ORIGINAL RESEARCH PAPER

Economics

FACTOR DETERMINING THE LEVEL OF OUTPUT IN ORGANIC AND INORGANIC FARMING IN NAGAPATTINAM DISTRICT

KEY WORDS: Organic farming, Conventional farming, per acre value of Output

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ABSTRACT

This paper makes an attempt to analyse the factors determining per acre value of output under organic and conventional farming in Nagapattinam district. Further, it has taken into account the organic and inorganic farming under different sizes of land holdings viz., Marginal, Small, Medium and Large farms. Regarding selection of farm households, about 200 farm households have been selected and interviewed for the present study. Among them, 100 farm households are organic farming and the remaining 100 are inorganic farmers. It could be brought out from the conclusion of the study that, it may be brought out the major factors determining the per acre value of output under organic farming are animal labour, electricity, farmyard manure, panchakavya, amirtha karaisal, neem cake, neem oil green manure, and vermi compost. It showed that even one percent increase in use of these inputs lead to increase in per acre value of output under organic farming. Regarding inorganic farming, it could be revealed that human labour, animal labour, electricity, seed, farmyard manure, potassium and neem cake are the major factors determining the increase in per acre value of output in the study region.

INTRODUCTION AND BACKGROUND

Green Revolution introduced in Indian agriculture in the mid sixties paved way for 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 ground water 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 al. 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 as a result of over use of the chemical pesticides (Chandra, et al., 2003). The occurrence of multi-nutrient deficiencies and overall decline in the productive capacity of the soil have been widely reported due to non-judicious use of fertilizer. A very sharp observation which is to be made here is that by adopting the New Agricultural Technology, the Indian farmers are not only experiencing loss in agricultural production and productivity but also they have lost the traditional natural eco-friendly knowledge of cultivation practice. 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 fertilizer, pesticides and solely depends on the use of on-farm and off-farm crop residues, organic wastes, animal manures, green manures and crop rotations. It mainly incorporates legumes and is highly helpful for biological pest control to maintain soil productivity (Bisoyi, R.N., 2003). It is a means of giving back to nature as what has been taken from it. By and large, the term organic refers to the farm as living organisms.

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 like 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 and Kamta Prasad, 2008). It may be seen that India produces a wide variety of organic crops such as grains, tea, coffee, soy, honey, 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 in the practice of organic farming viz., farmyard manure, vermin compost, green leaves, green manures, neem cake, cow dung, poultry manure, wood ashes, groundnut husk, paddy husk, sugarcane trash, molasis, cluster bean, oil cake, press and other natural manures (Ganesh 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, P.A., 2008) future prospects of organic farming (Tatatclhar, et al., 2008), strategies for organic farming (Mangala Rai, 2007), scope of organic farming in India (Bhuttacharyyaand Krishna Bihari, 2003), technical efficiency of organic farming (Madav, A., 2007); feasibility of organic farrniag in Indian context (Ramesh, P., et al., 2007), the relevance of organic farming and cost and return structure of organic farming in Indian context (Siva Murugan, C., and Anbumani, V. 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 Sirkazhi block of Nagapattinam District of Tamil Nadu.

II. Objectives

1. To identify the factors determining per acre value of output among the different sizes of land holdings under organic farming and inorganic farming.
2. To suggest suitable policies for the development of organic farming in Nagapattinam District.

Methodology

This study is based on both primary and secondary data. The primary data relating to the pattern organic and inorganic input use in agricultural production, organic resource availability and constraints experienced by the farm households have been collected by using a well-structured interview schedule from the study region. In addition to primary data, the secondary data have also been collected from the records available in the District Statistical Office of the Nagapattinam district. It has covered the agro-economic profile of the study area.

As far as the survey design of the study is concerned, it is based on four stage sampling incorporated at four different

stages, so as to acquire accurate information by the field of enquiry in Tamil Nadu viz., selection of a district in Tamil Nadu Sate, selection of blocks in the selected district, selection of a few villages from the blocks selected and selection of organic and inorganic farm households from the selected villages by using random sampling method. In selection of the district, the number of organic farmers will be considered as a prominent indicator. The same indicator has been used to select the blocks from the district. The crucial stage in the sampling process is the selection of farm households in the villages selected from the selected blocks. About 200 farm households have been selected and interviewed for the present study. Among them, 100 farm households are organic and the remaining 100 are inorganic farm households. An important observation, which is to be made here, is that the selection of organic farm households in Sirkazhi block is supported by the institutions Which are supporting and disseminating the Organic farming practice and they are experimental group in the study. More importantly, by recalling method what has been observed is that they are practising the organic farming method for more than five years. In addition, they are employing Nammazhvar approach in their organic farming method. In regard to the period of the study, it will cover one agricultural year starting from 1st July 2010 to 30th June 2011.

