Protection Department under the Ministry of Agriculture. Aerial spraying is subsidised heavily; only a small fee is requested. If the weed problem is not too serious or when flying is difficult due to mountains and other obstacles, farmers use knapsack- and tractor-driven sprayers. In this case, most of the costs have to be borne by the farmers, but the government subsidises the chemicals and sprayers.

### *3.2.11. Harvesting*

Prior to the 1962 land reform, crops were harvested manually. Various types of locally-made sickles were used. Using an ox-driven, heavy-rotary-wooden bar, farmers separated the grains from the wheat crowns. Then, the heap of mix of grain and straw was thrown into air by wooden fork, a little at a time. The grains were separated from the straw by the wind, and deposited by gravity. Nowadays, harvesting is mainly done by combine harvesters. Small 3-wheel and 4-wheel harvesters are also used. Except for very small plots, and when the use of combine harvesters and other types of machines is practically impossible (e.g., in areas with plots located on very steep hillsides), manual harvesting is not used. Manual harvesting requires a large labour force and consumes too much time.

Wheat is harvested in mid-June in the warm areas, and in mid-July in the cold areas. However, the specific harvest time largely depends on the availability of combine harvesters. As mentioned in the earlier chapters, the district accommodates a large number of combine harvesters, mainly being housed in two adjacent villages (zangi abad

and dowlat abad), located in Naqsh-e Rostam village-cluster, some 15 kilometres to the northeast of the district's centre. However, the large depot of combine harvesters in the district does not necessarily mean that the farmers have access to the machines at the time they need. The machines are taken to the warm areas of the Fars province and to several other neighbouring provinces in mid March. The time of harvest in these areas starts in early April. The machines are used to harvest wheat and barley in the warm areas, and gradually move towards Marvdasht district. Depending on the demand, the machines remain in these areas for a while before they are moved towards the district. Normally, the harvest in the warm areas ends in early June. If the year is good (i.e., a lot of rain falls during the year), the demand for the machines is high. The warm areas are mainly rain-fed. The rain results in a better crop and increases the cropped area. In this case, the larger number of machines remain in outside the district a little longer. Only a limited number of the machines is moved towards the district to start harvesting barley. If the year is bad (i.e., only a little rain falls), the cropped area is limited, and the plots are thin. In this case, the demand for the machines is limited. Thus, the machines are moved out earlier, sometime in mid May. The majority of the machines reach the district between early and late June. This implies that the district's farmers have no control over the time of harvest of their crops. This creates a big problem for them. When the machines come very late, grain loss occurs due to the late harvesting and because the grain falls easily upon contact with the head wheel of the machines.

In addition, some other problems affect the quality of machine harvesting. The drivers move the machines towards the cold areas of the province gradually as they try to reach the cold areas before the end of the harvest, the drivers pay a little attention to the quality of their work. To finish the job as quickly as possible, they set the machines to work faster than recommended, causing a large grain loss.

Yearly, the official prices for harvest are set by the provincial harvesting price committees. However, just as the case of other machinery services (ploughing, harrowing, etc.), given a lack of effective control, it is the unofficial prices which are applied in practice. The actual prices, which are much higher than the official prices, are set by the drivers of the combine harvesters and in order to get their crop in on time or at all, farmers have to pay what the drivers ask.

The cost of harvesting is paid in cash or in kind. The right to choose the type of payment remains with the drivers, depending on the estimation of yield, and on the quality of grain. If the yield is estimated high, and/or the grain is of a favourable type (concerning taste, colour, and ease of baking of the bread, etc.), the drivers ask for payment in kind. Then the price of harvest is equivalent to a proportion of the production, in the range of 10-15% of the produce.

In the cases where small harvesters are used, the harvested crop is threshed by a thresher. In this case, farmers have to collect the bunches of the harvested wheat bound by the harvester machines and feed them into the thresher. (In cases where the crop is harvested manually, the threshing is also done by a thresher). Where farmers lack access to a combine harvester or to threshing machines, they may use a tractor-driven ordinary harrow disk running over the heap of bunches of wheat to separate the grains from the crown and separate grain by hand winnowing.

### *3.2.12. Pest and diseases*

A wide variety of pests threaten wheat crops, of which the Sunn pest (*Eurygaster integriceps Put.*) and rats are the most important. The other main pests include *Haplothrips tritici Kurdj.*, *Syringopais temperatella Led.*, *Schizaphis graminum Rond.*, *Lema melanopa L.*, various types of sparrow (especially yellow sparrow), ants and locusts (*Dissosteira carolina*).

Various rusts, particularly yellow rust or stripe rust (*Puccinia striiformis*) and black fungi (*Ustilaginales*) are the main diseases. *Erysiphe graminis, Septoria graminis, Sclerospora tritici, Anguina tritici* and nematode (*Heterodera avenae*) are also important. The spread of the nematode is facilitated by continuous cultivation of wheat in the same plot. The following explains the main pests and diseases.

#### *3.2.12.1. The Sunn pest*

From hundreds of years ago, the Sunn insect has been a well known pest in the district. It creates a serious problem to wheat crops, reducing the yield, and changing the taste of the flour. Although the pest was always active in the district, it was never as intensive as it is now. In the past, due to the existence of a natural balance between the pest and its parasites and predators, the pest population had very little chance to grow up rapidly. In a very rare case in which an outbreak happened, a simple method of control was employed: to put fire to the natural plants (e.g., and particularly, *Astragalus sp.* and *Artemisia herba alba*) accommodating the inactive pests during winter (the Sunn pest flies to high altitudes of 2,000 to 2,500 meters and remains inactive for the whole winter season). Pest hosts were burned before the pests became active in the following year. Furthermore, the pests were collected from the wheat plants manually and then were destroyed by fire. Some farmers crushed the pests by squeezing them by hand. However, the recent outbreak of the pest is something new and a disastrous phenomenon. The outbreak started in 1982, when some 25,000 hectares of wheat farms were affected. In 1983-1984, the peak of the problem, more than 30,000 hectares were affected and were sprayed twice with pesticides. Although the affected area in 1985-1986 was smaller than in 1983-1984 due to a series of actions taken by the provincial plant protection department (which resulted in reducing the sprayed area by 98%), the Sunn pest problem still exists (Nejat Pur, 1986).

There are two main causes for the outbreak of the Sunn pest pointed out by the plant protection department. One cause is the recent conversion of the natural rangelands to arable farm lands. This has disturbed the natural living climate of the pest. Normally, the pest spends the winter time under the vegetation in the rangelands. Before the land conversions, in early spring, the pest awoke from its winter sleep, and started its flight, searching for food. Now, the converted lands provide the food for the pest in its resting place. The pest feeds on wheat grown on the converted lands. This helps the pest save energy for the journey to other farms, and increases its reproduction potential. The other reason for the outbreak is the overuse of pesticides, which has destroyed natural parasites and made the pest resistant to the chemicals.

Due to the scale of the affected area, it is not possible practically to overcome the outbreak of the Sunn pest using the traditional methods. Nowadays, the problem is treated chemically. The control of epidemic pests is the responsibility of the Ministry of Agriculture (MA). In large fields, the Sunn pest is controlled by aerial spraying. In small

scattered plots, and where there are obstacles for the airplane, spraying is done using knapsack sprayers.

In recent years, three major attempts to control the pest were taken by the Plant Protection Department under the MA. One effort was to make farmers with small and scattered plots use knapsack sprayers. The second attempt was to set up field inspection teams to monitor the pest population in different locations. The teams have to give an alarm when the pest population exceeds a certain limit. In that case, the affected fields are sprayed. The third attempt was to invest in biological and natural control of the pest. The pest is host to some parasites. The effort is to produce parasites in laboratories and to release them on farms. This is part of an integrated pest management programme.

#### *3.2.12.2. Rats*

Rats are a serious threat to the wheat crop. A chemical control is used by some farmers to avoid damage caused by rats. The usual way is to mix some rat poison with some seeds to make a poisonous bait. Due to the high risk of human poisoning involved, the responsibility for blending the bait falls under the agricultural service centres (MKKDs). Farmers have to take some seeds and some fat to the related MKKD for blending the seeds with the chemicals. Since there are many holes around, and farmers do not know which holes are used by rats, they first block all the holes using some earth. The day after, the poisonous bait is put into each hole opened overnight by the rats. However, due to a lack of a common action against rats, the rat control by individual farmers is not very effective. Untreated neighbouring plots accommodate a large population of rats. This makes the treated plots suffer from the neighbouring rats quickly. One reason why some farmers do not apply rat control is that the method is time consuming and requires labour. This costs farmers too much.

#### *3.2.12.3. Yellow rust and black fungi*

In 1986-1987, yellow rust, or stripe rust (*Puccinia striiformis*), became a serious epidemic problem for wheat crops all over the district. Almost all the wheat crops, especially those under the dorudzan dam, were affected by the disease. Due to this problem, the MTKF research has tried to generate resistant varieties.

Black fungi (*Ustilaginales*) is an old, but persisting threat to wheat crops. Prior to the recent widespread adoption of fungicides, the black fungi was an epidemic problem in the district. Nowadays, the use of fungicides has reduced the problem dramatically. Some farmers still use a traditional method of fungi control. These farmers are those who use local seeds. They mix different seeds, and apply the mix to the same plot to lessen the risk of the fungi. Seeds vary concerning resistibility to certain disease. This method is a multi-purpose method.

### 3.3. Crops grown in sequence with wheat

Table 7.15 provides some information on the number of varieties (local and improved), growth cycle, range of seed application, irrigation method, number of irrigation and yields of wheat and selected main crops grown in sequence with wheat. In the following, some selected crops are introduced briefly.

Table 7. 15. Selected characteristics of wheat crop and selected main crops grown in sequence with wheat in Marvdasht district (1990-1991).

| crops | number of varieties | type of variety[1] | field type[2] | seed quantity (kg/ha)[3] | growth cycle (days) | number of irrigations |
|---|---|---|---|---|---|---|
| wheat | 10 | IV,LV | I,RF | 200-300 | 210-330 | 5-6 |
| barley | 5 | IV,LV | I,RF | 150-200 | 180-270 | 3-4 |
| paddy | 3 | IV,LV | I | 50-70 | 150-200 | * |
| maize (green) | 4 | IV | I | 30-32 | 100-115 | 11 |
| maize (grain) | 4 | IV | I | 20-24 | 120-145 | 12 |
| sugar beets | 2 | IV | I | 30-35 | 210-300 | 22 |
| pulses: | | | | | | |
| -peas | 2 | IV,LV | I,RF | 20-25 | 150-180 | 8-9 |
| -beans | 4 | IV,LV | I,RF | 18-20 | 150-180 | 8-9 |
| millet | 2 | LV | I | 40-45 | 140-160 | 8 |

Note: 1- IV: improved variety, LV: local variety.
2- I: irrigated, RF: rain-fed.
3-applied by farmers
* : irrelevant
Source: author's field notes.

### *3.3.1. Barley*

Barley in pure stands is the main crop grown in association and in sequence with wheat in many farms. In the distant past, some farmers intercropped barley with wheat. Nowadays, intercropping is not used due to regulations set by purchasing centres, limiting farmers to clean their grains from particles other than wheat including barley. There are a number of reasons why farmers cultivate barley. Barley is a cash crop used locally as feed and food. Some farm households keep a flock of small ruminants for subsistence and for sale. To feed the livestock, the farmers grow some barley. Furthermore, barley is used as ingredient of stews by rural households. Moreover, some rural households still have retained the habit of eating barley bread from the past.

Land preparation, application of chemical fertiliser, seed treatment, weed control, etc., for barley is done just like what was explained for wheat. Barley is sown in the period between late October and late November. Farmers sow 150-200 kg/ha.

Compared to wheat, barley needs less water. At most, barley is irrigated 4 times (two times in winter and the rest in spring). If the year is good (i.e., rain is plentiful) farmers cut out one irrigation. The crop is irrigated for the first time in the period ranging from December to January. The second water goes to the crop in late February. If rain falls the second water is postponed until late March and sometimes to early April (in this case no more water goes to the crop). The crop is irrigated in spring in a 15-day interval following the beginning of spring (21th of March).

Two improved barley varieties and three local seeds are used in the district. The improved varieties are called jow-e karun (a crossbred from a Mexican variety) and jow-e valfajr. They are high-yielding and resistant to drought. The local seeds are known by shape: jow-e do par (a seed with two sides), jow-e chahar par (a seed with four sides) and jow-e shesh par (a seed with six sides), all are used on irrigated and rain-fed fields.

Basal dressing fertiliser is applied before sowing. A bulk of 200-300 kg of DAP and 50-100 kg of Urea fertilisers is used per hectare. The top dressing is done on mid-March. For top dressing, farmers apply 150-200 kg/ha of Urea fertiliser.

Barley is harvested one month earlier than wheat. The harvesting time ranges from mid May in the warm areas to mid June in the cold areas. The same problems explained for in the case of harvest of wheat (concerning the access to the harvesters machines) is true for barley.

### *3.3.2. Paddy*

Land preparation for paddy is started in late April. At the same time, farmers start to sow the paddy nurseries. Irrespective of the type of seeds (local or improved varieties) farmers sow 60 to 70 kg/ha. The size of nurseries is usually 1/10 of the plots. For land preparation, farmers start to level the land, using a grader. Following the land levelling, a harrow disk is applied which breaks down the large chunks of earth. The land is now ready for the next stage, submersion in water. Before letting in water, the plots are divided into small rectangular segments (karts) by earth boundaries (the earth boundaries are higher than those in the case of wheat). Following the submersion, using a 2-wheel paddy tiller machine, farmers plough the plots. In late May, farmers start to transplant the paddy seedlings to the plots manually. The seedlings are planted 15 centimetres apart in rows of 20 centimetre. On average, 450 kg/ha DAP and Urea fertilisers is applied as basal and top dressing.

Two local seeds and one improved variety are used by farmers. Most farmers use the local seeds for their taste and cooking characteristics. The local seeds are known as kamfiruzi (originally from Kamfiruz area) and qasr al dashti (originally from a suburb of Shiraz city, the provincial centre). The improved seed is called amol. The seed was originally released from the Agricultural Research Centre of Gilan province. Although the seed yields more than the local seeds, it is not popular due to unfavourable taste and cooking characteristics. Late September is the time for harvesting paddy. One month earlier, irrigation is terminated. The harvest is mechanised, using the combine harvesters normally used for wheat, with an especial head wheel adaptation. Following the harvest, some farmers prepare the land for late sown wheat.

Of the pests of paddy crops, *Hydronomus sinuaticollis Faust, Cicadella viridis L.* and *Chilo suppressalis Walk.* and of the diseases *Pyricularia oryzae* are the most important.

### *3.3.3. Sugar beets*

The history of presence of sugar beets in Marvdasht district goes back to long ago when some farmers grew sugar beets in limited areas throughout the district for local consumption. The wide spread adoption of sugar beet as a cash crop is marked by the construction of the Marvdasht sugar beets refining factory (located in Marvdasht city) in 1935. Since sugar beets are cultivated for the factory by contract farmers, the organisation of the sowing and some other services fall on the factory. The factory uses a commodity approach, providing a wide variety of services for the farmers. These include, in addition to sowing, training courses and services in application of basal and top dressing, weed control, pest control and harvest.

The usual way of land preparation for sugar beets is the same as explained for wheat, except for the depth of the plough. For sugar beets, a deep plough (40 centimetre in depth) is used. The land is prepared in January, some while before sowing.

The sugar beet crop is sown in late January through late March. 150 kg/ha seed is sown by drilling machines, which plant seeds together with chemical fertiliser in rows. At the same time, the machines also make furrows for irrigation. The improved varieties are provided by the refining factory.

In total, sugar beets are irrigated 22 times with a 12-day irrigation cycle. The amount of water for the crop adds up to 17,000 cu/ha (SKOF, 1980).

If weeds are few, thinning and weeding are done manually at the same time in April. If weed population is large, depending on the availability of weeding machines (provided by the factory), weeding is done mechanically or chemically. Tractor-driven or knapsack sprayers are used to apply herbicides.

The top dressing fertiliser is also applied by the machines. In the case of unavailability of the machines, the application is done manually. In this case, farmers apply a handful amount of fertiliser to individual plants.

The crop is harvested from early October to late November. However, the harvest period changes depending on the capacity of the factory to process the sugar beets, and on the availability of harvester machines. The capacity of the factory is limited. This causes problems in good years when sugar beets are harvested in excess of the processing capacity of the factory. Due to a lack of a programme to process the surplus sugar beets in other refining factories, the crops remain in the farms longer than usual. A delay of two months in harvesting causes a decrease in quality of the sugar beets.

Although the recommended method for harvest is to use harvester machines, some farmers harvest manually due to a lack of access to harvester machines at the time they need. Manual harvesting is done by using a shovel. This method damages the sugar beets. Before the harvest, farmers have to detach leaves from the flesh. Later, the leaves are grazed by livestock. The factory provides a subsidy for farmers to transport the produce to the collecting points. If the harvest is done on time, some farmers start to prepare the lands quickly for a very late sown wheat in January. Since the sowing is delayed, yields are lower than usual.

The most important pests of sugar beets are *Caradrina exigua Huebn.*, *Agrotis Segetum Schiff.*, *Agrotis Ypsilon Rottenburg*, *Chaetocnema tibialis Ill.*, *Conorrhychus brevirostris Gyll.*, *Lixus incanescens Boh.* and *Pegomya hyoscyami Panz. Erysiphe sp.*, *Heterodera schachtii, Pythium sp*, Beet yellows virus, and Beet mosaic virus are the most important diseases.

### *3.3.4. Maize*

Maize is cultivated for two different main uses: for grain, and as silage. The grain is ground and mixed together with some other stuff to make a poultry feed. Green maize is fed to cattle. For both purposes, improved seed varieties are used. Seeds are purchased from the organisation in charge of the provision of seeds and saplings (STN&B). The seeds are high yielding hybrid varieties treated with chemicals for fungi. The same operations for land preparation that was explained in the case of wheat is done for maize. Land preparation is done in mid May. A deep plough of 30 to 40 centimetre is preferred by farmers.

The basal dressing comprises DAP (Di ammonium phosphate) and Urea. For each hectare, farmers apply 300 kg of DAP and 100 kilograms of Urea. These amounts are respectively 2.5 time and 2 time the recommended dosages. The fertiliser is applied before sowing using a spinner broadcaster.

Farmers start to sow in late May. Sowing is done by a 5-row seed drilling machines. For the grain-type maize, farmers sow 20-24 kg of seed to one hectare. In the case of silage maize, the amount increases to 30-32 kg per hectare.

The first water for maize goes to the crop immediately after the sowing in late May. Five days later, the crop is irrigated for the second time. The following watering intervals are of 7, 9, and 11 days. Thereafter, an interval of 11 days is used for irrigation. The last irrigation is in August.

Weeding is mechanised or herbicides are applied. In large farms, a tractor-driven sprayer is used for the application of herbicides. Farmers with small plots use knapsack sprayers.

Top dressing fertiliser is applied when the plants are about 20-25 centimetres in height (in late June to early July). 200 kg/ha of Urea (four times recommended dose) is used. It is done manually.

Silage maize is harvested in early September. The harvesting time for the grain-type maize extends to late September. The harvest of the both types is mechanised. After the harvest, the land is prepared quickly for wheat production.

Several pests and diseases threaten the district's maize crops. Of the pests *Sesamia cretica Led., Circulifer sp., Leodelphox sp.* and of the diseases Maize Rough Dwarf Virus and Maize Mosaic Virus are the most important.

### *3.3.5. Pulses*

Beans and peas are the two most important leguminous crops cultivated in sequence with wheat. They appear in both irrigated and rain-fed fields. The other legumes are lentil, vetch (grass pea) and broad bean. The sowing date for beans and peas is late February. These crops remain in the fields about 6 months and are harvested in July. The seed quantity for beans ranges from 18 to 20 kg/ha and for peas 20 to 25 kg/ha. Both crops receive water 8-9 times. Weeding is done in April using herbicides. The harvest is done manually. A combine harvester is used for husking.

## 4. A farming system in transition

Farming activities as a whole, and crop production in particular, have undergone dramatic changes over the past few decades. These changes originate in the two most important political events in the century: the 1962 land reform and the 1979 revolution.

The pre-reform situation was marked by an extensive type of cultivation based on a systematic crop rotation and fallow. The cultivation changed into an intensive type with a shorter fallow and decreased fallow acreage after the reform due to the economic problems faced by farmers.

The Land Reform Act of 1962 redistributed land and water for a large proportion of farming population. The construction of the dorudzan dam and the introduction of water pumps facilitated the access to more water for more farmers. This enabled a large proportion of farming population to cultivate paddy (a cash crop). The introduction of tractors and other farm machinery as part of a mechanisation programme increased the

use of mechanical power in the agriculture. This saved time and energy for farmers. The use of high yielding varieties accompanied by chemical fertilisers and other agro-chemicals resulted in an increase in production of both food crops and cash crops. The establishment of various industries in the district and in the nearby areas provided off-farm job opportunities for farm household members. This resulted in the betterment of the farm economy. However, small farmers enjoyed less from the advancement than large farmers. Their lands were limited and dispersed and of poor quality, and gave a little economic return. The small farmers had to cultivate intensively by limiting fallow and shortening the interim period between planting crops in order to earn more money and lift their purchasing power in the market.

Following the revolution of 1979, further efforts were made by the government to improve the situation for the small farmers. These included a re-distribution of land and the introduction of maize as a cash crop. However, the limitation of fallow continued to be a major problem. This time, it was not only small farmers who limited fallow, but also large farmers. Small farmers continued to cultivate intensively by limiting fallow in order to retain their purchasing power at the market. Large farmers were confronted with socio-political problems which forced them to limit fallow and to shorten the interim period between planting crops.

However, the transition of farming systems from a traditional form to a more mechanised form has resulted in several problems in the district, of which the excessive use of chemical fertilisers, migration of rural people and the destruction of natural resources are the most important (the last point is discussed in chapter 5).

Farmers try to correct the dramatic decrease in soil fertility by using chemical fertilisers excessively. In some cases, the recommended quantity is exceeded several times. This has resulted in soil problems. Farmers complain that their soils are compacted. The intensive cultivation has also caused an increase in weed incidence. The excessive use of seed as a means for weed control, frequent burning of crop residues and an increase in spraying are all signs of increase in weed incidence. This has created socio-economic and environmental problems. From the social point of view, the burning of crop residue (as a means of eliminating weeds) has limited grazing for livestock which in turn has created conflicts between nomads and farmers. Spraying (both aerial and terrestrial), as the other option for weed control, is used in large areas in the district. This has destroyed the parasites and predators of pests, particularly of the Sunn pest. The destruction of natural enemies of pests helps the pests to reproduce quickly and create a disaster. The recent outbreak of the Sunn pest has resulted in large economic losses in terms of grain, particularly honey bees and the cost of spraying. This is not the final point of misery because the spraying kills more natural enemies and helps the pests again to reproduce quickly.

# CHAPTER 8

# INSTITUTIONAL SUPPORT

The aim of this chapter is to introduce the institutions and their various organisations in charge of providing access to the mix of development conditions in wheat production for the district's farmers. The chapter has four sections. To illustrate the scene of action clearly, the first section gives a comprehensive description of the policy-making and bureaucratic structure that conditions the performance of the institutions. The chapter describes in particular the structure and functions of the Ministry of Agriculture (MA), the body in charge of support services in wheat production, at the national, provincial, district, and village-cluster levels. The second section introduces the research, extension, and training institutions involved in providing access to wheat technology for the farmers. This includes an overview of the situation of the institutions from the point of view of objectives, work capacity, and resource base. The third section is devoted to introducing the institutions responsible for providing access to goods and services for the farmers. The last section sums up the discussion by presenting a conclusion on the institutional support for the farmers.

An important point, which I shall mention at the very beginning, is that the chapter presents a description of what the institutions are formally expected to do, rather than of what they are actually doing. Though in some parts the chapter mentions the actual performance, it does not analyse the situation thoroughly. The actual performance of the institutions is highlighted in chapter 10 which discusses the institutional and policy factors affecting the relevance and availability of technology for farmers in detail.

## 1. The Ministry of Agriculture after the re-organisation

In June 1980, about one year after the revolution, and with the approval of the Revolutionary Council, the Ministry of Agriculture (MA) was re-organised to extend the Ministry's services at the village level. At present, more than a decade later, the process of re-organisation is still developing. The process of revolutionary changes, following on from earlier changes introduced during the Shah's rule, has had important consequences for the institutional context. Beyond the specific changes in organisational structures, roles, responsibilities and policy directions, the revolutionary process necessarily has introduced a degree of tension and uncertainty into professional and personal relations. The changes in institutional culture in turn imply an awareness of decision-making factors beyond the merely technocratic. Neither the institutional boundaries of the AKIS, nor the internal relationships among the AKIS components, are as yet stabilised; they remain subject to delicate and fluid shifts in leadership and meaning in both their formal and informal dimensions.

At the time of data collection for the present research (1990-1991), the integration of research, extension, and training, aiming at the unification of the three organisations to form a single organisation under a new directorate (TAT directorate), was still pending. It was only in 1992 that the integration materialised. Furthermore, in early 1993, the re-organisation plan of the MA at different levels was amended, resulting in new formal relationships. In the new setting, four more directorates in charge of (1) engineering and technology, (2) marketing, (3) gardening and horticulture, and (4) land tenure systems

were added to the Ministry at the national level. At the lower levels, changes have occurred in both the structure and the name of the units. Thus, the MA continues its work using organisations, which are changing over time.

I draw attention to a point about the charts in the present chapter. The charts do not illustrate the organisation resulting from the most recent re-organisation plan (approved in early 1993), but reflect the structure existing at the time of the field research. However, the charts do reflect the organisation after the operationalisation of the differentiation of responsibilities between the MA and the Ministry of jahad-e sazandegi (MJS). Accordingly the divisions related to animal production, fisheries, rangelands, and forestry, which were part of the original MA, are not shown as being a part of the MA.

The main problems that acted as a motive for attempting the re-organisation included (1) the inappropriateness of the existing bureaucratic structure in the MA for the accomplishment of the post-revolution objectives (food security for the nation and helping small farmers), (2) the existence of organisational problems, e.g., the highly centralised bureaucratic structure of the MA, that acted as a constraint to effective coordination between the MA and the revolutionary organisations, especially the MJS, and (3), lack of an effective link between research, extension, and training (APC, 1989-a; and MA, 1982). The re-organisation aimed at improving the bureaucratic structure of the MA in such a way that it could easily help farmers, in particular small farmers, to make the best use of scarce resources in production. In its new arrangement, the MA is required to take development services to the village level. Prior to the re-organisation, the lowest unit of administration of the ministry was the district agricultural headquarters supported by extensionists housed at offices in selected central villages. Veterinary services and animal health and nutrition, crop protection, and other development services were provided for at the district level. The new arrangement enabled the MA to take the services one level down from the district, closer to the farm. This was implemented by the establishment of markaz-e khadamat-e keshavarzi-e dehestan, the MKKD (agricultural service centre at the village-cluster level). The MKKD is considered to be the core element in the re-organisation, and is the lowest unit of administration of the MA. Provided with assistance from rural cooperatives, the MKKDs are responsible for providing farmers with access to the development mix. In brief, the thrust of the re-organisation has been to (1) shift the emphasis somewhat from a bureaucratic toward a more technical form of organisation, and (2), decentralise operational decision-making and responsibilities to the provincial, district and the village-cluster levels.

A number of important objectives has to be accomplished by the new structure. Participation of rural people in rural affairs and in farm-related governmental efforts is seen as very important. This is implemented by giving showray-e eslami-e deh (village Islamic council, SED) a role at various levels in helping the MA to plan rural and farm projects, and also by linking the rural cooperatives to the agricultural service centres. The re-organisation is also marked by a more decentralised structure of administrative authority at the local levels (district and village levels). This is intended to make the process of implementation of projects efficient. The last, but not least objective is to create an appropriate climate for collaboration between research, extension, and training, and between them and other institutions in charge of providing access to development conditions.

In the new setting, the Ministry is provided with two assisting arms: scientific and cooperative. The former includes research, extension, and training institutions. The latter comprises various rural and agricultural cooperatives throughout the country, providing

access to inputs, credit, and the market. These two arms are designed to assist the Ministry to get agricultural sector moving.

The new structure has four administration levels within the MA: national (melli), provincial (ostani), district (shahrestan), and village-cluster (dehestan). At the national level, the MA has retained the authority for policy making as well as for supervision and evaluation of development projects, but it has delegated administrative authority to lower levels. As one goes down from the national level, one sees substantial authority given to administrators in controlling the resources at their level of decision making.

In 1988, nationwide, the MA had a total of 50,855 staff members of which approximately 2% worked at the Ministry's headquarters, and the rest at more than 40 related organisations and affiliated agencies, and at headquarters and service centres at the various levels (ISC, 1992). After the 1991 differentiation of responsibilities between the MA and the MJS, that detached several organisations and institutes from the MA, the Ministry's total staff added up to about 35,000. Of the staff, approximately 1/3 (11,500 persons) is technical and the rest works at auxiliary and audit units. By the end of the first 5-year post-revolution development plan (March 1994), a total of 19,337 professionals (composed of 1.6% PhD, 5.7% MSc, 23.8% BSc and the remaining 68.9% 2-year post diploma specialisation) will be added to the existing technical staff (11,500 persons) to increase it to 30,837 professionals (APC, 1989-a). The 1988 total budget of the Ministry added up to 806 million US dollars of which 63% was used in the implementation of 95 development programmes (Zaytun, 1989).

The component organisations that carry out the functions of the MA at various levels are vertically connected to their mother organisations at the national level for the purposes of technical guidance and logistics. For administration and finance, the organisations are under the management of the agricultural headquarters at the related levels. The national headquarters provide their technical staff at the lower levels with technical information and skills. These come in the form of nationally prepared written materials, audio-visual aids, training courses (both within the country and abroad), etc. In addition, recruitment, provision of vehicles, promotion of staff, etc., are the tasks of the national headquarters. However, in practice it seems that the vertical connections are frequently used by the national headquarters for increasing their organisational power over the province. There is a tendency amongst the national directors to keep their organisations at the lower levels fully under their control. The directors expect the lower level staff to work for the mother organisations, rather than for the agricultural headquarters at which they work. Caught up in the process of a transitionary period of re-organisation, and in the shadow of problems created by lack of appropriate organisation, the directors do not follow the lines of authority as they should. This makes the coordination between the different organisations involved difficult for the agricultural headquarters at the lower levels.

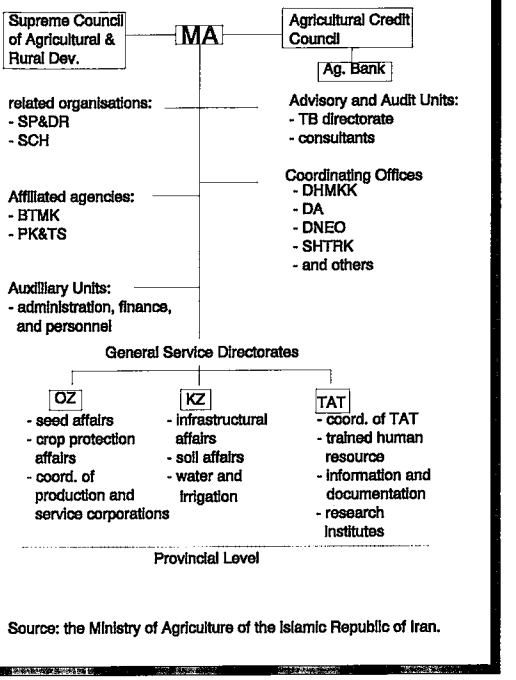
### 1.1. Organisation of the MA at the national level

At the national level, the MA is considered as the centre for policy making in crop production, soil and water affairs. According to the MA (1982), the other functions are to (1) make national-level plans, (2) prepare plans for inter-province projects and supervise these projects, (3) prepare drafts for laws in agriculture, and propose them to the legislative assembly, (4) provide needed credit for agriculture-related activities, (5) plan

the provision of various inputs required for crop production, and (6) plan and implement evaluation projects throughout the country.

Chart 8.1 illustrates the 1991 organisation of the MA at the national level. The ministry comprises of three general service units: directorate of tahqiq, amuzesh, and tarvij, TAT (research, training, and extension); directorate of khadamat-e zirbana'i, KZ (infrastructural services); and directorate of omur-e zera'at, OZ (crop production affairs). There is also a directorate of agro-industry (KS) charged with the care of affairs related to the state-run agro-industries. Furthermore, a directorate of programme and planning (TB) acts to coordinate plans and programmes of the general service directorates, and helps the directorates to get the proposed budgets approved by the state plan and budget organisation. In the course of time, according to the re-organisation programme, the KS and TB directorates will disappear, and their areas of concern will merge in the task areas of the OZ directorate and in an office for plan and budget, respectively. The general service directorates are supported by a directorate in charge of administrative, financial, and the legal affairs. A Supreme Council of agriculture and rural development under the presidential office, and an agricultural credit council supervising the agricultural bank, assist the minister.

Chart 8.1. Organisation of the Ministry of Agriculture (MA) at the national level (1991).




Source: the Ministry of Agriculture of the Islamic Republic of Iran.

There are a number of offices directed by the general deputy. These include a coordinating office for agricultural service centres (DHMKK), office of evaluation (DA), office of human resource organisation (DNEO), coordinating headquarters for rural cooperatives and agricultural corporations (SHTRK), public relations office (DRO), and office of international affairs (DOB). An office for legal and parliamentary affairs (DOP) relates the ministry to the parliament. There are also a few specialised organisations supervised by the OZ directorate that provide access to specialised services on cotton and oilseeds (SP&DR), and on tea production (SCH) for farmers. According to the re-organisation chart, and in the course of time, these organisations together with a few other agencies (all under the OZ directorate) in charge of provision and distribution of farm machinery and spare parts (BTMK), and agro-chemical inputs (PK&TS) will hand over their responsibilities to other organisations and subsequently will disappear. Rural cooperatives will take the responsibility for the input delivery, and the extension

organisation will take over the task of providing information. In the following, I will introduce the TB and TAT directorates, which are important to the present study.

### *1.1.1. The TB directorate*

The directorate of plan and programme plays a very important role in policy making and coordination in the ministry. It works to ensure correspondence between objectives and policies, and coordination between plans and budgets proposed by the different directorates of the ministry. The main functions of the directorate are to:

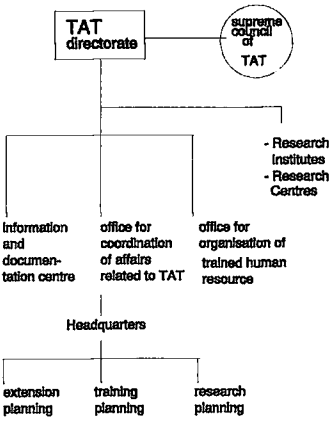
-collect, process, and present statistical data;
-prepare national agricultural plans within its task fields as part of the general economy plan;
-approve proposed development plans and programmes;
-approve proposed budgets, and prepare drafts for forwarding to the state planning and budget organisation for final approval;
-undertake studies about, and sponsor the works related to externally financed projects;
-undertake studies on farm production, and on socio-economic aspects of the rural life.

### *1.1.2. The TAT directorate*

This directorate is in charge of affairs related to research, training, and extension, and supervises the respective organisations. At the national level, the main functions of the TAT are to:

-make policies and indicate strategies for programmes related to research, extension, and training;
-establish effective links between research, extension, and training;
-supervise research institutes and research centres, and coordinate between them;
-establish links between research institutes and research centres on the one hand, and scientific and educational centres, both inside and outside of the country on the other;
-facilitate access to information from the research institutes for research centres and research stations.

Chart 8.2. Organisation of the TAT at the national level (1991).




Source: the Ministry of Agriculture of the Islamic Republic of Iran.

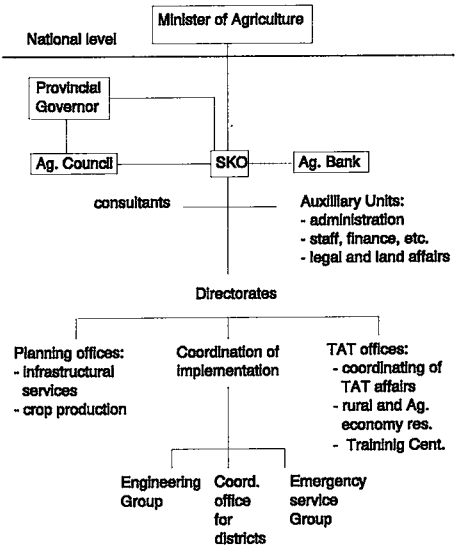
Since, at the institutional level, the focus of the present research is the performance of research, extension, and training, I shall elaborate on the TAT directorate in more detail. As chart 8.2 illustrates, the TAT comprises two branches: (1) research institutes

and research centres, and (2), offices in charge of planning for research, training, and extension.

The research institutes play their role by conducting research on nation-wide matters, providing the research centres with the necessary information, facilitating access to specialised education and training, and to other needs of which the satisfaction is beyond the capacity of the research centres. In the new setting, research-team work is emphasised, the research centres act as commodity research centres. All research activities in a centre focus on affairs related to a particular commodity. A full description of these institutes and research centres will be provided later.

The second branch of the TAT directorate is more concerned with facilitating the application of the research results. In other words, this branch is a practice-oriented TAT. The branch comprises three units: (1) office for organisation of trained human resource, (2) information and documentation centre, and (3) office for coordination of affairs related to research, extension, and training. The last office is further divided into three headquarters in charge of planning for research, extension, and training. The practice-oriented branch operates in the context provided by agricultural service centres. This branch functions to (1) link research, extension, and training, (2) link the operational units with research, extension, and training (3) prepare plans for integrated agricultural projects, and (4) prepare plans for the establishment of experimental and demonstration farms.

Chart 8.3. Organisation of the Ministry of Agriculture at the provincial level (SKO), 1991.




Source: the Ministry of Agriculture of the Islamic Republic of Iran.

## 1.2. Organisation of the MA at the provincial level (SKO)

The provincial Director of Agriculture is the representative of the Minister of Agriculture at provincial level and manages all units related to the ministry. The director is accountable to the minister for implementation of national policies and projects, and to the provincial governor for provincial projects. The latter projects are approved by the provincial plan and budget organisation and financed provincially.

Coordination between the SKO and other organisations involved in agricultural development, especially the MJS provincial headquarters, is sought through a Provincial Agricultural Council supervised by the governor. The council is composed of directors of the institutions.

