STRUCTURE OF AGRICULTURE AND METHODS OF CULTIVATION ON IRANIAN FARMS OF DIFFERENT SIZE

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ABSTRACT

In this paper, based on the results of several agricultural censuses and surveys, some major aspects of the structure of Iranian agriculture during the past three decades is described. Empirical evidence clearly shows that a large portion of population lives on farms and is employed in agricultural sector. While in early 60's, share-cropping was the main form of land tenure it has been mainly transformed into owner-operated. Average farm size during the past three decades, due to the nature of land reforms and population pressure has decreased to some extent and in 1988 has been 5.78 hectares. Land distribution was highly unequal with a large differential in population/land ratio, share of land ploughed by tractor, share of fallow land, type of management, use of chemical fertiliser, and wheat yields on farms of different sizes, with the resulting inefficiencies from social point of view.

The purpose of this paper is to detail the structure of agriculture and methods of cultivation on Iranian farms of different size. First, some main aspects of Iranian agriculture is described. In the second part of the paper, methods of cultivation on farms of different size is explained. Then a limited empirical evidence is presented, and finally the whole argument is summarised.

STRUCTURE OF AGRICULTURE

The results of population surveys and censuses show that the relative share of rural/agricultural population has been decreasing during the past several decades, especially during the period 1966-76. While the population of farm holder families had been increasing from 1960 until 1972, had decreased during the 1972-74 period. The population of holder families in 1974 was more than that of 1960, the population of non-holder families had decreased. In 1974 population of holder families ranged from 66.43 percent to 93.19 percent among provinces. In 1986 more than 45 percent of population lived in rural areas and 29.1 percent of employment of labour force has been in the agricultural sector. In 1988 the number of farm families with agricultural land has been more than 2.8 million (1); thus, the data indicate the importance of rural population and farmer families population in Iran. Another feature of Iranian agriculture which has gone through a basic change is the production relations in Iranian agriculture; they have been transformed from an overwhelmingly share-cropping system in the 1960's into those of the owner-operated (2,3,4,5) by the early 1970's. In 1974 more than 90 percent of the land was owner-operated. The data of 1972 survey and 1974 census indicate that land ownership was distributed highly unequally.

No single category of resource serves to measure farm size. The best measure would be one which combines input of capital, labour, and land. Value of output also gives a good single measure of size. Land is the major non-labour resource and, in Iran, only on the distribution of land is relatively detailed information available (3.6.7).

To explore the basic features of production in Iranian agriculture, farms are divided into three groups: small (<5 hectares), medium (5 - under 50 hectares), and large (50 hectares and larger), based on information collected in the 1973 agricultural census and the 1974 agricultural survey. Data regarding the number and percentage share of three classes of farms in 1974 indicate that more than 64 percent of farms in 1974 are smaller than 5 hectares and control less than 15 percent of the total land. On the other hand, more than 21 percent of the land belongs to large farms which comprise only 1.04 percent of the total number of farms. The average size of small farms is 1.52 hectares, that of medium farms is 12.20 hectares, and that of large farms is 190.04 hectares. While the average farm size in 1960 and during 70's was more than 6 hectares it has been 5.78 hectares in 1988 (1). Percentage share of work done by family members in different farm groups differs. Seventy-one percent of farms where all the work was done by family labour were small farms and only .25 percent of large farms provided all the labour input from family members. On the other hand, on 67.41 percent of small farms all the work was done by family labour and on only 14.60 percent of the large farms was all the work done by family members. Only on 4.49 percent of the small farms was most of the work done by non-family (employed) labour, but on 46.83 percent of the large farms most of the work was done by non-family (employed) labour (8). From these facts we can conclude that most small farms do not employ non-family labour, and those which do, employ very little non-family labour. Similarly, most of the large farms employ non-family labour.

Percentage share of output sold by farms of different sizes varies to a large extent. The data indicate that a high percentage of farms smaller than 50 hectares produced for their own consumption; on the other hand, around 97 percent of large farms sold half or more of their produce (7). From these facts we can conclude that small and medium farms in Iran in 1974 were producing mostly for their own consumption, while large farms were producing mostly for the market. However, it is important to note that about 50 percent of small farms were producing some produce for the market and hence were not exclusively subsistence farms.

