CHAPTER 2

Farm size-Productivity Relationship:
The Ongoing Debate

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CHAPTER - 2

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2.1 INTRODUCTION

The relationship between farm size and productivity is not very clear. Different economists hold different views. While some argue that, there is an inverse relationship in that productivity declines as farm size increases, other economists have argued that as farm size increases, productivity increases while, some other economists argue that productivity is neutral as between farm sizes. There are also economists who feel that inverse relationship holds over "certain ranges of size" and not over "all ranges of size". Thus, instead of clear cut conclusions on the issue, what we have is a debate. This debate was initiated by A.K. Sen (1962, 1964) with the conclusion that an inverse relationship existed between farm size and productivity in Indian agriculture, which is the principle hypothesis of this present study, to be examined for Gujarat Agriculture.
2.2 FARMSIZE AND PRODUCTIVITY

During the pre HYV period, the question of farm size was usually raised in connection with the following three issues:

1. The relative efficiency of farms of different size groups; efficiency being defined variously as:
   a. Productivity per unit of land,
   b. Productivity per unit of labour inputs,
   c. Net return per unit of capital employed; and
   d. Amount of surplus marketed per unit of land.

2. The concept of viable farm size which optimises the use of bullocks, the major indivisible input in pre-HYV agriculture, and the stock of family labour and provides the family with a subsistence income.

3. The issue of land reform i.e. to what extent a policy of redistributing land in favour of smaller peasants and landless labourers would further the twin objectives of attaining social justice as well as improving the efficiency of Indian agriculture.

Apart from these issues for over two decades, economists
have been engaged in a debate on the relationship between farm size, productivity and farm efficiency. While farm productivity implies output per unit of land, farm efficiency or farm profitability refers to the surplus of the value of output over all costs (including the imputed value of inputs contributed by the farmer or his family.)

Since 1954-55, the studies in the economics of farm management undertaken by the Government of India provided a statistical base for the economists to work out the relationship between farm size on the one side and productivity and efficiency on the other. The debate on farm size and productivity in India was initiated by A.K.Sen (1962) and was later on joined by A.M.Khusro (1964), A.P. Rao (1967), Hanumantha Rao (1966, 1968), Ashok Rudra (1968) and others, but the controversy has remained largely inconclusive. Most of these studies observed an inverse relationship between farm size and output per hectare in the Farm Management Studies Sen(1962), Khusro (1964), Saini (1969) and others] i.e. small farms in India were far more productive than large holdings because of intensive cultivation.

One explanation for this relationship was offered in terms of the superior quality of land under smaller holdings; more fertile land provides greater opportunities for earning income, so that the family size expands at a faster rate which leads to quicker sub-division of more fertile land over time [A.K.Sen;1964]. This
explanation was largely supported by B. Dasgupta (1977) in studying village socio-economic systems, who found that areas characterized by land scarcity were usually more advanced in terms of agricultural inputs and yield, whereas land is relatively more abundant in low-yield backward areas. When the fertility differential is fully accounted for, as Khusro (1964) shows, the negative relationship between size and productivity disappears. Krishna Bharadwaj (1964) finds, using the same data base that there is virtually no evidence of this negative relationship when individual crops are considered; this, however, does not necessarily contradict the above hypothesis as the prevailing cropping pattern usually takes account of fertility differences in soil. The major criticism of this explanation is its neglect of possibilities of non-farm employment of members of large families [K. Bharadwaj (1964)].

A more important explanation, perhaps, is the relatively much higher labour input in smaller holdings. The smaller a farm, the greater is usually its reliance on family labour and the larger a farm, the higher is usually the proportion of hired labour in its total labour input. As Sen argued, on the basis of following figure 2.1 giving a marginal product curve MP applied to a given area of land and a wage rate OW for hired workers; a large farm would employ OC of labour and receive a profit of MWB. But a farm based on family labour would employ the family members up to the point where the marginal product of labour is zero; that is, he would employ OP of
labour. If OW is imputed as the wage for family labour, the total labour cost for the family becomes OWAP, while the total output becomes OMP, and the profit OMP - OWAP = MWB - BAP. In other words, the family farm will produce BCP more, and earn BAP less profit, than the farm based on wage labour. There is nothing illogical about this decision by the family farmer to increase the output (which is largely for subsistence) and employment of family members (assuming no alternative opportunity for employment outside) at the cost of profit [A.K.Sen; 1962].