The main functions of the SKO are to:

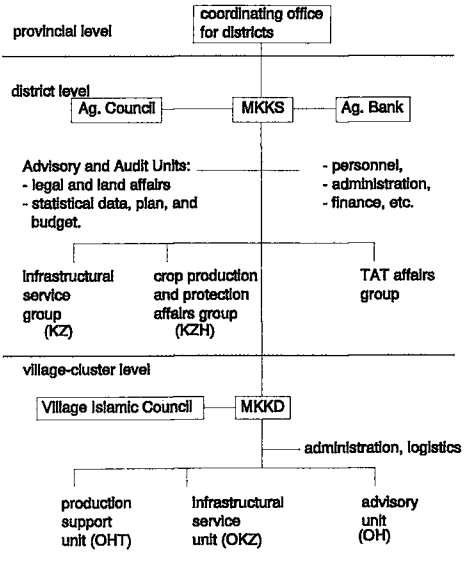
-advise the director of the SKO on agricultural problems in the province;
-analyse statistical data collected from subordinate districts, and forward them to the ministry;
-prepare a comprehensive provincial agricultural plan, and forward it to the provincial plan and budget organisation for budget allocation, and to the ministry for coordination;
-approve local development projects, take actions, or commission, for provision of the budgets, and coordinate between them;
-execute or commission the evaluation of local projects;
-develop qualified human resource for different units of the organisation;
-coordinate the provision of access to inputs and production resources for farmers;
-coordination of research, extension, and training.

As chart 8.3 shows, three directorates make up the general service units of the SKO: TAT, coordination of implementation, and planning. The TAT directorate is in charge of (1) coordinating research, extension, and training; (2) research on rural and agricultural economy; and (3) affairs related to training centres. Crop production and infrastructural services fall under the jurisdiction of the planning directorate. The directorate of coordination of implementation performs its tasks through three divisions: engineering group, coordinating office for districts, and emergency service group.

### 1.3. Organisation of the MA at the district level (MKKS) and at the village-cluster level (MKKD)

The district agricultural service centre (MKKS) is the executive apparatus of the MA at the district level. The centre is managed by a graduate staff member, normally with a BSc degree in an agriculture-related subject. The manager is provided with substantial administrative and executive authority over the centre. He is accountable to both the directorate of executive affairs at the provincial headquarters for implementation of national and local projects, and to the district's governor for cooperation with counterpart organisations. The manager is provided with an Agricultural Council, comprising managers of organisations involved in agricultural development, managed under the district's

Chart 8.4. Organisation of the MA at the district and village-cluster levels (1991).




Source: the Ministry of Agriculture of the Islamic Republic of Iran.

governor. The manager directly supervises the work done by the subordinate MKKDs in the district under his jurisdiction.

MKKS is divided into three service groups supported by auxiliary and advisory units for finance, administration, staff, legal, and land affairs. The service groups are involved in TAT affairs, production and protection services on crops, and infrastructural services. One point about the plant protection staff that should be explained here is that, at the village-cluster level, the staff are involved in advisory work and provide information on plant protection for farmers. At other levels, the staff are more concerned with jobs such as planning measures against pest outbreaks, and implementing the plans. According to APC (1989-a), on reaching the second half of 1989, MKKSs were established in 136 districts (63%) out of a total of 215 districts. More centres will be established to serve all the remaining districts by the end of the first 5-year post-revolution development plan (March 1994).

The MKKS of Marvdasht district was amongst the first few MKKSs established throughout the country in 1980. It is made up of a headquarters unit based at the district's centre and ten subordinate village-cluster service centres (MKKDs). The total technical staff of the MKKS is 131, of which 37% work in the headquarters and the rest in the MKKDs. The headquarters has 49 staff of which about one third (18 persons) work in service groups, and the rest in management, auxiliary, advisory, and audit units. As table 8.1 illustrates, the TAT group is composed of 6 extensionists. The other two service groups accommodate the remaining 12 persons. In 1989, the total development budget for the MKKS headquarters together with the budget for the 10 subordinate MKKDs was about US$ 2,510,000, approximately 50% of the total budget (Marvdasht MKKS, 1991). Of the development budget, 40% is devoted to the MKKS headquarters and the rest to the MKKDs. In 1987, the development budget accounted for 47% of what was given to the district development organisations as development budget (SBBF, 1990-a). The remaining 53% went to the district's JS department. The headquarters have 13 vehicles and one motor cycle at their disposal, most of them lacking maintenance.

**Table 8.1. Distribution of staff of the Marvdasht Agricultural Service Centre (MKKS) at the headquarters.**

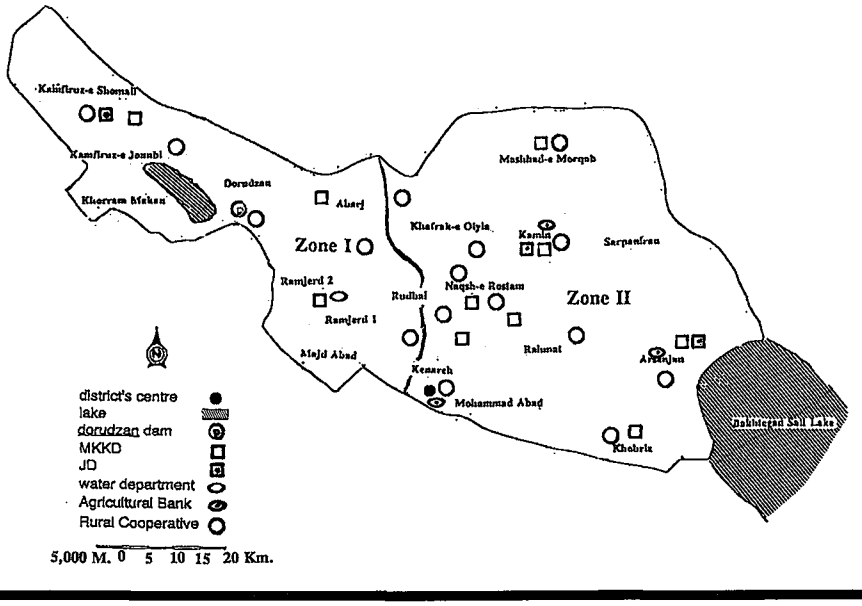
| units: | TAT G/D | KZ G/D | KZH G/D | others | total |
|---|---|---|---|---|---|
| staff: (number) | 4/2 | 1/4 | 3/4 | 31 | 49 |

Note: G= university graduate
D= diplomate
Source: Marvdasht MKKS (1991).

Village-cluster agricultural service centres (MKKDs) are the lowest unit of the MA, and the front-line where the ministry makes contact with farmers. Each MKKD is composed of three service units: advisory (OH), infrastructural service (OKZ), and production support (OHT). The OH unit is in charge of provision of technical information on crop production for farmers. This unit accommodates extensionists and plant protection technicians. The OKZ unit provides infrastructural services for farmers. Writing and distribution of permits for inputs, fuel, construction materials, etc., and provision of information on marketing, food processing, etc., is the responsibility of the OHT. The tasks of the three service units of MKKDs cannot be completed without assistance from the rural cooperatives. Cooperatives are responsible for providing access to inputs, credit, and the market. The service units are supported by an auxiliary unit in charge of administration and logistics.

However, the above task differentiation between the three service units is formal and a 'blue print'. In practice, the situation is somewhat different. Given a man-power shortage, and an increasing demand for inputs, infrastructural services, etc., the MKKSs' managers assign non-educational tasks to extensionists. The extensionists are mainly involved in writing and distribution of permits for inputs, fuel, etc., and inspecting the need for infrastructural services to farmers. As a contradiction to the re-organisation objectives, the OH units do not act as technical information providers, but are involved in various other service and managerial or supervisory activities. In fact, the OH units are Agricultural Service Centres in themselves.

**Map 8.1. Location of service institutions in Marvdasht district.**




The MKKD is managed by a technical staff member, often with a BSc degree (engineer). The manager of an MKKD is directly connected to, and supervised by, his superior MKKS manager for technical matters and for policy implementation. He is given some degree of freedom in the administration of his unit. MKKDs are supposed to get in touch with, and consult, village Islamic councils (SEDs) for preparation of development projects, and for getting them to collaborate in the implementation of the projects. SEDs are composed of rural people with socio-political importance in rural areas. (More about the role and importance of SEDs is provided in chapter 6 on the village system.)

In 1989, MKKDs throughout the country numbered 728. This left the remaining 1,273 (64%) village-clusters (dehestans) with no MKKD. It is expected there will be 300 more MKKDs established by the end of the first 5-year post-revolution development plan, i.e., March 1994 (APC, 1989-a).

Farmers in Marvdasht district are served by 10 MKKDs based at central villages (see map 8.1). The MKKDs accommodate 82 staff members. Of these, as table 8.2 illustrates, approximately 43% (35 persons) work in service units, and the rest in other

units such as management, administration, and logistics. Of the service units, OHT with a share of 43% of the technical staff is the most populated unit. The OH (the advisory unit) accommodates 14 extensionists (40% of the technical staff).

### 1.4. The Wheat Impact Programme (TATG)

One promising programme in wheat production executed by the MA is the TATG programme, which aims at increasing the yields of wheat in irrigated farms from an average of 1,964 (kg/ha) to a figure of 3,200. It was introduced by a parliamentary decree in 1989. The programme is made up of five projects: (1) provision of improved seeds, (2) mass multiplication of certified seeds, (3) full mechanisation of wheat production, (4) crop protection against outbreak of Sunn pest (*Eurygaster integriceps Put.*), and (5) crop protection against weeds. The programme emphasises the use of improved seeds to increase the productivity. For this, a technology package comprising the latest improved seed (qods) and a number of related technical recommendations is introduced to farmers by the programme. Recommendations are given on the application and quantity of seeds and agro-chemical inputs, and on the preparation of seedbed and on methods of irrigation.

**Table 8.2. Distribution of staff of 10 village-cluster Agricultural Service Centres (MKKDs) in Marvdasht district.**

| units: | OH G/D | OKZ G/D | OHT G/D | others | total |
|---|---|---|---|---|---|
| staff: (number) | 0/14 | 3/3 | 4/11 | 47 | 82 |

Note: G= university graduate
D= diplomate
Source: Marvdasht MKKS (1991).

## 2. The district's knowledge institutions

Four organisations are in charge of research, extension, and training on wheat production in the district. The research task falls under two organisations: (1) the provincial agricultural research centre (MTKF) under the MA, and (2) the college of agriculture of the Shiraz University (DKS college). Extension and training are the tasks of the extension component (the advisory unit) of the district's agricultural service centres, and agricultural training centres, respectively; both are operating under the MA.

In the following paragraphs, these four organisations will be introduced in more detail. Attention here should be paid to one point about the organisational charts of the research and extension organisations presented in the present report. The charts do not reflect the 1992 changes in the organisations which attempt to unify research, extension, and training to form a single organisation named TAT.

### 2.1. Agricultural research service

Agricultural research in Iran is predominantly organised by public sector organisations. Public research falls under three main organisations: the agricultural research organisation (ST) under the MA, agricultural colleges under the Ministry of Culture and Higher Education (MCHE), and the research section of the MJS. There is also a post-revolution research organisation under the MCHE, sazeman-e pezhuhesh-hay-e elmi va san'ati (SPE&S), which conducts some research on agriculture through its department of agriculture. However, the share of the SPE&S in research projects is small.

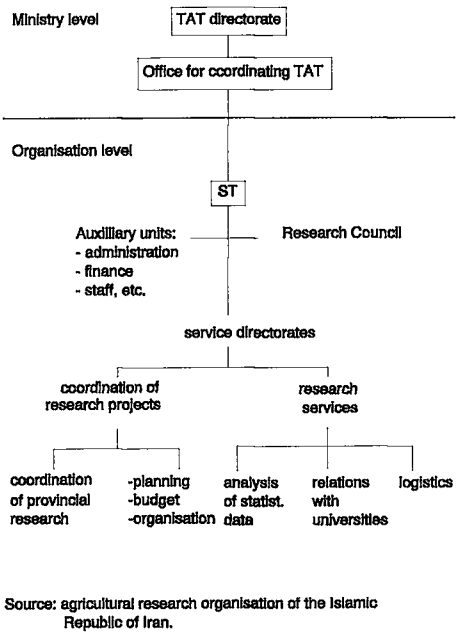
In 1987, the total budget for research in agriculture amounted to US$ 154,360,000 nationally. The figure is 40 times higher than the budget for 1968, and five fold the figure for 1979, the year of the revolution (APC, 1989-a).

The ST and agricultural colleges are the main research bodies involved in research on wheat. The main research organisations, which will be introduced in the present chapter, are the Fars provincial research centre (MTKF) under the ST and the DKS college of agriculture under the Shiraz University, which are both involved in research on the district's wheat production.

### *2.1.1. The MTKF research*

Before describing the MTKF, I shall introduce its mother organisation (the ST), which formulates research policies and supervises the centre's activities. According to APC (1989-b), about 95% of research on crops is in the ST. Following the recent differentiation of responsibilities between the MA and MJS, the ST (which once comprised 7 research institutes and one office for research on rural economy) found itself managing four research institutes and the research office for rural economy. It passed on three institutes involved in livestock, rangelands, and forestry to the MJS. The remaining institutes are in charge of research on seeds and saplings (TNB); sugar beets (TCH); plant diseases, pests, fungi, and weeds (ABG); and on soil and water (TAKH).

Chart 8.5. Organisation of the agricultural research orgnanisation (ST) at the national level (1991).




Source: agricultural research organisation of the Islamic Republic of Iran.

Chart 8.5 illustrates the organisation of the ST at the national level. As the chart shows, research services fall under two directorates for: (1) research services, and (2) coordination of research projects. The former is responsible for the provision of services on analysis of statistical data, links with universities, and logistics. Coordination between provincial research activities, planning, budgeting, and organisation fall under the latter. The research institutes are directly supervised by the TAT Deputy Minister.

In 1991, the total research personnel of the MA at the ST headquarters, research institutes, and at the provincial research centres and research stations, numbered 4,530 of which 34% (1,530 persons) were professional, and the rest concerned with administration, finance, and logistics. The academic staff accounts for 15% of the technical staff, whilst research officers (karshenas-e tahqiq) and research technicians account for 30% and 55%, respectively (APC, 1989-b; Shahbazi, 1991; and ST, 1991).

These figures give a researcher:extensionist ratio of 1:2. The ratio of researcher:farmer (wheat producer) is 1:1,735.

In 1987, the total budget for the four research institutes totalled to about US$ 98,360,000 of which 40% was for the research projects, and the rest was the operational budget (APC, 1989-b). The distribution of the budget amongst the institutes is quite diverse, 53% went to the TNB, 18% to each of the TCH and TAKH, and the remainder to the ABG institute. In 1990, the total research projects conducted by the four institutes numbered to 1,309 (ST, 1991). In the following paragraphs, I shall introduce the four research institutes briefly.

Established in 1959, the **TNB Institute** conducts research on plant physiology and genetics to produce improved seeds and saplings. The other functions of the institute are to control and certify seeds multiplied by contract farmers; and to collect, protect, and use the plant genetic pool of the country. At the national headquarters, the institute is made up of 12 research units concerned with: cereals, paddy, maize, pulses, oilseeds, cotton lint, horticulture and gardening, vegetables, forage crops, multiplication and control of seeds, plant genetic and statistics, and plant physiology. As statistics show (APC, 1989-b), in 1989, with a budget of US$ 52,385,000 of which 50% was for the projects, the institute operated through 64 provincial research centres and stations. In 1988, the total number of projects was 630. The institute accommodates the largest population of researchers of the ST. The population of 721 researchers of the institute is composed of academic staff (11%), research officers (38%), and research technicians (51%).

The **TCH Institute** was established in 1941, and is responsible for conducting research on sugar beets to produce high yielding seeds. Its research projects are conducted by 49 researchers at the national headquarters and at the 16 research centres and stations situated in areas favourable for sugar beet production. Of the researchers, 16% are academic, 31% research officers, and the rest are technicians. In 1987, the budget for the projects accounted for only 5% of the total budget of US$ 17,230,000.

The date of the establishment of the **ABG Institute** goes back to 1943. The institute is responsible for phytopathology and research on pests, fungi, and weeds. It operates seven research units at the national headquarters and 31 research centres and research stations throughout the country. The research units include plant phytopathology, entomology, pest taxonomy, weeds and parasites, pesticides, botany, and biologic control. It accommodates a total of 291 researchers, out of which about 30% are academics, approximately 40% research officers, and the remainder are technicians. In 1987, a budget of US$ 11,640,000 including 36% for the projects was allocated for the institute.

In 1966, the ST established the **TAKH Institute** to take care of research on soil and water. There are four areas of concern to the institute, in which the projects are conducted, which include: plant nutrition, soil improvement, irrigation, and soil and water protection. Over a period of fourteen years (1973-1987), a total of 3,229 research projects were conducted by the institute, of which about 45% were on plant nutrition, 30% on protection of soil and water, and the rest on the other two subject areas (APC, 1989-b). In 1990, 470 researchers constituted the research staff for the institute of whom 14% were academics, 38% research officers, and the rest technicians. The total allocated budget in 1987 added up to US$ 17,100,000 of which 45% was for the research projects.

The MTKF research centre lies in zarqan research station, some 10 kilometres to the southwest of Marvdasht city, the centre of the district. Besides the zarqan research station, four other stations are run by the MTKF, one in Darab district for research on

wheat, one in Jahrom district for citrus saplings, and two in Kazerun district for rain-fed crops. The latter two stations are under construction. Additionally, two more stations for cold climate research and for research on fig production are proposed. Due to the closeness of the zarqan research station to Marvdasht district, and the similarity of climatic conditions between the two areas, the research station is the host of projects for the district.

The MTKF represents the four national research institutes, and is made up of four research units: seed and sapling, sugar beets; plant disease, fungi, weeds, and pests; and soil and water. Prior to the 1986 spatial integration, which placed all the research units on the zarqan station, the units were remote from each other. In 1986, except for one unit that was based at the station, the rest was housed at the centre of the province.

A research staff of 118 persons, which accounts for 38% of the total personnel, works at the headquarters and at the research stations (ST, 1991). Of the researchers, 14% (18 persons) are academic, and the rest comprises research officers (42%) and technicians (44%).

In 1990, the budget for the projects accounted for 49% of the total budget of US$ 15,472,000.

The centre has a newly established library with a limited number of books at its disposal. A monthly news bulletin with limited copies keeps other organisations informed about the centre's research activities.

The cereal department of the MTKF has worked intensively in generating new wheat varieties suitable for the district. Six types of improved varieties have been released by the centre since its establishment. At the time of data collection (1990-1991), a new variety called falat was in the process of generation. The six varieties include rowshan, omid, adl, bayat, azadi and qods. A detailed description of these varieties are presented in chapter 7.

### *2.1.2. The DKS college of agriculture*

The DKS is situated in an agricultural region called bajgah, some 20 kilometres to the southwest of Marvdasht city, the centre of the district. The college is one amongst seven other colleges and schools under the Shiraz University. Its share in the university's research projects accounts for 21% (DKS, 1990-a).

There are ten departments and a number of auxiliary and audit units, that together make up the college. The departments include: crop science and plant breeding, horticulture and gardening, phytopathology, animal science, food science, mechanisation, agricultural extension science, irrigation, soil science, and agricultural economy. Furthermore, there are three research stations, one which is called kushkak situated in Marvdasht district, a short distance from Ramjerd MKKD. The other two stations are located at the college campus area. These stations together accommodate some 93 persons.

There are 122 educational staff accommodated in the college, which accounts for 33% of the total staff population (DKS, 1990-b). The academic staff include 8 professors, 8 assistant professors, 19 lecturers, and 17 tutors assisted by 70 educational officers, technicians, and co-technicians.

On average, over a period of five years (1985-1989), the annual budget was US$ 2,141,000 (DKS, 1990-b). The budget embraces costs of both the research projects and educational activities. Despite the fact that each year the college conducts a number of

research projects, it is more involved in educational activities. During the academic year of 1987-1988, the college accommodated a total of 968 students, of which the largest group (20%) was in crop science and plant breeding, and the smallest group (9%) in mechanisation.

The college implements its research activities through two types of projects; externally authorised (approved by the Shiraz University) and internally authorised (approved within the college). In 1989, the former numbered 31 projects of which five projects dealt with wheat, concerning irrigation, plant breeding, mechanisation, and agricultural economy (DKS, 1990-a). The latter included seven projects, none of them were on wheat.

## 2.2. Agricultural extension service

Most extension activities in the country's agriculture fall under the public domain. The public agricultural extension on crop production and on soil and water is the responsibility of the MA. The MJS is in charge of extension on subject areas other than those mentioned. At present, some extension is also done by the national tobacco organisation (SDK). In wheat production, extension is the task of the agricultural extension organisation (STK) an organisation under the MA. The following introduces the STK.

An organised extension service was first established in the extension department in the MA in 1952. Just preceding the implementation of the Land Reform Act (1962), the extension service had some 1,200 extensionists and some 800 home economic personnel nationally. The involvement of the extension staff in the land reform meant that the extension service lost most of its qualified staff, which in turn adversely affected the technical-information-providing task of the ministry. Two more events in the pre-revolution era acted to prevent the extension service from operating adequately in provision of technical information to farmers. These include (1) involvement in developing, training, and supervising the extension and development corps (STA), the organised groups of university graduates and under graduates who did their 2-year military service in extension; and (2), involvement in the TATM projects aimed at the provision and distribution of seed and saplings amongst farmers.

In 1964, the government launched a programme to strengthen the extension service and to increase its capacity by assigning STA members to act as extensionists. Over a period of 14 years, more than 50,000 STA members were trained by the extension service and sent to rural areas (the expected objectives not having been accomplished), the STA members did not contribute to the technical-information providing job effectively (Zamani Pur, 1991). In 1973, shouldering the sponsorship of the TATM projects, the extension service became involved in input provision and distribution tasks. Because of the involvement, a great deal of the extensionists' time was devoted to making contracts with applicant farmers, distribution of seeds and saplings amongst farmers, and preparation of the related materials such as bags.

Shortly after the 1979 revolution, the government abolished the STA programme. The home economics department was also detached from the STK (extension service). Staff size was reduced to 1,500 extensionists (Shahbazi, 1991). These changes, together with the emphasis of the government on production increase, led the STK into a new era, focusing on yield increase through the TATM projects. Moreover, acknowledging the importance of extension activities in agriculture, the government allocated more budget

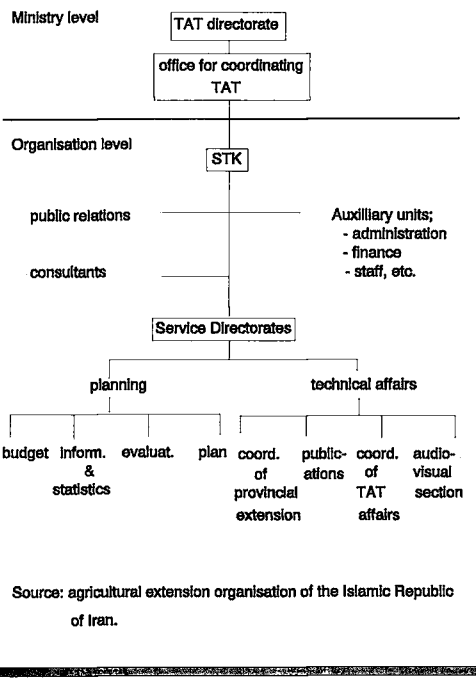
and human resources to improve the extension effort. The budget for extension has sharply been raised year by year. In 1992, the budget was twenty times that of 1984. In 1992, the total development budget for the STK added up to US$ 90,000,000, of which 30% went to the provincial level for local projects (STK, 1992). Furthermore, an attempt to return the STK to its original channel as a technical-information provider was made. In 1985, the TATM programme, which involved the STK in delivery activities, together with the related staff, was detached from the STK to form a new organisation. This left the STK with about 1,000 extensionists throughout the country (Shahbazi, 1991). In addition, the limitation on recruitment was lifted to allow the STK to increase its extension staff. By 1990, the STK had 2,989 extensionists (STK, 1990).

Another attempt to strengthen the STK was to integrate it with the research and training organisations. Although the integration formed part of the overall re-organisation programme, it was pended until 1992. At that time, the STK was still operating under the OZ (crop production) directorate. Since then, the STK has joined the research and training organisations to form the TAT directorate of the MA.

The STK is present in all established MKKSs, and in most MKKDs. In districts where agricultural service centres are not established, the extension service is present in its old setting, operating through extension offices at central villages. Serving a population of about 2,655,800 wheat producers of the country, the existing extension staff (2,989 in 1990) together with about 200 plant protection technicians at the MKKDs, yield an extensionist:wheat producer ratio of 1:833.

In the STK, extension is a single purpose activity, dedicated to providing farmers with access to technical information. For this purpose, graduate extensionists (karshenas-e tarvij, KT) are assigned to act as commodity specialists in crop production, soil and water affairs.

Chart 8.6. Organisation of the agricultural extension organisation (STK) at the national level (1991).




Source: agricultural extension organisation of the Islamic Republic of Iran.

At the national headquarters, there are 66 KT of whom 18 persons (27%) work for other organisations of the MA. The KT staff is divided into two service directorates: technical affairs, and planning (see chart 8.6). The former is in charge of coordinating extension services at the lower levels; supervising research-extension joint projects and affairs related to training of extensionists (the affairs related to the TAT); preparing written material for staff and for farmers; and preparing audio-visual aids (radio and television programmes, slides, films, equipments,

etc.,) for the personnel and for farmers. The responsibility for extension planning and for affairs related to budgeting, statistical data, and evaluation of projects and of personnel fall under the planning directorate. The service directorates are supported by a directorate in charge of administration, personnel, finance, and logistics. The KT staff are assisted by a group of extension technicians. The technicians number 50 of whom approximately 1/5 are committed to other organisations under the MA. The distribution by academic background of the extension personnel at the national headquarters and at the provincial level is illustrated in table 8.3.

**Table 8.3. Classification by academic background of a total 2,989 extensionists in 1990.**

| | total | karshenas-e tarvij | | | | technician | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Ph.D | MSc | BSc | total | Pdip | Hdip | lower | total |
| provinces: | 2,872 | – | 67 | 619 | 686 | 160 | 1,953 | 73 | 2,186 |
| national headquarters: | 117 | 1 | 14 | 52 | 67 | 1 | 22 | 27 | 50 |
| total: | 2,989 | 1 | 81 | 671 | 753 | 161 | 1,975 | 100 | 2,236 |

Note: Pdip.= 2-year post diploma specialisation.
Hdip.= high school diploma.
Source: STK (1990).

As mentioned earlier, the extensionists are mainly involved in non-educational activities. At different levels, especially at the village-cluster, the extensionists are busy with a variety of jobs, ranging from administrative work to writing permits for goods and services for farmers.

The main programme by which the extension activities are executed is the comprehensive extension programme (TJT), financed nationally on the basis of projects. Each provincial extension headquarters is required to prepare its TJT projects and submit them to the national headquarters for approval and for allocation of budget. The individual projects focus on commodities specific to the areas under the jurisdiction of the MKKDs. The technical information on different aspects of crop production, wheat production for instance, is detailed and placed into sub-projects.

The main extension methods used to execute the TJT projects include individual visits, group discussions, courses, farm demonstration, agricultural exhibitions, audio-visual methods, etc. The emphasis on the use of mass media in extension is considerable; it has led the STK to expand the related divisions at the national and provincial headquarters, and to devote quite a lot of time to preparing materials for it.

Recently, a number of important programmes have been introduced to improve linkages and extension methods. In the following, I shall describe two such programmes, which are important to the present study: (1) adaptive research programme (TTT projects), and (2) extension bonus.

The TTT programme was introduced in 1987 to strengthen the link between researchers and extensionists, and to retest on-station results in farmers' conditions. The programme is nationally financed, and supervised by both the research and extension organisations. A supreme TTT committee, based at the national research headquarters,

consisting of senior researchers and extensionists, governs the planning and implementation of the programme. The individual projects are prepared by provincial research and extension headquarters and submitted, first to the provincial research committee, later to the TTT committee at the national extension headquarters, and finally to the supreme TTT committee at the national research headquarters. The proposed projects proceed after the approval of the committees; otherwise they are sent back for the amendments. The theme for each project initially is chosen from among ready-to-go, on-station research results by a team of local researchers and extensionists. According to Bandpey *et al.*, (1991), within a period of two and half years since the onset, 189 projects had been implemented in 927 farms throughout the country. Of the projects, 35% was related to wheat (ST, 1991). The TTT projects provided opportunity for 246 researchers, 459 extension officers (karshenas-e tarvij), and 629 field level extensionists to be involved in the programme. The projects are supposed to be executed with the close collaboration of farmers whose agro-economic conditions allow them to implement the project on their farms. Since the projects do not provide funds to offer free-of-charge inputs for farmers, the project-farmers have to be wealthy enough to afford the inputs. In brief, the actual working of the TTT programme shows clearly how the AKIS in practice serves a particular category of farmers who, though important in meeting the national goal of self-sufficiency in wheat, do not fall into the small farmer category.

In 1988, aiming at improving the performance of extensionists and linking them to farmers, the STK launched a pilot project in Gorgan region of Mazandaran province in which the extensionists could receive a bonus for the productivity increase in their areas. The region was divided into small areas, each supervised by an extension officer (karshenas-e tarvij) and a few field level extensionists who formed a work-team. The team was supposed to work to increase the productivity of the area under its jurisdiction. The productivity increase above a certain level could qualify the team to receive the bonus.

As tables 8.1 and 8.2 illustrate, the total extensionist staff at the district headquarters and the 10 subordinate MKKDs in Marvdasht district numbers 20 (including 7 plant protection technicians at the MKKDs). Considering 18,169 wheat producers in the district, the extensionist:wheat producer ratio is 1:908. Four extensionists out of 20 are extension officers (KT), and the rest are technicians. The officers are university graduates with BSc degree in various agricultural specialisations. The work experience of the officers ranges from 7 to 23 years, while the period of staying at the centres ranges from 2 to 7 years. Except for one technician who has a 2-year post diploma certification, the other technicians are all high school graduates. The work experience of the technicians are diverse, ranging from 1 to 22 years. As for the officers, the technicians are relatively new in the centres, with periods of staying ranging from 5 months to 8 years.

According to SBBF (1990-b), the share of district extension in the total development budget of the MKKS (excluding the budget for the nationally financed TJT projects) in 1987 and 1988 accounted for only 11% and 6%, respectively (the total budget included the budget for the headquarters and ten MKKDs). The district's TJT projects received a budget of about US$ 94,000 in 1988 (ST, 1991). This makes a total budget of about US$ 200,000 for the district's extension in 1988 (some 12% of the total development budget of the MKKS). In other words, there is US$ 11 per each wheat producer.

According to Pezhumand (a MTKF researcher interviewed in 1990), up to 1990, in total, 6 TTT projects on wheat were conducted in 6 different locations of the district.

## 2.3. Agricultural training

Training on crop production falls under the agricultural training organisation (SAK), an organisation under the MA. The SAK was established in 1975 to take action in three areas: farmer training, staff training, and rural youth training. It has 934 staff members who work at the national headquarters and at 27 provincial training centres throughout the country. Of the staff, around 26% (242 persons) are educational, and the rest work in units in charge of administration, finance, and logistics. Of the educational staff, 53% are officers (karshenas-e amuzesh) and the remainder of the staff are technicians (SAK, 1993-a).

The 1990 total educational budget for the organisation totalled about twenty four million US dollars, some 33% of the total budget. The educational budget shows an 56% increase compared to the budget for 1989. According to SAK (1993-a), during a period of three years (1989-1991), the organisation conducted training courses for 53,219 farmers (some 2% of the total farmers) and 12,863 staff members of the MA (some 25% of the total ministry's staff members). Of the trained staff in 1989, only approximately 1% were extensionists (STK, 1991). Of the training centres, only 17 carry out the task of training rural youth through a 4-year full time vocational training programme. In 1993, a total 2,482 rural youth were being trained at the training centres throughout the country (SAK, 1993-b).

Besides its low performance with respect to the training of farmers and extensionists, the SAK hardly serves the rural women at all. A great deal of the labour force in agriculture is female, and the women play important roles in agriculture, as was illustrated in chapter 7. The share of the Iranian rural women in agriculture ranges from 40% in livestock production to as large as 75% in paddy and cotton production (Mirikhoozani, 1991). The rural women are active in a variety of agricultural activities such as feeding, milking, taking to grazing, helping in calving and lambing, preparation of seed bed, transplanting, weeding, and harvest. They are also active in food processing, producing milk products and by-products, and in the marketing of agricultural produce. Despite this, no training programme is aimed at serving this active category of the rural population.

The small farmers, just like rural women, are suffering from lack of sufficient institutional support including training. The trainees are selected from amongst those farmers who have contacts with the extensionists. Since the extensionists make contacts with large farmers, the trainees turn out to be large farmers also.

Marvdasht district is the host of two training centres: ali abad-e kamin (MAAAK), and Marvdasht (MAM). The MAAAK is dominantly involved in rural youth training, while the MAM in staff training. These two training centres are under the TAT directorate of the SKO (the provincial agricultural headquarters). In the following, I will detail some important characteristics of the two training centres.

### *2.3.1. The MAAAK training centre*

The centre is located at a close distance to the Sa'adat Shahr MKKD, about 80 kilometres to the northeast of Marvdasht city, the centre of the district. It is amongst the earliest established training centres in the country and has been in existence since 1960. At first, the centre was responsible for development of trained farmers and skilful agricultural labourers through 2-year training programmes. Later, staff training was added to its tasks. It owns 1,020 hectares of land out of which 400 hectares are arable. In 1991,

the centre had 86 staff members. Of the staff, 23% (20 persons) are educational (trainers), and the rest work in units in charge of administration, finance, and logistics (MAAAK, 1993). The 1990 total educational budget for the centre totalled about US$ 830,000, some 45% of the total budget of the centre (SAK, 1993-a).

Twelve trainers (60%) are university graduates (karshenas-e amuzesh) of which one has an MSc degree and the rest have BSc degrees in various agricultural subjects. The classification of trainers by age, years of experience, and length of stay at the centre, is illustrated in table 8.4. As the table shows, 70% of the staff are under the age of 40 year. Also, 65% have less than 10 years of work experience, and 70% have stayed in the centre for less than 10 years. All the trainers are male.

**Table 8.4. Classification by age, years of experience, and length of stay of 20 trainers at the MAAAK training centre (1991).**

| years: | <11 | 11-20 | 21-30 | 31-40 | >40 |
|---|---|---|---|---|---|
| | no. of trainers | | | | |
| age: | – | – | 5 | 9 | 6 |
| years of experience: | 13 | 5 | – | 2 | – |
| length of stay: | 14 | 4 | 2 | – | – |

Source: MAAAK (1993).

The educational activities of the centre are executed by an educational directorate under which a manger is in charge of supervising trainers. The trainers are grouped into five educational units: crop production, crop protection, horticulture and gardening, mechanisation, and post harvest affairs.

The centre has focused also on a rural youth training programme. On average, each year it trains about 230 youths (all male). In 1991, according to MAAAK (1993), the youth numbered 227. The centre also provided training courses for 1,495 farmers (from all over the province) and 54 technical staff members (from all over the province). Of the trained farmers and of the staff, approximately 30% and 10% respectively, were from the district. In other words, concerning wheat production, only 3% of the district's total wheat producers were trained. None of the trainees were extensionists.

### 2.3.2. *The MAM training centre*

The centre is housed in a suburb of Marvdasht city, some 7 kilometres to the west of the city, a region under the jurisdiction of Ramjerd MKKD. Covering 65 hectares of land, the MAM provides training for staff and for farmers. It was established in 1973 to provide training for the female members of the STA (2-year army service extensionists). About one year following the revolution (late 1979), and following the abolition of the STA programme, the centre was assigned to its present training job, providing training for farmers and for technical staff of the MA.

**Table 8.5. Classification by age and years of experience of 26 trainers at the MAM training centre (1991).**

| years: | <11 | 11-20 | 21-30 | 31-40 | >40 |
|---|---|---|---|---|---|
| | no. of trainers | | | | |
| age: | – | – | 6 | 9 | 11 |
| years of experience: | 16 | 5 | 5 | – | – |

Source: MAM (1993).

According to MAM (1993), the total staff of the centre numbers 69 persons of whom 26 persons (38%) are educational (trainers), and the rest work in auxiliary units, supporting the centre. Of the trainers, about 30% (8 persons) hold BSc degrees, 15% have high school diplomas, and the rest hold certificates lower than diplomas. As table

8.5 shows, the trainer population is young, approximately 60% fall below forty years of age. From the point of view of years of experience, approximately 60% of trainers (8 persons) have 10 years or less, 5% between 10 to 20 years, and the remaining 20% between 20 to 30 years.

The training programme is supervised by a directorate in charge of educational affairs. The directorate comprises three educational units: crop production, soil and water affairs, and mechanisation. According to SAK (1993-a), the 1990 total educational budget of the centre totalled about half a million US dollars (some 50% of the total budget). In 1991, the centre provided training courses of 2-week to 7-month duration for 356 technical staff, and short courses for 2,179 farmers. Of the staff, approximately 3% (11 persons), including two extensionists (10% of the total extensionists), were from the district. Of the trained farmers, 35% were from the district. The figure accounts for 5% of the total wheat producers in the district.

## 3. Institutions responsible for providing access to goods and services

Five organisations work in the district, the effect of which facilitates, or inhibits, the performance of the research, extension, and training. These include the JS department of the Ministry of jahad-e sazandegi (the reconstruction crusade organisation), the water department under the water organisation, agricultural bank under the agricultural credit council, the rural cooperative, and the Fars farm machinery organisation (BTMKF) under the MA. The following describes these organisations.

### 3.1. The JS department

Shortly after the revolution, the government decided to attempt to launch a large-scale effort for the alleviation of poverty in the rural areas. This decision justified the establishment of a reconstruction crusade organisation (jahad-e sazandegi, JS) in June 1979. The JS organisation was staffed with enthusiastic young people with a rural background, from low to low-middle class, who have eagerly tried to help the rural poor. At the beginning of the post-revolution era, given the very problematic socio-economic situations faced by the rural poor, specially small farmers, this organisation became involved in a variety of jobs ranging from input delivery to providing infrastructural services in rural areas. In the course of time, the organisation developed its service units and gained specialised skills in development activities, specially in the development of rural organisations such as the village councils, and in the installation of drinking water, construction of access roads and village public baths, rural electrification, delivery of inputs, land reclamation, etc.

