

## Recent Agricultural Development and Performance in Iran

Dara Behravesht

Like many other developing, oil exporting countries, the Iranian economy is heavily dependent on the petroleum sector.

The government of Iran has begun to build the infrastructure needed for economic development. While progress has been made in roads, hospitals, schools, ports, rail roads, electric power and water facilities, the demand for these services is increasing far more rapidly than the available supply. Despite these difficult problems which hinder agricultural development in Iran, there are strong indications that Iran will be able to overcome several of these constraints. However, success in the agricultural economy of Iran will largely depend on the innovative activities of the public sector and on the availability of technological assistance from international organizations and foreign firms. Also, the role of the public sector must be emphasized namely because Iranian agriculture is largely characterized by low income farmers who cannot afford either the investment or the risks involved in some aspects of agricultural development such as technological change and advancement.

## Adverse Climatic Conditions

Iran is basically an arid to semi-arid region of the world. The factors determining the formation of the different climatic regions of Iran are the strongly delineated orography of Iran, as well as the geographical position of the Caspian Sea and the Caucasus mountain ranges on the northern border, and the Persian Gulf and the Sea of Oman on the southern borders.

The average annual precipitation is only 230 millimeters, which, without losses, is equivalent to 400 billion cubic meters. This low precipitation is combined with other climatic factors, which include the following:

- 1 . Lack of precipitation during the growing season of most crops.
- 2 . Non-uniform areal distribution of precipitation. For example, while nine per cent of the land receives more than 500 millimeters of annual precipitation (Northern part of the Elburz Mountain, Caspian Sea plateau), on the central plateau of Iran, which covers about fifty per cent of the land mass, the average annual precipitation is only about 130 millimeters.
- 3 . High levels of evaporation caused by high temperatures; low levels of humidity in many regions; and prolonged seasonal winds.

## Land Resources and Land Use

Iran's 1,648,000 km<sup>2</sup> of total land, (land area is 1,636,000 km<sup>2</sup>), can be broken down as follows:

- 1 . Arable and permanent land:      9.0 per cent,  
(8.6 per cent arable and 0.4 per cent permanent crop land).

2 . Forest and woodland: 10.9 per cent

3 . Permanent pasture: 6.1 per cent

4 . Unused land: 18.8 per cent

(All of which is potentially cultivatable)

5 . Other: 52.6 per cent

(Mountains, desert areas, rivers, roads, residual areas, industrial areas, etc.)

From about 46 million cultivatable hectares of available land, only 16.9 million hectares (just over one third) are currently utilized for agricultural purposes. From this total, only 10.3 million hectares are under annual cropping, 1.2 million hectares are under permanent crops and the balance of 5.4 million hectares remain as fallow land.

## Water Conditions and Irrigation

In Iran, where water is generally the most important factor limiting agricultural production, irrigation must remain one of the basic approaches to higher productivity.

In 1989, only about 38 per cent of the arable and permanent crop land was under irrigation. Well over half of the agricultural production during that year came from this irrigated land. For example, 64.7 per cent of the total grain production came from only 32.6 per cent of the irrigated land allocated for grain production.

By precipitation, the lands of Iran can be divided into five categories, which are as follows:

1 . Arid Climate 13 per cent

(Receives less than 100 milimeters of rain.)

- |   |             |
|---|-------------|
| 2 . Semi Arid Climate                               | 61 per cent |
| (Receives between 100 and 250 milimeters of rain.)  |             |
| 3 . Dry Sub-Humid                                   | 17 per cent |
| (Receives between 250 and 500 milimeters of rain.)  |             |
| 4 . Moist Sub-Humid                                 | 8 per cent  |
| (Receives between 500 and 1000 milimeters of rain.) |             |
| 5 . Humid   | 1 per cent  |
| (Receives more than 1000 milimeters of rain.)       |             |

In fact, more than 90 per cent of the total area of Iran receives insufficient amounts of rainfall, and the evaporation rate also is very high.

