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Survey Based Research Paper

A Comparative Economic Analysis of Organic and Inorganic Manure Consumption in Agricultural Production with Special Reference to Pondicherry Union Territory

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ABSTRACT

Green revolution has resulted in over application of inorganic inputs such as fertilizer and plant protection chemicals. The post green revolution period has threatened the sustainability of Indian agriculture and raised a serious concern about receding groundwater level, loss of soil fertility, low diversity of production system and increasing cost of production. In view of these concerns, the modern-day agriculture gave birth to organic farming. The present study makes a comparative economic analysis of organic farming and inorganic farming under different sizes of land holdings in Pondicherry Union Territory. Since the organic manure consumption in agriculture results in increase in agriculture production, all the farms in the study region may use organic manure which may lead to reduction in the cost of production, and the same may be disseminated to the farmers through NGOs and other extension activities.

INTRODUCTION AND BACKGROUND

Green revolution introduced in Indian agriculture in the mid sixties paved the way for the important technological changes and led to an unprecedented rise in crop yields and land productivity in several parts of the country. At the same time, it resulted in over application of inorganic inputs such as fertilizer and plant protection chemicals. As a whole, the post green revolution period is threatening the sustainability of Indian agriculture and raising a serious concern about receding groundwater level in many agriculturally important areas, deterioration of soil fertility, decline in factor productivity, low diversity of production system and increasing cost of production (Amit Vikram et a1. 2008). More specifically, these problems altogether are leaving agriculture as an economically unviable enterprise for farmers. It is pertinent to point out that indiscriminate use of chemical pesticides to control various insect pests and crop diseases over the years has destroyed many naturally occurring effective biological control agents with an increase in resistance of insect pests towards the chemical pesticides (Chandra et al. 2003).

The occurrence of multinutrient deficiencies and overall decline in the productive capacity of the soil have been widely reported due to non-judicious use of fertilizers.

In view of these concerns and problems, the modern-day agriculture gave birth to organic farming. It is a farming system which avoids using synthetic chemical fertilizers, pesticides and solely depends on the use of on-farm and off-farm crop residues, organic wastes, animal manures, green manures and crop rotation. It mainly incorporates legumes and is highly helpful for biological pest control to maintain soil productivity (Bisoyi 2003). It is a means of giving back to nature as what has been taken from it.

It is noticed that at global level 24 million hectares are under organic farming presently, a major part of this area is located in Australia containing 10 million hectares under organic farming, followed by Argentina 3 million hectares, and 1.2 million hectares are under organic farming in Italy. In the case of Asia, the countries China, India and Japan are the largest organic producers. As far as Indian experience in organic farming is concerned, there are 37050 hectares under organic farming and the land area under organic farming is currently increasing (Rajesh Kumar & Kamta Prasad 2008). It may be seen that India produces a wide variety of organic crops such as grains, tea, coffee, soy, spices, cereals, fruits and vegetables. Similarly, it is seen that Tamil Nadu is one of the agriculturally prosperous States and it has encouraging agro-climatic conditions. The practice of organic farming is also coming up in the State as an alternate to new agricultural technology.

Further, it is seen that various organic inputs are used viz., farmyard manure, vermicompost, green leaves, green manures, neem cake, cowdung, poultry manure, wood ashes, groundnut husk, paddy husk, sugarcane trash, molasses, cluster bean, oil cake, and other natural manures (Sharma et al. 2008). In view of this, it could be noticed that a large number of studies are emerging in the area of organic farming taking value addition to organic produce (Borkas 2008),

strategies for organic farming (Mangala Rai 2007), scope of organic farming in India (Bhattacharyya & Krishna Bihari 2003), technical efficiency of organic farming (Madav 2003), and feasibility of organic farming in Indian context (Ramesh et al. 2007). In this context, the present study deviates from previous studies in the domain of organic farming by making a comparative economic analysis of organic farming and inorganic farming under different sizes of land holdings in Pondicherry Union Territory.

OBJECTIVES OF THE STUDY

The present study has the following objectives.

1. To analyse and compare the resource use efficiency between small and large farms by taking organic and inorganic manures.
2. To suggest suitable policies to improve resource use efficiency in organic farming practices in the study region.

METHODOLOGY

This study is based on both primary and secondary data. As far as the sampling design of the study is concerned, it employs multi-stage stratified random sampling method by taking Pondicherry region as the universe, with the commune as the stratum, the village as primary unit of sampling and the organic paddy farms as the ultimate unit.

Details regarding the area under paddy in each of the five communes in Pondicherry region were obtained from the records of Directorate of Economics and Statistics, Government of Pondicherry. Among the five communes, Mannadipet commune scores the largest area using organic manures in paddy cultivation. It consists of 24 revenue villages and totally 40 village. Among these villages Sorapet, Vambupet and Kodathur were purposely selected which form the primary data. The list of villages and number of farmers selected in each village are presented in Table 1.

Secondary data on land holding pattern, land utilization pattern, population, occupation, climate and rainfall, land, soil, water resources and cropping pattern were obtained from various government publications and other records. Farm level data were collected with the help of a well-structured interview schedule personal interview method. As far as primary data are concerned, the information regarding socio economic conditions of the farmers, cost and returns of paddy cultivation were obtained.

Though the farmers did not maintain any record of their farm business activities, they could give the required data and information regarding farming conditions by recalling from their memories to a satisfactory level. Further, adequate efforts were taken up to ensure the validity of the information provided by the respondents through cross checks.