V. RESULTS AND DISCUSSIONS

This section brings out the major factors determining the per acre value of output under different sizes of land holdings in organic farming and inorganic farming.

Table-1: Log Linear Multiple Regression Model – Organic

SI.NO	Source	Marginal	Small	Medium	Large	Pooled Farms
1.	Constant	5.98*(5.71)	4.57*(4.02)	6.41*(2.97)	14.46*(8.74)	8.42*(-0.42)
2.	Human Labour	0.49((-3.42)	-0.79(2.62)	0.82*(5.42)	0.64*(4.93)	-0.24(1.82)
3.	Arimal Labour	0.42**(-2.64)	0.**(04.36)	0.34**(3.06)	0.49(4.34)	0.09**(2.46)
4.	Electricity	0.33**(3.22)	0.22**(2.33)	0.44**(3.66)	0.49**(4.21)	0.66**(3.11)
5.	Seed	0.42**(3.09)	0.93**(8.42)	0.67(3.42)	0.26(2.93)	-0.31(3.06)
6.	Farmyard manure	0.42**(2.75)	0.29**(3.72)	0.24*(4.62)	0.49*(3.93)	0.34**(2.92)
7.	Natural Panchagava	1.62*(10.36)	0.11(2.02)	0.19(0.92)	0.24(1.33)	0.28(1.27)
8.	Amirthakarsal	0.42*(7.53)	0.59*(6.06)	0.82**(2.83)	1.24*(5.92)	0.34**(3.06)
9.	Machinery	0.22(3.43)	0.48(3.85)	0.63*(10.42)	-0.22**(8.42)	-0.25**(2.92)
10.	Neem cake	0.24*(6.38)	0.65*(5.22)	0.81**(3.422)	0.19**(3.72)	0.34**(3.44)
11.	Neem Oil	0.15(1.34)	0.24**(2.92)	0.06(0.43)	0.12(1.26)	0.18**(1.00)
12.	Green manure	0.38*(7.93)	0.42*(3.42)	0.24*(7.62)	0.29*(5.55)	0.88**(12.63)
13.	Vermic compostic	0.62*(-5.42)	0.26*(3.46)	0.11*(3.02)	0.24(0.24)	0.66**(0.82)
14.	Adj R square	0.62	0.45	0.84	0.34	0.48
15.	F	14.62**	18.34*	48.63*	1.42*	38.34*

Source : Computed
*** : Significant 1%**
**** : Significant 5%**

Frame Work of Analysis

In order to examine the inputs, which cause variation in per acre value of outiut among the different sizes of land holdings in organic farming and inorganic farming, the log-linear multiple regression has been employed

$$\log Y = a0 + = \sum_{i-1}^{11} \log Xi + e$$

Where for organic farming
Y= per acre value of output.
X1= Human labour
X2= Animal labour
X3= Electricity
X4= Seed
X5= Farmyard and manure
X6= Natural Panchagarya
X7= Amirthakaraisal
X8= Machinery
X9= Neem cake
X10= Neem Oil
X11= Green manure
X12= Vermi Compost

ε' s are normally, identically and independently distributed with mean '0' (zero) and variance

β 1,β2,β3, are the parameters to be estimated.

The above model has been estimated separately for marginal, small, medium and large farms by the method of least squares.

The results of log-linear model on organic farming under different sizes of land holdings are shown in Table 4.21. The value of co-efficient of determination (R2) indicates that all the organic inputs here jointly explain 84 percent of variations in the per acre value of output for the medium farms. It is followed by marginal farms 62 per cent, small farms 45 per cent and it is least in the case of large farms at 34 per cent. The value of R2 for the pooled organic farms indicates 48 percent. It is implied that out of 100 percent variation of per acre value of output, the given 12 independent inputs contribute maximum to the true of 84 per cent in the case of medium farms, 62 per cent for medium farms, 45 per cent for small farms and it is the least in the case of large farms at 34 per cent. Similarly, the pooled organic farms that is different sizes of land holdings marginal farms, small farms, medium farms, and large farms contribute 48 per cent co-efficient of determination.