In 1983, given the increasing focus of the government on the development of agriculture and improvement of rural life, a determination to bring about food security for the nation and to alleviate rural poverty, and yet a limited capacity of the Ministry of Agriculture (MA) to cope with large-scale problems in rural areas, the JS organisation was reorganised into a new ministry, the Ministry of jahad-e sazandegi (MJS).

At first, the differentiation of responsibilities between the MA and MJS was based on a line separating the services for dry-land cultivation and for irrigated agriculture. The former, together with the construction of rural infrastructure, was placed on the shoulders of the MJS. The MJS was also responsible for services to nomadic production. The rest of the responsibilities in agriculture were assigned to the MA. Later, in 1990,

experiencing numerous problems, such as confusion of farmers in referring to several service centres for their needs, the government set up a new division of responsibilities between the two ministries. The most recent division of tasks (implemented in 1991) assigns animal production, forestry, natural rangelands, and fishery, and also infrastructural services in the rural areas to the MJS, and the rest, i.e., crop production and affairs related to soil and water, to the MA. Presently, the MA and the MJS each have their own research, extension, and training organisations, and each extends its services through its own service centres at the village-cluster level. Coordination between the MJS and MA takes place through agricultural committees at the national, provincial, and district levels.

In wheat production, the influence of the MJS on the effectiveness and impact of the research, extension, and training concerns (1) the political pressures it exerts on these institutions, and (2) the role it plays in providing goods and services for farmers. The former is explained in chapter 10 and also in the chapter on the village system (chapter 6). As part of its function, the ministry is involved in providing infrastructural services, facilitating small agricultural industries, and distributing machinery spare parts amongst farmers. These tasks, in one way or the other, affect the adoption of technology by farmers. One important contribution of the MJS is the construction of access roads in rural areas. According to Abolhasani (1990), between 1979 (the year of its establishment) and 1986, the MJS has constructed 25,000 kilometres of access roads nationwide. Within that period, the length of the roads was increased three fold. However, it is still a long way from providing access roads for all villages of the country. According to Jahad (1990-b), there is a need to increase the existing roads (70,000 kilometres) by at least four times.

At present, the MJS is staffed by 55,658 persons (ISC, 1992) housed at the national headquarters and at the provincial, district, and village-cluster levels. A fairly decentralised bureaucratic structure has enabled the staff to perform with relatively few problems. The ministry does not follow the traditional rules of administration, finance, personnel, promotion, etc., which govern the old organisations. The structure gives the directors at the lower levels room for manoeuvre, and allows them to decide and take actions quickly when the time asks for it.

At the national level, the MJS is composed of ten directorates: forestry and natural rangelands, water catchment management, livestock and veterinary, fisheries, research and education, extension and rural participation, programming and planning, rural infrastructural services and small industries, legal and parliamentary, and administrative, personnel, and finance. The functions of the extension and rural participation directorate are (1) to select, train, and make use of para-professionals (nirohay-e mo'in) in extension, and (2) to develop farm skills by the assistance of the para-professionals. The para-professionals are rural people who act as voluntary extensionists in their regions. They are trained through occasional training courses over a five year period, a total of one month per year. According to Khaza'i (1989), there are about 12,000 of such para-professionals throughout the country.

At the provincial level, the MJS organisation's structure is similar to that already mentioned for the national level. The headquarters comprise ten departments, each (called committee) is managed by a graduate specialised in the matters at which the committee is aimed. The provincial organisation (sazeman-e jahad-e sazandegi-e ostan, SJSO) coordinates between district's headquarters; coordinates for implementation of national-level policies and projects; prepares plans for local development projects and

implementation, or commission the projects; conducts research projects; and develops human resources.

At the district and village-cluster levels, the divisions of the MJS are limited to three units responsible for: (1) infrastructural services, water catchment management, and rangelands affairs; (2) animal health, nutrition, and veterinary services; and (3) extension and rural participation. In Marvdasht district, the MJS works through the district headquarters (the JS department) situated at the district's centre and through three village-cluster service centres (JDs). The JDs are situated at three remote areas: Kamfiruz, Arsenjan, and Sa'adat Shahr (see map 8.1).

In 1987, the total development budget of the district's JS department totalled two and half million US dollars. This accounts for 53% of the total development budget for the district's agriculture (SBBF, 1990-a).

### 3.2. The water department

The department works under the provincial water organisation (SMAF), and provides irrigation water from the dorudzan dam for farmers in areas under the irrigation network. It is situated in Ramjerd 1 village-cluster in a close distance to the MKKD, some 35 kilometres to the district's centre, and 25 kilometres to the dam (see map 8.1). The role of the department is to act as an agent for the SMAF in the district to (1) release water into the channels as the time required and as demanded by the farmers, (2) oversee the water utilisation according to the contracts between the SMAF and farmers, (3) terminate contracts where rules have been broken, and (4) report any problems concerning the irrigation water back to the SMAF. The manager of the department is a member of the district's agricultural council.

### 3.3. The rural cooperatives

The cooperatives are considered as the assisting arms for the MA. Presently, the cooperatives are managed by a state organisation under the MA, called sazeman-e ta'avoni-e rusta'i (STR). In the course of time, the STR will undergo changes and hand over its tasks to rural cooperative unions, and the cooperatives will act independently from the MA. A coordinating office under the deputy Minister of Agriculture will connect the MA to the unions.

Functioning at the national, provincial, and district levels, the STR coordinates between the rural cooperatives, and facilitates the provision of inputs and consumer goods to the cooperatives' members. The other functions of the STR are to audit transactions and the financial affairs of the cooperatives, acting as an intermediary between the state organisations and cooperatives, facilitate marketing (both within the country and abroad), and provide training courses on accounting and on cooperative principle and techniques, etc., to the members. It also acts as intermediary between the agricultural bank and the cooperatives for distribution of short term credit.

Nationwide, according to the national statistics centre (ISC, 1992), 3,110 rural cooperatives with some 4.3 million members were active in 1989. These cooperatives hold a total capital of some 1.1 milliard US dollars of which 77% are operating capital and the rest are deposit. It makes an active capital per capita of some US$ 200. Of the cooperatives, 3,105 have formed 189 rural cooperative unions with some 236 and 151 million US dollars active capital and deposit, respectively.

Each year, nationwide, the sale of wheat is carried out through some 2,000 purchasing centres. The cooperatives have 735 storage houses at their disposal. The available storage capacity is not sufficient, accounting for only about 45% of the needed volume (STR, 1991).

Besides the rural cooperatives, a number of agricultural cooperatives are active throughout the country. Organised mainly by large farmers and educated urban people, these cooperatives are of two types: (1) related to the STR, and (2) independent cooperatives. The latter have emerged spontaneously, working on their own, and are supported by the MA.

In 1990, according to Mosleh (the manager of the district's STR, interviewed in January 1990), sixteen rural cooperatives, seven agricultural production cooperatives, and one mechanisation cooperative were active under the STR in Marvdasht district (see map 8.1). The production cooperatives are involved in bee-keeping, animal production, poultry, and services for harvesting. The cooperative for harvesting services is the second largest in the country, and provides services to farmers in several adjacent provinces. The depot of its combine machines accounts for 14% of the total combine machines of the country. The mechanisation cooperative is housed in Arsenjan area, and provides mechanised services for farmers by means of 5 tractors. With a membership of some 23,879 rural people, the district's rural cooperatives hold a capital of about 11 million US dollars of which 67% (7.3 million US dollars) is operating capital. This gives an operating capital per capita of some US$ 300.

The delivery and distribution of inputs as well as consumer goods amongst the district's farmers are achieved through 48 cooperative consumer shops throughout the district. In addition to these shops, some 200 local agents provide fuel (both for household consumption and for farm machinery) for rural people in remote areas where no consumer shop is available.

The other function of the district STR is to facilitate marketing of agricultural produce. In the case of wheat, the organisation acts as an intermediary between wheat producers and the provincial cereal organisation in charge of wheat silos. In this respect, twenty purchasing centres, of which 45% with covered storage houses, are active. Using mostly rented storage houses, the district STR has a storage capacity half that of the volume needed. This results in large depots of wheat in open air. Often farmers are asked to deliver their wheat directly to silos in the district or to the adjacent districts. In each purchasing centre a trained technician controls the quality and purity of the grains and grades the purchased grain accordingly.

### 3.4. The agricultural bank (BK)

Agricultural credit is provided through several banks of which the most important is agricultural bank (the BK). Being present at the sub-district level, the BK provides farmers with long, medium, and short term credit. In 1988, according to the Central Bank (BMI, 1988), a total credit of some 16 milliard US dollars was paid to farmers of which approximately 31% was from the BK and the rest from five commercial banks. This gives a credit per capita of some US$ 5,000. The 5 milliards US dollars credit paid by the BK was issued through 419,522 contracts in two ways: directly by the BK (68.3%), and through the rural cooperatives (31.7%). The credit paid by the BK to crop producers (some 2.7 millions farmers) accounts for 33.8% of the total credit.

Short term loans are given for only one cultivation year, payable through the rural cooperatives. Each member of the cooperatives can apply for a loan of some 640 to 2,564 US dollars per cultivation year. This kind of credit is particularly designed to help farmers in wheat cultivation. The loan repayment is due immediately after the harvest. The administration costs differ according to the applicants and areas. For the cooperative members, the cost is 3% of the total loan. It rises to 9% for non members. The economic circumstances of the area, also affect the determination of the administration cost. A special committee decides on the type of charge required. In addition to the bank's administration costs, cooperatives charge the applicants one percent.

The other kind of credit is given directly by the BK in form of supervised loans. They cover a wide range of agricultural activities. The maximum loan with no collateral is of some 128,205 US dollars. For this amount of credit, a group guarantee procedure, in which applicants form a group and the group guarantees the payments of the individual members, can be applied. Any loan larger than this requires collateral. The duration of long period loans depends on the activity, but is limited to a maximum of 15 years.

The district's farmers are served by three BK branches supervised by the provincial BK. One branch is situated at the district's centre, and the other two are in Sa'adat Shahr and Arsenjan cities (see map 8.1). One extra branch is also involved in monetary services housed at the district's rural cooperative organisation (STR).

In 1987, the share of the BK in the total credit given to the agriculture of the district was 62% by the amount of credit and 83% by the number of loans (SBBF, 1990-a). The rest of the credit was given by four commercial banks. In that particular year, the BK gave loan grants equivalent to some 18.7 million US dollars to the district's farmers of which 70% was for purchasing goods, land reclamation, and construction of storage houses. Of this, 4% went to improvement of land grading, 20% and 17% for purchasing livestock and farm machinery respectively, and the rest for miscellaneous items. In 1989, the total credit added up to some US$ 26,500,000 of which 32% was indirect credit given through the rural cooperatives (BK, 1990).

### 3.5. The provincial farm machinery organisation (BTMKF)

The BTMKF is an organisation under the MA in charge of providing and distributing farm machinery, implements, equipments, and spare parts amongst farmers. It aims at the increasing of the present average farm mechanical power from 0.43 Hp/ha to 0.9 by the end of 1993 (APC, 1989-a). The BTMKF is housed at the provincial centre, some 30 kilometres to the southwest of Marvdasht city. There is a service unit under the BTMKF situated at about 6 kilometres from the headquarters towards Marvdasht district. It provides maintenance services for tractor owners. The BTMKF attempts to distribute farm machinery and implements directly; and also to commission the distribution of the spare parts to a range of private enterprises and state-run organisations. In this respect, the JS department, rural cooperatives, and MKKDs act as intermediaries.

According to SKOF (1990), in a ten-year period (1979-1988), the BTMKF has distributed 10,845 tractors of different sorts and a large number of implements and spare parts. Of the tractors, approximately 15% went to the Marvdasht district.

## 4. Summing up the discussion

Thus far, the present chapter has presented a description of the formal institutional arrangement established to support the district's farmers. The description gives little information about what actually happens in practice. The aim in this chapter was not to analyse the situation, but to illustrate the efforts aimed at the development of agriculture. The actual scene of action is analysed in the following chapters, especially in chapter 10.

One thing is certain that a massive effort has been taken to support the district's farmers to adopt new technologies. This includes establishing a large bureaucracy, giving more administrative authority to the lower levels, and setting up the institutions responsible for providing farmers with access to the mix of conditions required for development. In this respect, considerable human, financial, and physical resources are devoted to the research, extension, and training. Furthermore, the market, credit, price, etc., are all taken into consideration. This should normally yield satisfactory results judged by the objectives that drive the efforts. However, the practice gives no promising results. What has been implemented in practice is different from what has been suggested by the formal setting. As an example, only a small part of the farmers' population is trained by the training centres. Female farmers also lack any training, and the small farmers receive the least training. This is in contradiction to the objectives of serving all farmers, especially the small ones.

# CHAPTER 9

## FARMERS' ACCESS TO RELEVANT WHEAT TECHNOLOGIES

This chapter is devoted to presenting and analysing the results of the field work. The aim is to provide a picture of the real situation of wheat producers in Marvdasht district, and to examine technologies as one element of the mix needed for development, from the point of view of relevance and availability. The chapter is divided into six sections, of which the characteristics of the sample farmers comes first. The wheat production pattern amongst sample farmers, and the major economic problems constraining their production, is the theme for the second section. The following section introduces the characteristics of a technology package for the wheat producers, and its adoption pattern amongst sample farmers. The fourth section is devoted to presenting the farmers' assessments with respect to the relevance and availability of the technology package. The relevance and availability of the technology package for different categories of wheat producers constitutes the theme of the fifth section. The chapter concludes with a section that analyses the technology package with respect to relevance and availability.

As mentioned in chapter 4, at the farm level, a technology package, including the most recently improved seed (qods), and five related technical recommendations which were introduced into the area as part of the 'Wheat Impact Programme' (TATG), were examined with respect to their relevance and availability for the wheat producers in Marvdasht district. The recommendations include: (1) adjustment of application of seed according to research recommendations, (2) adjustment of application of chemical fertilisers (3) use of chemical weed killers, (4) seed treatment against fungi, and (5) improvement of the way farmers prepare their lands in order to change their traditional irrigation method. The recommendations are not new to the district's farmers, and were introduced long ago when they were accompanied by the earlier types of improved seeds. The new variety has been introduced to substitute for the problematic azadi variety in the district. The rate of adoption of the new variety, and of the related recommendations, was expected to be high. High adoption would imply relevance and availability among their particular users. However, those farmers who have not adopted the recommendations, or rejected them after a period of adoption, could reveal problems associated with the technology and related recommendations.

### 1. Characteristics of sample farmers and their farms

A survey was conducted amongst wheat producers. A minor point about the analysis of the survey data needs to be made. The author did not carry out tests of significance. Though the sample can be considered representative (both village-clusters and respondents were randomly sampled), the aim of the study is not to describe the population of wheat producers of Marvdasht district. The aim is to get insight into the factors that affect the access and

**Table 9.1. Classification by age of sample farmers (N=106).**

| years | no. of farmers | % | cum. % |
|---|---|---|---|
| 18-20 | 2 | 1.9 | 1.9 |
| 21-30 | 25 | 23.6 | 25.5 |
| 31-40 | 18 | 17.0 | 42.5 |
| 41-50 | 27 | 25.5 | 67.9 |
| 51-60 | 23 | 21.7 | 89.6 |
| 61-70 | 11 | 10.4 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

relevance of wheat technologies promoted by government.

First of all, some characteristics of the 106 wheat producers who acted as respondents for the survey is introduced. Tables 9.1 through 9.7 show the age, years of education, years of wheat production, social participation, size of total land, land ownership, and size of wheat plots.

As shown in table 9.1, respondents are relatively young with 43% being 40 years or less. The age of sample farmers ranges from 18 to 70 years. On average, sample farmers are 43 years old. Approximately 64% of respondents are between 30 and 60 years old. The most frequent age category range is from 41 to 50 years old.

**Table 9.2. Classification by educational background of sample farmers (N=106).**

| educational background | no. of farmers | % | cum. % |
|---|---|---|---|
| totally illiterate | 46 | 43.4 | 43.4 |
| up to 6th grade of school | 49 | 46.2 | 89.6 |
| 7th to 11th grade | 8 | 7.5 | 97.2 |
| high school graduate | 3 | 2.8 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

Approximately 43% of farmers are illiterate. The figure is lower than the national illiteracy figure for the rural population (52%). A bare majority of respondents received formal education up to 6th grade of schooling (table 9.2). Only 3 farmers out of 106 are high school graduates.

As illustrated in table 9.3, approximately 75% of respondents have more than 10 years' experience in wheat production with a maximum of 60 years' experience. In other words, these farmers began participating in wheat production at a very early age (around 10 years). This shows the extent to which the respondents are familiar with the wheat production problems and constraints. The new beginners (less than 10 years experience) constitute approximately 25% of the sample with the minimum of 2 years experience. On average the respondents have 23 years experience in wheat production.

**Table 9.3. Classification by wheat production experience of sample farmers (N=106).**

| years | no. of farmers | % | cum. % |
|---|---|---|---|
| less than 10 | 26 | 24.5 | 24.5 |
| 11-20 | 25 | 23.6 | 48.1 |
| 21-30 | 29 | 27.4 | 75.5 |
| 31-40 | 14 | 13.2 | 88.7 |
| 41-50 | 9 | 8.5 | 97.2 |
| 51-60 | 3 | 2.8 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

The formal social activities in which farmers are active are listed in table 9.4. Approximately 1/4 of the sample farmers are not members of formal social organisations. However, a majority of farmers (73%) are members of rural cooperatives.

**Table 9.4. Classification by membership in formal village organisations of sample farmers (N=106).**

| social activity | no. of farmers | % |
|---|---|---|
| no social activity | 26 | 24.5 |
| member of village council | 6 | 5.7 |
| member of rural cooperative | 77 | 72.6 |
| member of village security group | 3 | 2.8 |

Note: due to membership of some farmers in more than one social organisation, the number of farmers and the percentage values exceed to the total of 106 farmers and the total of 100%.
Source: author's survey.

The size of the total land operated by the sample farmers ranges from as small as 1 hectare to as large as 80 hectares, with 8.7 hectare on average. As illustrated in table 9.5, approximately 65% of respondents hold less than the average [see the figures for total land (own land+lease hold)]. This shows the smallness of the majority of holdings. The most frequent size category is 5 to 7 hectares

which accounts for 26%. Approximately 30% of sample farmers hold less than 5 hectares.

The majority of farmers own their lands. Eighty four percent of farmers are owners, while the rest operate lease hold. In addition to their own lands, 17% of farmers have rented other lands to increase their cultivation area.

**Table 9.5. Classification by size of total land of sample farmers (N=106).**

| | (own land + lease hold) | | | (own land) | | |
|---|---|---|---|---|---|---|
| hectare | no. of farmers | % | cum. % | no. of farmers | % | cum. % |
| Less than 3.0 | 5 | 4.7 | 4.7 | 5 | 5.6 | 5.6 |
| 3.0-4.9 | 26 | 24.5 | 29.2 | 20 | 22.5 | 28.1 |
| 5.0-6.9 | 27 | 25.5 | 54.7 | 23 | 25.8 | 53.9 |
| 7.0-8.9 | 11 | 10.4 | 65.1 | 9 | 10.1 | 64.0 |
| 9.0-10.9 | 16 | 15.1 | 80.2 | 15 | 16.9 | 80.9 |
| 11.0-12.9 | 11 | 10.4 | 90.6 | 8 | 9.0 | 89.9 |
| 13.0-14.9 | 3 | 2.8 | 93.4 | 3 | 3.4 | 93.3 |
| 15.0 and greater | 7 | 6.6 | 100.0 | 6 | 6.7 | 100.0 |
| total | 106 | 100.0 | | 89 | 100.0 | |

Source: author's survey.

Lands are fragmented and scattered. Approximately 85% of holdings are fragmented. They consist of between 2-25 pieces of land. On average, each respondent holds 5 pieces of land. As Table 9.6 shows, the majority of respondents (57%) hold 2 to 5 pieces of land.

**Table 9.6. Classification by number of pieces of land of sample farmers (N=106).**

| pieces | no. of farmers | % | cum. % |
|---|---|---|---|
| one piece | 16 | 15.1 | 15.1 |
| 2-5 | 60 | 56.6 | 71.7 |
| 6-10 | 21 | 19.8 | 91.5 |
| 11-15 | 4 | 3.8 | 95.3 |
| 16-20 | 4 | 3.8 | 99.1 |
| 21-25 | 1 | 0.9 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

## 2. The district's wheat production scene

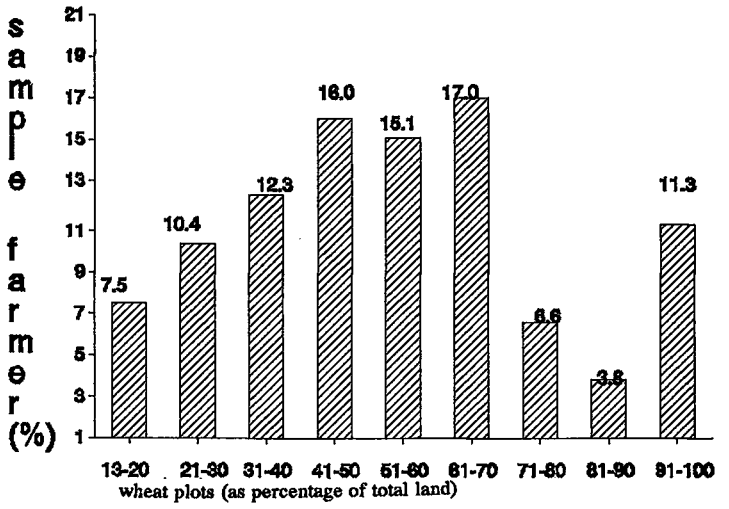
As shown in histogram 9.1, sample farmers have devoted a range from 13% to 100% of their total land to irrigated wheat, 55% on average. The distribution of irrigated wheat plots, which range from 0.5 to 40 hectares, is tabulated in table 9.7. On average, each sample farmer has cropped 5 hectares of wheat. Sixty six percent of sample farmers have cropped less than the average.

The yields of wheat show a varied dispersion pattern among sample farmers, ranging from 0.8 to 7.2 tons per hectare. On average, the yield is 4 tons per hectare, which exceeds the district's average for 1988-1989 (ASID, 1989) by 25%. As shown in table 9.8, approximately 60% of sample farmers have produced more than the average, which indicates the high production capacity of the sample farmers.

The high yields of the majority of farmers have been realised despite the various problems constraining the district's farmers. A broad range of problems concerning various conditions for productivity increase, such as price incentives, market, credit,

inputs, access to relevant technology, and etc., limits the district's wheat production. In the following paragraphs, the aim is to show the major economic problems experienced by sample farmers.

**Histogram 9.1. Percentage of total land devoted to wheat crop of sample farmers (N=106).**




Source: author's survey.

**Table 9.7. Classification by size of wheat plots of sample farmers (N=106).**

| hectare | no. of farmers | % | cum. % |
|---|---|---|---|
| Less than 1.0 | 3 | 2.8 | 2.8 |
| 1.0-2.9 | 45 | 42.5 | 45.3 |
| 3.0-4.9 | 22 | 20.8 | 66.0 |
| 5.0-6.9 | 12 | 11.3 | 77.4 |
| 7.0-8.9 | 11 | 10.4 | 87.7 |
| 9.0 and larger | 13 | 12.3 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

**Table 9.8. Classification by yields of wheat of sample farmers (N=106).**

| yield (ton/ha) | no. of farmers | % | cum. % |
|---|---|---|---|
| less than 1.0 | 1 | 0.9 | 0.9 |
| 1-2 | 4 | 3.8 | 4.7 |
| 2-3 | 6 | 5.7 | 10.4 |
| 3-4 | 33 | 31.1 | 41.5 |
| 4-5 | 32 | 30.2 | 71.7 |
| 5-6 | 15 | 14.2 | 85.8 |
| 6-7 | 11 | 10.4 | 96.2 |
| 7 and more | 4 | 3.8 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

## 2.1. The economic context for wheat production

The district's farmers produce wheat in an unfavourable economic context in which the price of wheat does not act as a strong incentive, and the cost of production is high. Furthermore, the market for wheat is not well operated, and problems with credit frustrate production. Despite these problems, as fully described earlier, the sample farmers do produce wheat successfully. They cultivate

it mainly for local consumption as well as for socio-cultural reasons, and to a lesser degree for economical purposes. The majority of farmers consume a large part of their produce, as the scheme for subsidised bread, which has been offered to urban people, is not available to farmers. Therefore, farmers have to cultivate wheat for bread to feed their families. Culturally, farmers prefer to eat their own wheat with its favourable taste, colour, and baking characteristics. Moreover, any attempt to eliminate wheat, or to minimise its share in farm output can be viewed as purposeful negligence with respect to the national objectives and, hence as opposition to the revolutionary government. Trying not to be seen as a 'anti-revolutionary person', each farmer devotes his entire land or part of it to wheat production. Large farmers are more vulnerable to being accused as 'anti-revolutionary persons' if they do not cultivate wheat, due to their general lack of sympathy with the revolutionary government. For this reason, large farmers try to cultivate large parts of their land with wheat. Besides the reasons already given, the size of farm, and the existence of an elastic market for wheat encourages large farmers to devote the main part of their farm to wheat production. Barley is the only crop that can compete with wheat on large farms. However, compared to wheat, barley has a relatively limited market, and its price sharply fluctuates as the price for livestock changes. For this reason, most large farmers prefer to crop wheat on the larger part of their farms rather than barley.

Two strategies to create economic incentives in wheat production have been used by the government: price increase and reduction of production cost. For each of the strategies a number of measures such as direct price increase, offering wheat prizes, applying different forms of subsidy, etc., have been employed. However, apparently the efforts, unexpectedly, have been unsuccessful: the price for wheat remains relatively low, and the expenditure stays high.

Low pricing has always resided at the top of the list of farmers' complaints about wheat problems. Farmers complain that wheat production is less profitable compared to other crops: especially cucumbers, tomato, water melon, rice, maize, etc. While it takes only a few months for the latter crops to produce, they carry incomes which are several times more than that of wheat. With regard to cucumber cultivation, for instance, the economic return is so high that farmers pay 60 times more to lease a piece of land to cultivate cucumber than they may pay for wheat. The price determination for wheat is often unrealistic, and does not take the real cost of production into account. The real production cost is very related to and dependent on black market prices rather than on the official price regime. But in determining the wheat price, only the official prices for goods and services are taken into account. The fact that farmers purchase their inputs mainly from the black market, where prices are several times more than the official ones and in turn raise the production cost, is often underestimated by the price committee.

With regard to production cost, farmers complain that the expenditure for wheat production is disastrously high. Their expenditure is highly dependent on the black market, and changes as the black market prices change. The total expenditure for one hectare of wheat production accounts for approximately 75% of the total gross income that farmers gain by selling wheat grains, residues, and by renting out the harvested fields to others for animal grazing (this figure is calculated by including the opportunity cost of rent of land. The opportunity costs as well as the cost of amortisation of farm machinery and buildings are not taken into account). In other words, the total net economic return for one hectare of wheat is 25% of the total gross return. Although the figure seems to be good enough to make it affordable in terms of farmers' living costs, this is not, in fact,

the case, due to the smallness of holdings. As shown in tables 9.5 and 9.8, on average, each sample farmer has 8.7 hectares of land at his disposal, and his wheat yields 4 tons per hectare. At most, if farmers cultivate their entire land with wheat, they acquire a total gross economic return for wheat equivalent to 38.3 tons of grain (including a quantity equivalent to 3.5 tons of grain for a total of 8.7 tons of straw), and a net return approximately 10 tons (considering the 1989-1990 wheat price in the country, up to 1,000,000 Iranian Rials, which is equivalent to 12,830 US dollars, for 10 tons of wheat grain sold to the purchasing boards). Since household goods are partly purchased from the black market, the living cost rises to a level higher than that estimated by the price committee. This means that farmers have to spend more money to meet their household necessities than officially estimated. On average, based on the figure of annual expenditure of rural household (ISC, 1992), the economic return to wheat covers only approximately 3/4 of the farmers' living costs (on average, the 1989-1990 figure for rural household's expenditure is 1,300,000 Iranian Rials, equivalent to US$ 16,660). For this reason, farmers have to cultivate part of their land with crops which are relatively more profitable than wheat and/or to engage in several other farm or off-farm activities to earn more money in order to meet farm expenditures and family living costs.

High production costs for wheat are mainly due to the high cost of inputs and farm services. The total cost of inputs (seed, chemical fertilisers, agro-chemicals), and the total cost of operation of farm machinery each account for 30% of the total production cost. This shows how important it is to keep the expenditure for inputs and machinery down in order to reduce the total cost of wheat production.

With respect to the cost of inputs, the main part of the expenditure is due to the high cost of chemical fertilisers. Farmers spend quite a lot of money for chemical fertilisers. As will be described later, at most, only four 50 kg bags of subsidised chemical fertilisers per hectare of wheat are sold by the MKKDs. Since most farmers apply more chemical fertilisers than recommended, they need more fertiliser than they get from the MKKDs. The excess need should necessarily be purchased from the black market. On average, the prices for Di-ammonium phosphate and Urea fertilisers in the black market are 260% and 336% more than in the MKKDs, respectively. Approximately, 66% of the total need for fertiliser of respondents is purchased from the black market.

Due to a lack of an efficient pricing system, and deficiency in governmental control mechanisms, the price of hiring farm machinery, on average, is 300% of the official prices. Depending on the time and the place of application, and also on the physical conditions of land, the figure increases by up to 500% for the rush periods of the season, in remote areas, and on very rough surfaces. Plots which have been previously cultivated with paddy cost more than those previously cultivated with wheat or barley. The reason is that after the paddy cultivation the soil becomes compacted and relatively difficult for ploughing. Since it takes more time, and the tractor consumes more fuel to plough, and also, according to some tractor drivers, since it wears out the tractor, it costs more to plough a paddy plot than an ordinary one. The cost of preparation of a damp paddy plot is even higher.

For those farmers who own farm machinery, problems of fuel shortage, and unavailability of spare parts frustrate the land preparation and harvest. Fuel and machinery spare parts are not usually adequately available at the official outlets. Farmers have to mainly purchase their necessities on the black market. As usual, the prices on the black market are much higher compared to the official ones. On average, sample farmers

purchase 45% of the needed fuel and 70% of machinery spare parts from the black market. The price of fuel on the black market is two fold the official price, and of spare parts seven times higher than the official ones. In some cases where the spare parts are scarce, the prices go up to nearly thirty times the official ones. As a consequence, the production cost for farmers increases.

The marketing of wheat is hampered by inadequate and inaccessible purchasing centres, late pay-back, and high incidence of unclean grain. Farmers often have to travel quite a long distance to take their products from the farms to purchasing centres. Although farmers are provided with a subsidy for the delivery of their wheat, they have to pay relatively high delivery charges due to sharp increases in delivery fees. On average, the respondents have paid 155% more than they received as delivery subsidy. This increases the total cost of production even further.

With respect to pay-back, the rural cooperative union, which acts as an intermediary organisation between the cereal organisation and farmers, pays the bills very late. In some cases farmers have to wait months before they receive the money. This creates problems for most farmers who urgently need cash to meet their living and farm necessities.

Another important problem expressed by the sample farmers is the high incidence of unclean grain in the purchasing centres. The main reason, as expressed by the control agents, is the high percentage of weeds and other impurities accompanying the grain. Farmers complain that the present grain rating system is unfair and a form of exploitation. They claim that the purchasing centres charge much higher than they should. The rural cooperative union claims that since the cereal organisation is the final collector of the grain and the one which re-checks the cleanness of the grain, it is uncertain as to what rate of uncleanness would be ultimately applied to the whole stock. In order to protect the union's interest it anticipates higher than the actual incidence of unclean grain in any one farmer's stock. At a later stage, the final rate is estimated, and the farmers receive their adjusted claims. This procedure takes time to process. However, farmers do not like to wait a long time for this formality.

The responsibility for short term loans lies with the rural cooperative organisation which acts as an intermediary between the agricultural bank and farmers. Each member of the rural cooperatives is provided with a special one-year credit. This is a non-supervised loan granted for cultivation of annual crops. Approximately 31% of respondents use the credit. The maximum amount that each farmer can receive is slightly more than the actual total cost for production of one hectare of wheat (25% more). It means, on average, that each farmer can use the loan to pay only the cost of 1.25 hectare of wheat, if the maximum loan is granted. However, since the size of the granted credit depends upon the amount of shares that farmers have in the rural cooperatives, some farmers receive much less than the maximum. The amount is, in any case, negligible compared to the amount of cash each farmer needs for wheat cultivation. This is why the majority of farmers prefer not to apply for the credit. By rejecting credit, farmers save their time since they do not have to follow a time consuming credit formality.

Long and medium term supervised loans are also granted by the agricultural bank and by commercial banks as well. Only 13% of sample farmers use these types of loans, mainly for purchasing farm machinery. The procedure for receiving these loans is, however, a time consuming process, and demands a great deal of time to finalise. Moreover, farmers have to refer to the main branch of the bank in the district's centre in order to apply for the loan. Travelling to the district's centre, however, requires time and

money. Besides, farmers are required to provide a collateral for large sums. The most acceptable collateral that people can use is the official purchasing document of the farm lands or the registration document of houses. However, many farmers fail to provide collateral. Some farmers have purchased their farm lands unofficially with no formal documents. And in contrast to the urban areas where houses are officially registered, farmers' houses mainly are built on their farms with no registration document. For small sums, farmers are obliged to provide guarantors, who have accompany the farmers to the district centre, adding to the farmers' difficulty. This is why only few farmers have used these kind of loans.

## 3. Adoption of the technology package by the district's farmers

In the following part of the paper, the way farmers have reacted with respect to adoption of the technology package will be introduced. Firstly, the present situation of use of high yielding wheat varieties in general as well as chemical fertilisers, and the latest variety introduced to the district's farmers (qods variety) in particular will be presented. It will be followed by a section on the situation of associated inputs and recommendations. As will be shown, a wide variety of reasons for not adopting the qods variety and its associated recommendations is expressed by the respondents. This shows the diversity of farmers' circumstances. It also indicates the extent to which the claims and benefits of the new variety and its associated inputs and recommendation are carefully examined by the farmers. If farmers find a technology that solves their problems, and socio-culturally and economically is beneficial to them, and also fits into their farms' conditions, they adopt it. Otherwise, they either reject it or, depending on the extent to which the technology is changeable to fit into their conditions, make some adaptation to the technology in order to adapt it to their own problematic circumstances.

**Table 9.9. Distribution by type of seed of sample farmers (N=106).**

| seeds | no. of farmers | % | cum. % |
|---|---|---|---|
| local varieties: | | | |
| jovenjani | 2 | 1.9 | 1.9 |
| reza khani | 1 | 0.9 | 2.8 |
| kal heidari | 1 | 0.9 | 3.8 |
| hoshvar | 1 | 0.9 | 4.7 |
| improved varieties: (only one variety used) | | | |
| qods | 6 | 5.7 | 10.4 |
| azadi | 40 | 37.7 | 48.1 |
| rowshan | 24 | 22.6 | 70.8 |
| omid | 2 | 1.9 | 72.6 |
| bayat | 2 | 1.9 | 74.5 |
| adl | 11 | 10.4 | 84.9 |
| improved varieties: (more than one variety) | 13 | 12.3 | 97.2 |
| both improved variety and local seed: | 3 | 2.8 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

### 3.1. Use of improved varieties and chemical fertilisers

Six different improved varieties and three different types of local seeds were found to have been applied by sample farmers. The improved varieties are qods, azadi, rowshan, omid, bayat, and adl. The local seeds are jovenjani, reza khani, and kal heidari. In addition to these local seeds, application of a mix of all local seeds (hoshvar) was also found amongst sample farmers. The distribution of the types of seeds of sample farmers is given in table 9.9. Approximately 5% of respondents have only applied local seeds, while 3% used both improved varieties and local seeds. The majority of respondents (95%) sowed their lands with improved varieties.

Use of chemical fertiliser is a popular practice amongst the district's farmers. Almost all sample farmers (99%) have applied chemical fertiliser to their crop. Not only the users of improved seeds but also the farmers with local seeds are found using chemical fertilisers.

From the point of view of knowledge on the application of improved seeds, most respondents lack the relevant information. Ninety three percent of respondents lack information on the seed application rate, 60% on the time of application, and 60% on the economical farm yield of the applied seeds. Regarding the knowledge about the characteristics of the seeds with respect to resistance to diseases, only 14% of respondents are knowledgable, while 66% lack any information and 20% know a little.

With respect to information on chemical fertilisers, all respondents know something about the different types of the chemical, their use, time of application, and their effects. Farmers can distinguish also among fertilisers by their colour and the shape of granules. Eighty seven percent of respondents lack information on the recommended application rate. When they were asked whether or not they knew what negative effects the excessive use of fertiliser would cause to their soil, 66% acknowledged soil problems.

### 3.2. Adoption of qods variety

The level of adoption of each improved variety differs greatly among the respondents. Despite widespread problems in the past with yellow rust, azadi variety is the dominant improved variety, followed by rowshan. As table 9.10 shows, approximately 54% of users of improved varieties have adopted azadi, 25% rowshan, and 19% adl varieties. The least adopted improved varieties are omid and bayat with only 2% adoption. The low adoption of these two varieties is due to the specific characteristics of the varieties which restrict wide adoption. Omid is a variety recommended for very cold climates in the district and bayat for the very warm areas. Since these two varieties are used in extreme conditions, the low adoption of the varieties by the sample farmers is justified. Qods, the latest variety which has been introduced into the area since 1988 to replace azadi, is only adopted by 13% of the respondents, although 63% of the respondents know the qods variety and its different characteristics, especially its high yields. Despite the large economic loss farmers experienced in 1985 due to contamination of azadi by yellow rust, they still prefer to use azadi variety rather than qods, its recommended substitution. Qods is a relatively new variety which, at the time of the survey (1990-1991), was cultivated for the second year by approximately 30% of its users and for the first year by the other 70%. Although wide-spread adoption is partly a question of time, the qods variety so far has impressively failed to be adopted. It had been expected that the variety would be adopted very rapidly by the majority of the district's farmers who had experienced the epidemic of yellow rust in azadi plots in 1985. And the qods variety has been promoted by the TATG programme as superior in term of its resistance to yellow rust and its higher yield compared to other varieties. Because of its importance, qods variety has been purposefully selected in this study for further analysis.

