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A Study on Resource use Efficiency of Agricultural Input Factors with Reference to Farm Size in Three Revenue Mandals of Nellore District: Andhra Pradesh

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Abstract

Farm-size is of an extreme interest in agriculture. This has been much debated over what may be appropriate size of the farm because the size of the operating unit, as in the case of manufacturing industries, decisively affects the income from agriculture. Since the amount of income is dependent on the size of the farm, preponderance in small and tiny holdings is mainly responsible poor peasantry in the third world countries. Even where there is no cost advantage or disadvantage for farms of various sizes, small farms will have, under usual price relationship, lower incomes and savings than large farms. Thus, size of farms is a vital element in determining the earning capacity of the farmer as well as the efficiency of a farming unit. Hence the present study aims to analyse the resource use efficiency of input factors in different size-level farms based on entire sample of Farms in three revenue mandals of Nellore District, Andhra Pradesh. Data was collected for the variables with the help of survey method through personal interviews of the farmers selected through mixed sampling. By studying the Marginal Value Products of factors of production, we assessed the relative importance of factors of production.

Index terms— Keywords: resourceuse, efficiency, marginal value product, marginal cost, regression co-efficient, geometric mean.

1 Introduction

arm-size is of an extreme interest in agriculture. This has been much debated over what may be appropriate size of the farm because the size of the operating unit, as in the case of manufacturing industries, decisively affects the income from agriculture. In case of manufacturing industry, we have optimum size of the unit, a size which is in existing conditions of technique and organizing ability has the lowest average cost of production per unit. Similarly in agriculture, too, we have a size, which under given conditions, would yield the best results to the farmer. The advantages of large and small farms have been debated for atleast a century.

There are economists and farmers who advocate large-scale farming for efficient operations, a satisfactory income to the farm family and food to the consumer at reasonable rate. But, on the other hand, some persons strongly advocate small-scale farming on the ground of social justice. Poverty in agriculture, in most of the third world countries is as much a problem of farm size as of other single factor. The great majority of farm families in these developing countries with low income line on undersized and adequate units. Even where there is no cost advantage or disadvantage for farms of various sizes, small farms will have, under usual price relationship, lower incomes and savings than large farms. Thus, size of farms is a vital element in determining the earning capacity of the farmer as well as the efficiency of a farming unit. The size of the farm is usually measured on the

basis of acreage. This is the only measure consistently used by the agricultural census of many countries of the world. India is a land of small units of cultivation. A predominantly large proportion of the cultivated holdings has steadily continued. Today about 82 percent of the holdings are being operated in small units covering about 39 percent of the total operated land. It is obvious at a glance that small units of cultivation reflect a serious imbalance on the land-man ratio. In contrast to large holdings which suffer from lack of labour and inputs, the small units suffer from holdings also have less of motivation than the other farmers. The new approach in agricultural production serves to emphasize the importance of small units of cultivation and to understand the problems connected with these.

Many evaluative studies were made an impact on new technology in transforming Indian Agriculture. The extreme diversities in resource endowments and relative factor scarcities have led the economists to make a diverse assessment about the impact of the new technology on the small and large farms. The northern states which are endowed with a developed in frastructural and irrigational facilities, surpass the other states in sharing the benefits.

2 F

There are number of studies on the agricultural sector in Nellore district. Among these studies, the research on agricultural production is very limited. The empirical investigations are needed to study the resource use efficiency of input factors in different sizelevel farms. Hence, the empirical and scientific investigational study of resource use efficiency of input factors in the rural economy of Nellore district is an important phenomena. In the present study, an attempt has been made to study the resource use efficiency of input factors in different size-level farms basing on entire sample of farms of three mandals, namely, Kaligiri, Muttukur and Pellakur of Nellore district of Andhra Pradesh.

