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# AN ANALYSIS OF FARM SIZE AND PRODUCTIVITY IN INDIAN AGRICULTURE

**Dr. R.H.PAVITHRA**
Assistant Professor
Department of Economics
Karnataka State Open University
Mukthagangotri, Mysore-570006

## ABSTRACT

This paper seeks to assess the significance of the celebrated inverse relationship between farm size and land-productivity in the context of Indian agriculture. It is argued that the inverse relationship does not reflect a superiority of peasant production over wage-labour-based production as is often supposed. It exists independently of production relations and thus reflects only a static superiority of small-scale over large-scale production. An essential precondition for this superiority, however, is a backwardness of technology. With technological progress involving the introduction of chemical fertilizers, labour-saving machinery and modern irrigation equipment, the inverse relationship is, therefore, likely to disappear.

**Key Words**: Farm size, Land Productivity, Technology, Irrigation equipment.

## INTRODUCTION

The share of agriculture and allied sectors in GDP stands at less than 20%, while more than 50% of the workforce is still engaged in agriculture. Because of this imbalance in structural changes in output and occupations, the disparity between per worker income in agriculture and non-agriculture has sharply increased. Accompanied by a slowdown in the growth rate of agriculture, this has put serious strain on smallholders income and livelihood. Against this background, we revisit the debate on farm size and agriculture productivity to suggest policy measures to address the twin problems of raising productivity and growth of agriculture as well as improving the income and livelihood of smallholders, who constitute more than 80% of farming households, 50% of rural households and 36% of total households in India.

## OBJECTIVES

1. To examine the Structure of Agriculture Holdings at global and India level
2. To explain the factors influencing the farm size and productivity
3. To highlight the changing pattern of farm size land holdings.
4. To explain the problems related to fragmentation of land holdings

## METHODOLOGY

The study is based on the secondary data collected from Books, journals, articles, news papers and internet, Ministry of agriculture website have been refered for the analysis purpose.

## REVIEW OF LITERATURE

The relationship between farm size and productivity has been intensely debated in India. A large number of studies during the 1960s and 1970s provided convincing evidence that crop productivity per unit of land declined with an increase in farm size (Sen 1962, 1964; Mazumdar 1965; Khusro 1968; Hanumantha Rao 1966; Saini 1971; Bardhan 1973; Berry 1972) which provided strong support for land reforms, land ceiling and various other policies to support smallholders on ground of efficiency and growth. Subsequently, various analysts started exploring reasons or factors for higher productivity of smallholders

(Berry and Cline 1979; Bhalla 1979; Binswanger and Rosenzweig 1986; Dong and Dow 1993; Frisvold 1994; Raghbendra et al 2000) and some of them even questioned the inverse relationship between farm size and productivity.

Bhalla and Roy (1988) observed that the inverse relation between farm size and productivity weakened and disappeared when soil quality variable was included in their study.

Chadha (1978) analysing farm level data for three agro-climatic regions in Punjab for 1969-70, reported that the inverse relationship had ceased to hold in more dynamic zones.

Ghose (1979) argued that an essential precondition for the existence of the inverse relationship phenomenon is technical backwardness implying that with the advances in technology the inverse relationship will vanish.

Similar to this, Deolalikar (1981) observed that the inverse sizeproductivity relationship cannot be rejected at low levels of agricultural technology in India, but can be rejected at higher levels.

Rudra (1968) concluded that "there is no scope for propounding a general law regarding farm size and productivity relationship".

Chattopadhyay and Sengupta (1997) in the context of West Bengal, reported that the inverse relation between farm size and productivity was stronger in agriculturally developed regions.

On the other hand, Hanumantha Rao (1975) and Subbarao (1982) reported a positive relationship between farm size and productivity and attributed this to higher application of fertiliser and other cash-intensive inputs on large farms.

Dyer (1997) argued that the inverse relationship is neither a product of superior efficiency on the part of small farms nor is it due to better quality land on the small farms but arises from the desperate struggle for poor peasants for survival on below subsistence plots of land. Hence, Dyer (1997) opined that redistribution of land on the basis of the inverse relation argument, far from alleviating poverty and creating employment opportunities, will only deepen and perpetuate extreme levels.

**Structure of Agriculture Holdings: Global Picture**

Globally, there are about 525 million farms out of which smallholdings of less than two hectares (ha) constitute 85% (Oksana 2005). Out of this 87% of smallholding farms are located in Asia, followed by Africa (8%). The rest 5% smallholdings are located in Europe and America (ibid). In Asia, China stands first in concentration of smallholdings followed by India, Indonesia, Bangladesh and Vietnam. The number of small farms in China in 1997 was 189.4 million accounting for 47% of smallholders in the world. It has been hypothesised in some studies by Hazell (2011) that many of the advantages of smallholders disappear as countries develop and it becomes more efficient to have progressively larger and more mechanised farms. This type of change has been experienced in western economies where economic transformation has been associated with an increase in the size of holdings with a near obliteration of smaller farms. The movement towards larger size holdings has continued even in the recent past in western economies. However, as can be seen from Table 1, the experience of Asia has been totally different from the western economies. During the three decades after 1970, farm size in the United States (US) and Canada increased from 157 and 187 ha, respectively to 178 ha and 273 ha. Denmark, France and Netherland have seen a doubling of farm size since the early 1970s. Latin American countries like Peru and Brazil also show a similar type of change in the structure of holdings as witnessed in western economies. In contrast to this, the concentration of smallholders has remained very high in Asia, with an average farm size in Japan, which is a developed country, Korea and China remaining below 1.2 ha.Farm size in India in the same period has declined from 1.84 ha to 1.32 ha.