Iranians facing these adverse natural conditions have tried over the centuries to exploit, as much as possible, the available water resources of the country. Extensive systems of enormous underground water tunnels or channels, called "Ghanat", with vertical shafts for maintenance and ventilation, have been constructed over many centuries for access to the underground water resources of the country.

These systems of Ghanats are still used extensively today in many regions of Iran. The head wells in some of these Ghanat systems are as deep as 250 meters, and many of the systems are more than 20 kilometers long. The total length of Iran's Ghanat systems are estimated to be approximately 350,000 kilometers, or a distance equal to that between the earth and the moon. In addition to the use of ground water resources, extensive efforts also have been made over the centuries to utilize the surface runoff from river and streams.

In addition, a modern water resources development program, with the proper conveyance and distribution system for irrigation, agriculture and

non-agricultural use was initiated in early 1950s. Today there are 13 large storage dams and reservoirs in Iran which regulate more than 22,000 million cubic meters of annual water flow. In Iran, where water is obviously such a limiting factor in agriculture, maximizing returns on water becomes an essential aim of agricultural development. At present, irrigated land proportions are small. Additional water is necessary for the extension of both agricultural land and increased arable land, as well as the reduction in the ration of fallowed land (The ratio of fallowed land to total land was 31 per cent in 1989).

### Labor Surplus

According to the census data of 1987 the population of Iran totalled 49,445,010. From this total population, only 22.5 per cent were employed as income producers, as shown in Table I .

Table 1 Total Population and Employment Ratio in Agriculture (in thousands)

year	total population	Employment		
		total	in Agriculture	% in Agriculture
1957	18,955	5,908	3,326	56.3
1967	25,789	7,116	3,380	47.5
1977	33,709	8,799	2,992	34.00
1987	49,445	11,002	3,191	29.00

Source: Statistical yearbook of Iran.

Although the percentage of the employment population engaged in the agricultural sector decreased each year, from 56.3% in 1967 to 29.0% in 1987, the absolute employment engaged agricultural population increased in the same periods. The percentage of those engaged in agriculture continued to decline thereafter largely due to the expansion of secondary and tertiary level industries. In fact, due to low farm income revenue and

other standard of living gaps between rural and urban areas, farmers increasingly became dissatisfied with their circumstances. They actively began looking for jobs in the larger cities, where wages were higher and where there were many more facilities and attractions than in the rural areas.

This transfer of population from rural areas to the urban centers took place mainly among the young people. However, Iran's agricultural sector normally has a surplus in the farm labor force. The agriculturally employment population per hectare actually increased from 0.19% to 0.33% between 1960 and 1986. The surplus farm labor force will eventually be absorbed by urban industries. However, with this surplus of labor, it is rather surprising to find a lack of rural industries.

### The Role of Government in Agricultural Development

The analysis above has been mainly concerned with negative economics. Here it is assumed that there are policy points from which the government can choose and that the objective of the government is to achieve the highest welfare possible for the society as a whole. It is argued below that one step toward achieving this objective is to transfer a portion of the government's resources into agriculture. In this way the government can more productively assist in the development of new inputs and techniques; can stimulate their adoption; and can more fully contribute to the modernization of Iranian agriculture.

It is obvious that the development of new technology requires both innovative abilities and continuous research. Of course these activities necessitate a relatively large amount of capital. The Iranian farmer does

not have adequate capital, nor can they afford the risks involved in such activities. Iranian farmers live in a world typical of many developing countries where personal attitudes emphasize "survival and maintenance of position rather than improvement and advancement of position" (John W. Mellor, *The Economics of Agricultural Development* (Ithaca, N. Y., Cornell University, Press, 1966)). In this case, the role of the government becomes of paramount importance in altering the farmer's attitudes and stimulating the needed development in agriculture.

The government of Iran has been able to accumulate a considerable amount of its oil revenues which could enable it to undertake the types of activities required to stimulate agricultural development. By providing both the capital and the other required inputs and services, such as research, guarantee agricultural production purchasing at reasonable prices, and providing marketing facilities, the government may be able to convince farmers to modify traditional attitudes in favor of improved farming activities. This approach could assist with a change in the individual farmer's outlook, improve his managerial skills and entrepreneurial ability, and provide incentives for him to innovate and increase productivity.