**Table 9.10. Distribution of improved varieties of sample farmers (N=101).**

| variety | no. of farmers | % |
|---|---|---|
| azadi | 54 | 53.5 |
| rowshan | 25 | 24.8 |
| adl | 19 | 18.8 |
| qods | 13 | 12.9 |
| omid | 2 | 2 |
| bayat | 2 | 2 |

Note: since some farmers have used more than one variety, the number of farmers and the percentage values exceed to the total of 101 farmers and the total of 100% .
Source: author's survey.

### 3.3. Seed application: quantity

The rate of application of improved seeds, recommended on the basis of research, is seen as a precondition for obtaining the best result. It is said that excessive application of seed makes the crop too intensive and the plants start to compete with each other for nutrition. This makes a bad crop which cannot bear the expected yield. However, most farmers use more seed than recommended. The majority of respondents (94%) have exceeded research recommendation for seed application by up to 186% (table 9.11). Whereas, the research recommendation for applying different improved varieties range from 130 to 195 kg per hectare, farmers' application varies from 100 to 400 kg. On average, the respondents have applied approximately 240 kg of seed which is 55% more than the average recommended quantity. The respondents who have applied less than the recommendation and those who sowed the quantity as recommended, account for 3% each. Further study shows that the figure for the users of local seeds is slightly smaller (234 kg on average).

**Table 9.11. Rate of seed application of users of improved varieties (N=101).**

| rate of application relative to the research recommendation (RR) | no. of farmers | % | cum. % |
|---|---|---|---|
| less than the RR | 3 | 3.0 | 3.0 |
| equal to the RR | 3 | 3.0 | 6.0 |
| exceeds by 50% | 34 | 33.6 | 39.6 |
| exceeds by 51% to 100% | 57 | 56.4 | 96.0 |
| exceeds by 101% to 150% | 3 | 3.0 | 99.0 |
| exceeds by 151% to 186% | 1 | 1.0 | 100.0 |
| total | 101 | 100.0 | |

Source: author's survey.

**Table 9.12. Rate of application of chemical fertiliser of sample farmers.**

| rate of application relative to the research recommendation (RR) | Urea (N=100) no. of farmers | % | cum. % | DAP (N=101) no. of farmers | % | cum. % |
|---|---|---|---|---|---|---|
| less than the RR | 23 | 23.0 | 23.0 | 4 | 4.0 | 4.0 |
| equal to the RR | 27 | 27.0 | 50.0 | 1 | 1.0 | 5.0 |
| exceeds by 50% | 28 | 28.0 | 78.0 | 16 | 15.8 | 20.8 |
| exceeds by 51% to 100% | 7 | 7.0 | 85.0 | 37 | 36.6 | 57.4 |
| exceeds by 101% to 150% | 8 | 8.0 | 93.0 | 19 | 18.8 | 76.2 |
| exceeds by 151% to 200% | 7 | 7.0 | 100.0 | 12 | 11.9 | 88.1 |
| exceeds by 201% to 250% | – | – | – | 5 | 5.0 | 93.1 |
| exceeds by 250% and larger | – | – | – | 7 | 6.9 | 100.0 |
| total | 100 | 100.0 | | 101 | 100.0 | |

Note: figures are rounded to the nearest value.
Source: author's survey.

### 3.4. Fertiliser application: quantity

The application quantity of chemical fertilisers varies a great deal. The total quantity applied ranges from 0 to 800 kg per hectare wheat. According to the research (Mahluji *et al.*, 1984), the recommended quantity of Urea fertiliser range from 110 to 275 kg per hectare of wheat and for Di-ammonium phosphate (DAP) from 100 to 190 kg, depending on the seed variety, and the quality of the soil. On average, the recommended figure for total fertiliser per hectare is 277 kg, but, on average, farmers have applied 454

kg of both DAP and Urea fertilisers per hectare of wheat. As table 9.12 shows, approximately 95% of respondents have applied more DAP than the recommended quantity. The figure is 50% for Urea fertiliser.

### 3.5. Seed treatment against fungi

The majority of sample farmers (93%) treat their seeds against different fungi, especially the black fungi. Seed treatment is not confined to improved seeds. The users of local seeds are also found treating their seeds. The adoption of the recommendation amongst both the users of improved seeds and of local seeds is high, 94% and 80% respectively. This adoption of fungicide was mainly due to the benefit the seed treatment has given to the farmers. The past history of the district's wheat production is marked by big economic losses due to contamination of the wheat crop by the black fungi. The contaminated area was estimated, on average, to be 40% of the total area cropped with wheat two decades ago, when the district experienced a wide-spread fungi problem. Learning from the past, farmers use fungicides to avoid big losses.

The other reason for wide adoption of seed treatment is the relative availability of subsidised fungicides in the MKKDs at the right moment. Approximately 91% of respondents have purchased fungicides from local MKKDs and the rest from the black market. Approximately 80% of them have received the chemical on time.

From the information point of view, farmers are relatively knowledgable. Approximately 96% of farmers know about the benefits of seed treatment. When farmers were asked whether they knew the recommended fungicide, 2/3 of respondents responded positively. The majority of them knew it by name, while the rest by colour of the chemical. The recommended quantity of the chemical is not known to all farmers, but to 64%. Around 80% of the respondents have knowledge about the hazards from the chemical and the various precautions they have to consider.

One interesting thing about the reaction of the farmers toward the use of poisonous chemicals is that not all those who know the hazards of the chemical to the human's health take serious precaution. Eighty seven percent of those who know the hazards follow the instructions to prevent poisoning, but the rest are careless. When asked for the reason for being careless they responded that death is with God. If he wants people to survive they will, otherwise they die.

### 3.6. Chemical weed control

Chemical weed control by those who use improved seeds (N=101) constitutes one but not the most widely employed method of weed control. Approximately 34% of the respondents have used chemical weed control, 28% did nothing, and the rest exercised various other types of weed control. A full description of different ways of controlling weeds is given in chapter 7. The most attractive attributes of the chemical weed control expressed by research are its fast effect, appropriateness for plots which are not, for any reason, subject to fallow, and gentle effect on soil's micro-organisms. Due to the benefits that chemical weed control bears for farmers, the approach is recommended by the extensionists to all farmers, even if they use local seeds. It was expected that the approach would be rapidly adopted by the district's farmers due to the problem of lack of enough land to leave fallow. However, due to several problems that will be discussed

later on, the recommendation has been adopted only by a relatively small numbers of farmers.

In order to examine the recommendation with respect to relevance and availability to all farmers, including users of local seeds, the analysis includes all 106 sample farmers. The pattern of adoption of chemical weed control by sample farmers (including the users of local seeds) is similar to that of the users of improved seeds. According to table 9.13, chemical weed control accounts for approximately 32% of practices, whilst non-chemical (traditional approaches) account for altogether 39%. In total, approximately 71% of respondents have attended to weed control by different (both modern and traditional) approaches. Moreover, approximately 68% of respondents constitute the non-adopter category for the chemical weed control. About 18% of the non-adopters have previous experience with the chemical weed control. They had used herbicide for some years and due to different reasons stopped the practice. These reasons will be discussed later on. Some 29% of the sample farmers have done nothing about weed control.

**Table 9.13. Distribution by type of weed control method of sample farmers (N=106).**

| method | no. of farmers | % | cum. % |
|---|---|---|---|
| non-chemical | 41 | 38.7 | 38.7 |
| chemical | 34 | 32.1 | 70.8 |
| no control | 31 | 29.2 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

In the order of importance, the different weed control measures employed by sample farmers include (1) excessive seed application, (2) use of herbicides, (3) burning crop residues, (4) leaving the land fallow, and (5) hand weeding. Application of each of these five different ways of weed control amongst sample farmers is tabulated in table 9.14. As illustrated, some respondents have used more than one approach. In some cases, both traditional and modern ways are employed together to intensify the effect of control.

**Table 9.14. Different methods of weed control employed by sample farmers (N=75).**

| method | no. of farmers | % |
|---|---|---|
| excessive seed application | 55 | 73.2 |
| chemical control | 34 | 45.3 |
| putting fire to crop residues | 7 | 9.3 |
| fallow | 4 | 5.3 |
| hand weeding | 2 | 2.3 |

Note: due to multiple answers by the same farmers, the number of farmers and the percentage values exceed to the total of 75 farmers and the total of 100%.
Source: author's survey.

As shown in table 9.14, excessive seed application is the dominant way to control weeds. It is followed by use of herbicides, the second most frequent approach. These two approaches are employed by 73% and 45% of the applicants respectively. The least frequent way of control is hand weeding (2%). Due to its high cost, hand weeding is less frequent and applicable only on very small plots. Fallow is not widely employed due to socio-economical reasons. Only 5% of respondents use this way of weed control. Burning crop residues, used by 9% of respondents, is discouraged by extensionists as a faulty practice which damages soil quality by destroying micro-organisms. It is relatively more employed than fallow and hand weeding, but less frequent compared to the use of herbicide and excessive use of seed. Mechanical weed control, however, is not found amongst sample

farmers. One reason might be that the machinery is not widely available. Mechanical control is usually practised on large farms and on state and research farms. Besides, the Ministry of Agriculture puts more emphasis on chemical weed control than on any other means.

With respect to the availability of information on chemical weed control, farmers were exposed to a series of questions in order to reveal the extent to which they are knowledgable on the matter. The majority of farmers are knowledgable on the characteristics and benefits of chemical weed control, use of sprayers and precautions to be taken in the application of the chemical. As shown in table 9.15, the farmers' knowledge on the characteristics of the recommended herbicide is relatively low.

**Table 9.15. Sample farmers' knowledge of chemical weed control (N=100).**

| knowledge | no. of farmers | % |
|---|---|---|
| characteristics of chemical weed control | 94 | 94 |
| characteristics of recommended herbicide | 31 | 31 |
| recommended quantity | 39 | 39 |
| time of spraying | 39 | 39 |
| use of sprayer | 86 | 86 |
| precautions | 85 | 85 |

Note: due to multiple responses by the same farmers, the number of farmers and the percentage values exceed to the total of 100 farmers and the total of 100%.
Source: author's survey.

### 3.7. Proper land preparation

In order to get the best results from using improved seeds, proper land preparation is emphasised by the research. Due to its importance for efficient use of resources and inputs, the recommendation is even emphasised for the users of local seeds. No matter what type of seeds farmers use, and whether or not they apply chemicals for weed and fungi control, all farmers are strongly recommended to properly prepare their lands. Proper land preparation could lead farmers to efficiently use their land, water, save labour and money, and get the most benefit from using improved seeds. However, due to several interwoven problems which create constraints to proper land preparation, farmers fail to do exactly as is recommended. The most problematic case is with furrow irrigation, which requires the land to be relatively flat and clean of stones.

The recommended operations for land preparation include (1) basic land grading, (2) pre-plough watering for making the soil soft enough for ploughing, and eliminating weeds by stimulating them to germinate before ploughing, (3) a sufficient number of ploughings (depending on the condition of the soil, the recommendation exceeds two times of ploughing each about 30 centimetre deep), (4) two or three times application of the harrow disk, (5) use of a land leveller, (6) application of a furrower (7) mechanisation of seeding and fertiliser spreading, and (8) use of irrigation siphon tubes. Although all these operations are recommended by the Wheat Impact Programme (TATG), relatively more emphasis is given to the use of a furrower. Use of plough, harrow disk, land leveller, and seed and fertiliser spreading machines are, according to extensionists, relatively popular and they need no particular emphasis. Due to the problem of water shortage for some farmers, the pre-plough watering is recommended only for those with

enough water. Use of irrigation siphon tubes is relatively less emphasised, because its use depends on the proper preparation of land, especially on the use of a furrower.

Due to water shortage, pre-ploughing irrigation is only employed by 13% of sample farmers. For the rest, the usual way to start land preparation is to plough. Tractor driven plough and harrow disk are the most popular farm implements used by the district's farmers. These two operations are employed by 100% and 97% of respondents, respectively. The quantity and quality of operations are, however, discussable. Although approximately 90% of sample farmers have knowledge of depth, number of applications, and directions of ploughing, and 93% on the use of the harrow disk, they do not produce quality work. The reasons for this are explored later.

Land levelling is relatively less common in the area. It is applied only by 58% of sample farmers. The use of a furrower in land preparation is a relatively new operation to the majority of the district's farmers. Although the operation had been employed by large farmers, farm corporations, research experimental farms, and by agri-businesses before the revolution, the operation was not introduced to the rest of farmers until recently. The use of a furrower, as a useful preparation operation, is now highly emphasised by the TATG programme. The programme encourages farmers to change their irrigation system from a traditional (qarqabi) to a modern (furrow) irrigation. Since the traditional irrigation is inefficient and wastes scarce resources especially water, the programme tries to introduce a new approach which lets farmers use the resources more efficiently. The programme stimulates farmers to adopt the new way of irrigation using the subsidised chemical fertiliser as incentive. Each farmer whose land is prepared according to the programme's recommendation can purchase four 50 Kg bags of subsidised fertiliser from the local MKKD for wheat production. The quantity is reduced to half that amount for non-adopters. The ultimate objective of the programme in land preparation is to lead farmers to sow their lands by using seed drilling machines and to irrigate by use of siphon tubes. Lacking sufficient seed drilling machines and siphon tubes, the programme advises farmers to furrow their land, sow and apply chemical fertiliser by using a centrifugal broadcaster and irrigate the furrows without siphon tubes.

Although 54% of sample farmers have employed a furrower, not all of them irrigated as recommended. According to table 9.16, Only 6% did so, while 56% continued to use their own traditional irrigation, and the rest employed a variety of different approaches which could be interpreted as different combinations of traditional and modern. In these mixed approaches, farmers have in fact tried to adapt the furrow irrigation to suit their own situations.

**Table 9.16. Distribution by type of irrigation of sample farmers (N=106).**

| irrigation type | no. of farmers | % | cum. % |
|---|---|---|---|
| traditional (qarqabi) | 59 | 55.7 | 55.7 |
| modern (furrow irrigation) | 6 | 5.6 | 61.3 |
| combination of modern & traditional | 41 | 38.7 | 100.0 |
| total | 106 | 100.0 | |

Source: author's survey.

As was described in chapter 7, the traditional irrigation method is to totally submerge the plot in water. Due to the bad gradient of the farm lands, the irrigated water runs down the land very fast and washes away soil and seeds. In order to overcome this problem, farmers traditionally divide the land into small parcels and put earth boundaries around each parcel to let the water flow gently during irrigation. Each small parcel is called kart. In the cases where

furrow irrigation was partially adopted, farmers continue to make earth boundaries around each parcel of land, or at least in some parts. The diversity of combinations of traditional and modern irrigation is due to the variety of ways of placing the earth barriers on the plot. The TATG programme's recommendation is to eliminate earth boundaries. Eliminating them creates problems for the farmers with badly graded land.

The traditional way of sowing and fertiliser application is manual. The mechanisation of seed and fertiliser application calls for drilling seed and fertilisers in rows to allow irrigation by furrow irrigation. However, due to lack of seed drilling machines, 59% of sample farmers use centrifugal broadcasters for both seed and chemical fertilisers and the rest still sow their lands and apply chemical fertilisers manually.

From the knowledge point of view, the majority of farmers are knowledgable about the recommendations on ploughing and on disk and leveller operations. The respondents for these operations account for 90%, 93%, and 79%, respectively. The knowledge of sample farmers about other operations is relatively low. The least knowledge is found on the characteristics of the furrower and the furrow irrigation system which accounts for 6%.

## 4. Farmers' assessments of the technology package

Reviewing the pattern of adoption of the technology package, we could categorise the technology and its related recommendations and techniques into two broad groups: (1) those adopted by the majority of farmers and (2), those adopted by only a limited number. Use of improved varieties in general, seed treatment against fungi, and use of chemical fertilisers, where adopters constitute 95%, 93%, and 99% of sample farmers respectively, fall into the first group. Among the land preparation practices, ploughing and application of harrow disk, adopted by respectively 100% and 97% respondents, also fall into this category. The rest, including qods variety, fall into the second. The question here is why the improved seeds (in general) and a few related recommendations and techniques are widely adopted by the majority of farmers, while qods variety and the majority of recommendations and techniques are not. The questions can be answered by looking at the technology package from the point of view of the farmers.

### 4.1. Improved varieties

High yield is the most attractive characteristic of the improved varieties, which gives them their advantage. Farmers have found that improved varieties yield much more than local seeds. On average, the improved varieties yield 4.2 tons per hectare for the respondents compared to 2.7 tons per hectare from local seeds. Due to the productivity of improved seeds, farmers enthusiastically try to use them and to provide the necessary inputs. For this reason, as will be discussed later on in this chapter, farmers purchase very expensive chemical fertilisers, for instance, from the black market, to meet the requirements of the improved seeds they use.

With respect to the minority of the respondents who have used local seeds (5%), cultural factors (taste, colour, ease of baking, etc.) constitute the main reason for preferring the local seeds over the improved ones. Farmers like to use their own local seeds because the seeds produce favourable bread. Other reasons include unavailability of improved seed at the time of application, lack of conditions for application of the improved seeds such as flat surface, good soil quality, etc., and lack of time to refer to

MKKD to buy the seed. Although the improved seeds could be purchased from local farmers, most farmers prefer to buy the original seeds from MKKDs for reasons which will be explained later on.

### 4.2. Relevance and availability of qods variety

Several constraints seem to be halting the adoption of the qods variety and the associated recommendations. The first and most important problem with the new variety is its vulnerability to yellow rust. The variety, as mentioned earlier, was introduced into the area as a substitution for azadi variety, which itself has shown sensitivity to yellow rust. However, qods variety has been unexpectedly affected by the disease since its introduction. This problem has been reported from different parts of the district, especially in those parts which are irrigated by the dorudzan irrigation network, where the humidity is relatively high. As farmers found the problem with the variety, most of them preferred to stick to their old varieties for the reasons explained.

Secondly, the variety demands relatively too much water since it shows vulnerability to drought. According to research, the variety needs to be irrigated at least five times. For the best results, seven times irrigation is recommended. For this reason, the district's farmers, who are usually limited by the availability of irrigation water, prefer to use varieties resistant to water shortage. The district has, as mentioned in chapter 5, the characteristics of a semi-arid climate with 320 millimetres of annual precipitation. For this reason water shortage is a common problem all over the district except in areas under the modern irrigation network and adjacent to rivers. Another problem which adds to the problem of water shortage is the high water waste. Although the amount of available water is very limited and should be utilised conservatively, the waste of water in the district's farms is high. Water is mainly wasted in long helical, earth, and low quality traditional ditches, which conduct water from the main sources to farms, and also in farms due to bad water management by farmers. The main traditional ditches are in some, not uncommon, cases as long as 5 kilometres in length. In recent years the government has implemented a country-wide project to help farmers to re-construct their traditional ditches and to cement them. The financial source for the project is the agricultural bank which provides a special credit with low administration cost for farmers. Since the re-construction of the village irrigation ditches is a communal activity the project requires farmers to apply communally for the credit. However, there are considerable social problems which create constraints to the project. Some villages share a single water source and there is a need for the cooperation of farmers from all the villages. In some cases where there are disputes over the water rights, the job becomes especially difficult.

In areas irrigated by the dorudzan irrigation network the problem appears to be somewhat different. In these areas, since farmers have no control over their water sources the water is not available at the time it is required. The procedure for receiving water from the irrigation network is for the farmers to communally apply to the district water department (the WD) and pay in advance. All farmers from a village who have a traditional water right have to apply communally and pay their share. Unless the WD receives sufficient application the water will not be released into the irrigation channels. The problem here is that some farmers do not cooperate with the group to apply on time. Some farmers wait quite a long time before they apply to the WD, hoping for rainfall before doing so. If sufficient rain falls, the first watering is done, and there is no need for

supplementary water from the irrigation channels at this stage. In this way they save labour and money. If the rain is very late, then farmers get worried and rush to the WD to ask for water. The problem here is that farmers who wish to irrigate their plots on time have to wait until sufficient applications reach the WD to receive their water. A serious problem is caused if insufficient rain falls before farmers can irrigate their plots. Inadequate rain provides enough moisture only for seeds to germinate. Germinated seeds are ruined by insufficient soil moisture if irrigation occurs very late. Due to the lack of control over their water sources farmers prefer to use varieties which are less vulnerable to drought.

A third reason, which is also related to water, is that farmers in areas under the irrigation network do not devote enough water to the wheat crop. Although one would expect that the farmers who receive water from the irrigation network might have no water shortage, one can see that the wheat crops in the area suffer from insufficient water. Due to the irrigation network, farmers in the area prefer to cultivate paddy on parts of their land. Paddy is a profitable cash crop which generates income for the farmers several times more than wheat. Although regulation by the WD in theory limits the size of each farmer's paddy plot to 0.4 hectare, due to inadequate control by the WD, farmers exceed the limit and cultivate several times more than they are allowed, thus when the wheat plant is in its final stage of growth (at the time when it needs enough water to produce grain) it is faced with a water shortage. In April, when farmers start to prepare their nursery for the paddy crop, they cut the final irrigation for the wheat crop and devote it to the paddy nursery. For this reason, farmers who cultivate paddy reject wheat varieties which demand water in competition with paddy.

Fourthly, qods variety produces short stem plants, which leaves farmers with a relatively small amount of straw. Most farmers economically rely on the amount of straw they produce. Farmers usually keep a few livestock for local consumption. They either keep the straw for local use to feed their livestock or sell it at the market to earn some money. For this particular reason, although azadi variety is sensitive to wind layering (vers), farmers prefer to sow their lands with this variety which produces more straw than qods.

Fifthly, the food preference of farmers is in favour of other varieties than qods. Farmers utilise their own product locally and prefer to use a variety which gives them the best taste, colour, and baking quality. A good bread to the majority of farmers is one which is white, easy baking, soft and tasty according to their own standards. The bread made by qods variety is not as tasty for farmers as azadi or adl, for instance. Also, the variety produces a type of bread which is red in colour and relatively hard to eat, with a lower baking quality than those of the other varieties.

Unavailability of seed constitutes the sixth reason. Farmers have to apply several times to the agricultural service centres (MKKDs) in order to purchase the seed variety. The seed typically is not available at the right time and not in enough quantity. Due to its relatively short presence in the district, other sources of qods seed are limited. In contrast, the other improved varieties are relatively abundant and can be purchased either from MKKDs or from the other farmers who have previously grown the varieties. Farmers often prefer to purchase seed from MKKDs, from the point of view of cleanliness, germination, and assurance that the original characteristics of the seeds are retained.

Due to lack of sufficient seed sifting machines, farmers are advised to sift their seeds manually by using a sieve. However, most farmers who purchase seed outside the

MKKDs, lacking enough time and money to afford the practice, sow their seeds without sifting. In this way many broken seeds and weeds are sown together with the seed. Relatively low germination is due to improper storage practices. Often seeds are left on the ground of the store for a long time in unfavourable conditions before sowing. Seeds also lack their original characteristics due to use of seeds retained over successive harvests. Due to unavailability of seed from the MKKDs, farmers use the improved varieties beyond the recommended period. However, some farmers have complained that the seeds purchased from the MKKDs are also accompanied by weeds, and has unexpectedly low germination power.

From the point of view of physical accessibility of the seed and associated inputs, farmers are also experiencing great problems. Most farmers have to travel a long distance to purchase their seeds. Forty percent of sample farmers have to travel between 5 to 35 kilometres to reach the local MKKD. On average, MKKDs are located at a distance of 11 kilometres to the villages in which the sample farmers live. Approximately 1/3 of the respondents' villages are situated in remote areas with the distances more than the average. Concerning the distances between the villages and the district's centre, where the black market commodities can be found, farmers are experiencing even greater problems. A range from 12 to 85 kilometres distance between the place of residence of sample farmers and the district's centre shows the extent to which farmers suffer from this particular problem. On average, the respondents have to travel 40 kilometres to the district's centre to buy their necessities.

## 4.3. Appropriateness of recommendation on seed quantity

The reasons farmers give to explain the excessive use of seed is tabulated in table 9.17. As illustrated, there are more than 15 different reasons expressed by farmers to explain the high rate of seed application. The wide variety of reasons expressed by respondents show the diversity of farmers' circumstances. Amongst the reasons, weed control, expressed by approximately 53% of respondents, is the main reason for excessive use of seed. Compensation for seed or crop loss due to various factors and discarding unwanted seeds are the other important reasons for high seed application rates. In the following paragraphs these reasons are explained.

### *4.3.1. Excessive use of seed for weed control*

As shown in table 9.17, weed control is the main reason for the excessive seed application rates expressed by more than half of the respondents. It is a traditional way to crop intensively in order to kill the competitor weeds. This method of weed control, together with burning crop residues, according to farmers is the best way of controlling weeds. They have found this practice more convenient, effective, and cheaper (in terms of cost of labour and sprayer machine, time, ease of handling, etc.) than to apply herbicides. Burning crop residues eliminates the weeds, and when followed by high levels of seed application, helps the wheat plants dominate weeds introduced into the field by different means. Some farmers are found applying herbicides in addition to a traditional method of weed control. For these farmers, excessive use of seed is the main control option and the chemical is used as the complementary method in order to eliminate any surviving weeds.

Table 9.17. Reasons for excessive use of seeds as expressed by sample farmers (N=95).

| reasons | number of farmers | % |
|---|---|---|
| -as a mean for weed control | 50 | 52.6 |
| -to discard other seeds left in soil | 7 | 7.4 |
| -compensation for loss of crop or seeds due to: | | |
| -various pests | 26 | 27.4 |
| -ice hazard | 20 | 21.1 |
| -little and irregular rain after sowing | 18 | 18.9 |
| -broken seeds | 14 | 14.7 |
| -problem of big chunks of earth on the land surface | 14 | 14.7 |
| -insufficient and irregular irrigation water | 13 | 13.7 |
| -salinity problem | 9 | 9.5 |
| -problem of stones | 8 | 8.4 |
| -too much rain which makes swamps | 8 | 8.4 |
| -grain loss due to thin crop | 4 | 4.2 |
| -low ability for germination | 3 | 3.2 |
| -problem of seed dislocation in inclined surfaces | 2 | 2.1 |
| -other reasons including cheap seed | 6 | 6.3 |

Note: due to multiple answers by the same farmers, the number of farmers and the percentage values exceed to the total of 95 farmers and the total of 100%.
Source: author's survey.

### *4.3.2. Excessive use of seed for discarding unwanted seeds*

Unwanted seeds which are left in the soil from the previous crop create problems for the wheat. Since unsifted wheat grains are subject to sanction in purchasing centres, any unwanted seeds lowers the income for farmers by increasing the sanction. This case is frequent in all parts of the district especially in areas where paddy is cultivated prior to wheat. Since most farmers have limited land at their disposal, and the practice of fallow is not practical for economic reasons, they cultivate wheat immediately after they harvest the previous crop. For this reason, many seeds from the previous crop are left in the soil which at a later stage compete with the wheat plants. In order to eliminate the unwanted seeds, farmers do the same thing as they usually employ for weed control. They sow intensively to make the wheat plants dominant to the competitor seeds. This way of control is employed by approximately 7% of the respondents.

### *4.3.3. Excessive use of seed for compensation for seed or crop loss*

Two types of losses occur: loss of seeds and loss of crop. The loss of seed is mainly caused by birds, ants, etc. The Sunn pest is the main cause of the crop loss. The other causes of the crop or seed losses are ice hazard, little and irregular rain after sowing, insufficient and irregular irrigation, broken seeds, big chunks of earth, salinity, stones, excessive rain, grain loss due to thin crop, low germination, dislocation of seeds, and miscellaneous reasons.

The traditional way of sowing, as discussed in chapter 7, is manual. Due to lack of seed drillers the only available seeding machine for those who do not want to sow

manually is the centrifugal fertiliser broadcaster (spinning), which is also used for seed. After sowing, a harrow disk supposedly covers the seeds with a layer of earth. However, due to improper seeding some seeds remain on the surface and are picked up by birds, ants, and others.

The Sunn pest damages the crop each year. Although spraying is intensive, the crop loss due to this particular pest is noticeable. Excess seed application is considered by farmers as a way to compensate for these two types of losses. This practice was used by approximately 27% of respondents.

The problem of ice hazard, which is stated by approximately 21% of respondents as the reason for excess seed application, mainly occurs in areas under the dorudzan irrigation network. As discussed earlier, due to late water release by the WD , farmers irrigate their plots late in autumn. In unusual cold nights, when the temperature point reaches below freezing, late irrigation causes seeds to freeze and spoil. Farmers apply more seed than recommended whenever cultivation is late and the possibility of frost is high.

Inadequate and irregular rain can cause other problems for those farmers who experience water shortage. The seeds are ruined if they do not get enough moisture to survive. Where farmers have no control over their water sources, or the water is too scarce the germinated seeds die because of inadequate moisture. For this particular reason, which is expressed by approximately 19% of the respondents, farmers use more seeds than recommended.

Farmers also try to compensate for crop failure due to broken seeds, which cannot germinate and are mixed with the good ones. Compensation for this reason is practised amongst approximately 15% of respondents. Good seeds purchased from local farmers are often accompanied by broken seeds. The main reason for broken seeds is the malfunctioning of combine harvesters. The machines are mostly old and function poorly. Spare parts are very costly and the owners of the machines overuse the old parts. This causes the machine to work improperly and damages the grains. Spare parts for combine harvesters are not often found in the official outlets. On the black market, they are very expensive; in some cases prices are 50 times higher than the official ones. Although the government has recently increased the number of combine harvesters, the problem still exists.

Due to various constraints concerning land preparation, which will be discussed later on in this chapter, many farmers fail to prepare their land properly. For this reason, chunks of earth remain on the surface and act as barriers to the seeds. This is most problematic in areas where rice is cultivated. The land previously cultivated with paddy is ploughed while it is still wet. This creates huge chunks of earth, which later becomes very hard and difficult to break down by the harrow disk. Seeds germinate under the chunks with no room to grow and die. In order to compensate for this type of seed loss, farmers apply more seed than recommended. Approximately 15% of the respondents attribute the excessive use of seed to this particular reason.

Insufficient and irregular irrigation also causes some seeds or young plants to die because of insufficient moisture. Since most of the district's farmers either have a water shortage problem or have no control over their water sources, they risk a crop failure if they sow according to the research recommendations. By sowing too much seed farmers try to reduce the risk of total crop loss. This particular reason constitutes approximately 14% of the responses.

In most areas under the dorudzan irrigation network, where the water table is high, the drainage problem is serious. The available drainage system, including open and underground drainage, accounts for only 17% of the length of the irrigation channels and 25% of the total planned drainage channels (SMAF, 1989). For this reason, most parts of the area experience a drainage problem. A farm with drainage problems cannot have the same yield as one without. Salinity prevents the seeds from growing in a normal manner, and causes crop failure. Approximately 10% of farmers try to increase the chance of having more surviving plants by applying excess seed.

Approximately 8% of sample farmers cite stones as a cause of crop failure. The seeds hidden under the stones die after germination because the stones act as barriers. Farmers with this kind of problem also apply more seeds than the recommended quantity.

On farms with a rough surface, the excessive accumulation of rain also cause problems for seeds. As will be discussed later on in this chapter, some farmers fail to prepare their land properly. The rough surface cannot distribute the rain evenly. Consequently, rain accumulates in some parts of the land and creates swamps. The excessive moisture causes the seeds to die. The problem is more serious in areas under the dorudzan irrigation network where insufficient drainage do not allow the lands to filter out the accumulated rain. This problem is given by approximately 8% of respondents as the main reason for too high a seed application rate.

Grain loss during harvest is also a reason for excess use of seed, as stated by approximately 4% of respondents. When the crop is too thin in some parts of the field and fat (heavy) in other parts, the combine harvesters fail to work properly and cause some grain loss. Farmers apply more seeds than is recommended to make the crop intensive enough to permit the machines to work properly.

Approximately 3% of respondents attribute too much seed application to the poor ability of seeds to germinate. Farmers have often found seeds purchased from other farmers to be low in fertility, and accordingly failing to germinate. When they cultivate using these seeds, the result is a very bad crop. For this reason, they sow much more than recommended. They say that, if they sow according to the recommendation, they would be faced with a very thin and uneconomical crop.

Steep gradients also create a problem by dislocating seeds. A land with a steep gradient allows the irrigated water to run very fast down the land. The water washes the seeds away and causes a very thin and bad crop. To compensate for this problem, approximately 2% of farmer respondents apply more seed than recommended.

The other reasons for excessive seed application include cheap seed price, and past experience of farmer in getting better crops when they sow intensively, which altogether account for approximately 6% of responses. One factor which clearly shows its dual effects in adoption of the new technique is the price of improved varieties. The price of the original improved varieties offered by MKKDs is 40% higher than the price of the local seeds. Still, the price is easily affordable by some farmers, which encourages them to apply more than recommended amount; however, for other farmers the price is too high, which prevents them from using the MKKD seeds altogether.

In the cases where farmers have applied seeds according to the research recommendation, they have done so not because they wanted to follow the research recommendation but for other reasons, of which the cost of seed is one. Unavailability of sufficient quantities of the original improved seeds of MKKDs and relatively high seed prices are the main reasons. The same thing is true for those who have applied less than the required seed amount.

## 4.4. Appropriateness of recommendation on fertilisers quantity

The research into the reasons why farmers apply more chemical fertilisers than the recommended amount reveals that all respondents (100%) attribute the practice mainly to the lack of essential nutrition in the soil. This deficiency, according to 98% of respondents, is due to the frequent cultivation of the land. The poor soil quality of the new arable lands distributed by the land distribution organisation is the reason for the rest.

Due to limitation of land, the need to meet local consumption needs and for various socio-economical reasons, farmers cultivate their land consecutively for years. Approximately 95% of respondents have no fallow. For local consumption and economic reasons, small farmers are not able to put any land to fallow. The size of holdings is small and the economic return of wheat is not, as discussed earlier, enough to cover family and farm expenses. Farmers have to cultivate their entire land, most of the time with two crops per year, cultivated right after each other. Large farmers, learning from their past experience in the early post-revolutionary era, fear to leave land fallow. Due to the general disorder in the country following the revolution, and because of the exploitative relations between large owners and villagers, which are fully discussed in chapter 6, large farmers have been subjected to land seizure. Any uncultivated piece of land could be forcefully taken by villagers. Although the anarchical and disturbed atmosphere of the early period of the revolution has now calmed down, the apprehensive feelings of large farmers prevent them from exercising fallow. If they decide to put any land to fallow they devote small plots, far from people, and only for a few months until they can cultivate the land with profitable, short period cash crops.

Crop rotation is practised occasionally on a limited scale, depending on the physical condition of the land, and market incentives for production of other crops. The practice is not, however, possible for some farmers due to inadequate land, and the need to cultivate wheat, mainly for local consumption. In areas under the dorudzan irrigation network, the problem is more economic. Farmers in these areas devote pieces of land to paddy crops which are the closest to the irrigation channels. These lands are mainly cultivated consecutively with paddy. If the entire land lies near the irrigation channel, and it is in excess of the limit for paddy cultivation, then the farmer rotates the paddy with wheat or other crops.

Low quality of chemical fertiliser is also mentioned by 9% of farmers as a reason for excessive use of it. These farmers complain that the fertiliser they get from the rural cooperative shops are sometimes deformed into large and very hard particles due to exposure to water. The deformed particles are so hard that farmers have to use hammers in order to break them apart before usage. In this case, farmers have to use more fertiliser than recommended to get the required effect. Rural cooperatives attribute the problem to poor transportation and inadequate storage facilities. Bags of chemical fertiliser are transported to local cooperative shops by vehicles which are not properly equipped against rain. They are also stored in inappropriate warehouses, or even outside without any cover which exposes the sacks to rain. The rural cooperative organisation claims that sometimes the exposure of the chemical fertiliser to moisture occurs between the country of origin and the final destination.

Low application of chemical fertiliser, and application of the recommended quantity are attributed by farmers to various reasons: unavailability of subsidised fertiliser at the time of application, very expensive black market prices, salinity of soil, use of manure,

and use of leguminous crops in crop rotation. Use of manure is not very popular due to the high cost of transportation and labour. It is only applied by 2% of sample farmers.

### 4.5. Relevance and availability of fungicides

The seed treatment recommendation has been adopted by 93% of respondents despite the unavailability of equipment. Almost all farmers (99%) lack the mixing device. Due to this problem, the mixing is usually done manually. Farmers put the seeds on the ground and pour the fungicide on top of the heap and, using a shovel, blend the seeds with the chemical. Lack of mixing devices seems to be of little importance to the farmers since none of the sample farmers complained about this. One reason might be that farmers are used to mixing the seeds manually. Although it is a hazardous way to mix seeds with the chemical and also less efficient, it is a simple method to follow. It can be done anywhere, using simple tools.

The inaccessibility of the MKKDs, from which farmers have to get the subsidised fungicides, is a negative factor in the availability of the chemical.

### 4.6. Relevance and availability of herbicides

Searching for reasons for the low adoption of chemical weed control compared to traditional ways, farmers express various reasons, of which those related to the multi-purpose characteristics of traditional approaches is the most important. Farmers solve several problems at the same time by employing the traditional approaches. Lacking enough time and money, farmers prefer to use approaches which are multi-purpose. One important advantage of excessive seed application, as the most important traditional way of weed control, is its multi-faceted benefits.

Table 9.18. Reasons for not adopting chemical weed control as expressed by sample farmers (N=72).

| reasons | no. of farmers | % |
|---|---|---|
| little or no weed | 29 | 40.3 |
| unavailability of sprayer | 27 | 37.5 |
| high labour cost | 16 | 22.2 |
| time constraint | 5 | 6.9 |
| lack of knowledge on benefits | 3 | 4.2 |
| lack of trust on herbicides | 3 | 4.2 |
| disagreement of partners | 2 | 2.8 |
| crop failure | 2 | 2.8 |
| scattered plots | 2 | 2.8 |
| unavailability of herbicides | 1 | 1.4 |
| small plots | 1 | 1.4 |

Note: due to multiple answers by the same farmers, the number of farmers and the percentage values exceed to the total of 72 farmers and the total of 100%.
Source: author's survey.

Farmers attribute the low adoption of herbicides to a variety of reasons. The reasons are tabulated in table 9.18. As shown, weeds are not a serious problem for approximately 40% of respondents. This is why they do not use herbicide. These respondents are mainly those who have used excessive seeds. The most frequent problem expressed by farmers which prevents them from using herbicide is the lack of sprayers followed by high labour cost. These two problems account for approximately 38% and 22% of responses, respectively. Three other reasons which are relatively important, and which account for approximately 15% of responses, are the lack of enough time to spray, lack of knowledge on the benefits of spraying and lack of trust in the effectiveness of the chemical. Disagreement of the partners, unavailability of the chemical, and small, scattered plots of land, which account

for approximately 8% of responses, are the other reasons. Approximately 3% of respondents who had applied herbicides to their crop experienced crop failure. Lack of technical information on the recommended quantity of the chemical, and on the time of application, are the main reasons for this problem.