3 II.

4 Review of Literature

Rajvir **??**ingh and Patel18 [1973] made an attempt to examine the relationship between output and farm-size in Meerut district of Utter Pradesh. The authors was concluded that in the context of new technology there is no indication of decrease in output per hectare with an increase in farm-size and, therefore, the hypothesis of inverse relationship is rejected in the area under study. One possible explanation for these trends is that, as farm technology undergoes a change; large farmers take together interest in using land more intensively with modern inputs at proper time in the week of higher probability offered by the New Technology.

Based on the data derived from different resources, Hanumantha Rao8 **??**1965] reached the following observations, "Despite better access to resources, output per acre among large farms under the traditional labour intensive technology was cost of (hired) labour was higher for them for small family farms. Also, managerial and supervisory diseconomies of large-size under labour-intensive methods accounted for lower labour input per acre among large farms. Technological changes created new production possibilities for large farms which could now increasingly substitute capital for labour by adopting biological as well as mechanical techniques and produce at a faster rate than small farms. The latest evidence shows that the inverse relationship between farm size and output per acre found under traditional technology no longer holds true with the adoption of new technology". **??**hatia and Datta3 [1987] made an attempt to analyse, whether the use of different energy inputs help in promoting employment. The study was conducted in the Amritsar District for the year 1984-85 and cultivators were divided into four groups namely marginal, small, medium and large sized farm groups. The study revealed that the number of family labour engaged in agriculture bears direct relationship with size of operational holding. However, employment (man equivalent days/acre) bears inverse relationship. The functional relationship revealed that in the case of marginal and small farms, human employment can be supplemented by the more use of mechanical energy, whereas in the case of medium farms the use of humanlabour can be increased some extent within the increased use of chemical energy but in the case of large farms, the use of human-labour was rational and can be increased with more use of chemical as well as mechanical energy.

Reddy, A.R. and Sen, C19 **??**2004] study was undertaken in the Sone Canal command area of the state of Bihar. A sample of 270 farmers comprising 207 marginal ($<$ 1 hectare), 31 small (1-2 hectares), 22 semi-medium (2-4 hectares) and 10 medium (4-10 hectares) farms were selected through stratified random sampling method. Technical inefficiency of the individual farms was estimated through stochastic frontier production function analysis. This study reveals that the technical inefficiency in rice production decreased with increase in farm size. The average technical inefficiency was highest in marginal farms (27.28%) followed by small farms (22.05%). Minimum average and technical inefficiency was observed in medium group. Technical inefficiency in the production of rice is negatively related with farm size.

Jain10 **??**1985] made an attempt to examine the interaction between farms size, technology and rural institutions to discover their influence on income distribution. The study reveals that in case of traditional crops or where irrigation and HYV seeds have not been used, little differences in per acre yield existed among various farm size groups. But under jointly managed capital intensive irrigation technology, the per acre yield of the rich and middle farmers was much higher when compared to the poor farmers. Family, it was also observed under individual managed labour intensive irrigation technology the per acre yield of the poor farmers was much

higher than that of the rich and middle farmers. The study, therefore, suggested that the technology suited for the poor is promoted, income differences can be minimized.

Pritam **??**ingh15 [1970] made an attempt to examine the economic efficiency of different farm-size groups. He tested the significance of various indicators of economic efficiency within the size groups and farm types. He concluded that there is a direct relationship between farm-size and economic efficiency on tractorised farms only. Moreover, the level of economic efficiency is higher on tractor-operated farms, on bullock-operated farms especially medium and large farms.

Debnarayan Sarker and Sudpita De5 [2004] study attempted to examine the extent of efficiency under different types of nature and different farm sizes in two types of villages -Technologically Advanced villages and Technologically Backward villages. This study considering all farm sizes in both the type of villages together, it can be said that except the lowest farm size where all farms are efficient, the proportion of efficient farm increase with the increase of farm size. This analysis shows that the use of high technological inputs in Agriculture is not so important in improving the efficiency level of the farms. This might suggest that only high use of technical inputs like irrigation, HYV seeds, chemical fertilizer per unit of land does not necessarily bring about maximum possible output for a given set of inputs, nor does it only make 'best practice' relationship between inputs and outputs.