Table 1 shows the population/land ratio in different farm size groups in 1974. The data indicate that the population/land ratio is much higher on small farms than on large farms - over 78 times as much ($2.994 \div 0.038 > 78$). This probably accounts in large part why large farms had to employ non-family labour.

Table 2 shows the percentage share of land ploughed by tractor on different size farms. Whereas only 33.03 percent of land under cultivation on small farms was ploughed by tractor, the corresponding

Table 1. Population/Land Ratio in 1974 by Farm Size, 1974.

Farm Size	Population	Area	Population / Area
Small	7,265,576	2,436,430	2.982
Medium	4,808,302	10,454,188	0.460
Large	188,094	3,526,603	0.053
Total	12,261,972	16,417,221	0.747

Source: Statistical Center of Iran. 1974 Agricultural Survey. 1977.

Table 2. Share of Land Plowed by Tractor by Farm Size, 1974.

Farm Size	Total Area	Area Plowed by Tractor	Percentage Share of Area Plowed by Tractor
Small	2,436,430	804,832	33.03
Medium	10,454,188	5,624,990	53.81
Large	3,526,603	2,817,309	79.89
Total	16,417,221	9,247,131	56.33

Source: Statistical Center of Iran. 1974 Agricultural Survey. 1977.

Table 3. Share of Fallow Land by Farm Size, 1974.

Farm Size	Total Area	Area (Fallow)	Percentage Share of Fallow Land
Small	2,436,430	575,551	23.62
Medium	10,454,188	3,859,653	36.92
Large	3,526,603	1,520,143	43.11
Total	16,417,282	5,955,347	36.27

Source: Statistical Center of Iran. 1974 Agricultural Survey. 1977, p. 15.

figure for large farms was 79.89 percent. In short, there is an indication that the large farms were relatively more capital-intensive, as was previously discussed.

Table 3 shows the percentage share of fallow land, in different farm size groups. As the data indicate, a large percentage of land in large farms is left fallow as compared with the situation in the small farm category, ie., 43.11 percent versus 23.62 percent. As it is shown in Table 5 that yields of wheat in farms of smaller than 2 hectares was larger than those in large farms. Yields on farms of smaller than 1 hectare were 2.31 times as much as the yields on farms of larger than 100 hectares. Type of management differs by size of the farm. In 1974 large farms had 17.83 percent absentee owners while smaller - and especially medium - size farms seldom had absentee owners, 1.78 and 1.22 percent, respectively (8).

METHODS OF CULTIVATION

One of the features of agricultural production is that the farmer has considerable choice in determining the method of cultivation to be used in producing a given output. The alternative methods of cultivating a particular crop can be represented in terms of an isoquant which indicates the various combinations of labour and material inputs which can be used to produce a given quantity of output. Each farmer will try to maximise his output given the cost of inputs, and minimise the cost of producing any given quantity of output. Which is the most economical method of cultivation will depend on relative factor costs. There are plenty of reasons to believe that the price of material inputs is relatively higher to small peasants and cheaper to big landlords (9,10). Thus, we would expect that the two types of farmers would adopt different techniques of production.

In Figure 1, the relative factor prices which the small farmer is expected to face are represented by the line SS′, whereas those expected to be faced by the large farmer are represented by the line LL′. It can be seen that the small farmer adopts technique A, which is relatively labour intensive, while the large farmer adopts technique B, which is relatively intensive in the use of material inputs, that is, in the use of working capital and the services of fixed capital. The large farmer tends to be capital-intensive and the small farmer tends to be labour-intensive.