**Structural Changes in Landholdings in India**

Between 1970-71 and 2005-06, the total number of operational holdings in India increased from 71.01 million to 128.89 million and operational holdings area declined from 162.18 million ha to 156.62 million ha. This resulted in the reduction of average farm size from 2.28 ha to 1.21 ha. In the same period, the share of small and marginal holdings in operated area doubled. Smallholders now cultivate 42% of operated land and constitute 83% of total landholdings (Table 3). The growth in rural population is the main factor underlying an increase in number of holdings in India. It is interesting to point out that since 1970-71, both the number of landholdings and rural population increased exactly at the same rate (1.76%). This broadly reflects the outcome of inheritance pattern prevalent in India.

**Farm land Holdings, Productivity and the factors influencing them independently**

Agricultural holding indicates the average size of agricultural land held by the farmers in India. An economic family land holding can be defined as one which could provide a reasonable standard of living to the cultivator and give full employment for a family of a normal size. There are five categories of farmers in India according to their holdings. A) Marginal farmers (≤1 hectare), b)Small farmer (1 to 2 hecteres), c)Semi medium farmers (2 to 4 hectors),d) Medium farmers (4

to 10 hectores), e) Large farmers (>10 hectors). The size of holding would ideally depend on method of cultivation and nature of the crop.

Productivity here refers to the productivity of crop output so productivity in agriculture is measured as the output of the crop per unit area. Its unit is yield/hectares. At a national level the demand for agricultural product will keep rising due to increasing population of India and high GDP growth rate so the supply of agricultural products has to match up the increasing demand to keep the prices reasonable. Hence agricultural farm land productivity becomes an important parameter for the economy. India being a huge country, these factors vary a lot from region to region but artificial means can be used to enhance the factors of fertility and irrigation. The following list gives us the factors of productivity

Fertility of land - Natural fertility cannot be changed but input of fertilizers, farm yard manure and nutrients can improve the fertility but all these will increase the cost.

Irrigation facility - Any irrigation project requires heavy investment and it depends on the level of underground water and nearest source of fresh water supply.

Labour supply and quality of labour - Labour supply will depend on the presence of any other scope of employment and quality will depend on traditional work culture and climatic conditions and both the factors vary a lot in India.

Climatic condition - Floods and drought due to unpredictable nature of monsoon affect the productivity.

Since last three decades' economists have been debating over issue of relationship between the size of farms and agricultural productivity in India. The debate was initiated by Prof. Amartya Sen in 1962. According to him with increase in size of farm holding, productivity declines and thus the productivity is more on small farms as compared to large farms. India has a labour surplus economy. The opportunity cost of labour is low. Small farms use much of family labour to the extent that marginal productivity of labour approaches zero. In case of small farms, output per acre is maximized while in the case of large farms using hired labour, output per unit of labour is maximized. The intensity of cultivation in case of small farm is greater than that of the large farm. Moreover, heavy input of labour on small farm is not on one crop only but in two or more crops produced in the same piece of land during a given production year. It is more so in case of irrigated land. Self-employment in the family farm equalizes the opportunity cost which is not different from market wage. Statistical validity of the inverse relationship between farm size and productivity is a confirmed phenomenon in Indian agriculture prior to Green Revolution. Green revolution is a capital intensive programme which was implemented in 1960s for growth of agricultural production. This capital was invested in the form of important factors of production like irrigation, fertilizer, Mechanization, Manure, pesticides, nutrients. The objective of the following analysis would be to determine all the factors like irrigation, fertilizers, Farm Yard

Manure and nutrients vary with the size of farm for the present set of data.

**Labour as a factor**

labour input is an important criteria for better productivity in farm land and becomes more important if the process in more manual .In Indian agriculture the Farm land labour can be divided into two type, family member workers and the other is hired workers. Generally in case of smaller size of holding the family members are mostly involved in the cultivation process and in larger farms it is a mix of both. In case of a marginal and small holding where in most of the cases only the family members are involved in farm cultivation the marginal productivity is not a factor. If required all the family members can be involved in the agriculture productivity process because the situation is more desperate and as result the intensity of cultivation is also more. The owner of smaller farm land does not have to employee hired peasants but in case of larger farms the situation changes. In case of larger farm land the owner has to take the marginal productivity of hired labour into consideration. As the intensity of cultivation for the small farm is more, the application of fertilizers, farm yard manure and nutrients might be affected as per the aggregated data analysis done before. As the small farm owner is more desperate even he can use manual means of irrigation to irrigate his land and its not possible in large farms due to its large size. It can be argued that the large farm owner would have more access to mechanized methods and capital for investment so his productivity can be higher at least after green revolution. Here the problem looks more like management of farm input resources rather than their availability. The better management of resources for small farm owner with more intensive cultivation has a bigger impact on productivity than the impact of advantage the large farm owner has in terms of more mechanization and capital availability. But the characteristics of land size holdings that is reduction in the average size of holding with time.