With regard to the unavailability of sprayers, only 20% of all sample farmers have the device, the rest have to hire. Lack of adequate sprayers on the market causes the purchase price, and also hiring prices, to rise sharply so that most farmers cannot afford to buy or hire. Labour cost, as the second important reason for low adoption of herbicide, is very expensive and adversely affects the adoption of labour intensive techniques. With respect to the time requirement for spraying, farmers often lack enough time to devote to spraying. It takes additional time to spray their plots, especially if the plots are scattered. In the cases where the plots are scattered, as is the case for the majority of farmers, it takes too much time to spray the whole cropped area. It also makes the spraying costly because of difficulty of reaching each plot of land. Very small plots can also be cleaned by hand weeding, and it is not economical for farmers to spray. For this reason, some farmers whose plots are small and have little weed problem prefer to use the hand weeding option to control weeds. Lack of trust in the effectiveness of herbicides in weed control also prevents farmers from adopting herbicides. Some farmers complain that the chemicals are not effective at all. Cases are reported in which the expiry date of application had already passed. Crop failure also occurs when farmers do not apply the exact amount of chemical and at the right time according to the instruction for use. These can be due to the illiteracy of farmers.

### 4.7. Appropriateness of recommendations for land preparation

As mentioned earlier in this chapter, most farmers experience various physical problems on their farms, especially the grading problem. Stone and drainage problems are the other two important ones. Only 27% of sample farmers possess land entirely flat without any stone and drainage problems. Drainage problems are found in 9% of farms. The rest of sample farmers experience grading and stone problems in various degrees, in the whole or in part of their lands. Although 55% of sample farmers have already graded most of their land, the problem still remains in some parts. Since most holdings are fragmented and consist of several small plots scattered far from each other, it is very costly to grade the entire land. It is not uncommon to see farmers whose single plot is flat in some parts yet very rough and inclined in the rest. Moreover, due to the low quality of the grading work offered locally, the problem of grading is not totally solved for those who have attempted the grading operation.

The recommendation for land grading is to have it done by the acceptable technical approach based on the designed grading plan, and using special grading equipment. Farmers are advised to apply to their local MKKDs for grading services. However, due to the intensity of the grading problem and lack of adequate equipment and technical staff, the MKKDs are not able to attend to all applications. The grading operation proceeds very slowly. Also, it is relatively expensive. For these reasons, farmers do some grading work locally by themselves, without any technical assistance from the MKKDs. By hiring a bulldozer, farmers correct the gradient by very simple approaches such as moving earth from high parts and depositing it on the lower parts. However, this method of land grading does not properly solve the problem. Most of the operated lands still slope in some parts, and the surface is very uneven. Unavailability of equipment is the major

problem expressed by 52% of the respondents who have a grading problem, and have never attempted to correct it. High operation cost is the other important constraint expressed by the rest. In total, 33% of sample farmers have serious grading problems.

Since the majority of farmers lack farm machinery, they have to hire. Due to the high hiring cost of farm machinery, farmers intend to employ the least possible number of operations. Amongst they who own farm machinery, depending on the soil condition and economic condition of the farmers, up to three times of ploughing and four times of application of the harrow disk is practised. The quality of these operations is always argued by farmers. Farmers complain that since they do not have any control over the operations, the tractor drivers are the persons whose knowledge, skill, and wishes affect the quality. Often, the drivers, who at the same time usually own the machinery, purposefully fail to operate as recommended by extensionists. Experiencing a high cost of operation, and lacking spare parts, while there is a lack of any control mechanism, the drivers try to prevent any possible damage to their machinery. Farmers often complain that the depth of ploughing, for instance, is much less than recommended. A depth of 10 centimetres as opposed to the 30 centimetres depth recommended is not uncommon. Unavailability of equipment and the problem of stones are the main reasons why some farmers have not employed any harrow disk. Unavailability of equipment, high cost of operation, stones, and improper ploughing and disk operations, are in the order of importance, the most frequent problems that prevent farmers from using land levellers.

Low adoption of modern irrigation method (the furrow irrigation) is due to several constraints. As shown in table 9.19, in the order of importance, grading problem, unavailability of furrower, cost of furrow operation, land fragmentation, the problems of stones, rough surfaces, disagreement of partners, time constraint, and wet soil due to time constraint to prepare the paddy plots for wheat cultivation are halting the adoption of the new technique. A relatively flat surface, as a prerequisite for the furrow irrigation is not available to the majority of farmers. As mentioned earlier, farmers whose lands are affected by the land grading problem experience serious constraints in the whole land preparation operation. Unavailability of furrowers and high costs of operation add to the total production cost and account for approximately 57% and 31% of the responses, respectively.

**Table 9.19. Constraints to adoption of furrower and furrow irrigation (N=49).**

| constraints | no. of farmers | % |
|---|---|---|
| grading problem | 31 | 63.0 |
| unavailability of furrower | 28 | 57.1 |
| cost of operation | 15 | 30.6 |
| land fragmentation | 7 | 14.3 |
| problem of stone | 6 | 12.2 |
| very rough surface | 2 | 4.1 |
| disagreement of partners | 2 | 4.1 |
| time constraint | 1 | 2.0 |
| wet soil | 1 | 2.0 |

Note: due to multiple answers by the same farmers, the number of farmers and the percentage values exceed to the total of 49 farmers and the total of 100%.
Source: author's survey.

Two constraints which are socially flavoured include disagreement among cultivation partners and time constraints. These two constraints need more explanation. Since more than 12% of sample farmers share their lands with others, the commitment of all share holders plays a very important role in the adoption of new techniques. In cases where all farmers, who share a piece of land work communally, all partners have to agree

on any particular matter which relates to all. Furrow irrigation as a new technique is not an exception.

With regard to the time constraint in irrigation, the case is much more complicated. It is related to the traditional water rights of farmers. Farmers irrigate their plots according to their water rights. The water right specifies the number of irrigation periods each farmer has, the time of each period, and the total amount of water each farmer can receive. Since the time of each irrigation period is defined, farmers have to irrigate their plots within the period of time in which the water is available. Most often the time of each irrigation period is not enough to use the modern irrigation method. The furrow irrigation needs relatively more time than traditional methods. The furrow irrigation method is a time consuming process due to its requirements for care, especially during the first watering. For the first irrigation, farmers are advised to pay attention to prevent furrows from flattening. This is, however, a serious problem for the farmers. If a farmer adopts the new method he has to irrigate very slowly according to the recommendation. In this case, the period in which water is available runs out too soon, and parts of the land are not irrigated. The problem becomes worse if the farmer wants to use siphon tubes, which needs even more time for operation.

There are, furthermore, several constraints to the use of machine broadcasters. As shown in table 9.20, for the majority of sample farmers the possession of small, fragmented, and scattered plots is the main reason that prevents them from using broadcasting (spinning) machines. As was shown in table 9.6, on average, each sample farmer's land is made up of 5 pieces. The parcels are mainly small. The largest parcels range from 0.25 hectare to 32 hectares. On average, the largest parcel is 3.8 hectares. The size of the largest parcel for approximately 68% of farmers is less than 3.8 hectares. The smallest parcels range from 300 square metres to 14 hectares. The smallest parcel is 1.3 hectares on average. In approximately 72% of cases the smallest parcel is less than 1.3 hectares. Where a parcel is extremely small, the size does not permit the farmer to use broadcasting machines. A piece of land of a few metres width limits the operation and prevents machines from working properly. In these cases, for example, if the farmer uses broadcasting machines, seeds and fertilisers drop onto the adjacent plots belonging to others.

**Table 9.20. Constraints for adoption of machine broadcasting of seed and fertilisers (N=40).**

| constraints | no. of farmers | % |
|---|---|---|
| small, fragmented, and scattered plots | 34 | 85.0 |
| unavailability of equipment | 27 | 67.5 |
| grading problem | 27 | 67.5 |
| cost of operation | 5 | 12.5 |
| problem of stones | 1 | 2.5 |
| time constraint | 1 | 2.5 |

Note: due to multiple answers by the same farmers, the number of farmers and the percentage values exceed to the total of 40 farmers and the total of 100%.
Source: author's survey.

The maximum distance between parcels of land for each farmer range from 10 metres to 6 kilometres. On average, it is 1 kilometre. In approximately 51% of cases the distance is larger than 1 kilometre. The minimum distance ranges from 10 metres to 4 kilometres. On average, it is approximately 900 metres. In 32% of cases the distance is larger than 900 metres. The problem of scattered parcels makes farm operations very

costly resulting in many farmers not being able to pay for machine use as the machines have to travel distances of several kilometres, which increases the cost of operation.

Land grading problems create constraints to approximately 68% of respondents using the broadcasting machine. In some cases where the grade is too big, the machine cannot work properly. In these cases, seeds are unevenly broadcasted which makes the crops bad. The crops become fat (heavy) in some parts and thin in the others. The same thing happens in plots which are covered by stones.

Unavailability of farm machinery nearby forces farmers to apply to rent machinery from other areas far from the farm. It requires time and money to go around to look for the machines. For this reason some farmers prefer to broadcast seed and chemical fertilisers manually in order to save time and money.

Table 9.21. Classification by land tenure and rejection of gods seed of sample farmers (N=93).

| holdings (ha) | no. of farmers | % | as % of farmers in the category |
|---|---|---|---|
| less than 5 | 30 | 32.3 | 96.8 |
| 5 to 7 | 22 | 23.7 | 81.5 |
| 7 to 11 | 23 | 24.7 | 85.2 |
| 11 and larger | 18 | 19.3 | 85.7 |
| total | 93 | 100.0 | |

Source: author's survey.

## 5. Responses of different categories of farmers with respect to the technology package

Since relevance and availability are relative concepts, a comparison between adopters from different categories of farmers, or with those who have rejected the technology package, shows to which category the package is (in whole or in part) more relevant and available, and to which category it is less relevant and available. Access to land as an important factor related to innovativeness could serve as a criterion for categorisation.

Table 9.22. Classification by land tenure and rejection of recommendation on rate of seed application of sample farmers (N=98).

| holdings (ha) | no. of farmers | % | as % of farmers in the category |
|---|---|---|---|
| less than 5 | 29 | 29.6 | 93.6 |
| 5 to 7 | 25 | 25.5 | 92.6 |
| 7 to 11 | 24 | 24.5 | 88.9 |
| 11 and larger | 20 | 20.4 | 95.2 |
| total | 98 | 100.0 | |

Source: author's survey.

Since the lands taken on lease (16%) are mainly waqf (religious endowment) and are rented on a very long term basis, we can treat them as owned lands. For this reason land tenure, which encompasses all sample farmers, is purposefully selected as an indicator of access to land, and preferred over the criterion of land ownership. From table 9.5, four categories of farmers are distinguished: (1) farmers whose lands are less than 5 hectares, (2) those who have 5 to 7 hectares at their disposal, (3) those whose lands are between 7 to 11 hectares, and (4) farmers who hold 11 hectares and larger. These categories account for approximately 30%, 25%, 25%, and 20%, respectively. Farmers in the first category represent the small farmers, while in the fourth group farmers represent the relatively large farmers. The technologies selected for the

assessment are (1) the use of gods (the latest improved seed), rate of application of (2) seed and (3) fertiliser, (4) chemical weed control, and (5) furrow irrigation. Tables 9.21 through 9.25 exhibit the results. As the tables show, these technologies are rejected by the majority of farmers in all four categories. But the rate of rejection ranges from approximately 62% for large farmers with respect to chemical weed control to 100% for small ones with respect to furrow irrigation, and, for the category owning 5 to 7 hectares, 100% with respect to rate of application of DAP fertiliser.

**Table 9.23. Classification by land tenure and rejection of recommendation on rate of fertiliser application of sample farmers.**

| | Urea (N=73) | | | DAP (N=100) | | |
|---|---|---|---|---|---|---|
| holdings (ha) | no. of farmers | % | as % of farmers in the category | no. of farmers | % | as % of farmers in the category |
| less than 5 | 21 | 28.8 | 67.7 | 30 | 30.0 | 96.8 |
| 5 to 7 | 21 | 28.8 | 77.8 | 27 | 27.0 | 100.0 |
| 7 to 11 | 18 | 24.6 | 66.7 | 24 | 24.0 | 88.9 |
| 11 and larger | 13 | 17.8 | 61.9 | 19 | 19.0 | 90.5 |
| total | 73 | 100.0 | | 100 | 100.0 | |

Source: author's survey.

Comparing small farmers with farmers in the other categories, we observe that, in all five technology cases, the small farmer category constitutes the largest number of farmers who have rejected all the 5 technologies. In addition, compared to the other categories, in three technology cases (use of gods seed, chemical weed control, and furrow irrigation), the small farmer category encompasses the largest number of farmers in the category who have rejected the technologies. And, in the other two cases (rate of application of seed as well as chemical fertilisers) it contains the second largest number of non-adopters. Comparing the small farmer category with the large farmer category, we notice that, with the exception of one case (rate of application of seed), relatively more farmers from the former have rejected the technologies. In the use of gods variety, approximately 97% of small farmers have rejected the technology compared to

**Table 9.24. Classification by land tenure and rejection of chemical weed control of sample farmers (N=72).**

| holdings (ha) | no. of farmers | % | as % of farmers in the category |
|---|---|---|---|
| less than 5 | 25 | 34.7 | 80.6 |
| 5 to 7 | 17 | 23.6 | 63.0 |
| 7 to 11 | 17 | 23.6 | 63.0 |
| 11 and larger | 13 | 18.1 | 61.9 |
| total | 72 | 100.0 | |

Source: author's survey.

approximately 86% of large ones. In chemical weed control, furrow irrigation, rate of application of Urea fertiliser, and rate of application of DAP fertiliser, approximately 81%, 100%, 68%, and 97% of small farmers have rejected the technologies compared to approximately 62%, 86%, 62%, and 91% of large farmers respectively. With respect to the recommendation on seed rates (table 9.22), the large farmer category encompasses the largest number of non-adopters. Approximately 95% of large farmers have applied more fertiliser than recommended, while the figure for the small farmers is approximately 94%.

Based on the above figures, we can conclude that the technologies are not adopted by the majority of farmers in all the four categories, but especially by the small farmers, who, according to table 9.5, account for 30% of sample farmers.

**Table 9.25. Classification by land tenure and rejection of furrow irrigation of sample farmers (N=100).**

| holdings (ha) | no. of farmers | % | as % of farmers in the category |
|---|---|---|---|
| less than 5 | 31 | 31.0 | 100.0 |
| 5 to 7 | 25 | 25.0 | 92.6 |
| 7 to 11 | 26 | 26.0 | 96.3 |
| 11 and larger | 18 | 18.0 | 85.7 |
| total | 100 | 100.0 | |

Source: author's survey.

## 6. Implications for relevance and availability of the technology package

For impact, the technology package should be adopted by farmers if it is to contribute to the national self-sufficiency objective, otherwise it is a waste of resources. Thus far, we have seen that the reactions of the district's farmers with respect to the package are diverse. And, with the exception of one component technology (seed treatment against fungi), which has been adopted by almost all farmers, all the other components of the package are rejected by the majority of farmers of different categories at various rates. Additionally, we have noticed that some farmers have introduced some changes into the technologies, and turned them into something totally new. The existence of different patterns of irrigation, which could be considered as combinations of traditional irrigation (qarqabi) and modern (furrow), is one example.

This raises the following important questions: why (1) farmers' responses with respect to the technology package offered are so diverse, (2) the majority of farmers in all the four categories have rejected the technologies, and (3), relatively more small farmers have rejected the technologies than large ones. One answer to the questions is the diversity of conditions in which farmers operate, and the lack of relevance of the technologies to these conditions. As we have seen, farmers' conditions are very different from those in which the technologies are developed (conditions of research stations). Farmers are experiencing many problems related to their socio-cultural and economic conditions: lack of consensus amongst the share holders to adopt, contradiction of technologies with respect to food preferences, little cash to spend, shortage of labour, time constraint, diseases like yellow rust, various land problems such as grading, salinity, stones, and small, fragmented and scattered plots. Since the technologies are rejected by the majority of both small and large farmers, as well as the other categories in between the two, we can say that the technologies are almost totally irrelevant.

Lack of access to the technology is another reason for non-adoption. There is another which adds to the problem: unavailability of the conditions for agricultural

development. If we go back to the discussion on the problem statement, and review the government's intensification strategy in wheat production, we observe the disparity that exists between the government's theory and its practice. As was stated, creating a wide spectrum of conditions for agricultural development is the aim of intensification strategy. However, in practice the strategy has not born satisfactory results. The district's farmers are confronted with various problems concerning the conditions for development such as lack of economic incentives, lack of access to production factors, lack of supportive laws and regulations, malfunctions in the market, unavailability of inputs, inaccessibility of MKKDs and input shops, and inadequate credit. These problems prevent the technologies from being effective even if they are tried out.

Röling (1992-b), throws light on the situation by stating that the adoption does not only depend upon relevant technology, but on a 'mix' of conditions. A 'mix' of necessary conditions for adoption includes price incentives, well operating market, access to inputs, adequate credit, quality farm infrastructure, access to relevant technology, access to production factors, etc. The extent to which the 'mix' of elements is properly set up determines in part the state of adoption of technologies. Technology, as only one ingredient of the mix, plays an important role if only the other elements are present. Each element has its importance in facilitating the adoption of technologies, and cannot be replaced by the others. One should look at the 'mix' from the farmers' point of view to see how important any one component is for adoption. A technology which is claimed to be relevant and which is available, in an inappropriate context, i.e., where one or more of the development conditions is lacking, is in fact irrelevant for farmers. This is so because in this case technology cannot take effect. To farmers it is necessary but not sufficient to have access to technologies which can fit into their circumstances. Farmers judge technologies not only from the relevance and availability point of view but also from the point of view of economic return, and availability of the market, inputs, land, water, capital, etc. From this, we understand that the district's farmers have no other choice than either to reject the technologies, or to adapt them to their own situation before they can put them into practice. This is so because of the disparity between the characteristics of technologies and the problematic farm situation in which they operate, and unavailability of the elements of the 'mix' for development.

To summarise the above discussion, we conclude that the reason for non-adoption of the technology package is not only related to the technologies but also to different elements of the mentioned 'mix'. In planning for improvement of the situation, we need to improve the way in which technologies are generated and developed, and to properly set the development conditions up.

One way of solving problems that frustrate the adoption of technology, especially by small farmers, is to change the present intensification strategy, which has proven to be ineffective in providing the necessary development conditions. There is a need to shift from the present strategy, which emphasises the creation of the required conditions, to one which places more emphasis on providing farmers with access to low input technologies that are relevant to present conditions. This needs re-orientation of research, extension, and education (knowledge institutions) towards the actual needs of farmers. This is so because access to relevant technology is directly related to knowledge institutions, and serves as an indicator for effectiveness of these institutions. Lack of access to relevant technology indicates the existence of problems in research, extension, and education. Since, as it was shown, farmers are experiencing problems with respect to the relevance and availability of the technology package, we can conclude that something

is wrong with the research, extension, and education institutions, which makes them less than effective in providing relevant technologies. The next step is to explore problems constraining these institutions, as they constitute the three main actors in the Agricultural Knowledge and Information System (AKIS) with respect to the district's wheat production, and to search for the main causes of disorders.

Problems in the core AKIS institutions are one constraint to the adoption of the technologies. Others are related to the institutions responsible for the other development conditions, which constitute the aspect system of the AKIS. The important question here is what the constraining problems are, that prevent the development conditions from being available. Since each of the development conditions is related to one or more institution(s), the answer lies in how efficient, effective, and adequate is the institutions' performance. Each institution, be it a knowledge institution, a supportive institution like an input delivery service, or a regulatory institution (policy related) can be the source of a constraining problem. The next chapter will discuss the institutional and policy factors affecting the relevance and availability of the technology package. Since the present study's focus is on the AKIS rather than on the whole production system, a more detail investigation of problems, and their causes in the district AKIS will be presented in the following chapter.

## CHAPTER 10

## INSTITUTIONAL AND POLICY FACTORS RELATED TO THE ACCESS AND RELEVANCE OF TECHNOLOGIES

The main aim of this chapter is to highlight the institutional and policy factors which frustrate, or facilitate, the performance of the district's institutions in providing farmers with access to relevant wheat technologies. The chapter has two sections: the first analyses the institutional level whereas the second deals with the policy. Analysis of the performance of research, extension, training, and farmers, in the Marvdasht district's wheat production constitutes the theme for the discussion of the first section. The second section comprises the analysis of the agricultural policy in general, and technology policy in specific.

### 1. Synergy analysis

As it became evident in the previous chapter, the Marvdasht district's research, extension, and training institutions (R&E&T) are ineffective. They have provided farmers with some irrelevant wheat technologies. According to the AKIS theory (Röling, 1992-b), one condition for R&E&T to be effective (i.e., to provide farmers with access to relevant technologies) is that researchers, extensionists, and trainers are interlinked with each other and with farmers to form an articulated whole. In this way, the combined contribution is more than the sum of the individual contributions. This is called synergy amongst the tasks of constituent actors. Synergy implies task differentiation amongst actors and integration between the tasks. This requires coordination, so as to mobilise forces that can overcome the incentives for default and entropy (Sims & Leonard, 1989 in Röling and Engel, 1991-a).

To examine whether the district's R&E&T, farmers and any others involved in the knowledge processes form an articulated whole, i.e., whether they experience synergy when carrying out their tasks, we use the AKIS conceptualisation as a diagnostic framework. In other words, we look at the relevant actors in Marvdasht district from the perspective that they should operate as a system. Here, a few points about the theory and the research perspective used shall be clarified. We deliberately (1) assumed a system of knowledge and information for the study area, (2) made a boundary for the system, and (3) used a Transfer of Technology (TOT) paradigm.

At the start of the study, a system of knowledge and information for the district's wheat production was assumed. The system is made up of sets of actors in the district, and the links and interactions between them, which are engaged in knowledge processes in wheat production, and which potentially work synergically to improve the goodness-of-fit between knowledge on wheat production and the real farm practices.

The system's boundary was limited to R&E&T and farmers. These actors initially were selected for the study because of their important roles in knowledge generation and use in the district's wheat production. The importance of the actors was based on and confirmed by the farm level results. This leaves the system with a number of other actors outside the boundary as contextual actors. Based on the farm analysis, only those actors who significantly affected the performance and impact of the system were selected for further study.

A Transfer Of Technology (TOT) perspective was chosen because of the importance of the research-based technology and technical innovation, and the way R&E&T are looked at in the country. Technology has been seen as playing an important role in development. In addition, the R&E&T are based on a traditional linear model of generation and use of knowledge. Other research paradigms, such as facilitating social process (Röling, 1992-a) for investigating the research problem clearly did not fit the actual situation as well as the TOT perspective.

In the following, we borrow from the analysis used in the RAAKS methodology (see Engel *et al.*, 1990). Firstly, we introduce actors who are involved in the knowledge processes and those who affect the performance of R&E&T and farmers in the district's wheat production. Secondly, we analyse the synergy amongst the tasks of actors, starting with examining task differentiation amongst the actors. This is followed by analysis of integration amongst the tasks of the actors, and coordination analysis. The order of presentation does not imply any priority amongst the three. Each is equally important in making the related actors act as a system. Analysis of the effects of some contextual factors, other than that explained by the analysis of the effects of coordination on the performance of the R&E&T, and farmers, will come later. We will complete this part of the chapter by summing up the effects of the institutional factors on access by farmers to relevant technologies.

## 1.1. The actors

Since the focus of the study is on wheat technologies, we limit the scope of analysis to wheat production. Another restriction is to exclude rain-fed wheat from the analysis. This is because, rain-fed wheat is less important in the district's agriculture.

**Table 10.1. Actors involving in knowledge processes in the Marvdasht district's wheat production.**

| actors | significance |
|---|---|
| farmers | constitute the main users of scientific knowledge, information, and technologies. |
| MTKF researchers | responsible for basic, applied, and adaptive research. |
| DKS researchers | responsible for basic and some applied research. |
| extensionists | the only formal extensionists in wheat. |
| trainers | responsible for training of staff as well as farmers. |

As table 10.1 illustrates, five sets of actors are significantly involved in the knowledge processes in the district's wheat production. They include (1) some 18,169 wheat producers in the district whose irrigated wheat adds up to some 60,000 hectares; (2) researchers from the MTKF provincial research centre (under the Ministry of Agriculture, MA), (3) researchers from the DKS college of agriculture of the Shiraz University, (4) extensionists from the advisory unit of the village-cluster agricultural service centre (under the MA), and (5) trainers from the district's training centres (under the MA).

There are some other actors who greatly influence the performance of the R&E&T and farmers. They include people from the policy environment, the political and bureaucratic structure, institutions providing goods and services for farmers, the black market, and the N&IR (National and International Research). Since these actors work in the context in which the R&E&T and farmers operate, I call them the 'contextual actors'. We will specifically deal with the contextual actors later when explaining the effects of the context on the performance of the R&E&T and farmers.

Technology policy makers and actors from the local political structure are the two most important sets of contextual actors. They play very significant roles in coordination amongst the R&E&T, and farmers. Thus, we discuss their role in coordination as well. Technology policy makers are authorities from the ministries of Agriculture and Higher Education. These are the people whose policies guide the MTKF researchers, extensionists, trainers and the DKS researchers at different levels (national, provincial, district, and local). Actors from the local political structure include several different sets of actors. Of these, village religious leader (ruhani) and the leader of the friday congregation prayer are the most important. The other actors from the local political structure include (1) those who work in revolutionary institutions like the JS department (under the Ministry of jahad-e sazandegi, MJS), members of village security group (BR) and members of village Islamic council (SED) and (2) the district's governor. [Chapters 6 and 8 provide a detailed description of all actors.]

**Matrix 10.1. Task differentiation and task performance among actors involved in knowledge processes in the Marvdasht district's wheat production, as seen by the technology policy makers.**

| | science | | | | | practice |
|---|---|---|---|---|---|---|
| | research | | | extension/education | | utilisation |
| | funda-mental | applied | adaptive | tech. dev. | integ./trans. | dissemination | utilisation |
| actors: | | | | | | | |
| farmers | | | 2 | 2 | | 2 | [2] |
| MTKF res. | [1] | [1] | [2] | [1] | | 2 | 2 |
| DKS res. | [1] | [2] | | | | 2 | 2 |
| extensionists | | | 2 | | [2]/[2] | [2] | 2 |
| trainers | | | | | [2]/[2] | [2] | 2 |

Note: 1= effectively performed
2= poor/limited performance
[]= specialised task domain
Source: authors' survey.

## 1.2. Task differentiation among the actors

By placing the actors' tasks in technology processes in a task matrix (matrix 10.1), we observe that each actor is involved in various tasks. The matrix shows three characteristics of tasks: (1) performance, (2) effectiveness of the performance, and (3) specialised task domain of the actors. The effectiveness of the task performance was assessed by asking the technology policy makers at the national level (N=8) whether the

actors performed their tasks as they should. In the matrix, if a task is effectively performed it is represented by '1', if not '2'. As I discovered later during discussions with the extensionists, one important point for attention is that the technology policy makers are biased towards research. This bias will be explained further in the section on integration.

As shown, most of the actors, from the technology policy makers' point of view, fall into the poor/limited performance group. Of various tasks performed by the actors, some constitute the specialised area in which the actors are mainly involved. The research task is the main concern of the MTKF and DKS researchers, though not confined solely to them. Fundamental and applied research are the main tasks for the researchers of both the MTKF research and DKS college. Adaptive research constitutes the task domain for the MTKF researchers. The TTT projects are the main devices by which the MTKF researchers make some adaptation to technologies. Some farmers (large ones) and extensionists are also involved in the adaptive research through the TTT projects. Technology development falls mainly into the task domain of the MTKF researchers. A small number of farmers are also taking part in technology development (improved seed multiplication for instance) by taking part in contract-based seed multiplication. These farmers are large farmers. The integration and transformation tasks fall into the task field of the extensionists and trainers. While the dissemination task is the specialised task domain of the extensionists, it encompasses all actors. Each actor is to some extent involved in dissemination. Farmers play their role formally through farm demonstrations, and informally through informal communication, thus disseminating information amongst the farming population. The dissemination task of the MTKF researchers is fulfilled through the adaptive research programme (the TTT projects), information bulletins, seminars, speeches, etc. The TTT projects link the researchers and extensionists to farmers. The DKS researchers disseminate information by a variety of ways. These include publishing their research results, presenting at seminars, giving speeches, etc. Trainers are engaged in dissemination tasks through training courses for farmers, rural youth, and extensionists. Utilisation of scientific knowledge is traditionally the main task domain of farmers. The domain is not confined to farmers: all actors are involved in the utilisation of various types of knowledge according to their specific needs.

As shown in matrix 10.1, the task performance of the actors is mostly rated poor/limited. Poor/limited task performance creates gaps between the tasks of the actors. The effectively performed tasks are those of the MTKF researchers with respect to fundamental and applied research as well as to technology development, and of the DKS researchers with respect to fundamental research. There are four main vulnerable tasks that cause problems for the knowledge generation-utilisation in the district's wheat production: (1) adaptive research that leaves a gap between applied research and technology development, (2) and (3) integration and transformation that leave gaps between technology development and dissemination, and (4) dissemination that leaves a gap between utilisation and the other tasks. In the following, I will elaborate on the problems these create.

The main constraint for the researchers that prevents them from performing the task of adaptive research effectively, is the problem of attitude. They have taken on a special attitude with respect to on-farm trials, and to farmers' participation in research. This will be discussed later in the section on integration analysis. Integration and transformation tasks are halted by the ineffective linkages between the researchers, extensionists, and trainers. The main constraint for performing the dissemination task is insufficient

resources in the extension department and training centres. This is discussed in the following section (integration analysis).

Overlapping areas encompass several tasks. These include (1) fundamental and applied research performed by the MTKF and DKS researchers, (2) adaptive research performed by the MTKF researchers, extensionists, and farmers, (3) technology development performed by the MTKF researchers and farmers, (4) transformation and integration performed by the extensionists and trainers, and (5) and (6) dissemination and utilisation performed by all actors.

No redundancy has been observed in the overlaps: all overlaps are complementary. There are two overlaps potentially susceptible to duplication of work: fundamental and applied research performed by the MTKF and DKS researchers. Duplication in these tasks is avoided by different linkage mechanisms. In this respect, the provincial committee for the approval of the projects of the MTKF research is the most important mechanism.

### 1.3. Integration among the tasks of the actors

To analyse integration amongst the tasks of the actors we must examine their linkages. Firstly, we start by introducing the different linkages that exist between actors. The analysis of linkages comes later.

The criterion employed for linkage analysis has four aspects: (1) the existence of a linkage between pairs of actors, (2) the frequency of use of a linkage by both actors of a pair, (3) the importance attached to linkages by the actors, and (4) the nature of linkages (formal and/or informal). These characteristics were assessed by those interviewed during the field research (N=156, including the same 106 sample farmers mentioned in chapter 9). Each set of actors, farmers for instance, were asked to reveal any linkage in which they were involved. Additionally, I asked the actors to express their views on (1) the frequency of use of linkages, and (2) the importance of linkages with other sets of actors (with respect to the AKIS as a whole). Here, I shall mention a point related to the strength of linkages. I am fully aware of the importance of some weak linkages, which can be, according to 'strength-of-weak-ties' theory (Granovetter, 1973, in Rogers and kincaid 1981), more effectively compared to strong linkages. In evaluating the strength of linkages I have considered a frequently used linkage as a strong one. The criterion used for determining linkages as formal or informal was the adherence of linkages to formal codes and regulations. If a linkage was based on formal codes and regulations, it was considered as being formal; if not, it was considered as being informal.

In order to summarise the various linkages for further analysis, I formed a matrix of connections (Van Beek, 1988, 1991). The matrix accommodates different actors in both X and Y axes. Sets of actors residing on the X axis are connected to others on the Y axis by various linkages. The linkages range from frequently used (A) to those that are not used (C). The importance of a linkage to the AKIS as a whole is shown by numbers ranging from '1' (very important) to '4' (unimportant).

In the matrix, any linkage marked 'A,1' (frequently used and very important) indicates a desired level of action. Malfunctions are represented by 'B,1' (occasionally used, while very important) or 'C,1' (not used, while very important). These linkages suggest improvements. Any linkage marked 'C,3' or 'B,3' indicates a potential importance that the linkage has to the actors. In this respect, actors would consider the linkage very important if some constraints can be removed. The intra-institutional

interactions are shown by the letter 'X'. Analysis of these processes is not the concern of this study. Any potential harmful linkage, which can negatively affect the actors' performance if overused, is displayed in brackets '[ ]'. A case in which an established linkage is not used is represented by the letter 'C'. One last point about the matrix is its diversity from the point of view of the actors' responses with respect to the characteristics of linkages. Characteristics of a linkage seen by one actor of a pair might not necessarily be the same as seen by another actor of the same pair. In other words, the matrix is not necessarily symmetrical.

A 25-cell matrix of linkages (matrix 10.2) is constructed to examine the interfaces between the actors. The matrix shows different linkages between pairs of the actors and illustrates various characteristics of linkages. There are 20 linkages between the actors, of which 8 represent both formal and informal linkages, and the remaining 12 linkages formal linkages. These linkages are of various combination of frequency and importance. From the point of view of frequency of use, the situation is disappointing: none of the linkages is used frequently. Moreover, 16 linkages (80%) are used only occasionally, and 4 linkages (20%) are not used. From the importance point of view, 60% of linkages are seen as very important, 10% of some importance, 10% potentially important, and 10% unimportant. One linkage is seen as potentially harmful: linkage of the MTKF researchers to farmers, as seen by the researchers. The MTKF researchers consider frequent contacts with farmers as a constraining factor, which limits their freedom of choice. Explanation for this together with the analysis of linkages between actors will be further elaborated.

**Matrix 10.2. Characteristics of linkages between pairs of actors involved in knowledge processes in the Marvdasht district's wheat production, as seen by the actors.**

| | farmers | MTKF res. | DKS res. | ext. | trainers |
|---|---|---|---|---|---|
| farmers | X | C,3 | C,3 | B,3* | B,3 |
| MTKF researchers | [B,2] | X | B,1 | B,1* | B,1* |
| DKS researchers | B,1 | B,2 | X | C4 | C4 |
| extensionists | B,1* | B,1* | B,1 | X | B,1* |
| trainers | B,1 | B,1* | B,1 | B,1* | X |

Note: linkages are formal unless otherwise indicated.

frequency of use of linkages:
A= frequently used
B= occasionally used
C= not used

importance of linkages:
1= very important
2= some importance
3= potentially important
4= unimportant

other sings:
* = both formal and informal
[]= potential harmful
X = internal process

Source: author's survey.

A broad range of different linkage mechanisms is used by the actors. The type of mechanism differs according to the actor's functions. Linkages between the institutions (research, extension, and training) are organisational, financial, functional, singular or in combination. These linkages link the R&E&T by means of sharing, and/or exchanging different resources including materials (man-power, budget) or immaterial (information). With regard to organisational and financial linkages, as described in chapter 8, the MTKF research, extension, and training organisations are integrated and placed under single management. Also, at the national level, a number of liaison officers are appointed in the research and extension organisations, to improve linkages. Linkage mechanisms between the actors include the adaptive research programme (TTT projects), participation of researchers in

editing the written extension messages, research reports, field visits, seminars, training as well as taught courses, communication methods, etc.

In total, 31 different formal and several informal extension and communication methods are used by the actors. The formal methods could be categorised into four groups: (1) regular and frequently used, (2) regular and less frequently used, (3) irregular and frequently used, and (4) irregular and less frequently used. Routine reports, formal circular letters, attending various task groups and committees, monthly bulletins, scientific papers, mobile movies, speeches during friday congregation prayer, and radio and television programmes all fall into the first group. The second group consists of annual reports, and various scientific seminars and speeches. The third group accommodates loose leaved books, pamphlets, and field days. Farm visits, chance visits, audio and video cassettes, and finally training and teach courses fall into the fourth group. The informal methods are of various types. These include sharing of information with friends at parties, discussing problems with peers in mosques after prayer sessions, visiting farmers in the village mosque, chatting with people at the village centre, talking during the time of refreshment at coffee houses, visiting each other in various traditional ceremonies, etc.

In this part of the chapter, the characteristics of various linkages between actors are subject to further analysis. As indicators of the state of integration, linkages play important roles in revealing bottlenecks that prevent the R&E&T and farmers from achieving a high degree of integration among the tasks for effective performance. For the purpose of integration analysis, we start by examining linkages between farmers and other actors. The analysis of linkages amongst the MTKF researchers and the rest of the actors comes afterwards. This part is followed by a section on the analysis of the remaining linkages between actors. Finally, a concluding section completes the discussion on integration.

### *1.3.1. Farmers and MTKF researchers*

The TTT projects and seed propagation contracts are the main linkage mechanisms used by the MTKF researchers to make contacts with farmers. As matrix 10.2 shows, and based on the responses of sample farmers, the MTKF researchers are the only ones that use the linkage.

Farmers generally do not use the linkage but consider it to be potentially important as an additional source of information. Farmers blame the lack of use of the linkage on various reasons. In this respect, lack of knowledge about the MTKF research and its activities is, as table 10.2 shows, the most frequently expressed (81%). Other reasons, in the order of importance, include (1) lack of equipments, inputs, etc. (18%), (2) lack of necessary conditions to apply research recommendation (14%), (3) inaccessibility of the research centre (12%), (4) communication problems (7%), (5) currently not experiencing any problem (3%), and (6) other miscellaneous reasons (8%). These problems prevent farmers from making contacts with the researchers.

The linkage is occasionally used by the researchers and assessed as having some importance (linkage 'B,2'). There are several reasons that explain the occasional use of the linkage: (1) lack of confidence on the applicability of the research findings, (2) an apprehensive feeling that the researchers have with respect to participation of farmers in research activities due to power relations, and (3) professionalism bias.