It implies that out of 100% per acre value of output variation, about 48 per cent is attributed to the given 11 independent organic inputs, the balance 52 per cent is explained by the factors other than the specified one. The 'F' ratios are found to be statistically significant, which are based on R2 in each size of land holding classes as well as pooled organic farms. Thus, all the models are suitable irrespective of the size holding classes as well as the pooled organic farms.

Out of 12 independent organic inputs, animal labour, electricity, farmyard manure, Natural Panchakavya, Amirtha Karaisal, Neem cake, Neem oil, green manure and Vermi compost have been statistically significant at 5 percent level for the pooled organic farms. Further, all these above mentioned organic inputs have been positively related to the per acre value of out-put in the case of pooled organic inputs. It showed that one per cent increase in the variables could increase the per acre value of output by 0.09 per cent for animal labour, 0.66 for electricity, 0.34 for farmyard manure, 0.28 for nature panchakavya, 0.34 percent for amirtha karaisal, 0.34 per cent for neem cake, 0.18 per cent for neem oil, 0.88 per cent for green manure and 0.66 per cent for verrnicompost.

It is observed in the case of the organic inputs that organic farming practices are mostly dependent on organic inputs for cultivation to enrich the fertility of soil, desilting the soil, increase the bio-stock on the land and under the land, the application of animal labour, consumption of electricity for irrigation, farmyard manure, panchakavya, amirthakaraisal, neem cake, neem oil, green manure and vermicompost which are extensively used in cultivation of crops and preserve the nature of the soil. In addition, the organic farmers in the study region have a strong belief that the natural inputs have the capacity to increase the level of output per acre irrespective of the crops cultivated in the study region under different sizes of land holdings.

In the case of human labour, seed, and machinery, they are negatively related to the per acre valve of output and it is found to be statistically significant 't' value. It denotes the fact that an additional one percent increase in human labour has brought reduction in the per acre value of output by 0.24 per cent, for seed it is 0.31 per cent, and machinery 0.25 per cent. It may be pointed out that from the negative co-efficient of human labour, seed, and machinery that the marginal and small farms have excessively used the human labour and medium and large farms have utilized machinery and seed more than the required amount in the practice of cultivation. Since the marginal and small farmers have their own family labour, they do not pay for their own Work in the cultivation, they are in a position to use their labour extensively. In the case of machinery and seed, the medium and large farmers have their own mechanical devices like tractor, power tiller and threshers and they have used it in an exorbitant amount. With regard to seed, the medium and large farmers are storing their own seed and also mostly they are not buying it from the market at the time of sowing. They used it more than the required amount.

However, among the significant variables, animal labour, electricity, farmyard manure, natural Panchakaviya, amirthakaraisal, neem cake, Neem oil, green manure and vermicompost have greater influence on the determination of per acre value of output in the organic pooled farms. 'F' value in the regression model is found to be statistically significant at 5 per cent level.

While making a comparison between input and output among the different sizes of land holdings under organic farming, the input human labour is relatively related to marginal and small farms which shows that one per cent increase in human labour leads to decline in per acre value of output by 0.49 for marginal farms, and 0.79 for small farms. In contrast to the above, human labour is positively related to the per acre value of output for medium farms at 0.82 per cent, and for large farms 0.64 per cent. It implies that the additional one per cent increase in the human labour will lead to increase in the level of output per acre. It is observed in the study region that when the size of the farm is large, the medium farmer and large farmers are unable to use their own labour and hired labour in the operation of irrigation, weeding the land more than once in a season but the marginal and small farmers use their own which recorded first place followed by medium farms at 0.82 per cent, 0.59 per cent for small farms and the least is recorded under marginal farms. It implies the fact that the large farms and medium farms are having still further scope for increasing the level of output pre acre by applying amirthakarisal as compared to marginal and small farmers. With regard to machinery, it may be observed that it is positively related to the level of per acre output for marginal farms, small farms, and medium farms, and it is negatively correlated to the level of output per acre for large farms. It may be brought out that one per cent increase in machinery leads to the level of output per acre for 63 per cent followed by 48 per cent for medium farms and 22 per cent for marginal farms. In contrast, it is seen that even one per cent increase in the use of machinery leads to a decline in the level of output by 0.22 per cent.