Not only do smaller farms apply more labour per unit of land, they also cultivate it more intensively in terms of other inputs. In short, the alternative explanations given for higher productivity on small farms were mainly related to the following aspects:

i. Intensive use of family labour on small farms,
ii. Qualitative differences in land and labour inputs; and
iii. Cropping pattern, Crop intensity and Technological differences.
It is also to be noted that, macro-study of 1961 census data shows the positive relationship between the proportion of small holdings on the one hand, and proportion of irrigated land and double-cropping on the other [B. Dasgupta; 1971]. Given the highly aggregative nature of the data used, from this finding alone one cannot infer that at the farm level, smaller farmers resort to more intensive cultivation; but statistical analysis of farm management survey data, as also data at still lower levels of aggregation, points to the same conclusion [K. Bharadwaj; 1974].

A related issue is the question of management: whereas the smaller farms are managed with the support of family members for the common good of the family (frequently under the stern but benevolent direction of the family head), the larger farms, which rely more on hired labour, find the management of farms a much harder occupation [C.H. Hanumantha Rao; 1966] In pre-HYV agriculture, the smaller farms usually apply more of almost every inputs - including fertilizers and bullock power, although the latter is more an indication of non-optimum use of an indivisible resource per unit of land and even more of land itself in terms of the proportion left fallow or used for erecting building and other purposes.

By the mid-sixties, land reform and the role of small farmers in Indian agriculture became explosive political issues; thus, when
the new technology associated with the high-yielding seed varieties was introduced, its implications for farms of different size categories became a major issue of debate. The proponents of the new technology contended that it was 'scale neutral'; new inputs like fertilizers, insecticides/pesticides and seeds were divisible and could be used in the same proportion by both the large and the small farmers alike [B. Sen; 1974].

However, opponents of the new technology pointed to the indivisibility of machinery, which could be more optimally exploited by the larger farms, to which the proponents, while admitting the role of the tractors and tubewells under the new technology, replied that their using time was divisible, and that it was possible for even a small farmer to hire tractor time in accordance with his farm size. On the other hand, the opponents argued about imperfections in the factor market and the small farmer's limited access to it [Keith Griffin; 1972]. Since most of the new inputs had to be purchased from the market with cash or through the co-operatives or banks and because of the unequal access to credit and co-operative resources by the farmers of different size-groups, the opponents argued that the new technology had widened the disparity between the small and large farmers in the country [C.H. Hanumantha Rao; 1975].

1. While admitting the scale-neutrality of the technology, C.H. Hanumantha Rao pointed out that it was not resource neutral, and so offered greater opportunity to bigger farmers, with more initial capital and larger access to the credit market.
In short, the green revolution in Indian agriculture has been characterised basically by a capital intensive technology in which hybrid seeds, use of chemical fertilizers, irrigation etc., play a significant role. Even though the new agricultural technology is "size-neutral" the access to capital and use of inputs for small and large farms, has not been the same and accordingly the distribution of gains between them has been uneven. In other words, after the green revolution in Indian agriculture (by introducing new agricultural technology), the inverse relationship has yielded place to positive relationship which means as farm size increases, the output (income) increases more than proportionately [Saini; 1979]. Thus, the income gap between small and large farms has widened [Hanumantha Rao; 1975, Saini; 1979, Singh and Patel; 1973].