Even the relationship between irrigation and fertilizers is also very direct. If one wants for apply more fertilizers then the irrigation facilities have to be very good so as per the irrigation data and fertilizers data both seem to follow the same pattern even if we consider labour not be a major factor here.

**Changing pattern of Size of Farm land holding with time**

One more important factors to this analysis that is the average size of holdings have been decreasing with time. The number of marginal holdings and small holdings have increased and the also area under marginal holdings and small holdings have increased. At the same time the number of Medium and Large holdings have decreased and also has the area under them decreased. There are two major reason for such a trend, they are as follows

Increasing population - With the rapid increase in population the same area of cultivable land is getting divided among more people. As a result of this the size of the holdings is reducing and area under marginal and small farms increase. To control the growth of rural population is even tougher in rural India due to lack of awareness of people due to limited education.

Law of inheritance - Under Hindu as well as Muslim Law of inheritance the landed property of a person has to be equally divided among all his sons and daughters which has led to more and more division of land and hence increase in marginal and small farms. Even if the land size is large now, it will get sub-divided when it goes to the next generation.

Decline in the joint family system - Earlier lot of families used to be joint families but this has declined over time and people generally prefer to stay with only single families. As a result the farm land is also divided more.

Slow growth in handicraft industry - In the villages the handicraft industry used to a source of employment for the village labour. But it has not grown sustainably with increase in rural labour so the rural population have had to depend more on agriculture as a source of employment.

**Problems related to subdivision of land holdings**

If the fragmentation and subdivision of land continues at this rate, then average size of the holdings will become even smaller and there will be more marginal holdings. Application of new technology becomes more difficult. A lot of cultivable land will be lost in making boundaries. One may argue that as in case of India the productivity of farm land will be more due to more intensive cultivation. But the per capita income of the owning family of the farm reduces with reduced farm land. Moreover, if the whole family is involved to increase the intensity of cultivation the labour might be under employed for the same return. If the labour is flexible then he can move to a bigger farm as peasant if there is a demand. As seen from the statics the number of large holdings is reducing in the country and hence is the employment opportunity for hired peasants. Another factor which limits the labour flexibility is when labour tries to move from one region to another language is a big barrier. Although Hindi is India's national language and English is the official one still lot of rural population speaks only the local languages and to be more specific only the local dialect. Skill becomes a barrier when the labour wants to move to industry in urban sector.

The inverse relationship between the productivity and size of farm does hold good at least in some areas of the country if not throughout the country. At the same time if the farm land gets more divided and sub-divided the holding no longer remains economic for a single family. The ideal holding size has to be somewhere between the smaller and large holdings of around 4-5 hectares. The farm size is large and they are well managed and supervised by using modern methodology like it is done in USA and Australia they achieve high productivity. But the same thing is not easy to achieve in India as discussed beforehand. The government has introduce land ceiling in some developed states. This means that family owning excessively large farm land have to give up their excessive land to public authorities and it will be distributed among families having uneconomic holdings. This process is not at all easy because if the land is fertile than none of the owning families would like to give up their land and also have to think about their future generations. Moreover, any kind of ceiling will go against the market forces of demand and supply and affect the prices of land. When we talk about division and fragmentation then in many cases the farm

land of a single owner is scattered throughout the village. In that case all the land in the village can be converted into a compact block and then the same land can be proportionately distributed among all the families which is called consolidation of Farm land. In states like Punjab, Haryana and Madhya Pradesh this process has been taken up seriously but in some other states like Assam and West Bengal the process has not even started. There are few reasons for which consolidation process is not easy. People in India are more attached to their piece of land, if someone has a better piece of land he would not like to sacrifice them. Both land ceiling and consolidation of farm land are policies to reach that optimal size of holding but they have not been easily to implement for the factors as mentioned before.

## Conclusion

It is clear that with the present level of productivity, three-fourths of smallholders cannot meet their livelihood from farm income alone. There are mainly two ways to improve their income. One, an increase in the land-man ratio, which is possible only if a sizeable segment of smallholders is moved out of agriculture. Two, provide alternative sources of employment to smallholders in or around their habitation to supplement their farm income. The experience of past six decades in India show that the strategy of raising the land-man ratio by shifting a sizeable number of farmer cultivators away from agriculture has not worked. Despite the acceleration in Indias economic growth after the early 1990s could not check the growth in population of smallholders. India needs to take serious steps to create employment avenues for smallholders outside agriculture but within the countryside itself so the workforce in smallholder households partly works on the farm and partly outside farm.

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