In shows that since most of the marginal and small farmers do not own machinery, they use the hired, machinery at optimum level.

In the case of medium farmers, they own machinery, they use it at optimum level and also they are aware of the fact that use of machinery will affect the nature of the soil. In the case of large farmers, it is seen that since they own their own tractors, threshers, power tillers, weeders and transplanters, they are lavishly using the machinery in agricultural operation. As a result, it is negatively related to the per acre value of output.

In regard to neem cake, it is observed that it is positively related to the per acre value of output. It is noticed that even one per cent increase in the application of neem cake leads to 0.81per cent of the level of output per acre followed by small farms at 65 per cent, small farms at 24 per cent and the least is found at 19 per cent for large farms. In this context, it could be inferred from the results that the application of neem cake does not affect or have adverse impact in determining the level of output per acre among the different sizes of land holdings under organic farming.

As regards the neem oil, it is seen that it has positive impact in determining the per acre value of output among the different sizes of farm categories. While referring to variation in determining the value of output per acre among the different sizes of holding classes, it is observed that one per cent increase in application of neem oil as fertilizer and also pesticide, it is higher for small farmers at 24 per cent, followed by marginal farmers at 15 per cent, large farms at 12 per cent and medium farms at 0.06 per cent. It implies the fact that medium farmers are more judicious in the application of neem oil as pesticide and mixing with other natural manures for pest control in the study region as compared to the other farmers categories.

In regard to green manure, it is positively related to the per acre value of output. It is observed from the results that even one per cent increase in the level of output per acre at 42 per cent for small farmers, 38 per cent for marginal farmers, 29 per cent for large farmers, and 24 per cent for medium farmers.

It could be reasoned out that among all the farmers under different categories of farm sizes, medium farmers have used green manure as green manure in a wise manner. Further, in the case of the input vermin compost which is a vital organic bio-input, it may be brought out that it is found to be positively related to the value of per acre output among family labour both male and female labours extensively in the operations of weeding and irrigation.

Therefore, it may be inferred from the results that even one per cent increase in the human labour will lead to decline in output per acre at 0.79 per cent for small farms and 0.49 per cent for marginal farmers. Similarly, the same trend has been observed in the case of animal labour among the different sizes of land holding. It may be observed that animal labour is negatively related to marginal and small farmers which implies that one per cent increase in animal labour lead to 42 per cent decline in output for marginal farms and 19 per cent decline in output per acre for small farms. The reason is that the live stock like cow, bullock, goat are greater than that of medium farms and large farms. As a result, the marginal farmers and small farmers use more animal labour and also able to use more farmyard manure in the field. In contrast to the above, the medium and large farmers are having relatively low level of livestock and it shows that one per cent increase in livestock will lead to increase in the per acre out put by 49 per cent for large farmer and 34 per cent for medium farm. It may be emphasized here that it, they have

more livestock like bullock, and cow which does not only support their cost of cultivation but also that will lead to increase in the level of soil fertility bio stock and ultimately they will become economically sound.

In the case of electricity, it may be observed that irrespective of farm sizes, it is positively related to the per acre valve of output energy. It implies that electricity is a vital input in supplying irrigation water that too during the scarcity of irrigation water, it has significant position impact on the level of per acre output. However, it is seen that even one per cent increase in the utilization of electricity leads to increase in the per acre output at 49 per cent for large farms, 44 per cent for medium farm 33 per cent for marginal farms and 22 per cent for small farms.

With regard to farmyard manure, it may be observed that it is positively related to per acre value of output among the different sizes of land holdings. By and large, there is variation in determining the value of output per acre among the different sizes of land holdings. It shows that even one per cent increase in farmyard manure will lead to 49 per cent of output per acre for large farms followed by marginal farms at 42 per cent, 29 per cent for small farms and 24 per cent for medium farms. Regarding natural panchakavya, it is seen that it is positively related to per acre value of output irrespective of all sizes of farms in the study region. Since it is out and out natural manure, even over application has not any adverse impact on the level of output per acre among the different sizes of landholding classes. In this regard, it may be observed that one per cent increase in application of panchakavya will lead to 1.62 per cent of output per acre for marginal farms, followed by large farms at 0.24 per cent, 0.19 per cent for medium farms and the least is found for small farmers at 0.11 per cent. Similarly, in the case of amirthakarisal, it is seen that it is positively related to the per acre value of output. However, there is variation in determining the level of output per acre among the different sizes of land holdings. It is observed that one per cent increase in amirthakaraisal leads to 1.24 per cent increase in the level of output per acre for large farms the different sizes of land holding classes. By and large, it is important the see from the results that one per cent increase in vermicompost leads to 0.62 per cent increase in per acre output for marginal farmers followed by small farmers at 26 per cent, 24 per cent large farms, and the least is found under medium farms at 0.11 per cent.