As for the size of the sample, 100 farmers were interviewed by taking two categories using organic manure and chemical fertilizer used farms. In each category, the sample farmers were divided into two groups namely small and large, based on the area under paddy crop. Those with less than five acres were considered as small farms and those with more than five acres of land were considered to be large farms. Regarding organic manure consumption, this study has taken all the organic manures used in the study region. They include farmyard manure, vermicompost, green leaves, neem cake, neem oil, sugarcane trash, paddy husk, molasses and paddy husk.

FRAMEWORK OF ANALYSIS

The resource use efficiency in the production of paddy crop was studied by fitting the Cobb-Douglas type of production function. This production function can be transformed into log-linear form and it is easy to fit by the method of the least squares. Also, the regression co-efficients obtained would give directly the elasticities of the respective input variables.

In the present study, the production of paddy per farm, was considered as the dependent variable and the inputs like land, seeds, organic manures, chemical fertilizers, human labour and bullock labour were considered as the independent variables.

The production function was formally expressed as:

$$Y = \beta_0 X_1^{\beta 1} X_2^{\beta 2} X_3^{\beta 3} X_4^{\beta 4} X_5^{\beta 5} X_6^{\beta 6}$$

This functional relationship was transformed into the log linear forms as,

$$\text{Ln}Y = \ln \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + U$$

Y = Physical output of paddy per farm, measured in kgs

X_1 = Area measured in hectares of paddy grown

X_2 = Seed, kgs/ ha

X_3 = Fertilizer input per farm, measured in kgs of total N + P + K

X_4 = Organic input per farm, measured in kgs of total N + P

X_5 = Human labour input per farm, measured in man days of eight hour and included family, attached and hired labour.

X_6 = Bullock labour input per farm, measured in pair days of eight hours.

β_0 = Constant term

β'_s = Regression coefficient of the respective inputs

U = Error term

Table 1: Name of the villages and number of selected farms.

S.No	Name of the village	Total number of farms	Sample farm	Total population
1.	Sorapet	128	45	3579
2.	Vambupet	107	37	790
3.	Kodathur	51	18	2649

Table 2: Resource use efficiency in biofertilizer paddy cultivation.

Variables	Selected farm size	
	Small farms	Large farm
Constant	1.3589	2.6587
Land (X_1)	0.0158 (0.1327)	0.2871 (0.1437)
Seed (X_2)	0.1859* (0.0868)	0.2865 (0.5816)
fertilizers (X_3)	0.3537** (0.1954)	0.3654** (0.1258)
Organic manures (X_4)	0.2853** (0.1064)	0.2354* (0.1065)
Human labour (X_5)	0.2641* (0.1148)	0.1614* (0.0768)
Bullock labour (X_6)	-0.0938 (0.0641)	-0.0968 (0.1408)
R^2	0.98	0.92
F-value	348.68	113.64
Σ bi	0.94	0.91

Source: Computed
Figures in the parentheses are the standard errors of the regression coefficients.
* Significant at five per cent level of probability; ** Significant at one per cent level of probability

RESULTS AND DISCUSSION

Resource Use Efficiency: Table 2 exhibits the results of the estimated production function, and the co-efficient of multiple determination R^2 were 0.98, 0.92 in small and large farms, respectively. It implied that the percent of the variations in the yield of paddy were 98.00 and 92.00 in small and large farms, respectively in this production function model. The value of R^2 was low in large farms (92.00 per cent) and high in small farms (98.00 per cent).

In small farms, among the six independent variables included in this production function analysis, the coefficient of three variables like seed (X_2), fertilizers (X_3) and organic manures (X_4) were found to influence the production of paddy positively and significantly. The co-efficient of the variable seed (X_2) indicated that a one per cent increase in the quantity of seed, keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.18 per cent. The co-efficient of the variable fertilizers (X_3) indicated that one per cent increase in the use of manures and fertilizers, keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.35 per cent. The co-efficient of variable organic manures (X_4) indicated that one per cent increase in the use of organic manures, keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.28 per cent.

In large farms, the fertilizers (X_3) found to influence the production of paddy positively and significantly. The significance of this variable indicated that one per cent increase in the use of fertilizers (X_3) keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.36 per cent.

CONCLUSIONS

In small farms, among the six independent variables included in this production function analysis, the coefficient of three variables like seed (X_2), fertilizers (X_3) and organic manures (X_4) were found to influence the production of paddy positively and significantly. The co-efficient of the variable seed (X_2) indicated that one per cent increase in the quantity of seed, keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.18 per cent. The co-efficient of the variable fertilizers (X_3) indicated that one per cent increase in the use of fertilizers, keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.35 per cent.

In large farms, the fertilizers (X_3) found to influence the production of paddy positively and significantly. The significance of this variable indicated that one per cent increase in the use of manures and fertilizers (X_3) keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.36 per cent.

The co-efficient of variable organic manures (X_4) indicated that one per cent increase in the use of organic manures, keeping all other variables constant at their mean levels, would increase the gross returns of paddy by 0.28 per cent.

From the estimated production functions, it could be seen that the sum elasticities of production (Σ bi) were 0.94 and 0.92 in small and large farms, respectively. These indicated that decreasing returns to scale prevailed in the production of paddy.

POLICY IMPLICATIONS

i. Since the organic manure consumption in agriculture results in increase in agriculture production, all the farms in the study region may use organic manure which may lead to reduction in the cost of production.
ii. An important suggestion regarding the organic agriculture in the context of Pondicherry region is that many of the farmers are not fully aware of the prospects of organic farming practices. In this context, the organic farming practices may be disseminated to the farmers through NGOs and other extension services.

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