Lack of confidence about the applicability of research findings under farmers' conditions is mainly due to lack of knowledge of local conditions. Being unfamiliar with local situations, the researchers fear that their results fail to be applicable to the farmers. This can adversely affect attitudes toward them. "**Sometimes we are not sure if the findings can work as successfully under farmers' conditions as they worked in the controlled conditions of the research experimental farm,**" some researchers expressed as reason for being cautious in taking an active part in the TTT projects. They added: "**we release our results only if we are sure about the applicability of them. We do not want to lose face.**"

**Table 10.2. Reasons for the lack of use of linkage to the MTKF researchers by farmers, as expressed by sample farmers (106).**

| reasons | number of farmers | % |
|---|---|---|
| lack of knowledge about MTKF research and its activities | 86 | 81.1 |
| lack of inputs, equipment, etc. | 19 | 17.9 |
| lack of necessary conditions to apply research recommendation | 15 | 14.2 |
| inaccessibility of the research centre | 13 | 12.3 |
| communication problems | 7 | 6.6 |
| currently not experiencing any problem | 3 | 2.8 |
| other reasons | 8 | 7.5 |

Note: due to multiple responses by the same farmers, the number of farmers and the percentage values exceed to the total of 106 farmers and the total of 100%.
Source: author's survey.

The potential influence of farmers on research is perceived by the researchers as an unfavourable consequence of farmers' participation in research activities. Having no voice from the farmers' side in research projects, researchers feel free to choose any research problems for their projects. The important point here is that the problems might not necessarily be the same as those that are important for the farmers. Researchers will not have the same freedom as they now experience if farmers participate in research planning, or have much of a say in it, so that researchers are forced to concentrate on the farmers' problems that are based on the farmers' own definitions. The potential power of farmers for influencing the MTKF researchers is clearly illustrated by statements made by farmers in a seminar on the occasion of the first gathering of high capacity farmers, i.e., whose wheat yielded more than 6 tons per hectare. Farmers stated that: "**the only thing we need is the institutional support. We have the capacity to produce more than we do now. If researchers and extensionists can solve our farming problems, and if the government helps us by increasing the wheat price and by providing necessary inputs, we do our best.**" According to the statement, one part of the farmers' demand is related to services offered by the R&E&T. The demand can place strong pressure on the R&E&T. This is since productivity increase in wheat is politically very important to the government. Any pressure from the farmers' side can be conveyed to the research institution by the government. Obviously, participation of farmers in research projects can result in more demands from farmers, and consequently increase pressure on the researchers. Thus, the researchers try to limit any programme in which farmers' participation is emphasised.

The researchers consider research activities as the only duty that they have to perform. Accordingly, the researchers avoid being involved in any type of work that has to do with extension or training. To the researchers, the research station is the only place for them to put their results into practice. Beyond that, it is the responsibility of others to perform. This attitude makes the researchers concentrate exclusively on on-station research resulting in a neglect of making contact with farmers.

The reason for attaching a low importance to the linkage is related to a kind of attitude that the researchers hold with respect to participation of farmers in research activities. The researchers do not see the farmers' participation as a necessary condition for making the research findings appropriate for farmers. To the researchers, farmers' participation in research is something vain that wastes scarce resources. They believe that farmers lack knowledge about real farming problems, and their participation in research activities interrupts research projects due to misdefining farming problems. This attitude makes the researchers limit their contact with farmers.

There is still another problem related to the linkage: marginalisation of small farmers due to the bias toward large farmers. This is due to the fact that the conditions of the large farmers allow them to use the research's results. It is very important to the researchers to get the same results from the field trials under farmers' conditions as they get from the research station. Thus, they look for the type of farmers whose conditions are favourable. This leads the researchers to choose large farmers for implementing their projects rather than choosing small farmers.

### *1.3.2. Farmers and DKS researchers*

Socio-economic research projects are the linkage mechanism used by the DKS researchers to make contact with farmers. Farmers are not involved in the linkage due to their lack of interest in the activities of the college. Despite this, considering the DKS researchers as potential information sources, farmers regard the linkage as being potentially important. As matrix 10.2 shows, the linkage of the researchers to farmers is marked 'B,1' (occasionally used and seen as very important). The infrequency of contacts of the researchers to farmers (despite of the linkage being considered as highly important) is due to the general problems in the college. Problems such as man-power shortage, high involvement in educational activities, etc., frustrate the performance of the researchers. We will discuss the problems later. Another problem of the linkage is its very limited scope. It connects the researchers to mainly large farmers that constitute a small portion of the farming population. This results in the other categories of farmers, especially small ones, being left unattended. The large farmer bias is mainly due to the fact that these farmers are more available for research interviews. Compared to small farmers, the large farmers have relatively fewer farming problems. This leaves them with more spare time to devote to the interviews. Furthermore, since large farmers are more in touch with extensionists, they are considered as the main sources of information.

### *1.3.3. Farmers and extensionists*

Approximately 72% of sample farmers have some relation to the extensionists. Only 4% of sample farmers use the linkage for information needs, and the rest for inputs and/or for the other non-information farm necessities. Meanwhile, being in need of information, the majority of farmers (75%) refer mainly to their peers, neighbours, and relatives for their information needs. There are two main linkage mechanisms used by farmers to contact the extensionists: (1) farmers' visits to extension centres (situated at the village level MKKDs), and (2) meetings at local events such as ceremonies, religious mourning, etc. in which extensionists participate. With respect to information needs, the linkage is used occasionally by most farmers, and seen as potentially important (linkage type 'B,3'). Amongst reasons expressed by farmers for lack of any, or occasionally used,

linkages to the extensionists, two reasons are directly related to the extensionists: (1) failure of the extensionists to solve technical problems and (2) low credibility of some extensionists (see table 10.3). These two reasons are expressed by approximately 75% and 14% of sample farmers respectively. The other reasons are, in the order of importance, (1) inaccessibility of extension centres (59%), (2) lack of equipment in order to practise the extension advice (53%), (3) currently not experienced any problem (11%), and (4) other miscellaneous reasons (8%).

Farmers relate the failure of the extensionists in solving farm problems mainly to extensionists' lack of technical knowledge. This view is also confirmed by the extension manager. The problem of the low technical knowledge of the extensionists is, according to the extension manager, partly due to weak linkages between the extensionists and trainers, and in termination of the pre-service and in-service training for the extensionists. I will explain this in the section on linkages between the extensionists and trainers. The other reason is more related to a problem that has adversely affected the extension activities over many years: involvement of extensionists in non-educational activities. The problem of assigning non-educational jobs to extensionists has always been a main complaint expressed by the extensionists. The involvement of extensionists in the implementation of the 1962 Land Reform Act is one example from the pre-revolution era. Distribution of permits for inputs and agro-chemicals, and involvement in non-agricultural activities, are recent examples. Non-agricultural activities include distribution of fuel coupons, permits for cement and other rationed commodities amongst farmers, etc. Distribution of rationed commodities is used as incentives for persuading farmers to adopt new technologies and techniques. Faced with man-power shortage, the MKKDs' managers place the responsibility of writing permits for the commodities on the shoulders of the extensionists. These jobs, which are by their nature very time consuming, prevent the extensionists from performing their actual educational duties. This gradually results in unfavourable conditions for the extensionists: total discontinuity in performing the educational jobs, and being left without any proper in-service training. This leaves them unable to cope with the farmer's technical problems.

**Table 10.3. Reasons for (lack of any)/occasionally used linkage of farmers to the extensionists for information needs, as expressed by sample farmers (N=106).**

| reasons | no. of farmers | % |
|---|---|---|
| failure of the extensionists to solve technical problems | 79 | 74.5 |
| inaccessibility of extension centres | 63 | 59.4 |
| lack of equipment | 56 | 52.8 |
| low credibility of some extensionists | 15 | 14.2 |
| currently not experiencing any problem | 12 | 11.3 |
| other reasons | 8 | 7.5 |

Note: due to multiple responses by the same farmers, the number of farmers and the percentage values exceed to the total of 106 farmers and the total of 100%.
Source: author's survey.

The low credibility of some extensionists is mainly attributed to their past unfavourable relations with farmers. As mentioned in the chapter on institutional support, a large number of extensionists became involved in the implementation of the 1962 Land Reform Act. The extensionists got into trouble when the land reform could not realise the promises made at the time by the government for distributing land amongst all landless and small farmers. It was a problem for extension because the blame was placed on the extensionists who were responsible for the implementation of the Land Reform Act. As a result, an unfavourable atmosphere was created for the extensionists that has adversely

affected their relationship with the farmers. Another negative point for the extensionists, as expressed by farmers, is related to their strong relationship with large farmers in the pre-revolution era and afterwards. Before the revolution, especially in the pre-land reform era, the extension services were greatly biased towards large farmers. After the revolution, as described in the chapter on the village system, ex-landlords and large farmers faced some social problems. Due to their past exploitative relationship with respect to villagers, ex-landlords became hated people in the eyes of rural dwellers. The post-revolutionary bias of extensionists towards ex-landlords and large farmers has led small farmers to believe that extensionists are still the supporters of ex-landlords and large farmers. This lowers the credibility of the extensionists in the eyes of the small farmers.

Farm visits by extensionists, and the TTT projects, are the main linkage mechanisms used by the extensionists to link up with farmers. Despite the high importance attached to the linkage by the extensionists, it is only occasionally used. The district's extension manager attributes the occasional contacts of the extensionists with farmers mainly to lack of resources, especially man-power and transportation vehicles. At most, the existing extensionists can serve only a 1/4 of the district's wheat producers, and the existing transportation vehicles account for 1/3 of the actual need.

Man-power shortage has always been considered by extensionists as a serious problem constraining educational activities. The problem has frustrated activities of the extensionists since the implementation of the 1962 Land Reform Act. In 1962, more than half of the country's extensionists were permanently involved in the implementation of the land reform. The extension organisation has suffered a lot since, due to the problem. In this respect, the recent man-power shortage is extremely serious. Despite this, (and although the government's prohibition on recruitment in extension organisation has been removed since 1987), recruitment has not been seriously taken into account. Surprisingly, this is done on purpose. The main reason for the purposeful neglect of the recruitment is related to a problem which is very constraining for the extension organisation: withdrawal of extensionists from extension centres and appointing them to non-educational jobs by managers of MKKDs. The MKKDs' managers face man-power shortage for dealing with various farm affairs. For this reason, the managers use the extensionists in various jobs ranging from distribution of permits for inputs, to management. To prevent extension centres from acting as man-power pool for other organisations, the national extension organisation has been reluctant to attempt a full scale recruitment.

Allocation of extension resources to purposes other than educational activities does not affect only manpower availability. Physical resources, especially transportation vehicles, are also affected. The MKKDs' managers lack sufficient vehicles in MKKDs. Therefore, the managers assign the vehicles belonging to the extensionists to various purposes ranging from routine activities in the centre to private use by the managers. The extent of the problem depends on the work load of the MKKDs. Due to heavy work loads on MKKDs the demand for transportation vehicles is high. For this reason, the vehicles sent by the national extension organisation have been mainly devoted to services other than educational. This frustrates the extensionists and prevents them from visiting farmers and performing their educational jobs. To relieve this problem somewhat, until such time as a more fundamental solution is found, the national extension organisation has stopped providing the extensionists with vehicles altogether.

### *1.3.4. Farmers and trainers*

Personal visits constitute the linkage mechanisms used by the district's farmers to maintain contact with the trainers. The linkage is very limited and only used by 3% of the sample farmers. Moreover, it is occasionally used and seen as potentially important. Farmers who use the linkage are situated near the district's training centres. Lacking frequent contacts with the extensionists, the farmers refer to the centres for their informational needs. According to the farmers, the linkage mechanism serves to link them to an additional source of information. The trainers use the training courses as linkage mechanisms to communicate with farmers. Manpower shortage in the training centres, inadequate budget, problems in training of the trainers, and problems related to training centres are the types of problems that have frustrated the linkage. We will discuss these problems later.

### *1.3.5. MTKF researchers and DKS researchers*

There are several linkage mechanisms that link the MTKF researchers to their counterparts in the DKS college. Of these, a provincial research committee, monthly technical speeches given by the researchers from the two organisations in the MTKF research centre, joint projects funded by the MTKF research, research reports, and information bulletins are the most important. The provincial research committee meets monthly, and is sponsored by the manager of the MTKF research. The committee is in charge of approval of the MTKF research projects. However, despite its high importance, the linkage is only used occasionally and is limited. Constraints that frustrate the linkage are manpower shortage in the college, high involvement of the college's faculties in educational activities, lack of incentives for the researchers, and an attitude held by the researchers of each of the organisations with respect to their counterparts from the other organisations.

Manpower shortage is a serious problem in the DKS college. The problem is not confined to the college, but is a country-wide problem that has halted the performance of many organisations. After the 1979 revolution, large numbers of people, including some academic staff of the college, looking for better opportunities, have emigrated abroad. Another reason for having a very small number of academic staff is a steep drop in staff number following the revolution. This is mainly due to having a large number of officials being dismissed by the 'revolutionary cleansing committees'. The government used the committees country-wide to remove all the old regime's adherents, anti-revolutionary people, and corrupted officials from the government's offices. Furthermore, retirement of staff without adequate new recruitment is adding to the problem. Inadequate recruitment is due to insufficient qualified candidates and to the government's prohibition on recruitment. Since the number of governmental employees is enormous, the government has prohibited any new recruitment in order to reduce the number. This is in response to a general policy to hand over many state-run activities to cooperatives and private companies. The prohibition on recruitment has been effective since the revolution. It is only recently that the government decided to allow certain organisations, including the college, to recruit. The problem here is the inadequacy of qualified candidates. Insufficient availability of qualified candidates has halted the recruitment plan for the college.

The problem of inadequate educational staff in the DKS college has forced the existing staff to engage mainly in educational activities. The Higher Education Ministry

has required the DKS researchers to work full time in educational jobs. This leaves little time for the staff to devote to research activities in general, and to joint activities with the MTKF researchers in particular.

With respect to incentives, there have been some initiatives from the Ministry of Agriculture. The ministry has tried to encourage the DKS researchers to devote their spare time to joint projects with the MTKF researchers. For this purpose, the ministry proposed to reward the participant researchers and to equip the DKS's experimental laboratories. However, the DKS researchers have not considered the incentives as stimulating. The incentives provided by other organisations are much more attractive than those provided by the Ministry of Agriculture. To this end, the main organisation that uses the spare time of the DKS researchers for educational purposes is the Free University. This makes the staff more inclined towards educational activities than to research.

Another problem is that researchers from the two organisations do not believe in each other's work capacities. Each underestimates the other's scientific capabilities, and considers its institution as the sole research institution that can perform the best. This widens the existing gaps between the two research organisations, and prevents the researchers from interacting effectively.

Annual and occasional research reports and information bulletins are the main linkage mechanisms used by the college to connect its researchers to the counterparts in the MTKF research. Due to the same reasons as previously explained, the linkage is occasionally used and given some importance.

### *1.3.6. MTKF researchers and extensionists*

Several linkage mechanisms are, at the institutional level, used to link the MTKF research and extension organisations. Of these, the organisational and financial integration are the most important. With respect to organisational integration, since it was only recently implemented, its effectiveness cannot be examined and requires a longer period before being subjected to analysis. The financial integration is a matter of formality. Although the financial integration has been in practice for several years, it has not given any effective results and has not led to strong and effective linkage between the two organisations. Each organisation makes its own budget plan in isolation, and uses the allocated budget in isolation. There is no inter-dependency between the two organisations' financial resources. The only effect of the integration may be that it has made the budgeting process more systematic.

At the actors' level, a committee for approval of the MTKF research's projects is the most important linkage mechanism among the actors. Moreover, other mechanisms include various research reports and a monthly information bulletin sent to the extension department. The committee is the main linkage mechanism used by the MTKF research to bring its researchers in contact with the extensionists. However, the research approval committee is, according to the extension manager, a poor linkage mechanism that has a very limited effect. This is due to the failure of the mechanism to interconnect the projects of the research and extension. It fails to bring the researchers and extensionists together to interact effectively. There is no representative from the district extension department but one from the province. A problem here is the frequent replacement of the extension representative, and his occasional attendance on the committee. These are mainly due to problems in the extension department such as frequent changes in

management, and manpower shortage. In fact, the representative has little say in approving the projects. This is due to a dominant atmosphere in favour of the research projects made by most committee members. The committee includes mainly heads of various departments of the MTKF research. Thus, the committee seems to be a way of informing the extensionists about research projects, rather than to link them to the researchers.

The main linkage mechanism used by the extension department to link the extensionists to the researchers is the TTT projects (adaptive research programme). However, despite its high importance, the linkage is used occasionally and limited (linkage type 'B,1'). This is due to several constraints: (1) inadequate resources, (2) absence of strong incentives, and (3) lack of suitability between expectations and performances of the researchers and extensionists.

With respect to resources, the most constraining problems for the extension department are manpower shortage and inadequate transportation vehicles. Each project, during the period of implementation, needs to be visited and overseen several times by the project researcher and the local extensionists. For this reason, it demands extra manpower and transportation vehicles. These problems, which were previously described, prevent the researchers and extensionists from interacting properly with each other. Shortage of vehicles is a serious problem that has halted the on-going projects. Failing to provide extra vehicles from the national headquarters, the extension department tries to solve the problem by devoting the existing vehicles to the projects. The problem here is that the shortage of transportation is a serious one in the extension department. Thus, the problem remains unsolved and interferes with the implementation of the projects. The MTKF researchers, on the other hand, consider the projects as imposed ones that demand extra work, and thus do not contribute to the effort to solve the problem. To the MTKF researchers, the TTT projects are those that are set up by the extensionists to occupy the researchers with primitive and unnecessary jobs (they point toward retesting the research's results in farmers' conditions). In fact, the researchers look at the projects as ones that are used by the extension department for evaluating the research's results. For this particular reason, the researchers consider the TTT projects as traps, set up by the extensionists to create problems for the MTKF researchers.

With regard to incentives for joint activities, both researchers and extensionists complain, and do not consider the existing incentives as being as effective as expected. Travel allowances, paid for visiting the projects, and assigning the same privileges to the participants of the TTT projects as to others are the main incentives. The problem here is that the travel allowances are inadequate and the privileges do not stimulate researchers to participate in the projects.

Another important problem that frustrates the linkages between the MTKF researchers and extensionists is that the expectations they have of each other's performance are too high, which results in disappointment. The MTKF researchers blame the extensionists for inability to perform their educational jobs. They claim that there are many different technologies generated by them a long time ago. Despite this, farmers do not use the technologies. They relate the reason of non-adoption of the technologies to lack of information. The extensionists, on the other hand, blame the researchers for lack of understanding of the farmers' conditions. They claim that they have already introduced the research's results to farmers, but farmers failed to adopt them due to the inappropriateness of technologies. A phrase more frequently heard from the extensionists is: "**the research's results do not solve the farms' problems.**" The accusations have

reached a point where much time and energy of each go into putting the blame on the other party. This has resulted in an unfavourable atmosphere between the MTKF researchers and extensionists that prevents them from interacting properly.

### *1.3.7. MTKF researchers and trainers*

The main linkage mechanisms used, at the institutional level, to link the MTKF research and training department include organisational and financial integration. For several years prior to a recent reintegration between the organisations, the MTKF research and training were run nationally under the same deputy minister of agriculture. This was in order to link the researchers and trainers systematically. However, the organisational integration led to the subordination of the trainers compared to the researchers. This was due to the bias of the deputy minister toward research. The problem recently resulted in some changes in management of the research and training. The changes happened in three stages. Disintegration of the research and training organisations happened in the first stage. The second stage was marked by the integration of the extension and training organisations. Finally, in the third stage, the three organisations were reintegrated and placed under a single deputy minster.

Occasional coordinating meetings at the management level constitute the main linkage mechanisms used by the MTKF research to bring its researchers in contact with the trainers. However, despite its importance, the linkage is only occasionally used (linkage type 'B,1'). This is due to a number of constraints, of which the inferiority of the trainers to researchers is the most important. A complaint that had always been given by the trainers, was that the two organisations had not received the same attention from the deputy minister. There has always been much more attention paid to the research than to training. This was mainly due to the fact that the deputy minister had a bias towards research. He was also the general director of the research organisation. The reason for inferiority of the trainers to researchers, as expressed by some trainers is: "**the deputy minister has always been surrounded by the researchers, and pre-occupied by their increasing needs. He lacks the time to devote to us and our needs.**" As expressed by one ex-director of the training organisation: "**the trainers had never had a chance to receive the same attention from the deputy minister as the researchers always received. The main reason was that the deputy minister ran the research organisation. He is, according to the research constitution, the head of the organisation. This made him bias towards the research**". The inferior position of training has adversely affected the performance of the trainers. Being affected by the problems in the national headquarters, the district's training centres are experiencing many constraints in implementing their tasks. They have always suffered from poor pre-service as well as in-service training for the trainers, inadequate budget, manpower shortage, etc.

The main linkage mechanism used by the training centres to link the trainers to the researchers is occasional and limited use of the researchers in various training programmes. However, despite its importance, the linkage is less frequently used. This is due to the limited number of training courses implemented by the training centres affected by the problems already explained.

### *1.3.8. Extensionists and trainers*

Although both the extensionists and trainers consider their linkages very important they use them only occasionally (linkages type 'B,1'). At the institutional level, organisational and financial integration are the main linkage mechanisms used to link the two organisations. The situation of organisational and financial integration is the same as already described in the case of linkages between the MTKF research and extension organisations; the former is too young to be analysed, and the latter not effective.

Training courses for extensionists constitute the main linkage mechanism used by the extension department to link the extensionists to trainers. Shortage of trainers, inadequate budget, problems in training of trainers, problems concerning physical resources, especially training centres, and lack of a strong demand from extensionists to attend the training courses, constitute the main problems preventing the linkage from being used frequently.

The training organisation is one, amongst others, in the Ministry of Agriculture and where the least number of recruitment have been taken place following the 1979 revolution. This, together with a steep decrease in staff number, has resulted in a very limited number of trainers in the organisation. The steep decrease is mainly due to the dismissal of staff by the 'revolutionary cleansing committees' and non-replacement of retired staff. The organisation has recently started to recruit new people, but the problem of manpower shortage is very serious. For this reason, it will take quite a long time for the organisation to gear itself towards full capacity for extension training.

A review of the financial resources of the organisation in subsequent years since the revolution shows that the organisation has always suffered from an inadequate budget. According to managers of the training centres, the latest budget for the training centres accounts for approximately 1/3 of the centres' needs. This problem is specially due to a low attention being paid by the management to training as compared to research, as explained previously.

Another constraining problem that adversely affects the performance of the existing manpower in the training organisation is lack of a systematic training programme for the trainers. The training is random and infrequent, and all in all, it cannot prepare the trainers for their duties. Lacking the necessary up-to-date knowledge for their educational duties, the trainers rely on their old knowledge. This problem has been expressed by the extensionists who attended the training courses as one of the constraints for extension training. The main problems that frustrate the training for the trainers include inadequate resources and lack of incentives.

Problems concerning the training centres form other constraints to training activities. One training centre out of the two in the district has been used as a military training centre since 1980 (the early stage of the 8-year Iran-Iraq war). During the war, due to a lack of training centres to train its personnel, the revolutionary army started to forcefully occupy a large part of the centre. Although the war ended in 1988, the problem still exists: the centre is still used by the revolutionary army. This has adversely affected the district's training. Acknowledging the problem, the Ministry of Agriculture has tried to regain the centre; however it has failed to convince the army to leave the centre. One alternative approach for improving the situation is to devote the other training centre in the district to extension training. But, the other training centre is used for the rural youth programme. Although the lack of a training centre for extension training is a pressing problem, the training organisation insists on continuing to use the other training centre for

the youth. This is because of the fact that more attention has been paid to the rural youth programme than to extension training.

A strong demand from the extensionists, that can exert pressure on the extension department to arrange in-service training, is lacking. The extensionists relate this problem to lack of incentives. These include, in the order of importance, lack of (1) psychological incentives such as attention from the management with respect to their needs and problems, (2) professional incentives such as appropriate job descriptions, promotion, training, etc., and (3) material incentives, in particular higher salaries.

Occasional coordinating meetings at management level represent the main linkage mechanism used by the training department to connect its trainers to the extensionists. However, despite its importance, the linkage is occasionally used. This is due to the full engagement of the managements in various other affairs.

### *1.3.9. DKS researchers and extensionists*

The only linkage mechanisms between the DKS researchers and extensionists are research projects on extension and communication methods funded by the provincial extension department. The linkage is occasionally used, and seen as very important by the extensionists; while it is not used, and considered as unimportant by the researchers. The researchers have no interest in using the linkage due to general problems in the college, explained above.

A general lack of attention to the extension's needs is a constraint for using the linkage by the extensionists. It was only recently that the extension organisation started to ask universities country-wide to conduct some research on extension and communication methods. Before that, hardly any serious efforts have been made in this direction. The lack of attention to extension's needs is due to a general lack of knowledge on extension science, and on the role of extension in development. Recently some officials have started to show their interest in the extension activities and to support these verbally by saying honourable phrases about its importance in development. However, hardly any of them acknowledge the science. Lack of understanding of the extension's needs has resulted in serious problems for the extension department. To fund research projects on the extension and communication methods, the department needs to ask the budget committee for the allocation of the necessary budget. The point here is that the committee hardly understands the importance of research on the extension topics. This means the extension department is unable to use the linkage effectively.

### *1.3.10. DKS researchers and trainers*

The training organisation has used several linkage mechanisms to link its trainers to the DKS researchers. Of these, training courses for trainers, and using the DKS's academic staff in training of extensionists are the important types of linkage mechanisms used. Although the linkage is seen as very important by the trainers, it is only occasionally used (linkage type 'B,1'). This is due to problems in the training such as inadequate budget and general problems in the college.

What should be noted here, is that the linkage is not used by the researchers. Additionally, it is seen as unimportant. This is due to lack of interest for making contacts with the trainers. General problems such as man-power shortage, high involvement in

educational activities, etc. in the DKS college, which have already been discussed, are the main constraints for the linkages.

### *1.3.11. Implication for integration among the tasks of actors*

According to the AKIS theory, strong linkages amongst actors is needed for integration. A strong linkage is one that is used frequently and is seen a very important for the system as a whole. However, as matrix 10.2 shows, none of the linkages amongst actors is used frequently. Furthermore, only 60% of linkages are seen as very important for the system as a whole. This indicates two important deficiencies: lack of strong linkages and lack of a system vision amongst the actors.

There is a need to make some adjustments to the linkages in order to have them frequently used. The areas for improvement include all the interfaces between the actors. Some interfaces demand special attention for improvement because of lack of use of key linkages by the actors. These include interfaces between farmers and both the MTKF and DKS researchers, and between the DKS researchers and both the extensionists and trainers.

With respect to interfaces between farmers and the rest of the actors, one important point remains to be mentioned: marginalisation of small farmers due to a bias in favour of large farmers. Lack of any linkage between the knowledge institutions and small farmers creates gaps between what the government focuses on and what the institutions serve. This will be discussed later in the section on coordination analysis. Strong linkages amongst this special category of farmers and the rest of the actors is needed for a high degree of integration.

Lack of system vision amongst the actors has resulted in some actors considering themselves to be isolated. In this respect, some of the actors fail to recognise that their activities are inter-related with the others. This is why some of the actors judge the importance of their linkages to others with respect to themselves, and not to the AKIS as a whole. The improvement of the situation calls for a learning process by which the actors can appreciate a broad perspective offered by the systems thinking.

## 1.4. Coordination among the R&E&T and farmers

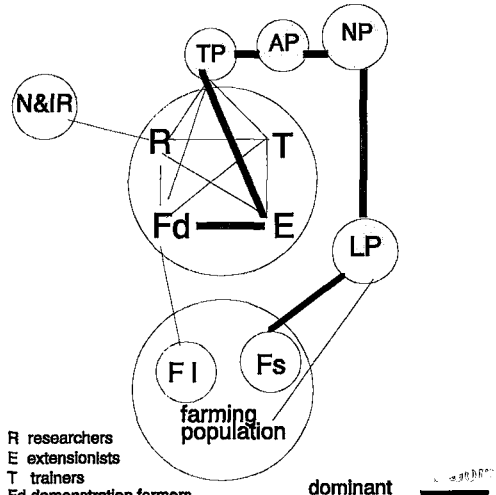
From differently identified AKIS configurations (Engel *et al.*, 1990), a relatively centralised policy driven type, most favourably represents the configuration of the district's R&E&T and farmers in wheat production (see figure 10.1). The main external driving force comes from the national policy. Policies are mainly made by the high authorities at the national level and imposed on the actors at the lower levels for implementation. A dominant influence of the national policy makers is exerted through the agricultural policy for self-sufficiency in wheat, and the technology policy for wheat intensification. The influence then points toward demonstration farmers through the extensionists. Demonstration farmers, as examples of those who make the best use of technologies, inputs, resources, and policies, are supposed to work as the main disseminators of information amongst the farming population.

Small farmers, as the special target group for the government, are under the dominant, external influence exerted by the actors from the local political structure. Amongst other functions, these actors act as a feedback mechanism for the national policy makers, and connect them with small farmers.

A combination of different coordination mechanisms is employed amongst the actors: (1) direct supervision, (2) mutual adjustment, and (3) ideological motivation. I will briefly explain these mechanisms in the following paragraphs. Use of each mechanism (or a combination) depends upon the type of actors and their activities.

Direct supervision through a top-down structured system, in which each superior directly supervises the work of his inferiors, is the main coordination mechanism applied within the institutions. In this type of coordination, each actor is vertically connected to actors of the same institution at higher levels. Each actor acts as a supervisor for his subordinate(s), while (at the same time) is supervised by his superior(s). At each level, the horizontal links are mainly between the managers. All actors are accountable to the policy makers. Policies and decisions are mainly made by actors at the highest level of authority, and the local actors are mainly considered as implementors. Monitoring and evaluation constitute the main coordinating tools, and reward and sanction are the incentives.

Figure 10.1. Configuration of R&E&T and farmers in the Marvdasht district's wheat production.




Source: author's field notes.

The TTT projects, which bring the MTKF researchers, extensionists, and farmers together with liaison officers in the research and extension organisations and joint projects between various actors, etc. represent devices for mutual adjustment for coordinating the actors. The necessity of using of these devices in coordination only recently became known to the policy makers.

Ideology plays its role in coordination, being used to encourage actors to work jointly in a defined direction. This mechanism is very influential in the case of farmers. Farmers consider religion and religious belief as very important. A national slogan for motivating the mass of farmers towards national objectives is: "**work together for the national interest in a narrow sense, and for the unity of the muslim community in a broad sense**". This mechanism is supported mainly by actors from the local political structure, and promoted through various incentives ranging from receiving verbal blessing to gaining social prestige.

Although various mechanisms have been employed to enhance coordination, actors do not cooperate with each other. Despite the government's emphasis on the small farmers' development, this category of farmers is hardly served by the knowledge institutions. A comparison between what the AKIS theory suggests for strong coordination in the system, and what the knowledge institutions experience in practice, reveals several

constraints for coordination. According to AKIS theory, strong external and/or internal pressures on the knowledge institutions are needed to bring about the coordination. The pressures can be exerted by a variety of sources. Amongst others, farmers' organisations, management, and policy makers are the important sources of pressure. But in practice, there is a lack of any pressure from the farmers' side as well as from the management. The pressure from the policy makers is the only important one that is used for directing the knowledge institutions toward the objectives. The problem here is that the policy makers' pressure is not effective. This is due to several reasons of which the most important are: (1) the diversity of views about the types of farmers to be served, (2) the inhibitory role of the JS department, as part of the local political structure, with respect to the R&E&T, (3) uneven distribution of pressure on the actors, and (4) inappropriate policies, and delay in formulating appropriate policies, due to problems related to coordination mechanisms. These problems are the theme for the following paragraphs.

There is a disparity of views amongst the technology policy makers and actors from the local political structure. Their views on the types of farmers to whom the R&E&T services should be devoted do not coincide. This reduces the intensity of the pressure on the knowledge institutions. This is due to a lack of concurrence between the pressure forces. As figure 10.1 shows, the technology policy makers concentrate on demonstration farmers, while actors from the local political structure focus on small ones. Demonstration farmers are mainly large farmers whose main contacts are with their large farmers counterparts. "**Large farmers possess favourable conditions for using high yielding technologies. Moreover, they are resource-rich and therefore they can afford expensive inputs. Thus, large farmers can achieve high yields over a relatively short period if the R&E&T services are focused on them.**" This is the theory used by the technology policy makers for explaining the reason for concentrating on large farmers.

On the other hand, the theory used by actors from the local political structure favours small farmers. Issues of social justice, helping small farmers on whose support the government is built, and keeping small farmers in rural areas, as long as there are no other job opportunities than agriculture, are important in the theory of actors from the local political structure. In this respect, the most important force comes from the actors of the JS department (under the Ministry of jahad-e sazandegi, MJS). Helping rural people to eliminate the rural poverty is the main concern of the department. As mentioned in earlier chapters, the MJS has competed with the Ministry of Agriculture for the resources for agricultural development since its establishment. Also, concentration on large farmers in agricultural development has always been one main critique of the MJS on the performance of the other ministry. Small farmers have no relation to the district's knowledge institutions, especially where it concerns the Ministry of Agriculture. In the absence of any farmers organisation, small farmers take their demands to actors from the local political structure (especially to actors from the JS department). A strong relationship between small farmers and the JS personnel ensures that the latter takes actions in favour of the former. The point here is that the JS department lacks any connection with the district's agricultural knowledge institutions.

For this reason, actors from the JS department try to influence the institutions indirectly by using a variety of ways such as contacting authorities at the higher levels. The issue here is that the indirect influence is not very effective and efficient. The higher authorities are involved in many national-related socio-political affairs and have little time to devote to local matters. The local affairs are seen as comparatively less important. Besides, the procedure takes a lot of time. Local requests have to go to different people at

various levels. Sometimes the requests are stuck in some places for a long time due to frustrating bureaucratic procedures. More often, small farmers have to stop their work to follow up their requests. It is not uncommon to see small farmers refer to their representatives at the parliament to ask the politicians to take action for them. At the Ministry of Agriculture, they are seen asking the office of the minister for appointments, trying to evoke the minister into answering to their demands. In the absence of any control of actors from the local political structure over the district's knowledge institutions, and the existence of a bias in favour of large farmers in the Ministry of Agriculture, small farmers are hardly served by the institutions. Due to lack of clarity of policies, the two great, but conflicting forces (the pressures of the technology policy makers favouring large farmers, on the one hand, and of actors from the local political structure supporting small farmers, on the other) reduce the effect of the resultant pressures on the knowledge institutions. This means that the policy makers fail to effectively coordinate the actors.

The reaction of the JS department with respect to performance of the organisations under the Ministry of Agriculture (MA) is a critical one. On the one hand, the JS department, as a revolutionary organisation, is part of the local political structure. On the other, as part of the MJS, it competes with institutions under the MA. The competition is not confined to the institutions at the district level, it also exists strongly at the national level between the MJS and MA. The MJS is, according to its constitution, responsible for helping the rural poor to improve their lives. It is also in charge of improving the animal and forestry production that have suffered badly during the last few decades. Simultaneously, being a revolutionary organisation, the ministry enjoys social prestige, and maintains strong relations with politicians and religious authorities. These make the ministry a powerful body in the country. One thing that brings this powerful ministry in conflict with the MA is its task for agricultural development. Being involved in agricultural development, both the MJS and MA have always competed with each other for available resources. The competition has led the two ministries to be very critical of each other's performance. The MJS considers the MA as a repressive institution of the pre-revolutionary regime, and one that is oriented to serve large farmers. The personnel of the MJS believe: "**for many years, small farmers and poor rural people were left alone as marginalised. Instead, the Ministry of Agriculture has served large farmers who needed the least assistance. These days, it is very hard to believe that the ministry can shift its orientation to serve small farmers.**" They also believe that the MA as a whole is passive in contributing to the self-sufficiency objective due to its deeply-rooted bureaucratic structure. On the contrary, they believe that the MJS as a revolutionary organisation can serve the mass of rural poor. The ministry is staffed by young, rural-background, and revolutionary-minded people who eagerly work for the farmers. Also, a decentralised bureaucratic structure allows the MJS to perform its jobs with fewer problems. Personnel of the MA, on the other hand, blame the MJS for its inexperienced cadre whose activities are mainly emotionally-stimulated. Because of this, the cadre does not care very much about scientific techniques in research and extension activities. Due to its social prestige and power, the MJS has always been the winner. Not surprisingly, the MA is experiencing the opposite. The MA feel themselves to be performing in a problematic situation in which it has to defend its vulnerable position all the time. A great deal of time and energy of the MA has been wasted due to the problem. This adversely affects the performance of the district's R&E&T.

Uneven distribution of pressure on the actors is illustrated in figure 10.1. As shown, the pressure of the policy makers is dominantly exerted upon the extensionists. The pressure is mainly used for directing the extensionists to act as bridges between the researchers and demonstration farmers for the purpose of information flow. Assuming that sufficient knowledge, information, and technologies are generated and developed by the researchers, the policy makers emphasise the dissemination task more than any others, even though not all the problems concerning the provision of access to relevant technologies for farmers are related to extension. Farmers are experiencing many problems with respect to the R&E&T services. In other words, the emphasis of the policy makers on the task of the extensionists is necessary but not sufficient. There is a need for equal emphasis on the tasks of other actors. Lack of equal pressure on the other knowledge institutions, especially on research, reduces the effect of the pressure on the extension.

Lack of effective monitoring and evaluation systems has paralysed the flow of feedback information from the actors' level to the policy makers. As described earlier, direct supervision is the most important coordination mechanism, and monitoring and evaluating the main coordinating tools in the hands of the policy makers. Any problem with the tools can severely damage the coordination by providing the policy makers with wrong information or delaying the process of policy making. The monitoring and evaluation systems are frustrated due to several problems. Of these, (1) lack of resources, especially manpower shortage at the operational level, (2) lack of incentives amongst operational staff, (3) self-protecting bias of the staff, and (4) a sluggish bureaucracy are the most important.

It is not uncommon to receive very late feedback information from the operational level due to severe manpower shortage. The monitoring and evaluation systems are limited by general problems in the knowledge institutions. The R&E&T are experiencing severe manpower shortage. The shortage is due to non-replacement retirements, the elimination of staff due to the revolutionary staff cleansing, etc.

At the operational level, the extensionists and actors from the local political structure are the main actors on whom the monitoring system is based. The former is active in the formal feedback system, the latter in the informal. However, there is more emphasis on the formal feedback system. The problem here is that the formal monitoring system is slowed down due to poor performance of the extensionists who have various jobs to do. The extensionists are heavily loaded with various jobs, and rewarded neither with sufficient salaries nor any additional incentives. Lack of incentives brings the extensionists to an indifferent state in which they do not pay enough attention to the importance of the feedback information. This causes delays in passing information on to the higher authorities.

