Agriculture Productivity and Farm Size in India

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Abstract: *The Farm Management Studies conducted by the Ministry of Food and Agriculture in certain selected regions of India in the mid-1950s clearly revealed that output per acre declined with the increase in the size of holding. Several explanations have been offered for this inverse relationship between farm size and output per acre.*

Keywords: Labour-Based Explanation, Fertility-Based Explanation, Tenancy-Based Explanation, Management-Based Explanation

1. Introduction

The Farm Management Studies conducted by the Ministry of Food and Agriculture in certain selected regions of India in the mid-1950s clearly revealed that output per acre declined with the increase in the size of holding. Several explanations have been offered for this inverse relationship between farm size and output per acre.

Output and Inputs Per Acre According to Farm Size:

The simplest way to measure the relationship between farm size and output per acre is to fit an exponential function of the type $Y = \alpha X^{\beta}$ to the individual farm data, where X is either output per acre or total output of the farm.

If Y is output per acre, the regression coefficient β would have a negative sign if output per acre declines with an increase in the size of holding. If Y is taken as total output, β would be positive but less than unity-indicating that output increases less than proportionately to the farm size—which means a decline in output per acre.

less than one, there are diminishing returns to land size. This result is quite in line with the findings of the Farm Management Studies arrived at on the basis of the grouped data that output per acre declines with increase in the size of holding.

The Farm Management Studies also indicate that the decline in output is traceable to a corresponding decline in the inputs per acre.

According to such Studies, the proportion of area irrigated invariably declines with the size of the holding. Thus output is not just related to farm size. The percentage variation in output by farm size is invariably higher if we include the role of irrigation in the agricultural production function.

Four Explanations:

Four different (alternative) explanations of the relation between farm size and productivity have been offered by economists. These are:

1. Labour-Based Explanation:

According to Amartya Sen, small farms are more efficient than large farms due to low opportunity cost of family labour to small farms. For this reason the marginal net product of labour is less than the ruling wage rate. Moreover, the complimentary inputs such as capital and irrigation also vary less than proportionately to size.

Due to the larger capital stock per acre (capital being labour-absorbing in nature), and greater managerial efficiency among the small farms, the marginal net product curve of labour (MP'_L) would lie above the corresponding curve for the large farms (MP,) in Fig. 1. And, even if further employment of labour is stopped at the point L_f instead of L_g where the marginal net product is equal to the wage rate, the labour input and output per acre on small farms would be higher.
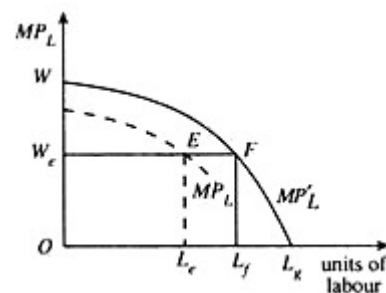

Figure 1: Labour productivity in small and large farms

2. Fertility-Based Explanation:

Sen's second explanation goes in terms of natural or original fertility of the soil (and not in terms of its current productive capacity resulting from improvements). Sen argues that output per acre may show a declining trend if natural fertility of soil declines with increase in the size of holding.

His explanation of the inverse relation between farm size and fertility goes as follows: those who have succeeded in acquiring fertile soils would grow very fast due to larger per capita income and this would lead to greater sub-division of such holdings. This very fact establishes an inverse correlation between size and fertility.

However, there is not much empirical support in favour of this explanation. Due to lack of its factual basis, fertility-based explanation is the weakest of all explanations offered by Sen.

3. Tenancy-Based Explanation:

A. M. Khusro has suggested a partial explanation of economies of scale in Indian agriculture in terms of tenurial disincentives. Tenurial disincentives may result in lower input and output per acre among the tenanted holdings.

This—together with the fact the proportion of area leased—in increases with size—would lead to decline in output per acre with size. This, however, contradicts the results of the Farm Management Studies, in which the proportion of land taken on lease declines as the farm size increases.

No doubt there is hardly any encouragement for permanent improvements on the tenanted holdings and current inputs (particularly cheap family-labour) may be applied in large quantities. This is because, as the marginal net product is positive for such virtually 'costless resources, their application will add to the income of the tenant even when the rent is a fixed proportion of the gross product.

According to the Farm Management Studies, the ratio of wage costs to output is the lowest for tenanted holdings, as they belong to small and medium size groups. The effect of tenancy on the behaviour of productivity with size is, therefore, much significant.

4. Management-Based Explanation:

If the availability of capital is not a bottleneck for large farms—as has been postulated by Sen—then the behaviour of productivity can be explained only in terms of the management factor and income-leisure preferences among the big farmers.

As the farm size increases beyond 20 acres or so—which is often treated as a convenient managerial unit under Indian conditions— to 100 acres or more, the managerial input cannot be increased in the same proportion, because it is economically feasible to appoint paid managers in hierarchal order by replacing labour when output increases.

According to E. A. G. Robinson, since conditions of production in agriculture are extremely diverse and important decisions have to be taken at different time periods, due to lack of continuity of production large farms face managerial (supervisory) diseconomies (since efficient farm managers cannot be retained throughout the year). Moreover, according to T. Schultz, since indivisibilities are relatively few in agriculture, technical gains on a large scale may be negligible, especially under labour-intensive cultivation.

The Farm Management Studies indicate that inputs and outputs per acre decline consistently with size for holdings above 10 acres.

Management bottlenecks could, thus, adversely affect productivity as the size of the farm increases due to the decline in labour and capital inputs per acre.

Another point to note is that small farmers are motivated by income. They cultivate the same land more intensively for earning more income. In contrast, the big farmers indulge in conspicuous consumption and show greater leisure preference, rather than income preference. So they do not cultivate more and more land for enhancing their income further.

Moreover, many big farmers are both traders of agricultural products and money-lenders. They find these two activities-viz., trading and money-lending—more rewarding than more intensive cultivation of land. Thus the attitudes and relative attractions of the farms for alternative activities determine the productivity of land to a large extent.

a)   Theoretical Implications of the Debate:

According to Sen, differences in the size of holding, as such, is not very important. In his view, what makes the crucial difference is whether a farm is family-based or wage-based. However, other explanations of the inverse relation between farm size and productivity suggest that the size of holding, as such, is an important factor affecting productivity.

Labour-based as well as management-based explanations suggest that measures to transfer land from the big to the small and medium farms through sales or through tenancy on a commercial basis are desirable.

The management-based explanation would suggest further that, if we rule out a substantial reduction of large holdings through such measures, then it would be necessary to encourage widespread adoption of mechanised processes. It is because this measure would help to intensify the use of inputs among large farms by overcoming managerial difficulties.

Policy Implication:

In the opinion of Hanumanthia Rao:

"Agriculture being a biological operation and on-the-farm inputs being divisible, there is no evidence of significant economies of scale. Moreover, small farmers are better placed on account of adequate availability of family labour and closer supervision of farm operations. The experience of green revolution has demonstrated that given the access to technology, inputs and credit, small farms can fully participate in growth by adopting new technology. This experience underlies the need for public investment in agricultural research to evolve land-saving technologies and activities, adequate provision of extension services and institutional credit for small farms to meet the growing requirements of an input— intensive agriculture."

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