Published: December 15, 1999
Last Updated: May 26, 2013

FARMING

FARMING in Persia. This article reviews major characteristics and trends of farming in Persia during the period from 1960-1995.

In the mid-1990s Persian agriculture accounted for over 25 percent of the Gross Domestic Product (GDP), 25 percent of employment, and 33 percent of non-oil exports. It also met 75 percent of domestic food requirements and 90 percent of the needs of agricultural industries in the country. Farming and animal husbandry respectively generated 54 and 44 percent of the added value in the agricultural sector. The contributions of forestry and fishery were about 1.8 and 0.2 percent respectively. Farming and horticulture provided approximately 90 percent of the calorie intake and 81 percent of the protein needs of the population (Wezārat-e kešāvarzī, 1997, pp. 7-20).

During this period, agricultural activities in Persia took place in 68,125 villages (*deh*, q.v.; see also ĀBĀDĪ) and in over three million independent holdings known as *bahr- bardārī* (*National Census*, 1996). The village, which traditionally was the provider of agricultural services, was a very heterogeneous settlement in Persia. It could vary in size from few hectares to several thousand hectares, and its population might fluctuate from a few to hundreds of families. Seventy percent of villages had a population of less than 250 and in some instances a village could be more than fifty kilometers from its nearest neighbors (Azkīā, p. 8).

FACTORS OF PRODUCTION

Water. Water is the most limiting factor in Persian agriculture. The average annual rainfall in the country is 251 mm, less than one-third of the world average (Wezārat-e kešāvarzī, 1997, p. 1). This low rainfall is very unevenly distributed in different regions and fluctuates between a minimum of 35 mm in the desert areas and a maximum of 2,000 mm in southern coastal regions of the Caspian Sea. Over two-thirds of the country fall in the arid and semi-arid zones. Only in 9 percent of the country's total land area the average annual rainfall exceeds 500 mm and in only one percent of it rainfall is more than 100 cm per year (Wezārat-e kešāvarzī, 1996, pp. 3, 4). Considering the fact that annual moisture evaporation level is between 1,000 and 4,000 mm, most regions in the country face a negative water balance (Nowrūzī, p. 51). Under these conditions dry farming (*daym*) is impossible in a vast expanse of the country. The amount of annual precipitation in the country is estimated to be 413 billion m3. In 1994 the total usage of surface and underground water for agricultural purposes was 78 billion m3, of which 40 billion m3 was supplied by underground sources and 37 billion m3 from the rivers (Wezārat-e kešāvarzī, 1996, pp. 3-4). The coefficient of irrigation efficiency in Persia's agriculture was estimated to be 31.6 percent and, therefore, Persia possesses much potential for agricultural expansion through increasing irrigation efficiency.

In the past, underground waters were utilized through a system of *qanāt*s and springs. However, after the introduction of power pumps, use of deep and semi-deep wells as well as pumping from rivers rapidly expanded and became prevalent . There were very few deep and semi-deep wells in the early 1950s, but by 1989 their number had grown to more than 60,000 and 144,000 respectively. During the next five years, the number of these wells reached over 84,000 and 223,000 respectively, indicating an increase of 40 and 54 percents (*Sāl-nāma*, 1995, p. 205). Diversion from rivers, supplemented by the small quantity of controlled flood waters, was a major source of water supply in many parts of the country.

The history of dam building and irrigation networks in the country can be traced to ancient Persia (see BAND). In the modern history of Persia construction of dams began to serve two general purposes, to generate electricity and to control irrigation water. The Golpāyagān (earthen) and Dez (concrete) dams were the first modern dams, built in 1957 and 1962 respectively, with a total capacity of controlling slightly more than 700 million m3 of water per year. In 1980, twenty operating reservoir dams controlled

approximately 36 billion m3 of water, which increased in 1994 to twenty-four dams controlling 47 billion m3, of which roughly 14 billion m3 were devoted to farming (*Sāl-nāma* , 1981, pp. 335-37, 1995, p. 206).