Self-protecting bias often make some extensionists pass on wrong information to higher authorities. This is to protect themselves against any unfavourable conditions that they might get into, due to wrong impressions that the policy makers might get on the performance of the extensionists. As I mentioned earlier, the policy makers place more emphasis on the dissemination task than any others. They assume that sufficient information and technologies that can solve farmers' problems are available at the research stations. They think that the only thing to do is to transfer the technologies and information to farmers, and to teach them the know-how. According to the extensionists, this is a wrong impression produced by the researchers. The researchers have induced the policy makers to believe that the research's task is successfully done. By inducing this

impression, the researchers place themselves out of any argument about any problem concerning the technologies. The extensionists believe: **"in the shadow of lack of any effective evaluation on the research's findings, the researchers' claim is generally accepted by the policy makers."** Also, the policy makers seemingly attribute the adoption of technologies mainly to access to high yielding technologies and information, and not to a 'mix' of development conditions such as access to market, inputs, incentives, relevant technologies, etc. Since the main task of the extensionists is, according to the constitution of the extension organisation (though it is not true in the real situation), to disseminate information amongst farmers, the policy makers come to believe that the extensionists are the key elements in adoption of technologies by farmers. This makes the policy makers blame the extensionists for any non-adopted technologies. To prevent such an unfavourable situation, some extensionists manipulate the field data in order to favour their interests, before passing it on to higher authorities.

The role of the existing bureaucratic structure with respect to the R&E&T is an extremely inhibitory one. Its negative effects on the actors' performance are present in all activities. One negative effect is the blockage of flow of feedback information necessary for coordination. The local reports prepared by the field level staff have to be read and approved by local authorities before any further advancement. Each report goes through a long, slow-motion procedure in which many people are involved. This causes a delay in formulating appropriate policies when the time is ripe for such requirements. Another main area of frustration for the R&E&T created by the bureaucracy, is the resources utilisation. The allocated budget, for example, comes very late, in some instances a few months later than expected. This largely prohibits the R&E&T from maintaining a well operated monitoring and evaluation systems.

### 1.5. Other contextual actors that affect the performance of the R&E&T and farmers

The R&E&T and farmers perform in a complex context in which several facilitating or inhibiting factors affect their performance. These factors are related to a number of actors within this context. I shall call these actors the 'contextual actors'. I have grouped and placed contextual actors into five contexts. As figure 10.2 shows, the contexts include (1) policy environment including technology policy, (2) local political and bureaucratic structure, (3) institutions providing goods and services, (4) the black market, and (5) the National and International Research Centres (sources of scientific information). The influence of each contextual actor on the performance of the R&E&T and farmers is rather important.

Figure 10.2. The context in which the Marvdasht district's R&E&T and farmers perform.


Source: author's field notes.

In the section on coordination, I demonstrated the importance of the policy environment, as well as the political and bureaucratic structure on the performance of the R&E&T and farmers. What we

previously discussed about the policy environment is not its whole influence, but only with respect to coordination amongst the actors. The effects of the policy environment on the actors is much greater than shown. It influences all different characteristics of the actors through allocation/control of resources, and creating incentives, laws, etc. It also affects the impact of the R&E&T directly, through providing farmers with access to laws and incentives and indirectly, through influencing the institutions providing goods and services. Thus, there is a need to elaborate more on policy effects. Due to the importance of the policy environment, the analysis of its effects on the performance of the R&E&T and farmers fall into a separate section. The section analyses policy factors affecting access to relevant technologies.

In the following, we briefly discuss the effects of contextual actors other than those involved in policy, politics, and bureaucracy.

**Table 10.4. Institutions providing access to goods and services for farmers, which affect the impact of the Marvdasht district's R&E&T.**

| institutions | responsibility |
|---|---|
| rural cooperatives | delivery and distribution of inputs, fuel, credit; and marketing. |
| agricultural bank | providing farmers with different types of loans. |
| water department | distribution of water for farmers under the modern irrigation network. |
| mechanisation organisation | distribution of farm machinery and spare parts. |
| JS department | improvement of village infrastructure (village roads for instance), distribution of small farm machinery and spare parts. |

Source: author's field notes.

### *1.5.1. Institutions responsible for providing access to goods and services*

Table 10.4 illustrates institutions providing access to goods and services for farmers and their responsibilities. The institutions include rural cooperatives, the agricultural bank, the water department, the mechanisation organisation, and the JS department. These institutions are in charge of market, inputs, fuel, credit, irrigation water, farm machineries and spare parts, and infrastructure. In this respect, as chapter 9 has shown, the district's farmers operate in a very ill-prepared context. Farmers lack access to market, inputs, water, credit, etc. This in turn adversely affects the impact of the R&E&T by preventing farmers from adopting technologies. For this reason, also for improving the impact of the R&E&T, there is a need to analyse relations between the constituent actors and those providing access to goods and services. Based on what the theory suggests for improving the impact of knowledge institutions (Röling, 1990), there is a need for horizontal links between the R&E&T and institutions providing access to goods and services for farmers. This is to ensure that the 'mix' of essentials, i.e., market, credit, inputs, appropriate technologies, etc. is available for farmers.

The extension department is the only institution that has linkages with the institutions providing access to goods and services for farmers. As matrix 10.3 shows, linkages display various frequency of use and importance, and represent formal as well as informal interactions. The importance of the linkages for the whole agricultural system, and for contributing to the national objectives, are based on an assessment by the managers of the institutions (N=5). The managers are the main people who use the linkages. For the purpose of the study, we only select linkages between the extension department and the institutions providing access to goods and services for farmers for further analysis. Analysis of the other linkages between the institutions are not the concern of this study.

As the matrix illustrates, out of 10 linkages, not one is frequently used. Four linkages (40%) are occasionally used, and the rest are not used at all. From the importance point of view, 5 linkages (50%) are seen as very important, 4 linkages (40%) of some importance, and the rest as unimportant. Linkages of the extension department to the rural cooperatives, the agricultural bank, and the water department are both formal and informal. The informal linkages are based on friendship relations between the actors, especially that of the managers. Some of the informal relations have been long established. Since the machinery organisation operates at the provincial level, the linkage to the organisation is implemented through the provincial extension department.

**Matrix 10.3. Characteristics of linkages between the Marvdasht district's extension department and institutions providing access to goods and services for farmers, as expressed by the managers.**

| | ext. | rural coop. | agric. bank | water dep. | mach. organ. | JS dep. |
|---|---|---|---|---|---|---|
| extension | X | B,1* | B,1* | B,1* | B,1 | C,1 |
| rural coop. | C,2 | X | – | – | – | – |
| agric. bank | C,2 | – | X | – | – | – |
| water department | C,2 | – | – | X | – | – |
| machinery organ. | C,2 | – | – | – | X | – |
| JS department | C,4 | – | – | – | – | X |

Note: linkages are formal unless otherwise indicated.

| frequency of use | importance of linkages | other signs |
|---|---|---|
| A= frequently used | 1= very important | *= both formal and informal |
| B= occasionally used | 2= some importance | –= not related to the study |
| C= not used | 3= potentially important | x= inter. process |
| | 4= unimportant | |

Source: author's survey.

Except for the linkage to the JS department that is not used, all the other linkages of the extension department are occasionally used. Coordination meetings at the management level are the main linkage mechanisms used by the extension to link to the institutions. There is still another linkage mechanism set by the MKKDs' managers to link the extension department to rural cooperatives and the machinery organisation. The MKKD's managers have assigned the extensionists to write and distribute permits for inputs and machinery spare parts amongst farmers. Surprisingly, the linkages are loosely maintained despite the high importance attached to the linkages by the extension manager. The manager acknowledges that farmers need to have access to all the necessary elements in the 'mix' for development (market, credit, production resources, infrastructure, relevant technologies, etc.) to be able to adopt technologies. The reason for only occasional contact is, as expressed by the extension manager, related to the time constraints experienced by the manager. The manager has been pre-occupied with various problems, ranging from those related to personnel affairs to those related to educational

obstacles. The educational obstacles are mainly caused by involvement of the cadre in non-educational jobs due to obligations imposed by the MKKDs' managers. In other words, the extension manager is left with little time to devote to making contact with the managers of the other institutions. There is one important point about linkages between the extension and rural cooperatives as well as the machinery organisation that needs some explanation. The linkage is, in its present form (writing and distribution of permits for inputs amongst farmers), troublesome for the extension. This is because it interrupts the educational duties of the extensionists. As previously explained, involvement of the extensionists in non-educational duties reduces the effectiveness of the staff.

The case of the JS department is totally different. Although the extension manager considers the linkage to the JS department as very important, he hardly makes any contact. This is due to a very critical relationship between the ministries of Agriculture and the jahad-e sazandegi that has been discussed earlier. The conflict between the two ministries has produced an unfavourable atmosphere. In this respect, the cadres hardly ever interact with each other because they do not believe in each others' work capacities. For this reason, neither the extension manager nor the JS makes contact with each other.

With respect to linkages of the institutions to the extension department, the situation is disappointing: none of the linkages are used. This is due to a low importance the managers attach to their linkages to the extension. The worst case is of the JS department; its manager considers the linkage unimportant. The problem is mainly due to the lack of a system vision amongst the managers towards agricultural production. The managers only mind their organisation's interests and think in a very specific task area in which they are supposed to perform. They never think that their services should be coordinated with those of others including research and extension. Thus, they judge the importance of the linkages with respect to their organisations, rather than to the whole agricultural system and to the ultimate objective (self-sufficiency).

### *1.5.2. The black market*

The black market plays a dual role for the adoption of the technologies. On the one hand, it provides access to technologies and the related inputs for farmers. On the other hand, it frustrates the adoption by increasing the cost of using the technologies. In other words, the black market only provides the access to goods and services for farmers from the physical point of view, and not economically. The case of chemical fertiliser is a ready example. Although the input is available on the black market, it costs more than subsidised fertiliser. It is so expensive that some farmers cannot afford to buy the required quantity.

The black market grew rapidly during the eight-year war (1980-1988) due to the general disruption in the country's economy. The way the black market's middle-men work is mainly based on creating a shortage of rationed commodities including inputs and farm machinery spare parts. The middle-men attempt to collect and stock the commodities in large quantities (which is illegal). Then, the commodities are kept for a while until the shortage causes the prices to rise sharply. The commodities are sold to needy farmers under the counter. It is done with great caution to avoid being caught. Thus, the middle-men use a network of people to sell the commodities. The black market prices are often a few times more than the open market (un-subsidised) prices. They are also often several fold (in some cases nearly thirty times) more than the official prices (subsidised prices).

Here, one important question is that of how the commodities get into the black market. In theory, the commodities are provided, delivered, and distributed by the state agencies and state-related cooperatives. The point here is that corruption results in the re-routing commodities to serve the middle-men. As the government's investigation bureau have revealed, the bulk of the commodities are siphoned to the middle-men by a network of different people. These include some agents of rural cooperatives with the involvement of some corrupted officials in charge of delivery and distribution of the commodities. The latest scandal which occurred in the study area at the time of the study, was a case of chemical fertiliser.

Unless the government can deal effectively with the black market operations to eliminate its frustrating effects, adequate access to the technologies cannot be provided to farmers. Since the black market operation is a phenomenon which results mainly from malfunctions in policy, effort to eliminate the problem should focus on improving the policy environment.

### *1.5.3. The National and International Research Centres*

The National Research Centre (NRC) influences the performance of the R&E&T through the national approval committee for the research projects. All locally approved research projects have to be approved by the national committee. Any non-compliant project should be amended by the local researchers and sent back for final approval. Although the role of the committee in coordinating local projects, examining the projects against the national research priorities, and preventing duplications, is very important and essential, the committee sometimes acts as an inhibitory factor for the local needs. In this sense, the local researchers are limited to what the committee defines as the area of concern.

The influence of International Research Centres on the performance of the R&E&T is mainly exerted through national research projects approved by the NRC. New improved varieties of wheat, which show high yield, are first introduced to the NRC, for testing in local conditions. The NRC distributes the varieties among the district research centres. The problem here is that by assigning out trials on the varieties to local researchers the researchers have insufficient time for locally-defined projects. On the other hand, the incentives for participating in national projects are attractive to the local researchers. By conducting national projects that are accompanied with somewhat more recognition within the research community, and prestige, the local researchers try to lift themselves up the promotion ladder. In fact, national projects are somewhat easier to handle, for the national project constitutes a type of adaptive research. Thus, contrary to locally-defined projects, national projects carry with them much of the necessary information already generated by the International Research Centres. Locally-defined projects need information which sometime is not so easily available.

## 1.6. Summing up: the assessment of synergy amongst the tasks of the R&E&T and farmers

Thus far, we have seen that the researchers, extensionists, trainers, and farmers, are linked together through various linkage mechanisms. This is only one of the conditions required for synergy. According to AKIS theory, the linkages should make the actors interact as parts of an articulated whole. However, the actors do not strongly

interact with each other. Consequently, the R&E&T are ineffective in providing farmers with access to relevant technologies. Three main causes of the problem which have been revealed by the present study are: (1) weak linkages amongst the actors due to lack of use/occasional use of linkages, (2) gaps between tasks of the actors, and (3) ineffective coordination. A wide range of problems frustrates the integration, task differentiation, and coordination. The problems include lack of a system vision amongst the actors, inadequate resources, lack of strong pressures on the knowledge institutions, sheer prejudice between sets of actors, lack of incentives, etc. These prevent the R&E&T and farmers from contributing effectively towards the ultimate objectives. Any attempt towards improving the performance of the R&E&T and farmers needs to be made in the three malfunctioning areas.

Apart from the problems mentioned above, a mix of various constraints created by the context in which the actors take their place frustrates the performance of the R&E&T and farmers. Each contextual element influences the actors in one way or another. One set of problems is due to a lack of strong interactions between the knowledge institutions and those providing access to goods and services for farmers. Any attempt towards eliminating these problems necessarily demands some efforts to solve the constraints that frustrate strong interactions amongst the institutions. This demands strong linkages and coordination at the interface between the institutions. This in turn is necessary to overcome inhibitory forces created by several factors. Of these factors, the lack of a system vision amongst the managers of the institutions, inter-organisational conflicts, and lack of resources are the most important.

The above constraining factors are not the only ones affecting the access to relevant technologies for farmers. As will be discussed in the following section, policy factors are adding to the problem.

## 2. Policy analysis

The policy on intensification of wheat emphasises support of farmers by creating appropriate laws and incentives for adopting technologies. The policy supports R&E&T by allocating resources and creating necessary laws and incentives to provide farmers with access to high yielding technologies. As I described in chapter 9 and explained in the first part of the present chapter, there are discrepancies between what the policy suggests and what farmers and R&E&T experience. In this section, the aim is to explain how and why the policy adversely affects the access and relevance of technologies for the district's farmers. Six major problems will be analysed. Of these, three are related to the general policies on agriculture, and the remainder to technology policy.

### 2.1. Problems associated with the general agricultural policies

(1) Lack of clarity of policy for self-sufficiency, (2) lack of correspondence of policies on wheat productivity increase and national objectives, and (3) lack of correspondence of goals and expectations of the policy makers and policy beneficiaries (farmers), constitute the main types of constraints associated with the general policies in agriculture. Each problem acts as a brake, to slow down the achievement of self-sufficiency in wheat. In the following, we discuss each problem in more detail.

### 2.1.1. *Lack of clarity of policies*

There are two different development goals held by the government: (1) food security for the nation, and (2) socio-economic and political justice for the poor, in particular the rural poor. These two goals are supposed to be achieved by (1) bringing about self-sufficiency in the main agricultural products, and (2) supporting small farmers in all different aspects of their lives. The important point here is that, for political reasons, small farmers are the constituents who are supposed to make the nation self-sufficient. Therefore, the two goals are very inter-related. In this respect, institutions involved in the country's agricultural development in policy terms are obliged to focus on small farmers, to raise their level of productivity, and to help them contribute to the self-sufficiency goal.

One thing causes these two goals, which carry political meaning, to come into conflict. For political reasons, self-sufficiency should be achieved within a short time. The problem here is that relying on poor and small farmers for self-sufficiency in a short span may not work. In order to raise the level of productivity of small farmers, and to create favourable working conditions for them, there is a need for special measures, which require a longer period of time, special development programmes, a large resource base, small-farmer-oriented staff, patience in working with small farmers, etc. Taking into account some of the conditions (mentioned before) that the country's small farmers experience, one can expect that the small farmers are unable to make the nation self-sufficient in the near future. Swift steps towards self-sufficiency necessarily calls for promoting those who are more productive, in the sense that they enjoy the favourable conditions needed for productivity. In other words, promoting large farmers is, for the time being, the only option open for the development institutions to achieve self-sufficiency objectives quickly.

The problem is that supporting large farmers is not in line with the second objective (socio-economic and political justice for the poor). In this respect, the government plays a constraining role by leaving its policies ambiguous. Large farmers are, at present, the main contributors to the self-sufficiency objectives. It are they who have large surplus for sale. Acknowledging this, the government does not want to interrupt the present achievements by excluding this category of farmers from development services. Thus, the intensification policy is left vague with respect to the type of farmers to be targeted by the R&E&T services. This makes the situation difficult for the Ministry of Agriculture (MA), which is responsible for self-sufficiency in wheat. Lacking a clear policy on the type of farmers to be targeted, the MA is confused as to what should be the right target for its services. Lacking the means for helping small farmers and being under political pressure to make the nation quickly self-sufficient, the ministry focuses on large farmers. But the result is that the ministry is accused by actors from the local political structure and by small farmers of being in favour of wealthy farmers who do not need any help. This problem is clearly stated by the general director of agricultural department in Fars province (Shari'atmadari, interviewed in December 1990): "**one prime constraint in institutional services for farmers is the ambiguity of the policy. If it was clearly stated what type of farmers we had to serve we could successfully go on without problems. We do not have access to necessary resources to serve the whole population of farmers. And, at the same time, we are experiencing extreme pressures mainly from the parliament to take quick measures for bringing about self-sufficiency. What do people expect us to do? The only option available to us is to focus on large farmers. Besides, no where is it stated that large farmers are**

**forbidden to be helped."** He added: **"this is why we help large farmers, and are experiencing many criticisms."**

### *2.1.2. Lack of correspondence of implemented policies and national objectives*

Further problems occur when agricultural sector policies do not correspond to the overall national objectives. In this respect, two main tensions exist: (1) favouring urban consumers or farmers, and (2) helping large farmers or small ones. The following paragraphs elaborate the problems.

Self-sufficiency in food is one of the main national objectives. According to the national policy, agricultural development is the base for the economic development of the country. The importance of agriculture, specially wheat production, to the nation was explained in chapter 1. Giving top priority to agricultural development, the national policy requires the government to give more support to farming activities than to any other activities. However, despite their importance, farmers get little help compared to urban consumers. According to Yunesi (1989), for the period of 1978-1984, the government subsidy paid on food commodities for urban people exceeded the total development budget for agriculture by 9%. In other words, urban consumers have been supported more by the subsidy policy than farmers. The main reason for the consumer-bias of the policy is the political dynamic: high consumer prices may cause immediate socio-political problems, while comparatively, the problems of farmers are less politically harmful. Thus, given limited resources, the government focuses more on lowering consumer prices by giving subsidy on foods.

The large-farmer bias leads agricultural policy makers to neglect small farmers. There are two main government policies for stimulating production increase: (1) keeping production expenditures low by subsidising inputs and other farm necessities, and (2) creating incentives by raising farm-gate wheat prices. However, these two policies are not in correspondence with the national objective of favouring small farmers. This objective needs to be approached by supporting small farmers directly. However, the subsidy and price policies help large farmers.

The policy for subsidy on inputs and other farm necessities requires farmers to use the latest technologies and to sell the product to the state purchasing boards. In other words, the subsidy is set as an incentive for farmers to adopt technologies and to contribute to national food production. Farmers get four bags of subsidised chemical fertiliser per hectare, for instance, if they follow the extension advice on furrow irrigation. Otherwise, the amount given is half that. However, as chapter 9 showed, small farmers have largely rejected the technology. Furthermore, the subsidy on the delivery of product to purchasing boards helps large farmers more than the small farmers. Large farmers have large surplus for sale and better access to transport for carrying their produce to the point of sale. They get most benefits out of the policy.

With respect to the price policy, small farmers are not the main beneficiaries. According to statistics (ISC, 1991, and FAO production year books, 1984-1990) of a period of five years (1984-1989), on average, only 25% of the total wheat produced is sold to the state purchasing boards, mainly by large farmers. Since the wheat market is a state monopoly and the product hardly reaches urban areas through illegal channels, we can conclude that the remainder is consumed locally. This includes the wheat consumed by farm families, and transacted in small quantities in local markets to be used for bread

and as seed, animal feed, etc. The point here is that, although small farmers are affected by the price policy, they do not get as much benefit as the large ones.

### *2.1.3. Lack of correspondence of goals and expectations*

The policy makers are facing national-level problems, food shortages for instance, which threaten national and political interests. For this reason, they focus more on achieving the national objectives than the local objectives, since the local objectives immediately concern only the farmers. To policy makers, local objectives are worth achieving if they correspond to the national objectives. The point here is that farmers' objectives do not necessarily coincide with the national ones. Low wheat prices compared to other crops attract farmers to more profitable crops that are not, most of the time, the main crops. The main objective of farmers is not necessarily to contribute to national self-sufficiency, but to earn more money and to meet local and family needs. Faced with economic problems, such as low family income, farmers place more emphasis on their interests than the national interests as stated by the government.

**Box 10.1. Illustrative views of sample farmers on wheat production.**

**farmer 1:**

**"I know that I have to cultivate wheat because we need to be self-sufficient. But, I need money as well to cover my expenses. How can one expect me to cultivate wheat for a little money, whereas I can earn several times more from a piece of land cultivated by crops like cucumber, tomato, water melon ant the like." [Thus the farmer replied when asked to give the reason why he had not cultivated wheat on all his land but only in a small part.]**

**farmer 2:**

**"I shall never sacrifice the paddy for the wheat simply because the former is my best fortune". [The farmer replied to the question of why he had not cared for his wheat crop as much for the paddy crop. He had allocated the last water for wheat to the paddy nursery plot.] He suggested: "the wheat should be made more profitable compared to other crops if the government wants us to produce more".**

**farmer 3:**

**"It is not wise for me to reject profits which I can earn if I cultivate a crop like maize instead of wheat. Wheat bears little money which is even not enough to cover all my living and farm costs". The farmer gave his view on what he thought about his role in contributing to wheat self-sufficiency. He added: "I cultivate wheat in some part of my land because it is not good for me to own a large piece of land and not to cultivate wheat. The remainder of the land is left for maize and potato. I wished I had access to enough water to cultivate some paddy".**

**Source: author's field notes.**

The argument that farmers use to justify their action are, as box 10.1 illustrates, economical: to earn more money towards the maintenance of their family and farming expenditures. Farmers believe that the national objectives should be achieved through the

achievement of the local ones: **"if the government wants us to produce wheat it should make the crop more profitable as other crops are."** They added: **"taking into account the present wheat price, which is very cheap, we get little return for real hard work. The government says that it is a matter of national interest to cultivate wheat. OK! We believe that. But producing with such a low price may only be possible a few times. Previously we did it at the end of the revolution to obey the national leader, and for showing national solidarity. The problem occurs when we have to continue it for a long time. This cannot go on for ever. We need money to go towards the maintenance of the family and farming expenditures."** They suggested that: **"if the wheat is made more profitable we would certainly cultivate it".**

## 2.2. Problems associated with the technology policies

Three major problems are related to the present technology policies: (1) lack of correspondence between the priorities of the R&E&T and farmers with respect to technologies, (2) inappropriate technology policy with respect to the R&E&T services that conflict with local needs, and (3), lack of correspondence between the national and local priorities for the R&E&T due to a centralised policy-making structure. Analysis of these problems constitutes the theme for the following paragraphs.

### *2.2.1. Lack of correspondence between priorities*

Based upon the intensification policy, the priorities of the R&E&T with respect to technologies are to generate and transfer high yielding varieties/efficient techniques. The aim is to raise the level of productivity of farmers, and consequently to bring about self-sufficiency in wheat production. But, farmers often give priority to other aspects of wheat production than the high yield. Socio-cultural reasons, as well as the extent to which technologies fit into farming systems, affect the farmers' choice of technologies. Farmers favour improved varieties that give a favourable taste and have other desired characteristics relating to colour, ease of processing and baking. A high yielding seed with unfavourable characteristics from the point of view of food preference is not welcomed. Further, most farmers are dependent upon their family labour for farm activities. A very labour intensive technology can create social problems for farmers within the family. A technology may force farmers to overuse family labour. This, in turn, adversely affects family affairs. In addition, most farmers usually keep a few livestock for milk and meat. The main source for feeding the animals is crop residues, specially wheat straw. High yield is not the most important characteristic compared to wheat straw. The capacity of improved seeds to produce large quantities of straw is important. Thus, except for cases in which wind layering (vers) threatens the crop, farmers usually prefer long stem seed varieties.

### *2.2.2. Inappropriate policy for the R&E&T services*

The latest policy for R&E&T services in wheat production, though it is not totally operationalised, creates additional problems for Marvdasht district's farmers, especially small farmers. According to the latest policy, wheat production services of the R&E&T are to be provided to farmers only in wheat production zones. The country is agro-ecologically divided into different zones. Farmers in each zone are expected to cultivate

only certain crops. The crops are, according to the zone's plan, considered to be the most suitable ones that can be grown in the zone. Wheat is, for instance, expected to be cropped only in certain areas where the agro-climatic conditions allow the crop to bear most, using least inputs. In this respect, areas outside the defined wheat zones are excluded from the R&E&T wheat production services. Farmers in these areas should cultivate crops that are agro-ecologically suitable for their specific zones. The objective is to use production resources and inputs more efficiently. This creates problems for most farmers, especially small ones, who cultivate wheat for local consumption. Lacking any government support plan that can give them access to external wheat for bread, farmers outside the wheat zones have no other choice than to cultivate the crop for their consumption. Since farmers outside the zone areas are excluded from the R&E&T services, the access to relevant technologies formally is denied them.

### *2.2.3. Lack of correspondence between the national and local priorities for the R&E&T*

One major problem with respect to the policies in general, and the technology policies in particular, is the centralisation of policy-making. Policies are made at the national level by the high authorities and expected to be implemented by officials at the lower levels. The structure for policy making is inspired by the political structure that is a centralised one. The policies are supposed to support the R&E&T. However, the policy making structure adversely affects the R&E&T priorities. Local priorities are overlooked, and the R&E&T are forced to plan in accordance with the central directives. A centrally made policy cannot properly take the local needs into account because of lack of sensitivity to the diversity of needs and poor feed-back regarding the actual situation. This is one reason for the bias of the R&E&T in favour of large farmers. The bias exist despite of the opposition of actors from the local political structure. Actors from the local political structure try to influence the R&E&T to make them responsive to the needs of small farmers. However, being directed by the technology policy, which favour large farmers, the R&E&T focus is the large farmers.

## 2.3. Implications for building a conducive policy environment

A conducive policy environment in which actors can eagerly and diligently perform their tasks is needed for optimal AKIS performance. Any problem associated with agricultural policies in general, and with technology policy in particular, can inhibit the performance of the actors and of the AKIS as a whole. But, the Marvdasht R&E&T and farmers lack such a conducive policy environment. This in turn adversely affects farmers' access to relevant technologies. Any attempt to improve the present problematic situation of wheat production in the district demands some improvements in the existing policy environment.

# CHAPTER 11

# CONCLUSIONS AND RECOMMENDATIONS

The present chapter has three sections. The first presents conclusions on research results. The conclusions highlight important points at three levels: farm, institutional, and policy. The second section makes suggestions for resolving the social problems related to the study. Building upon the lessons learned through practice, so as to contribute to theory development, constitutes the theme of the third section. This section meets the scientific objectives of the study.

## 1. Conclusions

As a result of the 1979 revolution, a major change occurred in the outlook of the Iranian politicians towards rural people. Small farmers, who had been marginalised for many years, have become politically important. The government considers small farmers as the main political target of its development efforts. Before the revolution, the government's services were large-farmer oriented. Thus, the post-revolutionary government has brought many socio-political changes in the rural areas in favour of small farmers.

However, despite the government's development efforts, small farmers do not effectively contribute to the national objective of self-sufficiency in agriculture. The yields of the majority of farmers, specially the small ones, remain low. This is the problem which motivated the present research.

Looking for a broad perspective to deal with the research problem in a comprehensive way, I chose the AKIS theory. The theory was used as a diagnostic framework to explore the research problem. The comprehensive perspective gave an opportunity to examine the research problem in the broad context in which it takes place.

The aim of this research is not to generalise from the particular case for the whole country, but to provide information and give insights into knowledge generation and use in the country's agriculture. The insights generated by the research are: how farmers and institutions work in practice, what prevents them from working synergically as a system, and what steps one should take to improve the situation.

### 1.1. Conclusions at farm level

At the farm level, two boundaries for the research were made which limited the area and the domain of the study. The first boundary limited the research to one district out of the 215 districts in the country. Marvdasht district was selected because of its agro-ecological, socio-economic, and political interest in the light of national objectives. The research also gives results that are more specific to the district. Concerning the second boundary, the scope of the research is limited to wheat production. The reason for the selection of wheat as the domain for the research was its importance in the country in its socio-economic, cultural and political aspects. Wheat carries an important meaning for both the people and the government. It is the main staple food for the nation. It is also seen as a holy crop. Furthermore, self-sufficiency in wheat contributes toward the revolutionary government's political success, and brings dignity within the international

community. Given the small importance of rain-fed wheat in the district, the study is further limited to irrigated wheat.

The intensification strategy aims to create the conditions for use of high yielding technologies by farmers. Unless the technologies are used by farmers, they are manifestations of wastage of scarce resources. In order to examine claims and benefits of technologies for farmers, a technology package introduced to Marvdasht district's farmers by the 'Wheat Impact Programme' (TATG) was selected. The rate of adoption of the package by farmers was expected to be high. However, the majority of the district's farmers have rejected the component technologies. Three constraining factors prevent farmers from adopting, and from contributing to the national objective of self-sufficiency in wheat. Any attempt to persuade farmers to adopt should necessarily improve the three factors. The factors are: (1) inappropriateness of the technologies for farmers, (2) lack of access to the technologies, and (3) lack of access to the necessary development conditions other than the technologies.

The examination of claims and benefits of the technologies has revealed their inappropriateness. The technologies do not fit into the farming systems and the agro-ecologic, socio-economic, and cultural conditions facing the farmers. Lack of fit between the latest technology for watering (the furrow irrigation) and the farmers' conditions is an example. The technology demands flat and clean surfaces, large pieces of land, plenty of time for irrigation, etc. Meanwhile, farmers are confronted with problems such as land grading, land fragmentation, stones, social problems related to water rights, etc. These problems prevent farmers from adopting the proposed technologies. Thus, one area for improvement is to design technologies more relevant to the actual conditions that farmers face.

Another problem of the technologies is unavailability and inaccessibility. Farmers lack access to the technologies and their related inputs in a timely fashion. Unavailability and inaccessibility of chemical fertiliser, herbicides, sprayers, farm implements for land preparation, etc., for the farmers are the prime examples. Moreover, the majority of farmers lack the necessary information for using the technologies. Furthermore, since farmers purchase most of the inputs from the black market, they have to spend a lot of money to use the technologies, raising the cost of production.

To persuade farmers to adopt the technologies requires properly setting up the 'mix' of development elements. These elements include market, incentive structure, inputs, and relevant technologies. Lack of any element of the 'mix' causes problems. Farmers judge technologies not only from the point of view of availability and relevance, but also in terms of access to conditions other than technology. They operate in a very ill-prepared context in which the appropriate access is not provided. In this respect, the price of wheat does not offer an incentive for farmers to adopt the new technologies. Furthermore, the market is malfunctioning, credit is insufficient, and it is difficult and time consuming to get loans. Production factors, particularly land and water, are limited. With respect to facilities for implementing projects, land preparation machinery and implements for instance, the problem is overwhelming.

Lack of access to, and the irrelevance of the technologies indicates the inappropriateness of the intensification strategy. While the strategy emphasises the creation of conditions for development, the majority of farmers lack access to such conditions. This is an obstacle to self-sufficiency, and in full contradiction to the national objective of helping small farmers.

## 1.2. Conclusions on institutional support

At the institutional level, I used the AKIS' conceptualisation as a diagnostic framework to examine whether the district's Research, Extension, and Training (R&E&T) and farmers form an articulated whole. Firstly, from the beginning, a system of knowledge and information for the study area was assumed. Secondly, a boundary for the system, limiting system's actors to R&E&T and farmers, was drawn. Thirdly, a Transfer of Technology perspective (TOT) for the study was chosen deliberately.

The district's farmers lack effective institutional support necessary for development. The lack of effective performance is attributed to a lack of synergy between the tasks of the R&E&T and farmers. In other words, from the AKIS' perspective, the institutional actors do not form an articulated whole.

Factors that adversely affect the performance of the actors are related to (1) task differentiation amongst the actors, (2) integration between the tasks of the actors, (3) coordination amongst the actors, and (4) the context in which the actors perform. In sum, a wide range of problems causes the lack of synergy amongst the task of the actors.

### *1.2.1. Task differentiation, integration, and coordination*

Gaps exist between the tasks of the actors. Poor/limited task performance is the cause for the gaps. The areas of vulnerability include four tasks: (1) adaptive research, (2) integration, (3) transformation, and (4) dissemination. These tasks leave gaps between (1) applied research and technology development, (2) technology development and dissemination, and (3) utilisation and the other tasks. The gaps prevent the actors from performing effectively on the knowledge generation-use continuum. The main problems are (1) negative attitude of the researchers with respect to the participation of farmers in research activities, (2) lack of effective linkage amongst the R&E&T and (3), insufficient resources.

With respect to the integration, the situation is a disappointing one. For the assessment of integration, we examined linkages between the actors. Linkages are, generally speaking, weak. The actors use the linkages occasionally. In some cases, linkages are not used at all. In our study, this indicates the weakness of the ties even though they may be seen by the actors to be very important for the whole AKIS. The most problematic cases in which linkages are not used include linkages between farmers and both the MTKF and DKS researchers, and linkages between the DKS researchers and both the extensionists and trainers. Problems that frustrate integration vary greatly, ranging from attitudinal to problems related to resources and incentives. The main problems include (1) lack of a system vision amongst the actors, (2) lack of knowledge on extension science, (3) lack of fit between expectations and performances, (4) sheer prejudice among the researchers, (5) biases of the policy makers towards research, (6) large-farmer biases of the R&E&T, (7) professionalism biases of the researchers, (8) lack of confidence of the researchers in the applicability of the research results, (9) researchers' fear of experiencing farmers' pressure, (10) frequent changes in management, (11) lack of resources, and (12) lack of incentives.

Another important problem related to linkages is the marginalisation of small farmers due to the large-farmer biases of the knowledge institutions. The institutions hardly serve this category of farmer, or the women who are active in family farming.

Despite the existence of various coordination mechanisms, the actors do not cooperate effectively. The coordination is frustrated by a problem of lack of strong

pressure on the R&E&T. In the absence of any effective force, the knowledge institutions attend to their own objectives rather than to the national objective of serving small farmers. There is a lack of pressure from the farmers' side as well as from the management. The pressure from the policy makers is the only force, but not effective, to direct the knowledge institutions to serve small farmers. The main constraining problems for an effective coordination force are related to a lack of clear policy on the farmers who are to be served, inter-organisational problems between the two ministries involved in agricultural development (the MA and MJS), a greater emphasis on dissemination compared to other tasks, and a lack of effective monitoring and evaluation systems that frustrates policy-making.

### *1.2.2. Conducive environment for the actors*

The R&E&T and farmers lack a conducive environment to perform effectively. The problematic areas are related to the policy environment, political and bureaucratic structure, institutions providing access to goods and services for farmers, the black market, and the National and International Research (N&IR). With respect to the policy environment, there is a lack of effective policies. The policies are not supporting the actors effectively. A more detailed conclusion about the effects of policy on the performance of the actors is presented later.

The reaction of actors from the local political structure towards the R&E&T and farmers is diverse. These actors actively support small farmers, but not the large ones and not the R&E&T. In addition, the JS department (under the Ministry of jahad-e sazandegi, MJS), a revolutionary organisation and part of the local political structure, plays an inhibitory role with respect to the knowledge institutions under the MA. Lacking favourable atmosphere for cooperation, the JS department compete with the R&E&T over the resources available for agricultural development. The two sets of institutions are very critical and hostile towards each other. A main frustrating problem for the cooperation between the two sets of institutions is the inappropriateness of the present division of responsibilities for agricultural services between the MJS and MA. The present arrangement, and previous arrangements, have all been found inappropriate in the sense that they failed to create a suitable base for cooperation between the two ministries. The present arrangement is apparently inconsistent with the national objective of helping small farmers.

With respect to the bureaucratic structure, a main problem is the lack of fit between the structure and the kind of services the government intends to provide for small farmers. The bureaucracy adversely affects the performance of the R&E&T by frustrating their activities. The frustration is experienced in particular with respect to the processes of information flow, resource allocation, and utilisation of allocated resources.

The institutions providing access to goods and services for farmers adversely affect the impact of the R&E&T by failing to perform their job effectively. This contributes to the low levels of adoption of the new wheat technologies. The main constraint in this context is a lack of effective linkage between the institutions. There are four aspects to the problem here. The first is that linkages of the R&E&T are only confined to the extension department. The R&T have no linkage with the institutions. The second is that, except for linkage between the JS and extension departments, the other linkages are used only by the extension department. The occasional use of linkage by the extension department constitutes the third aspect of the problem. The fourth aspect concerns the

extension-JS linkage. The linkage is not used by either of the two departments. The main constraints to effective interaction are: (1) lack of a system vision amongst the managers of the institutions, (2) conflicts between the JS department and the R&E&T under the MA, and (3), lack of resources.

Although, concerning the physical aspect, the black market does provide access to the technologies and related inputs for farmers, it frustrates adoption by raising the costs.

The burden of implementing the projects of N&IR on the local researchers is heavy. It leaves little time for them to devote to local projects. At the present, the local researchers are much inclined towards non-local projects. This is due to a rigid decision-making structure at the national level. The structure encourages the researchers to do what they are told to do nationally. Furthermore, the incentive structure attracts the researchers more to non-local projects.