Agricultural development in Iran depends partly on governmental investment in agriculture. It is argued that public investment in rural infrastructures such as irrigation, roads, electric power, and related facilities are a necessary condition for agricultural development. In the absence of these facilities the private sector's interests may be too low to induce the investment necessary for agricultural development.

In the large domestic market of Iran, the demand for agricultural production is high and could cover the needed demand for investing in

agriculture. In Iran there is the argument that the rate of return in other industries is higher than in agriculture. However, recent technological developments have increased investment productivity in agriculture and thus lowered the capital / output ratios in that sector.

The important factors in Iran that determine the optimum transfer of resources to agriculture include the demand for agricultural products as well as the improvement of the economic and social structure of about half the total population who depend on agriculture as a sole source of livelihood. The demand for agricultural products is relatively high due to the growing population of Iran, and low agricultural output, which also provides a reassurance of domestic food supplies.

Thus a case can be made for transferring a larger ratio of the government's resources into agriculture, but only if the following factors are also taken into account. The first is to give a higher priority to the agricultural sector in the economic planning of the country. The second is to guarantee all agricultural production prices. (Although the government currently does purchase some of the major farm crops from the farmers and at guaranteed prices, such established purchasing prices sometime do not conform with reality.) In addition, it may also be suggested that the current industrialization policy of Iran seems to mistakenly place a higher priority on major industry, which is a detriment to the agricultural sector.

What is needed is a long-term industrial plan outlining the process of industrial expansion and analyzing the inter-relationships within the industrial sector as well as those elements which lie between the industrial and other sectors. Subsequently, attention should be given to the completion of the infrastructure that is needed by both industrial



projects, as well as to modernize agriculture, which would then enable it to satisfy a larger portion of the increasing demand for agricultural production.

In examining the need for expanding public investment in agriculture, one should take into account several other important factors. One is that the agricultural sector is very large, and, also, as a result its expansion, it will require more investment and more infrastructural construction than the same relative expansion in industrial sector. Another factor which favors agricultural expansion is the psychic contribution which it can make to the morale of the people and their ability to increase the self-sufficiency of the country's food supplies. A third reason relates to the important role which agriculture can play in economic development. We cannot find any developed, industrialized country without an advanced and developed agricultural sector. All of these factors, if properly considered, could stimulate the government's interests in substantially contributing to the agricultural development of Iran.

## Requirements of the Policy

The following are five important strategic points regarding the future development of Iran's agriculture.

### 1 Policy for Water Use and Irrigation Development

In countries like Iran, where water is one of the most important constraints placed on agricultural development, major improvements in water resources and irrigation should be accorded a very high priority in any government planning. Despite the lack of abundant rainfall in Iran,

the available water resources are not efficiently utilized. For example, from a total of some 400 billion cubic meters of total annual precipitation, only 26 billion cubic meters (or only about 1 / 16th the total) are properly used in beneficial consumption.

In 1989, irrigated land amounted to only 44% of all cultivated land in Iran. Obviously an increase in irrigated land would stimulate production and improve the farmers income levels. However, more studies are needed to determine which irrigation methods are most suitable to the climate and soil conditions of the various regions of Iran as well as to their respective crops.

Success in achieving greater water-use efficiency by introducing new irrigation methods, and improving existing ones, will depend heavily on the extent to which the farmers receive proper information and directions regarding new agricultural methods. In addition, success can only be measured by the extent to which the farmers are willing to alter their traditional agricultural practices and attitudes. The government's agricultural extension service must play a major role in disseminating needed information and practical guidance.

Also, in Iran, irrigation efficiency is low in Iran, and with current methods, the beneficial use of the water provided by irrigation is far less than its potential. Irrigation efficiency can be increased by organizing and coordinating the flow and distribution of water as well as using improved methods of irrigation. For example, the rate of evaporation in Iran is relatively high, but new covered canal linings and piping systems could greatly reduce water-transmission losses.