In many parts of Persia, particularly in the eastern and central regions where there is neither adequate rainfall for rainfed farming (*daym*) nor sufficient river water, the ingenuity of ancient Persians in utilizing underground waters is embodied in the *qanāt* system which has made farming possible in otherwise arid piedmont and catch basins. The *qanāt* system, which in its time constituted an outstanding technological innovation in farming, brings the underground sources of waters to the surface using gravity and the natural slope of the land. The *qanāt* not only does not require any form of energy but, by creating a balance between annual precipitation and water usage from underground sources, prevents the depletion of these sources without any negative effects on the environment (Beaumont, et al., Part III). Because of the enormous physical and human investment in the *qanāt* system, some researchers believe it is comparable to the seven wonders of the world. The total length of the underground canals and wells of the *qanāt* system was estimated to be 311, 000 km, of which the length of the wells constitute 42 percent and the remaining 58 percent were comprised of underground canals. It has been estimated that 427 million labor days were required to build this system. In 1954, it was estimated there were 46,000 *qanāt*s in Persia (Ṣafīnežād, 1980, p. 32-34). This number was reduced to 30,000 in 1989 and to 28,000 in 1993 (*Sāl-nāma*, 1995, p. 205). The main reason for this decrease was the high cost of maintenance due to the increase in labor cost, the decreased availability of skilled labor (the *mōqannī*s, experts in the *qanāt* system), and the excavation of deep wells in the vicinity of the *qanāt*s which led to lowering of the water table in the subterranean sources and their eventual drying up.

Land. Of the approximately 165 million ha of the country's land area, about 30 million ha are arable. In the mid-1990s, 18.6 mil. hectares of this was under cultivation or fallow, 14 million ha of which was devoted to cultivation of annual and prennial crops. Annual crops occupied 12 million ha, over 85 percent of the cultivated land. The remaining 2 million ha were allocated to orchards. The total fallow land was 4.6 million ha, of which 3.4 million ha were in the rainfed area (Wezārat-e kešāvarzī, 1997, p. 2).

Cereal grains constituted the most important crops in Persia. In the case of irrigated crops, 62 percent of the land under cultivation was devoted to wheat, barley, and rice. In the case of rain-watered crops ,wheat and barley occupy 81

percent of the cultivated area (Wezārat-e kešāvarzī, 1997, p. 41). The key role of cereal grains in the popular diet gave them a strategic and a political priority in the cropping pattern of the country. About 90 percent of calorie intake in the country came from crops, while animal products played a small part in the calorie intake of the population (Kalāntarī, p. 10). Wheat was the staple food for the majority of people in Persia, and any rise in its price has always been politically sensitive.

One of the undesirable characteristics of land holding system in Persia has been the prevalence of small holdings comprising many scattered plots. The size of more than 77 percent of holdings was less than 10 ha (see Table 1), which collectively constituted one-third of all land used in agriculture. The average land holding within this group was less than 3 ha, of which roughly one-forth lay fallow each year. The remaining 2.25 ha were divided almost equally between rainfed and irrigated farming. While the average irrigated land area under cultivation in these holdings was 1.13 hectares (*Sāl-nāma,* 1995, p. 21), the optimum size of a holding (to be both under cultivation and lying fallow) was estimated to be 6 ha (Solṭānī, pp. 114-20).

Another important problem was the prevalence of fragmentation, particularly in the irrigated lands. On average a holding possessed more than seven scattered plots, and sometimes the distance between two plots could be few kilometers (Bāfekr, p. 168). The major problem associated with this system of land holding was its inability to take advantage of economies of scale, which resulted in higher costs thus rendering competition in world market impossible. Another negative impact of this phenomenon was that despite the hard labor of every family member,the income of farmers remained low. In addition, severe population pressure on arable land led to unsustainability of water and land resources, degradation of the environment, and ultimately loss of natural resources (Wezārat-e kešāvarzī, 1997, p. 21).