The land distribution and market structure in Iran is such that large and small farmers are expected to face different prices. The economic power of large farmers is likely to ensure, in general, that they receive most factors of production at less than what the small farmers tend to pay for land and capital and receive less than perfect market price for their labour. The system thus results in greater inequality in the distribution of income than under perfect market system. We now argue that, in addition, the

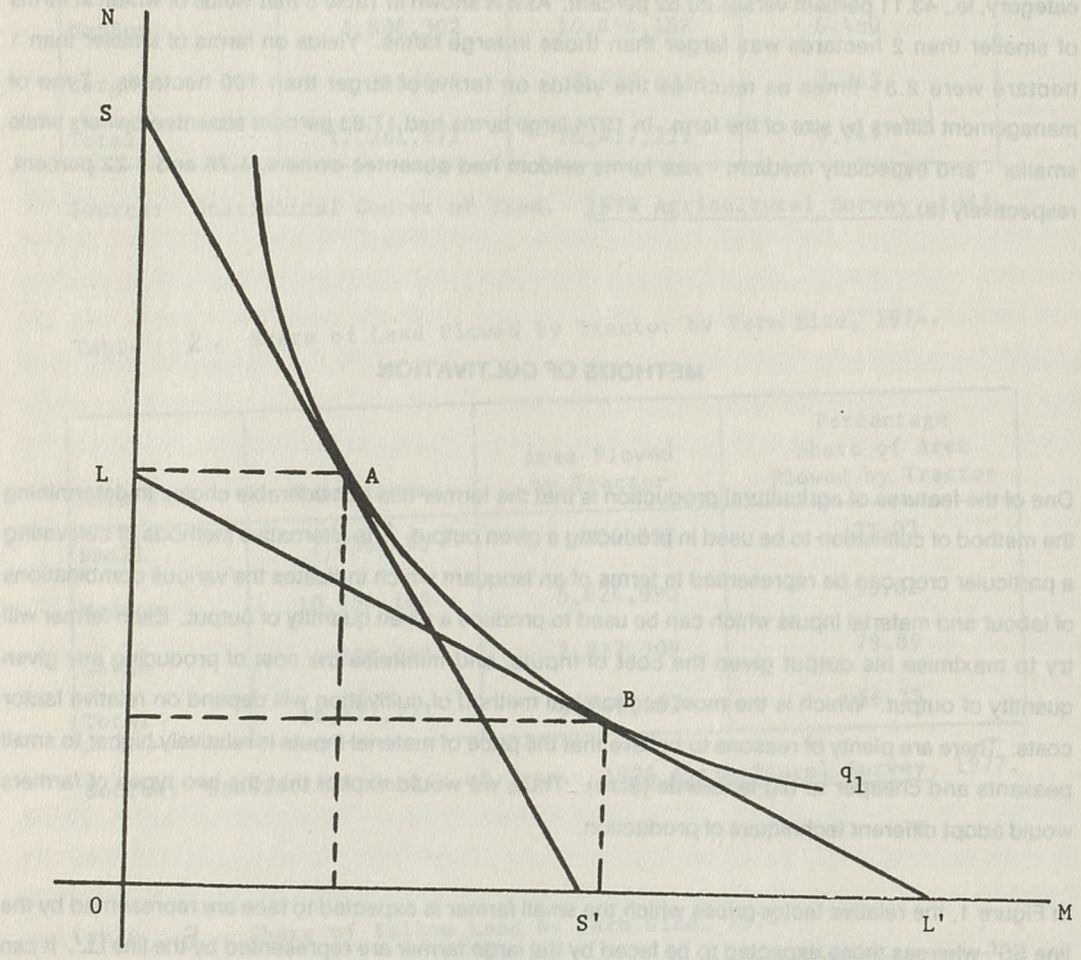

Figure 1. Different Input Prices and Different Techniques of Production on Small and Large Farms

Table 4.