## 2 Structural Adjustment

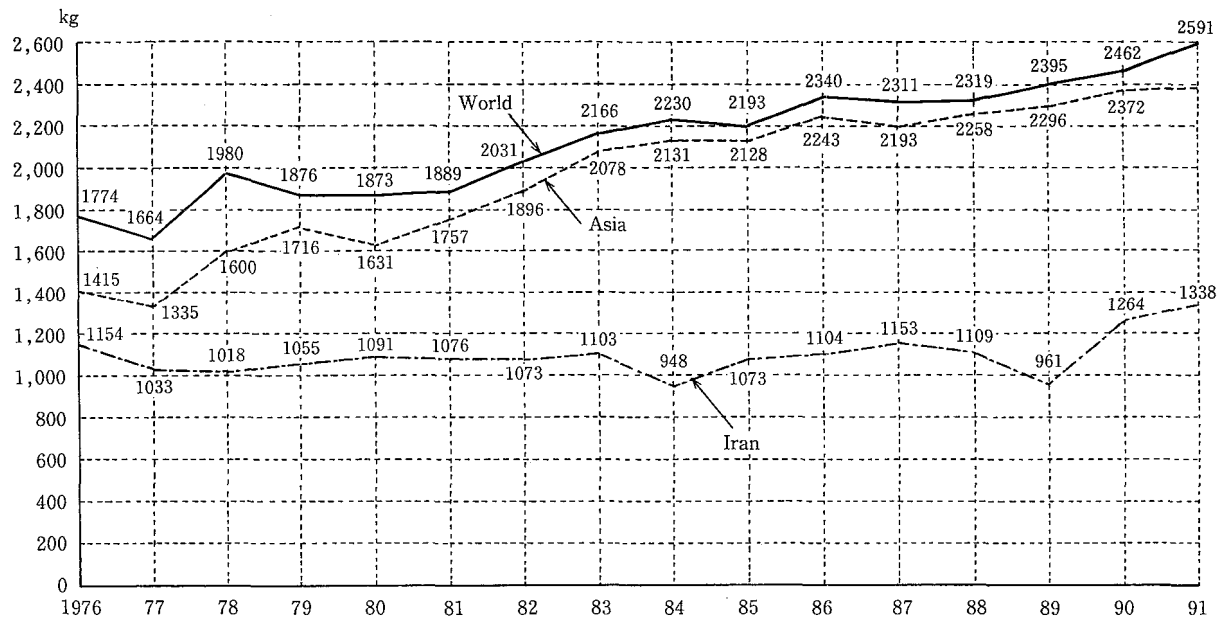
Some procedures in the current economic structure of Iran's agriculture should be rationally modified. For example, from 1970 until 1979, the proportion of grain areas was about 85% of the total area for all other crops. Obviously, the 15% allotment for all other crops is far too small. One of the basic reasons for the high percentage of allocations for grain production is the Iranian farmers living conditions. The farmers grow grain, mainly wheat, in order to provide bread for the basic survival of their families. However, Iran is still not self-sufficient in grain production, and every year the government must import huge quantities of grain to meet the demand of the population.

With a long-term view of increasing the income levels of the people, as well as improving their diets, the agricultural structure of Iran must be altered from traditional mono-culture into diversified agriculture, forestry, fishery, and etc. Currently the government does not have a sufficient plan to properly structure productive farming and cropping patterns. The government encourages farmers to produce grain, especially wheat, and carefully follows this policy of wheat production in order to secure what is believed to be a much needed domestic supply. The rational is to avoid dependency on wheat imports. However, the policy is obviously not working correctly.

It is the opinion of the writer that there are better ways to reach the aim of the above-stated government policy. The ultimate goal of achieving a larger wheat production to insure domestic supplies can occur by increasing wheat productivity per hectare instead of changing other crop areas to wheat production.

For example, as shown in Figure I, the productivity per hectare of

Figure 1 Yield Per hectare of Wheat



Source: FAO Production Yearbook

wheat is about 1000 kilograms. This figure is very low, even when compared to other developing countries. Only by increasing these production levels, per hectare, can Iran attain the government's goals. One should also remember that the productivity per hectare of irrigated wheat land is more than two times that of non-irrigated land. This can only mean that one essential element to increased production is properly improving irrigation facilities and expanding irrigated lands.