From time immemorial until the land reform of the 1960s, landowners organized sharecroppers in work groups, which not only facilitated the division of crops between landowners and sharecroppers and solved the problems of land fragmentation but also significantly improved efficiency in the usage of water, the scarcest resource. These multi-family or collective production organizations bore different names in different regions, but in their organizational principles they were essentially similar and only differed with respect to the varying amounts of water available in each area. These collective production units were known as *bona* in Tehran and Qazvīn, as

ḥarāṭa in Kermān and Shiraz, as *sÂaḥrā* or *sarkār* in Khorasan, and as *darkār* in Kohgīlūya and Behbahān. A by-product of landlord-peasant (*arbāb o raʿīyatī*) agrarian relation this method of production, particularly in the eastern parts of the country, was based on the five factors of production, land, water, seed, draft animal, and labor power. The landlords owned at least two and at most four of these factors of production, and in some cases the plowing was provided by oxen owners (*gāvband)*. Labor was always provided by the peasants. *Bona* was an independent farming unit which covered several plots of land, had a given amount of water, and employed a group of farmers in different capacities. The number of *bona*s in a location depended on the amount of water and land available. The size of the land in different *bona*s in a village was the same, and the amount of water allocated to each was virtually equal. Each farmer's share of the harvest depended on his position in the *bona*. The headman, *ābyār or sarbona,* received the largest and the cultivator, *barzgar*, the smallest share of the crop. With the landlord's approval the *bona* was granted official recognition and was registered in his records (Ṣafīnežād, 1974, passim). Since the *bona* system, which had been supported by the old landowning class, was a component of the old landlord-peasant mode of production in the arid and semi-arid areas in which wheat and barley cultivation predominated, it disappeared with the abolition of the landlord-peasant relation in the course of the land reform of the 1960s (Ashraf, 1991, p. 289).

Land Ownership. On the eve of the land reform of the 1960s, 52 percent of the holdings were owned by large, middle, and small land owners; 33 percent by owner-cultivators;10 percent by the state; and 5 percent by religious endowments (*awqāf*). Of these holdings, 43 percent were operated by sharecropping tenants (*zāreʿ-esahmbar*), 13 percent by fixed-rent tenants (*zāreʿ-e ejārakār*), 33 percent by owner-cultivators (*mālek*), and 11 percent by a combination thereof. The total land area under these arrangements was estimated to have been 11.4 million ha, of which the share of each type of holding was sharecropping tenancy, 55 percent; fixed rent tenancy, 7 percent; owner-cultivating, 26 percent; and mixed holding, 12 percent (Ministry of Interior, Public Statistics, XV, table 101).

The 1960s land reform abolished the old landlord-peasant agrarian relation (*arbāb o raʿīyatī*) and substantially increased peasant ownership and small private holding (see further, Lambton, 1969, passim; Majd and Nowshirvani, passim; Ashraf, pp. 282-90; Malekānīān, 1992, pp. 47-75). Also developed was a

variety of private commercial farming, including medium-sized and large farms as well as agri-businesses (*kešt o ṣanʿat*). Furthermore, to promote commercial agriculture in the public sector, the government established eight large agricultural enterprises with 155,000 ha of highly valuable farm land and a $200 million annual budget. It also established 93 farm corporations (*šerkathā-ye sahāmī-e zerāʿī*) with 315,000 ha of land and 39 production cooperatives (*taʿāwonīhā-ye tawlīd*) with 100,000 ha which were managed by government agents with minimum participation by peasant shareholders (Ashraf, pp. 286; see also Bergmann and Khademadam, passim).