### 1.3. Conclusions on policy support

With respect to the policy of the government on agricultural development, this study has revealed several points of weakness. A supportive policy environment that could facilitate effective performance does not exist. The weaknesses encompass both the general agricultural and the technology policies. Indeed, they have some negative effects on the access to relevant technologies by farmers.

With regard to the general policies, the main constraining problems concern the lack of clarity in the policy for self-sufficiency, lack of correspondence of the policies on productivity increase and other national objectives, and the lack of coincidence between the goals and expectations of policy makers and farmers. In the following these problems will be summarised.

**1.** Lack of clarity of the policy for self-sufficiency prevents the Ministry of Agriculture (the body responsible for self-sufficiency in wheat) from focusing on a right target. Receiving no clear guidelines from the policy, and lacking sufficient resources to help small farmers, the ministry focuses on large farmers. This is contrary to the national objective of helping small farmers.

**2.** The policy instruments in agriculture do not correspond to the national objectives. In this respect, the subsidy policy helps urban consumers far more than it helps farmers, and supports large farmers far more than it supports small ones. Furthermore, the price policy is more helpful for large farmers.

**3.** A coincidence in what policy makers and farmers hold as goals is an important condition for success in achieving the national objectives. The coincidence is of great importance to the country as a whole because of the political support the farmers give to the government. At present, however, policy makers pay little attention to what farmers consider to be important goals.

Another part of the problem at the policy level is the technology policy. For both the knowledge institutions and farmers to perform as expected, a suitable technology policy environment is needed. The policy environment should guide and support the R&E&T to provide access to relevant technologies to farmers, and to help farmers to adopt. However, the policy analyses indicate the existence of malfunctions. The problems

concern (1) lack of correspondence between the priorities of the R&E&T and of the farmers with respect to technologies, (2) inappropriateness of the technology policy on R&E&T services, and (3), lack of correspondence between national and local priorities for the R&E&T. The following highlights the problems.

**1.** The policy with respect to R&E&T to provide farmers with access to high yielding technologies, neglects what the farmers consider as of socio-cultural importance. There is a dissimilarity between what the technology policy makers perceive as a good technology and the perception of the farmers. To the surprise of the policy makers (in addition to economic benefits) favourable socio-cultural benefits, ability to adapt to local agro-ecology, and capacity to fit into farming systems typically are perceived by the farmers as important characteristics of technologies.

**2.** The fact that policies are often formulated without careful study of local situations creates problems for farmers. Farmers operate in a context with complex webs of interwoven socio-economic, cultural, and agro-ecologic factors. They suffer from inappropriate policies that fail to deal properly with any of the factors. The case of the latest policy (restricting the R&E&T services to specific zones) is one example of such inappropriate policies. Although the policy is useful in the sense that it moves toward a more efficient use of scarce resources, it is not, in the present form, consistent with the national objective of helping small farmers. Farmers are excluded from access to the services if they are located outside the zones designated for wheat production. It is most problematic for small farmers who produce for subsistence. Due to their market orientation, large farmers might not get into any trouble by switching from one crop to another. However, small farmers have no other choice than to cultivate wheat for local consumption.

**3.** Another major problem associated with the policies in general, and technology policies in particular, is the lack of sensitivity to local needs due to a centralised policy structure. The policies have been formulated in a centralised structure that leaves local people with little room to make a contribution. The policies neglect what the R&E&T and farmers consider as being important locally. The local actors need to help set the priorities for technology generation and use so as to fit the problematic situations they experience locally.

## 2. Recommendations

Thus far, the present research has detected the constraining problems and their causes that frustrate the access and relevance of the technologies for farmers. In other words, the 'why' questions are provided with answers. Now the time has arrived for us to switch from 'why' to 'how' questions. The 'how' questions ask for actions to improve the existing problematic situation in which the R&E&T and farmers perform. We put forth suggestions for how to eliminate the problems.

At the farm level, the inappropriateness of the intensification strategy calls for a change in strategy. One alternative strategy, which can help small farmers, is to provide farmers with low input technologies appropriate for their existing conditions.

At the institutional and policy levels, there are several major points important for changing the existing problematic situation in favour of small farmers. These include: (1)

decentralisation of policy and bureaucratic structure, (2) empowerment of farmers, (3) information flow up, (4) creating responsibility and accountability among knowledge institutions, (5) attention to special needs of small farmers and (6) creating a systems vision among related actors at all different levels.

## 2.1. Decentralisation

There is a need to improve the present policy-making and bureaucratic structure. A more decentralised structure is needed for helping small farmers. Small farmers have various needs, which are often hard to be seen or understood, e.g., correspondence of seed varieties to food preferences, availability of family labour, farming systems, etc. Small farmers need special arrangements specifically tailored for them. A centralised structure with too much power at the top and little at the bottom is not suitable for taking care of local needs. Local needs require local treatments, quick action in terms of allocation and utilisation of resources, etc. These cannot be met by a centralised structure. There is a need to give people at the bottom level more decision making power and resources. The knowledge institutions need the power for decision making, resource allocation and utilisation, recruitment, etc., in order to meet the small farmers' needs.

Furthermore, a grass-roots change in the bureaucratic structure is needed. The period of more than a decade after the revolution testifies the ineffectiveness of the bureaucracy in serving farmers, especially the small ones. The revolutionary idea of helping small farmers necessarily needs an effective bureaucratic structure. An alternative is to strengthen the bureaucratic sub-structure merged in the MJS. The government could extend the MJS pattern to the MA and other technical ministries, and to use it as a substitute for the existing bureaucratic structure. The MJS emerged right after the 1979 revolution in the face of the necessity of helping the rural poor. The idea (favouring small farmers), and a special kind of work spirit among the staff, which motivated them, have helped the ministry to develop an appropriate structure necessary for serving small farmers. In contrast to the old bureaucratic structure, the newly emerged structure seems to be based on faith in people. A permit for resource utilisation, for instance, does not need to be signed and controlled by several authorities at different levels. It seems that the structure has made the staff very active, the processes of information flow smooth, the utilisation of allocated resources on time, etc. In all, it is a valuable experience for the post-revolutionary government, which should be fruitfully learned from, extended, and used as a substitute for the malfunctioning bureaucratic structure.

## 2.2. Empowering farmers

In order to make claims upon the knowledge institutions, and to pull down the resources necessary for development, farmers need to gain enough power to countervail the power of institutions. The default option for research, extension, and training is to serve those who already have social and economic power and thus need the least assistance, i.e., large farmers. To correct this drawback, there is a need for a deliberate action to give other farmers more power to influence the knowledge institutions.

A main step forward would be to give farmers active roles to play in controlling the knowledge institutions. In this respect, two important actions are needed: (1) to give farmers more political power, and to help them to organise themselves and (2) to hand over to the organised farmers the whole or part of the financial power over knowledge

institutions. This model has been applied successfully in Dutch agriculture, where farmers' organisations have the power to finance half of the research costs, and to manage the extension services (see Bos *et al.*, 1991 and Wielinga, 1988).

### 2.3. Information flow up

It is necessary but not sufficient to have a down-stream information flow from research to extension and from extension to farmers in an AKIS. An up-stream information flow from and about farmers is equally important. It closes the feedback loop. To stimulate up-ward information flow, it is necessary to set up appropriate mechanisms for facilitating farmers' participation in research, extension, and training. Although the TTT projects (adaptive research programme) bring together researchers, extensionists, and farmers, and constitute feedback mechanisms for researchers and extensionists, these are limited. Furthermore, the projects are large-farmer oriented. Moreover, training has no voice in the projects.

An alternative approach is to facilitate farmers' participation through study groups. These groups can be formed by farmers who like to meet on a regular basis, discuss various problems amongst themselves, and share information and experiences, and try out possible solutions.

In the group approach, careful attention should be paid to group formation and its development. Consideration has to be given to the aim of the group approach, so that, according to Oakley (1983), it reflects the general extension strategy. If this strategy is largely concerned, in the first instance, with an increase in agricultural production via technological transfer, then the groups will function as vehicles for technological transfer. If, on the other hand, the concern is to develop the groups for their own sake and to make them more able to tackle their own problems, then the aim of the group approach will be different. It seems that the reasonable aim is not simply to use the groups for extension work but to promote actively their development and eventual independence from the extension service.

To have self-sustaining groups, which can handle their own problems, several conditions should be satisfied. Firstly, initiation should come from inside the farmers' community rather than from the extension service; secondly, for the group to achieve any kind of self-directed development, it must establish an internal structure to give it the organisational base for this development; thirdly, the criteria for membership must be specific, e.g., one basis for selection could be common interest, that is, a level of socio-economic activity, which is common to a particular segment of the rural community. This common interest could be defined, for example, in terms of relationships towards the land, e.g., small holder, tenant, or sharecropper.

The use of group methods in the present situation of Iran, where the problem of shortage of extensionists is very serious, can also open a better way to serve a larger number of small farmers with the existing extensionists.

Another promising approach to doing more with the same number of extensionists is to use written materials (farm journals and bulletins) for mass distribution. Given the rate of literacy, such an approach could prove effective, although the contents, illustrations and language should be carefully targeted, and pre-tested for small farmers. Magazines can also be used for the information flow up: case studies or human interest stories about small farmers in farm magazines are read by officials and others in institutions serving small farmers.

## 2.4. Responsibility and accountability of the R&E&T

Lack of responsibility of R&E&T for end results, and lack of accountability to small farmers, are the problems that should be improved to make the institutions more responsive to the farmers' needs. At the present, nobody is responsible for the outcomes of the R&E&T's work. Furthermore, the institutions work without taking into account the needs of small farmers.

To improve the situation, there is a need for creating appropriate incentives for the R&E&T. One approach is to make salaries dependent on the usefulness of the services, with farmers participating in the assessment of how useful in fact the services are. This motivates the personnel to concentrate on the needs of farmers. In this respect, the Gorgan extension project, which was explained in chapter 8, is a useful experience. The project provides the extensionists with a bonus for the production increase achieved in their area. Here, a great deal of attention should be paid to the institutions' responsiveness to small farmers. The large-farmer biases in the Gorgan extension project prevent the extensionists from serving small farmers. Unless deliberate actions can direct the researchers, extensionists, and trainers to help small farmers also, they have many incentives to serve the large farmers.

## 2.5. Special needs of small farmers

As the present research shows, the farming population is not a homogenous; and on the contrary, it is made up of various categories. Farmers are different from each other in various socio-economic and cultural aspects, and heterogenous with respect to farming systems, agro-ecologic and physical conditions of their farms. This indicates that a single technological prescription is not fruitful for all. Each category of farmers needs to be treated according to its special needs. In this respect, small farmers need special measures appropriate for the conditions they experience. This calls for breaking the heterogenous population of farmers into relatively small homogenous segments for planning purposes, technology design, and service delivery. Segmentation of farmers is one major step in changing the situation for small farmers. For segmentation, different variables are suggested in literature. Two such possible variables were introduced in chapter 2: early adoption and farming style.

The next step would be to formulate appropriate policies, and to set up the right institutions for helping small farmers. Right now, the policy is unfavourable for small farmers, and the institutional support is absent.

Given the guidelines from the national objectives, the policy environment should help small farmers. It could be argued that, until a major action could be launched by the government, it is more effective if the government abolishes the subsidy on inputs and services, and lets farmers pay the real market prices, because small farmers are those who get the least benefit from the subsidy. The subsidy policy helps large farmers more than it helps small ones. Instead, the government could use other policy tools such as the crop insurance programme, special credit designed for small farmers, facilitating farmers to develop their local markets, etc.

With respect to institutional support, there is no need for creating new institutions, but for a redivision of tasks and responsibilities amongst the ministries involved. There are two ministries (the MJS and MA), responsible for agricultural development, to which farmers refer for their various farming needs. The MA has responsibility for wheat

production. The ministry is supposed to help all farmers, but it mostly helps large farmers due to a lack of resources, political pressures for quick measures to meet the self-sufficiency objective and large-farmer biases. To improve the situation for small farmers, we suggest a new approach to the division of responsibilities between the MJS and MA, which gives responsibilities to the ministries based on services for different categories of farmers. In this approach, the MJS would be responsible for helping all small farmers regardless of their farming activities. Research on general subjects such as soil and water, and services for large farmers would all be placed under the MA. All the other categories of farmers in between the large and small farmers would get services from the ministries based on their status with respect to the chosen criteria for small and large. This approach has several advantages over the past and present arrangements, as follows:

**1.** Regardless of their farming activities, small farmers would become connected to a revolutionary organisation that favours them. In this way, the government's services would go directly to the intended target (the small farmers). At the present, small farmers have no connection with the JS department for crop production. In wheat production, for instance, all different categories of farmers are under the jurisdiction of the MA, but due to the fact that the knowledge institutions (under the MA) have a bias in favour of large farmers, small farmers are not served.

**2.** Small farmers would receive all services necessary for their whole farming systems from a single Ministry. At the present, the farmers have to refer to institutions under the MA for services related to crop production, and to the MJS for the rest of their activities. This creates problems for the farmers in terms of spending a lot of time and money to refer to different service centres for various farming necessities.

**3.** Evaluation of the institutional support would be easier. At the present, there are many weak points about the responsibilities that can blur the evaluation. Production problems related to one institution can easily be attributed to a malfunctioning in other institutions. In a farming system, all farm activities are interrelated. Therefore, the existence of a problem in crop production, for instance, can be attributed to malfunctions in other farming activities. This makes it difficult to distinguish as to which institution is responsible for certain problems. The following example illustrates this complicated situation clearly. Farmers feed the straw of wheat and barley to their livestock. A short stem wheat variety, for instance, can cause a problem of insufficient straw for farmers to feed their livestock. This might lower the weight of the animals' carcasses. At the same time, there might be some problems in services given by the JS department on livestock production for farmers that contribute to the problem. The whole problem here might be attributed by the JS department to the failure of institutions under the MA in providing farmers with necessary services in wheat production. This can cause a conflict between the MJS and MA. The alternative approach would prevent such a problem by placing full responsibility for affairs related to the whole farming system of each category of farmers, on the shoulder of a particular ministry.

There are a few points of caution about problems that could be created by segmenting the farming population. These need careful attention and special measures taken to avoid unfavourable effects for small farmers and for the country as a whole. The following will explain more.

1. There would be a need for developing parallel jobs in different institutions for the same farming activities. This costs a lot in terms of necessary resources. Research, extension, training, and other development services in each ministry would demand an allocation of resources. The most constraining problems might be concerned with physical resources and staff training. Buildings, laboratory equipments, and other physical resources are costly. Furthermore, there might be too much wastage due to insufficient use of resources by the institutions. A laboratory belonging to one ministry might be left unattended, while the other ministry might be in need of it. Training will take time, and it costs a lot to train the huge number of required staff.

Despite these limitations, it is worth making certain institutions responsible for small farmers. The major justification is the importance of small farmers in the country. If the national objective is to support small farmers, the government's policies should be consistent. With respect to waste of scarce resources, it is manageable. The problem can be avoided by creating a suitable atmosphere for cooperation between the staff of the two ministries. This can be done by linking the ministries and coordinating them effectively. The role of policy environment is very important here.

2. The majority of farmers might suffer from large fluctuations in prices of non-monopoly farming products. The MA, being the sponsor of large farmers, would concentrate fully on raising the level of production of the farmers by introducing High Yielding Varieties. Since large farmers mostly have suitable conditions for using HYV, the efforts of the MA would result in a quick increase in farm surpluses. As the products reach the market they would saturate it, and cause a sharp decrease in prices. Since large farmers are the first to reach the market, they get the most benefit while prices remain high. As the time passes on, the prices drop. Large farmers for a time can maintain their incomes by again increasing their output. But, at the same time, the rest of the farmers start selling their products. Thus, the small farmers would find the market prices had deteriorated, leaving them with nothing but a loss.

This problem can be avoided by the government's effective intervention until the country approaches a time when the majority of farmers (small farmers) reach the same level of productivity as that of large farmers. The government can play its important role here by formulating appropriate policies to protect the interests of small farmers. In this respect, several policies could be implemented. It is important to compensate the small farmers when the market prices are low. Furthermore, the government can set production quota for large farmers. Any excess can be heavily taxed.

## 2.6. Creating systems vision

It is not fruitful to look at researchers, extensionists, trainers, and farmers as if they are isolated. All these actors are, in one way or another, involved in knowledge processes. Furthermore, it is unhelpful if one examines the performance of R&E&T and farmers without considering the effect of the context in which they perform. We can help more by improving the problematic situation for farmers by looking at R&E&T and farmers from a perspective that they should form a system. Acquiring such an understanding requires a special learning process. There is a need to train all those who are involved in knowledge processes such as researchers, extensionists, trainers, farmers; and those who influence knowledge generation and utilisation such as policy makers, politicians, managers at all different levels, etc., to acquire a clear understanding. In this

respect, universities can contribute to this vital endeavour by opening new departments for knowledge management studies. There is a need for AKIS studies on local situations in order to contribute to efforts for improving the problematic situations in the country. Using a broad perspective provided by this theory, a comprehensive view on the situation can be developed for policy makers and other actors. Local AKIS studies are indispensable due to the fact that imported prescriptions are not usually appropriate for studying local dilemmas.

## 3. Implications for theory

What we have learned from examination of local practice helps us to build the development of the theory. Based upon the analyses made, we draw attention to a few points about the stated scientific objectives of the study. These concern (1) the appropriateness of the choice of theoretical perspective and the applicability of the method used, (2) clarification of the relevance and availability of technologies, and (3) influence of the political structure on the AKIS' performance. These are explained in the following paragraphs:

**1.** Thus far, the present study, which uses the AKIS theory as a diagnostic framework, has shown promising results in terms of relating the theory to practice. The "eyes" offered by the theory have helped the present researcher to examine current practice from a perspective that research, extension, training, and farmers should work as a system. This is a valuable assistance made available by the theory without which the research could not yield its insights into the unique and complex dimensions of Iran's agricultural knowledge and information systems and processes.

Furthermore, the comprehensive research method showed its usefulness in assisting the present researcher to become acquainted with the situation at various levels. The broad view provided by the method was ample enough to guide the following in-depth study. In all, the reconnaissance and in-depth phases of the study proved complementary for helping the researcher to broaden and deepen his view on the research problem.

**2.** The hypothesis that there are contextual and specific requirements for technologies to be adopted by farmers has been well-tested. We conclude that, in addition to some inherent attributes for adoption, such as relative advantage, compatibility, trial ability, etc. (Rogers, 1983), technologies should meet certain requirements. These include (1) access to relevant technologies and (2) access to the conditions for development other than technology. Market, incentive structure, production factors, research and extension services, etc., constitute the conditions. Access to each condition is equally important. Lack of access to any element of the mix of conditions prevents farmers from adopting. Therefore, rejection of a technology cannot be attributed only to a lack of access to a relevant technology but also to a lack of access to the other requirements.

To persuade farmers to adopt, there is a need to set up properly the whole mix of elements for development. This important point emerged clearly during the farm level study. This also suggests another crucial point that concerns institutional and policy support. That is to say, that not only knowledge institutions are responsible for adoption, or rejection, of technologies by farmers, but also a wide variety of institutions in charge of the elements of the mix for development, other than technology. In other words, a

technology that is claimed to be relevant should be examined in the context in which it should work.

**3.** In an AKIS with a centralised political structure, the information flow to knowledge institutions is, according to Wagemans (1990), problematic. Due to the uniqueness of the situation under the study, no solid cause-effect relation could be concluded, although the information flow was found to be clearly problematic. Although the political structure is centralised, and the upward information flows are problematical, one cannot relate these two without placing them in the bureaucratic context inspired by the present political structure. More than a decade after the 1979 revolution, the country is still in a transitionary stage of changing its bureaucratic structures. The political structure has been changed significantly since the revolution and led to grass-root changes. However, the government's bureaucracy is, more or less, the same as during the pre-revolution period. It is because the structure has not been changed radically that the context remains uncertain. The government has introduced a few changes into the old bureaucratic structure to improve it. Of these, re-organisation of the Ministry of Agriculture, introduction of anjoman-e eslami (the Islamic staff council) at different administrative levels, and revolutionary cleansing committees are the most important. These were explained in chapter 2. However, the changes have not been effective in improving the old bureaucratic structure, in terms of serving poor and small farmers. The relatively decentralised structure which emerged under the MJS provides experience for decentralising the bureaucratic structure of the country.

Thus, there is a need for further study on the relation between the political structure and upward information flows as the present political structure develops further the agricultural bureaucracies.

## ABBREVIATIONS

| | |
|---|---|
| **AKIS** | **Agricultural Knowledge and Information System** |
| **BR** | **The village security group** |
| **BTMK** | **Farm machinery organisation** |
| **DAP** | **Di-ammonium Phosphate chemical fertiliser** |
| **DKS** | **College of agriculture of the Shiraz University** |
| **EJS** | **The leader of district's friday congregation prayer** |
| **FSR** | **Farming System Research** |
| **GDP** | **Gross Domestic Product** |
| **GNP** | **Gross National Product** |
| **HVZ** | **Post-revolution land distribution organisation** |
| **HYV** | **High Yielding Variety** |
| **JS** | **The reconstruction crusade organisation (jahad-e sazandegi)** |
| **KIS** | **Knowledge and Information System** |
| **KT** | **Agricultural extension officer** |
| **MA** | **Ministry of Agriculture** |
| **MCM** | **Million Cubic Metre** |
| **MJS** | **Ministry of jahad-e sazandegi** |
| **MKKD** | **Village-cluster agricultural service centre** |
| **MKKS** | **District agricultural service centre** |
| **MTKF** | **The Fars agricultural research centre** |
| **NJ** | **Friday congregation prayer** |
| **NRC** | **National Research Centre** |
| **RAAKS** | **Rapid Appraisal of Agricultural Knowledge System** |
| **RPF** | **Resource-Poor Farmers** |
| **RRF** | **Resource-Rich Farmers** |
| **RS** | **The village elder** |
| **SED** | **The village Islamic council** |
| **SJM** | **Forestry and rangelands organisation** |
| **SKO** | **Provincial agricultural headquarters** |
| **STK** | **Agricultural extension organisation** |
| **STR** | **Rural cooperative organisation** |
| **TATG** | **Wheat Impact Programme** |
| **TATM** | **Agricultural Product Impact Programme** |
| **TJT** | **Comprehensive extension programme** |
| **TTT** | **Adaptive research programme** |
| **WD** | **Water department** |

## Appendix I

## Land tenure system prior to the 1962 land reform

Before the reform, share cropping was the major land tenure system. It was implemented in about 49% of the number of all the holdings, and 62% of the area of all the holdings (Amid, 1990). The other types of tenure were owner-operated and fixed-rent tenancy. Table I.1 illustrates the numbers and the areas of holdings by types of tenure in 1960.

**Table 1. Numbers and areas of Iranian holdings by type of tenure (1960).[1]**

| type of tenure | number of holdings (thousands) | % of all holdings | area (1,000 ha) | % of total area[2] |
|---|---|---|---|---|
| sharecropping | 919 | 49 | 7,021 | 62 |
| owner-operated[3] | 692 | 37 | 3,353 | 30 |
| fixed-rent tenancy | 266 | 14 | 982 | 9 |
| total | 1,877 | 100 | 11,356 | 100 |

Source: Amid (1990).
Note: (from the source)
1- the original table contains 204,000 mixed tenures that occupied 1,315,000 hectares. Here, the share of each mixed-tenure category is distributed among the main tenure systems in proportion to their shares of the sub-total.
2- sometimes rounding of percentages causes slight discrepancies.
3- it includes both the family holdings which were cultivated by the owners and large estates which were operated by wage labour.

### 1. Sharecropping

In a sharecropping system, the sharecroppers formed a farming group known as boneh. Boneh was considered as a unit of production composed of a limited number of cultivators headed by one of the members called abyar (irrigator) (Safi Nezhad, 1989). The membership in boneh was based on economic and social status. Boneh had a hierarchical system based on the division of labour amongst its members. At the top was the landlord (arbab), and at the bottom were the cultivators (barzegars). Figure I.1 illustrates the structure of a 6-member boneh. As shown, the abyar was connected to the landlord through the village headman and the landlord's representative. Each abyar was assisted by two members called dom abyar. One village usually had several bonehs, their number being related to the amount of land and water.

In boneh, the division of labour between the members was based on several socio-technical factors such as social status of the members, skills for performing certain jobs, etc. Each member had certain duties to perform. The main responsibilities of the abyar were, to coordinate amongst the members and oversee the boneh's performance, plan for irrigation, allocate plots for different crops, sow, recruit and dismiss the members. The dom abyar was responsible for irrigation, construction of earth boundaries for dividing plots into karts (this is described in chapter 7), sifting, manuring, etc. Ploughing, planking, assisting the dom abyars in irrigation, weeding, delivery of produce from the farm to the threshing place and threshing were, amongst others, the duties of the barzegars (cultivators).

The boneh that we just described was called an arbab-ra'iyyati (landlord-peasant). In this type of boneh, all the five production factors (land, water, seed, traction power and labour) were under the control of the landlord. Other types of boneh also existed, of which the most important was the gav bandi boneh. In this type, boneh was under a person called gav band. Gav band was a wealthy local man who owned a few oxen and worked on a contract basis with land owners, on the one hand; and with bonehs'

members, on the other. This type of boneh was used in villages owned by the state (khaleseh villages) and in endowed lands (waqf), though it was also used in some villages owned by large absentee landlords (arbabs) who could not, for some reasons, supervise the bonehs. In the gav bandi type of boneh, the land owner provided land and water, while the gav band provided the remaining production factors.

The provision of production factors and the division of the output amongst the landlord (or gav band) and bonehs' members differed according to the type of crop and from place to place. There was a wide range of formulas used. Some of the most popular formulas will be described below.

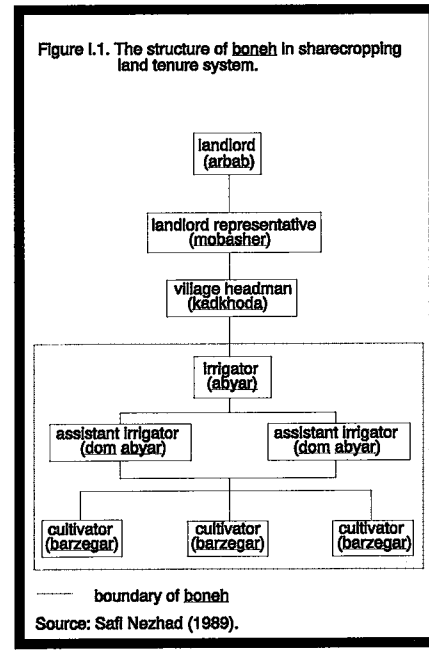


Figure I.1. The structure of boneh in sharecropping land tenure system.
Source: Safi Nezhad (1989).

In shatvi crops (winter crops including wheat and barley), one popular formula was that the landlord provided land, water and draught power. The provision of labour and the cost of necessary inputs were the responsibility of the bonehs' members. Concerning distribution of the output, the first, 20% was deducted. From the deducted amount, 10% went to the landlord for the cost of the provision of draught power and the remainder went to the boneh for the labour cost for collecting the harvest, delivering it to the threshing place and guarding it from danger. Further deduction from the total output was for miscellaneous items such as costs of making tools, maintenance, etc., which went to the village artisans and that of sifting which went to barzegars. The remainder was divided by four, of which three parts went to the landlord and one part to the boneh's members (Safi Nezhad, 1989). Another formula was that the landlord provided land, water, seed and draught power. In this case, 67% of the total output went to the landlord and the rest to the boneh. In a gav bandi type of boneh, the provision of land and water fell on the land owner, while the provision of seed and draught power was the responsibility of the gav band. Bonehs provided the labour. In this case, depending on the place, between 40% to 50% of the output went to land owner, while between 25% to 40% went to the gav band and the remaining to the boneh's members (Safi Nezhad, 1989).

Concerning bahareh crops (the spring cultivated crops such as sugar beets, pulses, etc.), a usual formula for dividing the output amongst the parties was first to take some seed for the following cultivation. From the remainder, 60% went to the landlord and the remaining to the boneh's members. In this case, the provision of land, water and draught power were the responsibility of the landlord, while the provision of seed and labour were that of the boneh.

The division of share within the boneh also differed from place to place. The amount of output obtained by the boneh was subdivided between the members equally or unequally. In a skewed distribution, the share of the leader (abyar) was higher than that of the others, and the share of his assistance was higher than that of the cultivators

(barzegars) (Amid, 1990). The abyar usually received some other shares from the arbab as a gift for good performance (Safi Nezhad, 1989).

## 2. Resource utilisation

The lands belonging to each village were defined hundreds of years ago. Each village had a defined natural or built boundary which was recognised by rural inhabitants. The boundary made the village distinct from other adjacent villages. It embraced the village lands including farms, gardens, rangelands, residential area and waste land. The arable land was divided into different blocks according to topography, irrigation (rain-fed or irrigated), soil quality, distance to water source and to village roads, and potentials for growing different crops (e.g., suitable for wheat). Each block was given a local name which expressed the characteristics of the block. An irrigated block which was located in a place with plenty of sunshine, for instance, was called boluk-e aby-e bar-e aftab, whilst an irrigated block located in a place with little sunshine was called boluk-e aby-e- bar-e nesar. The rain-fed blocks followed the same type of naming. Figure I.2 illustrates different blocks in a village.

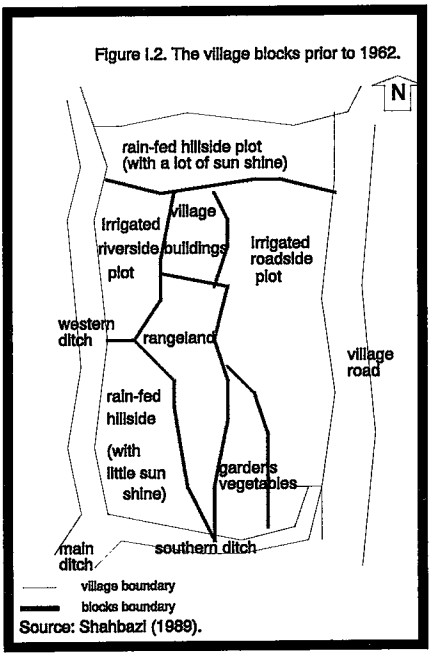


Figure I.2. The village blocks prior to 1962.
Source: Shahbazi (1989).

The land allocated to each boneh was based on a unit of holding called joft gav-zamin (a yoke-of-oxen-land). A joft gav-zamin was defined as the amount of land that could be cultivated by using the traction power from a yoke of oxen (Shahbazi, 1989). The traction power was used for ploughing, planking and threshing the output. A typical way to determine the unit of joft gav-zamin was to estimate the amount of traction power provided by the available yokes of oxen in the village. Based on this estimation and on the available water, the amount of arable lands of the village which could be cultivated was determined. Then, the amount of land cultivated by using the traction power from an average yoke of oxen in the village was defined as one joft gav-zamin. This unit was obviously local and differed from one village to another. The more powerful the yoke of oxen in a village with high water availability, the larger the size of the joft gav-zamin unit. Application of this local land unit was, in fact, an indication of the potential man and animal traction power required for the cultivation of the village land with the available water.

Not always did farmers hold the entire joft gav-zamin. In some cases, farmers had part of the unit, for instance, one eight, one fourth, one third, etc. The allocation of land by the landlord to each farmer was dependent on a number of factors. These included (1) the estimated joft gav-zamin in the village, (2) the number of yokes of oxen, (3) the availability of labour and skill, (4) the financial position of the farmers for providing the necessary inputs and (5) the attention of the landlord towards farmers (Shahbazi, 1989).

In this respect, based on moral, social and technical reasons the right to use the surface of the land for indefinite time was given to farmers.

A village with 20 joft gav-zamin, for example, would mean that, in a normal situation (if all farmers had one joft gav-zamin), the arable land of the village provided a livelihood for at least 20 farm families using 20 yokes of oxen and employment opportunities for a number of village labourers (khosh neshins). When farmers had only some part of the joft gav-zamin (one third, one fourth, etc.), a larger population was dependent on the land.

If there were 7 bonehs in the village, for instance, each block was divided into 7 plots. Each plot was given by the landlord to a boneh at the beginning of each agricultural year. Applying this example to the village shown in figure I.2 in which 6 different blocks exist (including the rangelands), we come up with figure I.3. Except for the rangelands, the other blocks were divided into 7 plots. Each plot was assigned to one boneh by lot. In this way, each boneh received one plot from each 5 blocks. In other words, the bonehs' land were consisted of 5 different plots dispersed throughout 5 different locations within the village boundary. The village rangelands were shared (mosha').

Water allocation was based on water rights. The amount of land cultivated in each village was a variable of the amount of water available. Water was divided amongst bonehs (sharecropping groups) equally. Each boneh received 24-hour water per each water cycle. The water cycles were different from place to place based on several factors such as the number of bonehs and the volume of water needed for various farm activities. In a village with 10 bonehs and a shared garden, for instance, the water cycle was 11 days. In other words, each boneh received 24 hours water per each 11 days interval. The water cycle remained unchanged as long as the number of bonehs and the volume of water allocated to activities such as gardening remained the same.

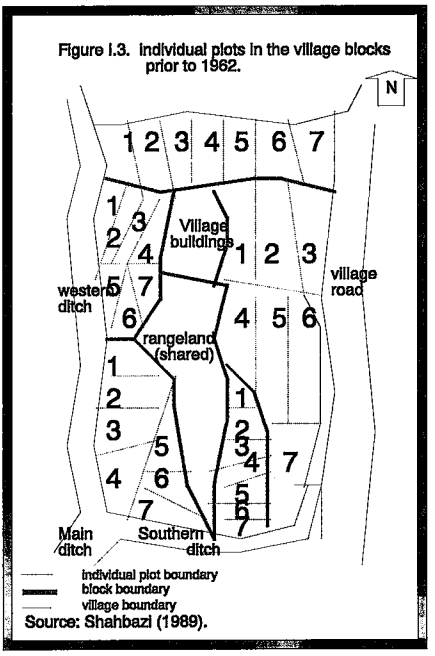


Figure I.3. Individual plots in the village blocks prior to 1962.
Source: Shahbazi (1989).

Bonehs had to plan for cultivation according to the water cycle and their turn of receiving water. At the beginning of each agricultural year (late August), the abyars (leaders of bonehs) met and determined the water turn for each boneh. The first turn was determined by lot. The following turns were given to the plots stretching down slop starting from the first plot. After the down-slop plots received their water, the plots stretching up-slope received their water starting, again, from the first plot chosen.

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## SAMENVATTING

## FACTOREN DIE DE BESCHIKBAARHEID EN BRUIKBAARHEID VAN TECHNOLOGIE VOOR TARWE-BOEREN IN IRAN BEPALEN: EEN STUDIE VAN HET LANDBOUW INFORMATIE- EN KENNISSYSTEEM

Een combinatie van socio-economische, culturele en politieke factoren hebben ertoe geleid dat Iran twee belangrijke nationale doelstellingen nastreeft: zelf-voorziening in voedsel en steun voor arme boeren. De gekozen operationele strategie streeft ernaar de landbouw te intensiveren door het scheppen van de voorwaarden voor produktiviteitsverbetering. Dit is gepoogd door het introduceren van variëteiten met een hoge opbrengst en het gebruik van externe inputs, alsmede door het opzetten van allerlei instituties, om toegang tot goederen en diensten te verschaffen en om een structuur te scheppen voor het implementeren van beleidsmaatregelen.

Deze inspanningen van de overheid hebben niet geleid tot het bereiken van de nationale doelstellingen. Op het nationale niveau blijven twee problemen de overheid plagen: het land importeert grote hoeveelheden voedsel en de produktiviteit van kleine boeren blijft laag. Op het veld-niveau schept het voortbestaan van grote verschillen in opbrengst een belangrijk probleem.

Door op dat veld-niveau de kosten en baten van de ingevoerde technologieën te onderzoeken, alsmede die van de institutionele inspanningen, kon worden aangetoond dat boeren, en vooral kleine boeren, moeite hebben te technologieën te aanvaarden. Die geringe aanvaarding volgt uit het gebrek aan toegang tot de 'mix' van ontwikkelingsvoorwaarden, zoals de beloningsstructuur, markt, inputs, irrigatie, relevante technologie, enzovoort. De oorzaak hiervan moet op zijn beurt gezocht worden in institutionele en beleidsfactoren.

Op het institutionele niveau zien we dat tussen onderzoek, voorlichting, onderwijs (d.w.z. de instellingen die direct betrokken zijn bij het verschaffen van toegang tot relevante technologie) en boeren geen synergie bestaat. Dit probleem ontstaat door gebrek aan taakverdeling tussen de actoren, zwakke integratie van taken, en zwakke of afwezige coördinatie. Bovendien bestaat er geen stimulerende omgeving. Een aantal factoren, gerelateerd aan beleidsvorming, de bureaucratische en politieke structuren, de instituties belast met het verschaffen van goederen en diensten aan boeren, de zwarte markt en de nationale en internationale onderzoeksinstellingen, belemmeren een effectieve taakuitoefening van de diverse actoren.

Op het beleidsniveau is de situatie problematisch met betrekking tot zowel algemeen als technologiebeleid. In het algemeen kunnen we zeggen dat het beleidskader niet bevorderlijk is voor het bereiken van de gestelde doelen.

## Curriculum Vitae

Seyed Akbar Mirikhoozani was born in Shiraz, the centre of Fars, a southern province of Iran, on November 29th, 1953. He studied in civil engineering in Shiraz, before obtaining a BSc degree in Agricultural Engineering at the Oklahoma State University, in the USA in 1980. On his return to Iran, he joined the reconstruction crusade (jahad-e sazandegi), an organisation established in post-revolution for supporting rural poor, in the Fars province, performing managerial tasks. In 1981, he started his career at the Ministry of Agriculture, first as the Head of the provincial farm mechanisation organisation (BTMKF) and later as the General Director of the provincial agricultural organisation (SKOF). From 1984-1985 he completed a MSc from the University of Reading, in the United Kingdom, specialising in Agricultural Extension and Communication. On his return to Iran, he moved to the agricultural extension organisation (ST) at the headquarters in Teheran and worked as the Deputy General. In the meantime, he became involved in committees responsible for: collaboration between the research and extension organisations through adaptive research programme (TTT projects); collaboration between extension services and universities; making links between the extension service and the adult education programme, and organising farmer participation in the extension service through 'the best producer' programme. He also wrote a number of publications in Persian relating to agricultural extension. Between 1989 and 1993, he worked for his Ph.D degree at the Wageningen Agricultural University, in the Netherlands.