### 3 Developing the Rural Infrastructure

In a situation characterized by a relatively static technology, as found in Iranian agriculture, the farmer attains his knowledge of task performance and resource allocation through experience. However, the farmer's many years of experience and tradition have not adequately contributed to the improvement of their agricultural practices, or their production. This is largely due to the fact that basic, traditional knowledge in rural, traditional cultivation is not based on productive scientific approaches. In fact, rural farming practices have not changed very much over the years, and as a result, Iran's agricultural productivity has remained at a low level.

In order to achieve a high rate of agricultural development, new inputs and techniques of production must be properly introduced. The extent to which farmers can take advantage of the available technical and economic opportunities, however, is greatly affected by the level of basic infrastructures found in their areas. This includes both the physical infrastructure, such as roads and irrigation systems, and the organizational structure, such as educational extension services, as well as disease and pest control organizations.

Extension services can help the farmer acquire information about the production characteristics of new agricultural procedures and practices. A higher level of extension services and activities results in a greater flow of information about new agricultural procedures. Such established programs also lower the costs of obtaining new information, and with such direct assistance available, only a basic level of education is required by the farmer for its proper interpretation and implementation.

The rural agricultural problems are further complicated, however, by relatively high rates of illiteracy in Iran (See Table 2), which greatly hinders the spread of information regarding more productive farming practices. Under these conditions, the resources spent on scientific experiments do not yield their expected returns. This is especially true since often the findings are not properly implemented and the farmers continue with their traditional agricultural practices.

#### 4 A Policy for Technological Innovation

Technological change can play an important role in advancing agricultural development. The government of Iran should substantially strengthen its extension services by adequately staffing the extension organizations with qualified technicians and efficient, skilled workers. The extension services should be effective in disseminating information regarding solutions to current problems and properly demonstrating improvements in techniques that result in improved production. Traditional farmers can be guided into adopting new and more productive techniques if they are shown that the results justify their efforts.

In Iran, as with other developing countries, the enormous size of the traditional agricultural sector, often with its lack of formal education, and

Table 2 Literacy Rate in Rural and Urban Area of Iran

(1000)

	1957			1967			1977			1987		
	7 Years and above	Number of literacy	%	7 Years and above	Number of literacy	%	6 Years and above	Number of literacy	%	6 Years and above	Number of literacy	%
Total	14364	2210	15.4	18843	5533	29.4	27113	12877	47.5	38527	23887	62.0
Rural Area	9689	592	6.1	11240	1700	15.1	13930	4249	30.5	17295	8371	48.4
Urban Area	4675	1618	34.6	7603	3832	50.4	13183	8628	65.5	21212	15507	73.1

Source: Statistical Yearbook of Iran

its conservative resistance to change, as well as its limited methods of production and self-sufficiency, greatly contributes to the considerable amount of time and effort required to upgrade the quality and effectiveness of the country's agricultural extension services. While these conditions continue to exist, the availability of a substantial amount of capital and foreign exchange may well put Iran in a better position than many other developing countries when it comes to properly improving the performance and effectiveness of their agricultural extension organizations.

## 5 Population Control

While the population of Iran has increased 2.6 times in 30 years, from 1957 (first population census) until 1987 (latest population census), agricultural land areas were virtually unchanged during the same period. The population growth rate in Iran is one of the highest in the world. Therefore, agricultural land per capita has decreased each year. In fact, agricultural land per capita decreased from 0.83 hectares in 1960 to 0.30 hectares in 1989. With the high population growth rate of Iran (calculate from 1976 until 1981 at 2.8%), planning for increased agricultural land will require considerable effort on the part of the government as well as the farmers. If the population growth rate of Iran continues unchecked at the above-mentioned rate, then by the end of the century Iran's population will be approximately 80 million.

The requirements for family planning and population control are essential in Iran, and growth rates must be reduced further to about 2.0% by 2000 and kept at this level during the following years.