Table 4. Characteristics of the Agricultural Sector

		Small Farm	Relation	Large Farm
Factor Prices	Wage Rate	w_s	$\leq$	w_b
	Rental Rate of Land	r_s	$>$	r_b
	Interest Rate	i_s	$<$	i_b
Techniques of Production	Labor-Land Ratio	$[N/L]_s$	$>$	$[N/L]_b$
	Capital-Labor Ratio	$[K/N]_s$	$<$	$[K/N]_b$
	Capital-Land Ratio (a)	$[K/L]_s$	$\gtrless$	$[K/L]_b$
Output per Factor Input	Yield per Hectare	$[Q/L]_s$	$>$	$[Q/L]_b$
	Productivity of Labor	$[Q/N]_s$	$<$	$[Q/N]_b$
	Productivity of capital	$[Q/K]_s$	$>$	$[Q/K]_b$

(a) Depending on whether $[i/r]_s \lessgtr [i/r]_b$

system may result in allocative inefficiency. Because land and capital are cheap relative to labour, the large farmer tends to adopt techniques of production, which from the point of view of the social optimum, but not from that of private profit maximisation, are characterised by excessively high land-labour and capital-labour ratios. Conversely, the small peasant will combine less than the socially optimal amount of land and capital with his labour. Total output would increase if factors were redistributed so that large farmers used more labour-intensive methods of farming and small farmers used more land-space and capital-intensive techniques.

These differences in methods of cultivation are expected to result in differences in labour and land productivity. The explanation of these expected differences is obvious: small farms have a high land productivity because they are cultivated very intensively, and large farms have a high labour productivity because they are cultivated relatively intensively. These differences in the intensity of cultivation, in turn, are to some extent due to the differences in relative factor prices that the two types of farmers confront. Thus, one of the basic characteristics of the agricultural sector, at any moment in time, can be explained in terms of imperfections in the factor markets and the consequences expected are summarised in Table 4.

Although it was suggested that there are likely to be imperfections in all factor markets, ie., in the markets for land, labour, and capital, the conclusions regarding income inequality and allocative inefficiency do not depend on this. It is sufficient for our purposes that there be monopoly elements in one market only. Suppose, for example, that the labour and land markets are perfectly competitive, but that the capital market (as explained before) is organised in such a way that small farmers pay substantially more than large farmers for credit. This single inequality implies that the price of labour relative to the price of capital will be higher for the large farmer than the small farmer, and, in consequence, the proportions in which factors are combined will differ on the two types of farms, as well as the productivity of the various factors of production. Hence, inequality and inefficiency will arise if any factor market is not perfect in the manner it was described. Of course, the more widespread the monopolistic elements, the greater will be the disparities in income and the lower total production will be.

A LIMITED EMPIRICAL EVIDENCE

The data in Table 5 indicates the positive correlation between farm size and use of machinery. Percentage share of land ploughed by tractor in farms of smaller than one hectare is only 16.78 percent, and the larger the size of the farm the higher the percentage of the land ploughed by tractor; the corresponding figure for farms of larger than 100 hectares is 82.92 percent. The larger farmers tend to substitute tractors for labour. Fertilisers, in contrast, are a substitute for land, not labour, and

Table 5. Percentage of Fallow Land, Wheat Yield, Land Plowed by Tractor, Fertilizer Use, and Population/Land Ratio by Farm Size, 1974.

Farm Strata	Percentage of Land Left Fallow			Wheat Yields (kilogram per hectare)	Percentage of Land Plowed by Tractor	Quantity of chemical Fertilizer (kilogram per hectare)	Population/ Land (persons per hectare)
	Total	Irrigated	Rainfed				
Under 1 hectare	11.37	9.78	16.68	1594	16.78	371.70	11.65
1 - under 2 hectares	18.48	13.19	28.00	873	24.67	135.31	3.48
2 - under 5 hectares	26.78	22.09	30.72	659	37.61	62.38	1.55
5 - under 10 hectares	34.32	30.15	36.54	480	48.10	38.06	.77
10 - under 50 hectares	37.94	34.41	39.22	346	56.05	35.22	.34
50 - under 100 hectares	30.60	38.07	41.17	530	72.96	51.33	.12
100 hectares and more	44.50	44.26	44.80	690	82.92	76.19	.03
Total	36.28	32.71	38.38	483	56.33	56.23	.75

Source: Statistical Center of Iran. 1974 Agricultural Survey, 1977.

that is why farms of smaller than two hectares, and those of smaller than one hectare, in particular, have a very high tendency to use fertiliser. Land-use patterns, as evidenced by the percentage share of land left fallow, indicate inefficient use of land; the percentage share of fallow land on farms of larger than 100 hectares is about four times as much as that of farms smaller than one hectare. And this is despite the fact that during the land reform programmes, landlords had a tendency to keep better land with more adequate water for themselves.