An Evaluation of Factors Determining the Value of Output Per Acre And The level of Organic Input Application Under Different Sizes Of land holding classes. It could be interred from the results of pooled organic farms viz., marginal, small, medium and large farms that except human labour, seed and machinery, all other organic inputs like animal labour, electricity, farmyard manure and natural panchakavya, amirthakaraisal, neem cake, neem oil, green manure and vermin compost are found to be statistically significant. However, marginal and small farmers are using human labour exclusively, since they use their own farming labour force. In the case of seed, large farmers use higher amount of seed which shows the fact that they are economically sound and in turn, they have seeds more than required. It also applies in the case of machinery, since they have all mechanical devices which are used in different agricultural operations right from plugging to transportation. In addition, the co-efficient of determination (R-2) is relatively higher for medium farmers as compared to other categories of farmers. To conclude, all the 13 variables selected are more relevant and apt in analyzing the factors determining per acre value of output under different sizes of land holdings in organic farming.

Table-2

SI.NO	Source	Marginal	Small	Medium	Large	Pooled Farms
1.	Constant	7.52*(5.93)	6.42*(6.27)	14.63*(4.62)	10.06*(2.64)	5.46*(4.96)
2.	Human Labour	-0.63*(3.42)	-0.82**(3.69)	0.24(3.22)	0.31(03.06)	0.64**(3.52)
3.	Arimal Labour	-0.63*(3.42)	-0.82**(3.63)	0.12(5.62)	-0.29**(-7.44)	0.37*(3.42)
4.	Electricity	0.24**(3.52)	0.62**(4.63)	0.77**(3.22)	0.82**(3.44)	0.92**(3.21)
5.	Seed	0.68*(2.92)	0.74**(3.42)	033(5375)	-0.57(12.33)	0.47(3.49)
6.	Machinery	0.27**(2.75)	072**(2.09)	-0.22**(-2.82)	-1.28*(-5.52)	-01.14(1.42)
7.	Farmyared manure	0.33*(8.88)	0.44*(3.39)	0.22(9.15)	0.52(15.33)	0.79*(12.66)
8.	Pesiticide	-0.42(7.34)	-0.51(3.44)	0.40(2.63)	-0.82(3.21)	-0.92*(2.93)
9.	Potassium	0.37*(6.89)	0.33**(02.66)	-0.73**(02.49)	-0.22**(02.49)	0.16*(5.93)
10.	Complex	0.09*(4.64)	0.63**(-2.66)	0.39*(8.44)	0-21(0.58)	0.08(1.92)
11.	Urea	-0.57*(14.33)	-0.49**(10.22)	0.23**(3.69)	-0.66**(2.29)	-0.25*(6.79)
12.	Neem cake	0.62**(3.93)	0.82**(3.52)	0.78**(4.02)	0.81**(3.44)	0.89**(3.22)
13.	Adj R square	0.55	0.75	0.84	0.29	0.49
14.	F	14.64**	22.42*	48.64**	5.64*	35.62*

Source : Computed
* : Significant at 1%
** : Significant at 5 %

Figure in parentheses indicated 't' rations Framework of analysis for in-organic farming.

In order to examine the inorganic inputs which case variation in per acre value of output among the different sizes of land holding under in-organic forming similar log-liner multiple regression model has been employed.

$$\text{Log } Y - \alpha o + \sum_{i-1}^{11} \log X_{1+\epsilon}$$

Where
Y = Per acre value of output
X1 = Human labour
X2 = animal labour
X3 = electricity
X4 = Seed
X5 = Machinery
X6 = Farmyard manure
X7 = Pesticide
X8 = Potassium
X9 = Complex
X10 = Urea
X11 = Neem cake

ϵ 's are normally, identically and independently distributed with mean '0' (zero) and variance ,

$\beta 1, \beta 2, \beta 3 \ldots\ldots \beta 11$ are the parameters to be estimated.