By the early seventies, most of the researchers and commentators working in this field agreed that the introduction of the new technology had worsened the distribution of income in the countryside, largely because of differential access of various farm size categories to new inputs and credit. The proponents of the new technology now argued that this was unavoidable; without the participation of the large, "progressive" knowledgeable, resourceful and enterprising farmers, the technology would have had little chance of success [S.S. Johl, 1974]. Unlike the small farmers, who were tradition-bound, risk-averting and devoid of means to undertake expansive investments, the larger farmers were capable
of modernizing agriculture and of operating with a time horizon which
spans several agricultural years, in addition to being highly
effective in bringing large surpluses to the market; while the
distribution of income following the adoption of new technology
favoured the larger farmers, the surplus they generated helped the
growth of output and employment, which benefited the poorer
sections of the village population. Moreover, with time spread of
knowledge and improvements in the facilities for distributing inputs,
more small farmers would adopt new seeds and the associated
inputs and practices; in the long run, the income distribution in the
countryside would not remain as skewed as it was in the early years
of the new technology.

Those, who opposed the above formulation contested the
argument that the selective approach of the new agricultural
strategy favouring the rich farmers was necessary and unavoidable;
a better strategy would have been, they contended, to carry out
far-reaching institutional changes, including radical land reforms and
elimination or at least effective curbing of the influences of the rural
rich. Such a policy would have received popular support and helped
in increasing production. In contrast, the new technology was
causing growing proletarization of the peasantry, alienation of the
large majority in the countryside from the government programmes,
and strengthening of the village power structure; this process of
growing inequality could not be reversed without sweeping
institutional changes.
An important aspect of the debate on the new technology is its implications for a policy of land reform. The empirical findings - as shown earlier - of inverse relationship between the farm size and productivity during the first part of the sixties added forceful weapon to the armoury of the proponents of land reform. A major empirical question now is to what extent such relationship holds under the new technology and if it does not, does it weaken the case for land reform and associated measures for helping the small farmers? A subsidiary question is, how has the new technology affected the small farmers in terms of their rate of adoption and return?

2.3 SUMMARY OF DEBATE

In sum, Sen argued that an inverse size-productivity relationship existed in Indian agriculture. This conclusion was reached on the basis of the data presented in the Farm Management Services conducted in different parts of the country. Many other economists, like D. Mazumdar, A.M. Khusro, G.R. Saini and C.H. Hanumantha Rao, also analysed the data and reached conclusions similar to Sen (1962, 1964).

Ashok Rudra (1968), joined the debate and argued that while inverse relationship may hold in certain areas, it is not a universal phenomenon and can not be said to operate in all parts of the country. His conclusions are best summed up in his own words as, “we may
emphasize that we never expressed the view that the inverse relationship was not to be observed in any circumstances in Indian agriculture. Our view was that such a relationship could not be regarded as a universally valid law operating in Indian agriculture; and that there were indications in the Farm Management Survey data themselves that in certain areas yield per acre, instead of declining with increasing size might actually be increasing. Also, that in certain cases where an inverse relationship could be recognised to hold it might do so among the smallest size class of farmers but not among others. It was our view that in many areas, one could not possibly observe any systematic pattern of dependance between yield per acre and farm's size.  

In a study based on disaggregated data (belonging to the same village), A. P. Rao concluded that productivity remained constant over all the holding sizes, i.e. holding size had no effect on productivity. Krishna Bharadwaj also reached similar conclusion.

Thus, what emerges from the debate on the relationship between farm size and productivity is a totally confusing picture; studying the same data, different economists have reached different conclusions by employing different statistical techniques. However, the two main rivals in the debate, A.K. Sen and Ashok Rudra, later on attempted a synthesis of their views and restated the position, thus:

"The totality of empirical research on the relationship between farm size and productivity has yielded a far from uniform picture. Even those who have emphasised confirmation of the inverse relation on the basis of individual household data have noted failure to see such a pattern in several regions. The general conclusion to emerge is the diversity of Indian agriculture, regarding the existence of the negative relation between size and productivity; the negative relation may hold in certain parts of the country, at certain times but not everywhere and not at all times. It also appears that even when the inverse relation is more frequently confirmed than rejected, it would be a mistake to take it to be an empirical generalisation for Indian Agriculture as a whole."