After the Revolution of 1978-79, another land reform was implemented. The first legal document for this reform was drafted as a bill by three Islamic jurists (*faqīh*s) in 1979 and was approved by the Revolutionary Council in April 1980. According to this act, farmlands were divided into four categories: (a) wastelands and pastures; (b) confiscated lands; (c) uncultivated land which was formerly cultivated; (d) cultivated land in excess of the ordinary local level, i.e., the average size of holdings in a rural area. Teams of seven were set up to implement this act. However, as a result of different opinions voiced by the jurists over the compatibility of articles (c) and (d) above with the *šarīʿa*, the implementation of this law was soon halted. Eventually, the law regarding permanent conveyance to farmers of lands under their temporary cultivation was approved in the Majles by a margin of over 75 percent in 1986. This law legalized the distribution of more than 800,000 ha of land by requiring a fair price for them from the 120,000 farmers who had seized these lands. In 1988, in order to eliminate all legal disputes, the Expediency Council ratified this law and charged the executive with its implementation (Schirazi, pp. 73-324; Ashraf, 1991, pp. 299-303).

The landholding patterns before and after the land reform (for the years 1960 and 1973) as well as in the post-revolution era (for the year 1991) are given in Table 2. The Gini coefficient of concentration, with maximum 1 and minimum 0, shows that the degree of concentration in land distribution in these three distinct periods were 0.55, 0.61, and 0.62 respectively, indicating that the concentration of holdings rose somewhat after the land reform and continued to increase slightly after the revolution.

Mechanization. The International Fund for Agricultural Development (IFAD) has depicted Persian agriculture as highly mechanized (IFAD, 1993, p. 12). The introduction of machinery in Persian agriculture began in 1935 with the establishment of a company associated with the Ministry of Finance under ʿAlī

Akbar Dāvar (q.v.). In 1947 the government issued import licenses for agricultural machinery to farmers and instituted special tariff exemptions. With the establishment of the Organization for the Development of Agricultural Machinery (Bongāh-e tawseʿa-ye māšīnhā-ye kešāvarzī) in 1952, what in practice amounts to an administrative apparatus to promote the expansion of mechanization in agriculture was organized. Over 90 percent of the cultivated land in 1988 was plowed by tractors and 71.5 percent of holdings used tractors. The intensity of utilization of machinery varies regionally. In Ḵūzestān 99.5 percent of irrigated lands have been plowed mechanically. This ratio was 47 percent in the province of Kurdistan, the lowest in the country. In 1991, mechanical plowing for rice, cotton, and sugar beets exceeded 99 percent. This ratio was over 95 percent for irrigated wheat and barley, as well as for potatoes, onions, and oilseeds; for other products it was nearly 90 percent. This ratio was lower, however, for other farming operations such as disk harrowing, fertilizer distribution, and land leveling. For example, in the case of land leveling, excepting the rice fields, the ratio varied from a high of 37 percent to a low of 8 percent. A survey of the utilization of machinery in agriculture reveals that the use of machinery was largely limited to the initial and final stages of the production process, i.e., plowing and harvesting, and the intermediary stages of production were still heavily depended on human labor and traditional methods (Nūrī Nāʾīnī, 1993, p. 13).

In 1994, 60 percent of the energy used in agriculture was provided by machines, 30 percent by humans, 7.5 percent by electrical power and 2.5 percent by animals. The energy use per hectare in farming was estimated to be 0.72 horse power in 1991 (Darvīš, p. 47). The supply of agricultural machinery to farmers in the years after the Islamic revolution at prices subsidized by the government had a large positive effect on the spread of mechanization in agriculture. The gradual decrease, and in some cases elimination, of these subsidies has resulted in a reduction of demand for the number of agricultural machinery. As a result, in 1998 the demand for tractors and combines fell short of the total output of these machines by the domestic industry. For example the number of tractors sold in 1981 was approximately 15,000; but in 1991, 1994 and 1996, it decreased to 7,753, 1,952 and 877, respectively. A similar trend took place in respect to plows, combines, and power pumps (*Sāl-nāma*, 1996, p. 123). The most prevalent method of procuring machinery services in the agricultural sector was in the form of renting.