The above model has been estimated separately for marginal, small, medium, large and pooled farms by the methods of least squares under inorganic farming.

RESULTS AND DISCUSSION

In order to determine the relative contribution of different inorganic inputs to the per acre value of output, the log-linear model is estimated. The results of marginal, small, medium and large farmers and pooled farms are presented in table 22.

The value of co-efficient of determination (R2) indicates that all the inorganic inputs have jointly explained about 84 percent of variations in the per acre value of output energy for the medium farms. It is followed by small farms at 72 per cent, marginal farms at 55 per cent, and the least is found for large farms at 0.29 per cent.The value of R2 for the pooled inorganic farms indicates 0.49 per cent. It could be brought out that out of 100 per cent variation of per acre value of output, the given 11 independent inputs contribute maximum to the tune of 84 per cent in the case of medium farms, 72 per cent for small farms, 55 per cent for marginal farms and it is the least in the case of large farms at 29 per cent. In addition, pooled inorganic farms Contribute about 0.49 per cent of co-efficient of determination. It brings out the fact that out of 100% per acre value of output variation, about 0.49 per cent is attributed to the given 11 inorganic inputs, the balance 51 per cent is explained by the factors other than the specified one. The "F" ratios are found to be statistically significant, which are based on R2 in each size of land holdings as well as pooled farms. Therefore, it is inferred that all the models are suitable irrespective of the size holding classes as well as pooled farms.

It may be seen that out of 11 independent inorganic inputs, human labour, animal labour, electricity, seed, farmyard manure, potassium, and neem cake are found be statistically significant at 5 per cent level for the pooled farms. Further, among them except machinery, pesticide and urea have been positively related to per acre value of output in the case of pooled inorganic farms. It enlightens that even one percent increase in those variables, could increase the output per acre for human labour by 64 per cent, animal labour by 37 per cent, electricity by 92 per cent, farmyard manure by 79 per cent, potassium at 16 per cent and neem cake by 89 per cent. In contrast to the above, the inputs like machinery, pesticide and urea are negatively correlated to the per acre value of output and it is found to be statistically significant 't' value. It could be brought out that even additional one per cent increase in these variables will bring decline in the per acre value of output at 14 per cent for machinery, 0.92 per cent for pesticide and for urea it is found at 25 per cent.

Further, it is clear from the results that over application of machinery, pesticide and urea lead to decline in the level of output per acre.

Among the significant variables, it may be brought out that even one per cent increase in human labour brings a change about the value of output at 0.64 per cent for human labour, 37 per cent for animal labour, 92 percent for electricity, 47 per cent for seed, 79 percent for farmyard manure, 0.16 percent for prottasium, 0.08 percent for complex and 89 percent for neem cake at the pooled inorganic farms.

When the input and output are compared among the different sizes of land holding classes, electricity, machinery, farmyard manure, potassium, complex, urea and neem cake are found to be statistically significant 't' value at 5 percent level in the case of marginal farms.

It may be inferred from the results that these energy inputs are positively related to the per acre value of output energy in the case of marginal farms. Further, It could be inferred from the results that one per cent increase in electricity, seed, machinery, farmyard manures, potassium, complex and neem cake will lead to increase in the per acre value of output by 24 per cent, 68 per cent, 27 per cent, 33 per cent, 37 per cent, 0.09 per cent and 0.62 per cent respectively.

In contrast to the above, human labour, animal labour, pesticide and urea are negatively related to the per acre value of output. They imply the fact that an additional one per cent increase in these inputs leads to decrease in the per acre value of output by 0.63 per cent, 0.42 per cent, 0.42 per cent and 0.57 per cent.

It could be brought out that the negative co-efficient of these inputs are due to the fact that excessive utilization of human family labour and animal labours in agricultural operations. In the case of pesticide and urea, it could be reasoned out that the marginal farms have used inputs beyond the required level.

Similarly in the case of small farmers, electricity, seed, machinery, farmyard manure, potassium, complex and neem cake are positively related to the per acre value of output. It implies the fact that even one per cent increase in these energy inputs will lead to per acre value of output by 0.62 per cent, 0.74 per cent, 0.72 per cent, 0.44 per cent, 0.33 per cent, 0.63 per cent and 0.82 percent.