Thus, both authors have come to agree that (i) the inverse relation is not a "universal" phenomenon in Indian agriculture, and (ii) in the various regions where the inverse relation has been tested it is "more frequently confirmed than rejected".

It is thus clear from the above discussion that, even though most of the studies asserted an inverse relationship between farm size and productivity per hectare, the controversy has remained largely inconclusive. The present study, therefore, is an attempt to estimate the productivity differential between small and large farms.

and then to decompose this difference into (a) neutral technological difference\(^4\) (b) non-neutral technical differences, and (c) input-use contribution (efficiency) in Gujarat state, to answer the questions raised.

### 2.4 NEED

In last, through Farm Management Studies, a few attempts were made to quantify the contribution of the above possible factors to the overall productivity, productivity difference and/or overall resource-use efficiency between small and large farms. In present study, therefore, an attempt has been made to look at the controversy relating to the relationship between size of farm holding and productivity with a different approach, that is, using decomposition analysis of the change in ratio. The decomposition technique adopted here allows one to have a more systematic look at the factors and their contributions to the crop-wise productivity.

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4. \(^4\) Detailed exposition of the concepts of neutral and non-neutral technological change can be found in Hicks (1964), Brown (1968), Nadiri (1970) and Ferguson (1970). But in the present study they are defined as:

- Effect of technological change on per hectare productivity of small farms over large farms is equal to the ratio of the scale parameters of the production function of the small farms to the large farms, it is called “neutral technological difference”, and
- Effect of Technological change on per hectare productivity of small farms over large farms is equal to the ratio of the elasticities of the inputs of small farms to the large farms, when large farms use same level of technology as small farms; this is called “non-neutral technological difference”.

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differentials between the farms of different size group. Most of the Farm Management Studies have been conducted in the states other than Gujarat which are relatively better endowed zones of India. Thus, the importance of this study is further enhanced because of the paucity of studies for Gujarat State.

Further, a study of the differences in crop-wise productivity between farms of different size group have important implications for:

(a) Land reform policies,
(b) Allocation of public resources to help farmers, particularly the small ones to increase production efficiency; and
(c) Development of technology.

2.5 "STYLISTED FACTS" OF INDIAN AGRICULTURE

Some of the "stylised facts" of the Indian Agriculture as observed by other Indian economists are to be examined in relation to Gujarat, which form the bases of the hypothesis of the present research work.

5. It may not be appropriate to call the following hypotheses as "stylised facts" because except for the first one all other hypotheses are not yet empirically well established and generally accepted by economists. But for want of a better term, this terminology is adopted from "Growth Theory" literature for the purposes of the present study.
These are as under:

1. There exists an inverse relationship between the land size of holding and productivity per hectare [Farm Management Survey Reports] i.e. to estimate the crop-wise productivity differential between farms of different size groups.

2. When family labour employed in agriculture is given an imputed value in terms of the ruling wage rate, much of Indian agriculture seems unremunerative [A.K. Sen, 1962].

3. By and large, the profitability (efficiency) of agriculture increases with the size of holding, "profitability being measured by the surplus (or deficit) of output over costs including the imputed value of labour" [A.K. Sen, 1962].

4. Labour days spent per hectare on all crop production are inversely related to the size of holding [Krishna Bharadwaj, 1974].

Moreover, less discussed but meaningful hypothesis can be added:

5. The adoption rate of high yielding varieties is generally higher for big farmers [Hanumantha Rao; 1975].
The above mentioned hypotheses are neither mutually exclusive nor collectively exhaustive categories. Some of the hypotheses are interrelated with one another and the existence (or validity) of one may follow the existence (or the validity) of the other. The main purpose of listing of these hypotheses is to examine later on, how far Gujarat State exhibits these characteristics which were observed in other zones of India [Ashok Rudra; 1968, Rudra & Sen; 1980]. It should be noted further in this context that the first of the above stated statements is the most fundamental and all others are either its consequences or its explanation. In the present study, therefore, it is intended to discuss this "stylised fact" in some what more detailed form in CHAPTER-6, following the discussions about agro-economic profile of Gujarat State, related methodology, data base and concepts.