Despite the much greater use of machinery on the larger farms, their output per hectare is less than that of the small farms (11). If marginal productivity of land on small farms is larger, then this implies that a more equal distribution of land would increase the total output.

Relative abundance of labour on small farms relative to that of large farms is evidenced by the population/land ratio on farms of different size. While the ratio on farms of smaller than 1 hectare is 11.65, the ratio decreases as the farm size increases. The ratio on farms of larger than 100 hectares is as low as .03.

SUMMARY

Summing up the crucial organisational characteristics of Iranian agricultural production: (1) the distribution of land is highly unequal (in 1971, 33.36 percent of farmers had only 2.29 percent of the land and 0.35 percent of farmers had 13.20 percent of the land); (2) a high percentage (67.41) of small farms do not have hired labour, and the larger the size of the farm the higher is the percentage of hired labour; (3) the population/land ratio on small farms relative to that of large farms is very high (2.982 for small farms and 0.053 for large farms); (4) large farms are more mechanised than small farms (33.30 percent of land on small farms is ploughed by tractor, while the corresponding figure for large farms is 79.89 percent; (5) a large percentage of land on large farms, relative to that of small farms, is left fallow (43.11 percent versus 23.62 percent); (6) yields on small farms are higher than those of large farms, and (7) absentee ownership is higher for large farms than for small farms (17.83 percent versus 1.78 percent).

Based on the above information about the structure of production in Iranian agriculture, in the next subsection, by a model of subsistence farms, the process of emergence of economic stress on small farms is detailed.

In short, the patterns of input use, land, tractors, and fertiliser are consistent with the notion that different farm sizes face different input prices; and therefore, the conclusions reached, namely the relative under-utilisation of labour, from a social point of view, by large farmers and the more unequal

distribution of income and inefficiency in the agricultural sector, are therefore being realised under these circumstances. The final result may even be the absolute deterioration in the income position of landless and small farmers, which results in rural out-migration as its reaction.

REFERENCES

1. Data Source: Statistical Center of Iran. 1974 Agricultural Census. 1977, p 1 and 1988 Statistical Year book of Iran. 1989. pp. 26,62 and 213.

2. Arsalanbod, M. Land Tenure in Iran. Unpublished paper.

3. Arsalanbod, M. Farm Size Structure and the Distribution of Income in the Rural Areas of Iran. in Income Disparities Among Farm Households and Agricultural Policy. Proceedings of the 14th Symposium of the European Association of Agricultural Economists. 1987.

4. Parvin, M. and Taghavi, M. A Comparison of Land Tenure in Iran Under Monarchy and Under the Islamic Republic. in Post-Revolutionary Iran. Amirahmadi, H. and Parvin, M. (editors). Westview Press, 1988, pp. 168-182.

5. Majd, M. Land Reform Policies in Iran. American Journal of Agricultural Economics. November 1987.

6. Arsalanbod, M. Distribution of Farm Size in Iran. Unpublished Paper.

7. Koopahi, M. Study of the Distribution of Agricultural Holdings by Size in Iran. Iranian Journal of Agricultural Sciences. Vol. 17 Nos. 3 & 4, 1987.

8. Data Source: Statistical Center of Iran. 1974 Agricultural Census. 1977.

9. Griffin, K. The Political Economy of Agrarian Change. Harvard University Press, 1974.

10. Dale W. Adams and Douglas H. Graham. A Critique of Traditional Agricultural Credit Projects and Policies, in Agricultural Development in the Third World, Carl K. Eicher & John M. Staatz (Editors), The Johns Hopkins University Press, 1984. pp. 313-328.

11. Moghadam, F. An Evaluation of the Productive Performance of Agribusinesses: An Iranian Case Study. Economic Development and Cultural Change. Vol. 33, No. 4, July 1985. pp. 755-776.