As against this the negative co-efficient of human labour, animal labour, pesticide and urea show that even an additional one per cent increase in these inputs will result in reduction in the size of output per acre by 0.82 per cent, 0.29 per cent, 0.51 per cent, and 0.49 per cent. It shows that marginal and small farmers are using similar method in applying these inputs in an excessive manner under inorganic farming.

With regard to medium farmers, it could be inferred from the results that human labour, animal labour, electricity, seed, farmyard manure, pesticide, complex, urea and neem cake are positively related to the per acre value of output. More specifically, the inputs like electricity, machinery farmyard manure, complex, urea and neem cake are found to be statistically significant at 5 per cent level.

It could be inferred from the results that the foresaid inputs which are positively related to the per acre value of output under medium in-organic farmer category could increase the per acre value of output by 0.24 per cent, 0.12 per cent, 0.77 per cent, 0.33 per cent, 0.22 per cent, 0.39 per cent, 0.23 per cent and 0.78 per cent.

Contradictorily, the inputs, potassium and machinery are negatively related to the per acre value of output. It shows that one per cent increase in these input could lead to decline in the per acre value of output by 0.22 per cent and 0.73 per cent. Since medium farmers use their own machinery in agricultural operation, it showed negative co-efficient. In the case of potassium, it may be argued that in the study region medium farmers have used potassium beyond the recommended level'of dosage under inorganic fanning practices.

In the case of large farmers, it may be observed that out of eleven independent variables, electricity, neemcake and farmyard manure are statistically found to be significant at 5 per cent level. It implies the fact that even one per cent increase in the above said inputs could increase the per acre output under large farms by 0.82 per cent, 0.52 per cent, and 0.81 per cent.

As against this, the inputs viz., seed, machinery, pesticide, potassium, complex and urea are found to be negatively related to the per acre value of output in the study region. It shows that one per cent increase in these variables will lead to decline in per acre output at 0.57 per cent, 1.28 per cent, 0.82 per cent, 0.21 per cent and 0.66 per cent. However, it may be observed that since the large farmers use their own machines in agricultural operation in an excessive manner, especially in ploughing the over utilization of these inputs, transplanting, threshing, and — transporting of graineSS, led to negative outcome in aggregation.

In the case of chemical fertilizers and pesticides, it is noticed that they have the misbelief that over application of chemical fertilizer will lead to an increase in per acre output, though the reality is reverse.Yet another observation is that since the size of the farm is large and they are under inorganic practice of

cultivation, they depend on synthetic fertilizer and pesticides to support their land.

VI. CONCLUSION

With regard to the factors determining per acre value of output under organic farming, it could be concluded from the results that out of 12 organic inputs animal labour, electricity, farmyard manure, natural panchakavya, amirthakaraisal, neem cake, neem oil, green manure and vermicompost have been positively related to per acre value of output. It shows that even one per cent increase in these inputs will lead to increase in the per acre out.

As regards the factors determining per acre value of output under inorganic farming, it may be inferred that human labour, animal labour, electricity, seed, farmyard manure, potassium and neem cake are positively related to the per acre value of output.

VII. Policy Implications

The following policies could be of immense use for policy makers, planners and agricultural scientists in the field of organic farming. Further, the policies suggested here are in the context of the analysis of the present study.

i. Farmers should be made aware of the importance of natural inputs such is farmyard manure, neem oil, neem cake, panchakavya, amirthakaraisal and green manure. Since they are vital organic inputs and enrich the fertility of soil, the application of such inputs should be encouraged as against the synthetic chemical farm inputs which destroy the organisms on the soil and under the soil.

ii. In the preparation of natural inputs like vermicompost, amirthakaraisal, panchakavya and other natural inputs, the government should give proper training to the farmers.

iii. Incentives should be widely given to the farmers to adopt the practice of organic farming.

iv. The government should supply organic inputs at subsidized rate to the farmers who are practicing organic farming.

v. Regarding organic products, the government should give more price to the organic products.

vi. The growing demand for organic products in the global market should be made known to not only to the organic farmers but also to the inorganic farmers. This will have a significant impact on the inorganic farmers to shift from inorganic farming to organic farming.

vii. Farmers should be made aware of agriculture residues on the ground that they should be used as organic inputs.

viii. It may be suggested that marginal and small farmers should be made more viable by giving special importance by the government.

ix. If organic farming practice is given proper importance, all the adverse consequences could be overcome in the years to come.

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