EMPLOYMENT

In 1906, of the total employed workforce in the country, 90 percent worked in the agricultural sector. This ratio was still 75 percent in 1946, showing a decline of only 15 percent in 40 years. After 1946, with the increasing importance of the oil, the industrial, and the service sectors, the decrease in proportion of employment in agriculture accelerated and in the years 1956, 1966, 1976, 1986, 1991, and 1996 it dropped to 56, 48, 34, 29, 25, and 23 percent of total employment respectively (*Sāl-nāma*, 1997, p. 74; *National Census*, 1956, 1966, 1976, 1986, 1991; see also Solṭānī, p. 21; Wakīlī, p. 29).

Of the total number of jobs created in the period between 1976 and 1986, 1.8 mil. were in urban areas and only 300,000 in rural areas. This means that for every job created in the countryside, six were created in the city. After the end of the war with Iraq, farm processing industries and non-oil exports received more attention and, as a result, between 1986 and 1991, the rate of job creation in rural areas was three times the rate of the previous decade (Farjādī and ʿAbbāsī, p. 275).

Despite an average annual decline of 4.2 percent in overall labor productivity (value added per capita) during the decade of 1976-86, the agricultural sector enjoyed notable growth compared to other sectors during this period and up to 1991. The average rate of growth of productivity in these two periods was 3.8 and 3.2 percent respectively. This steady growth was indicative of the relative independence of this sector from foreign imported inputs and oil revenue (ibid, p, 297).

PERFORMANCE AND POLICY

1960s to 1970s. From the second through the fifth development plans (1955-1978; see BARNĀMA-RĪZĪ) under the Pahlavi regime, the major objective of the planners was rapid economic growth. Since the achievement of rapid growth in a short time was deemed to be more difficult in the agriculture than in other sectors, the planners paid more attention to the industrial and service sectors. The contribution of agriculture to the GDP, which was 26 percent in 1963, fell to about 10 percent in 1975 due to the rapid increase in oil revenue, industrial production, and the service sector. As a result, in this period, the average annual growth rate of industry was about 15 percent; of the service sector, about 14.3 percent; of oil, 9.1 percent; and of agriculture, 4.6 percent (Bānk-e markazī-e Jomhūrī-e eslāmī-e Īrān, p. 123; see also ECONOMY ix, Table

5).

Despite this relatively high growth rate in agricultural production, a number of factors caused a rapid increase in the importation of wheat, sugar, and meat from about 0.5 million tons or 7 percent of total domestic agricultural production in the early 1960s to over 2 million tons or 10 percent in the late 1970s. First, the population explosion, with an average annual growth rate of 3.2 percent, led the total population to leap from about 19 million in 1956 to over 34 million in 1976. Second, rising income in urban areas led to increasing demand for foodstuffs. Third, government subsidies for wheat, sugar, and meat and their low price encouraged their increasing consumption by the rapidly growing urban population. Finally, the price control at a low level for cereals, combined with increasing urban demand for high quality agricultural products such as industrial crops, fruits, vegetables, milk and meat, led to a rapid growth in production of those commodities and impaired the incentive for farmers to produce cereal crops. As a result, the rate of growth of cereal production lagged behind the overall rate of growth of agriculture and was limited to an average of 2.4 percent per annum from 1960-75. This, together with a population growth rate of 3.2 percent, resulted in a large increase in cereal imports (Ashraf, p. 289).

1980s-90s. In the post-revolution period of the 1980s the government's agricultural policy focused on self-sufficiency in wheat and rice. Furthermore, the government placed particular emphasis on support for traditional and medium-size farms by a variety of aids and the dismantling of large agro-industrial enterprises. Soon after the revolution, the Crusade for Reconstruction (*Jehād-e sāzandagī*), composed of volunteers to serve in rural areas, was formed and assumed an important role in the social, political, and productive lives of farmers. This organization, after some ups and downs, was redesigned as a ministry (Wezārat-e jehād-e sāzandagī) and assumed official responsibilities in forestry and pastures, the marine life and fisheries, animal husbandry, and rural development. Other farming operations, including production of annual and perennial crops, remained under the authority of the Ministry of Agriculture (Wezārat-e kešāvarzī). The division of responsibilities between these two ministries has led to some difficulties, including some duplication and competitiveness. The Ministry of Energy (Wezārat-e nīrū) has continued its responsibility for the construction and maintenance of dams and main canals.

With the start of the war with Iraq and the establishment of economic

sanctions in 1980, the agricultural sector received more attention and "self-sufficiency in basic agricultural products almost at any cost" became a major objective of the state. The price stabilization policies pursued by the government in conjunction with a relentless general inflation (about 300 percent) in the period between 1981 and 1989, culminated in a steep decline of relative prices of essential commodities and the creation of a black market for all goods covered by state price regulations. As a result, the service sector came to generate 50 percent of the GDP, and the sub-sector of trade services alone accounted for 45 percent of this amount. In sum, these policies resulted in disruption of the allocation of resources, undesirable growth in the services of middlemen, deterioration of the already skewed distribution of income, windfall gains for a few, reduction of government earnings, and the spread of corruption (Nīlī, pp. 363-64). These conditions prompted the government to base the first development plan on a program of economic reform and adjustment.

As a result of the confiscation of large land holdings and the involvement of revolutionary organizations in the rural areas and agriculture on the one hand, and the weakening of medium size land owners on the other, the prevalent organizational form of farming became that of peasant farms and a few large government organizations. Consequently, during the period between 1979 and 1989 average farm size declined and investment opportunities in agriculture decreased. The average growth in agriculture has been estimated to be 4.1 percent during the 1979 to 1987 period (Šūrā-ye barnāma-rīzī-e kešāvarzī wa āb, pp. 1-2).

From 1989 to 1999 the first and second five year development plans covering the years 1989-94 and 1995-99 were launched. The major characteristic of agricultural programs in these plans was the effort to equalize prices of domestic agricultural products with those of international markets in order to promote production incentives. However, the actual practice since the beginning of these plans was implementation of a guaranteed pricing system based on the cost of production and a 20 percent profit margin for the farmers. Although the contribution of agriculture to the GDP decreased under the first plan (1989-94) from about 29 percent to 27 percent, the value added in this sector has witnessed a growth of 5.9 percent. Moreover, during the same period, the investment per capita in the agricultural sector has been equal to one-fifth of average investments in other sectors of the economy (Wezārat-e kešāvarzī, 1996, pp. 13-14).

In the period between 1975 and 1995, the total area under cultivation has increased from 9 million to over 12 million ha and the yield of wheat per hectare increased from 919 to 1,709 kilograms. As a result, wheat production level increased from 5.8 million metric tons in 1980 to 8 milliion tons in 1990 and 11.2 million tons in 1995 (see Table 2, Table 3, and Table 4).

The production of horticulture and fruits also increased in the 1980s and 1990s. Given Persia's comparative advantage in the quality of many fruits due to its special climate, the development of this sector received much attention in this period. A market-oriented pricing policy and growing demand of the Persian Gulf Emirates for Persian fruits combined with limiting the role of government to provide technical assistance have been the main instruments for developing this sector. As a result, the total production of fruits rose from 2 million metric tons in 1975 to 4.9 million tons in 1985 and 10 million tons in 1995 (Table 5).

The performance of farming in three the decades from 1965 to 1995 is summarized in (Table 6), showing major agricultural and cereal indices including total agricultural production, agricultural per capita, total cereal production, and cereal per capita. It should be noted that despite a considerable increase in cereal production during the last three decades, the country is still dependent upon the import of about three million metric tons of cereals.

See also ĀB; ĀBĀDĪ; ĀBYĀRĪ; AGRICULTURE; BAND, DEH; ECONOMY ix and x; GEOGRAPHY; GEOLOGY; HYDROLOGY.

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