Srinivasa Gowda, Basavaraj Bankar, Basvaraj and Hugar26 **??**1988] studied the productivity differences between small and large farms by analyzing the parameters of their respective production functions. The study revealed that the productivity differences between small and large farms were largely attributable to the existing technology. The author found that the level of output use had a relative significant influence on productivity difference. Large farms were found to have a technological advantage over small farms under irrigated conditions, while the reverse was true under unirrigated conditions. The study concluded that an improvement in technology appropriate for them but also an increase in their access to the modern agricultural inputs.

Venkatesam Naidu and Venkateswarlu28 [1988] discussed the resource use efficiency on maize farms in Karimnagar district of Andhra Pradesh. They adopted Cobb-Douglas Production Function to study the resource use efficiency of sample farms. The authors identify in the case of maize production, contribution of family labour and total cost of cultivation decrease with increase in farm size. Small farmers used more manures and less fertilizers, whereas medium and large farmers used more fertilizers and less manure. It is also observed that the average yield of hybrid maize was more on small farms and decreased as the farm size increased. Cost of production was the lowest in small farms. **??**ingh and Pandey25 [1971] studied the resource use efficiency in a dry farming area of Banda district of Utter Pradesh. The study concluded that the farmers are handicapped with inadequacy of growth promoting inputs such as manure, fertilizer and irrigation facilities and are using the conventional input, labour in excessive quality due to non-availability of other nonfarmer employment opportunity. The author observed that the new technology of high yielding variety was still in its infancy owing to the un assured irrigation facilities. Therefore, policy for the growth of this dry farming area of crop thriving under low rain-fed conditions and adequate provision for credit and non-farm employment is made for raising the farm productivity and for uplifting the standard of living of the people in the region.

5 III.

6 Objective of the Study

The following is the objective of the study:

? To study the Agricultural resource use efficiency of input factors in different size-level farms in three revenue mandals of Nellore District, Andhra Pradesh.

IV.

7 Data and Methodology

The following methodology is adopted to study the above objective. The present study extends over Nellore district of Andhra Pradesh. A multistage random sampling design was used. We purposefully selected three mandals, Namely Kaligiri, Muttukur and Pellakur of Nellore District at the first stage and later with help of random sampling ten to twelve villages were selected from each Mandal. After the selection of villages a complete list of agricultural families was prepared. As it is generally believed that the technology was sizebased, the list of farmers was further divided into three categories of farms defined as under; 0.00 acres -2.50 acres : small farms 2.51 acres -5.00 acres : medium farms 5.01 acres and above : large farms From the sub-divided list of farmers 15-20 farmers were selected from each village for preparing a sample of 420 farmers taking for Kaligiri, Muttukur and Pellakur mandals. Data was collected for the explanatory and explained variables with the help of survey method through personal interviews of the farmers selected through mixed sampling for this study relating to the agricultural year 2004-2005.

8 a) Specification of Variables

A great deal of caution is essential in the selection, classification and aggregation of input variables used in the production process for studying resources productivity. Different researchers have classified and aggregated farm

inputs in different ways suitable for their studies. Various ways of classifying and aggregating input variables in production function studies together with a brief description of variables used as explanatory variables in the present study are giving below.

i. Bullock-Labour Preparation of farm is an important agricultural work and bullock-power have been taken as an explanatory variable by a number of writers. Chaudhari4 ??1962], ??eddy and Sen20 [2004], Hopper9 ??1965] and Radhakrishna16 ??1962] have used it in terms of plough unit days consisting of one pair of animal-labour day and one human-labour day comprising one plough unit. While Rajkrishna17 ??1964], ??adal and Singh1 [2001] specified this variable in terms of bullock-labour days, ??obellow and Desai21 [1966] included a labour with a pair of bullocks. Here, we also include one human-ii. Human-Labour Human-labour too, has been used as an explanatory variable in the estimation of production functions either in physical units of time or in value of terms. Shan22 ??1969] and Goyal7 ??2003] used all human labour while, Hopper9 ??1965] and Mathur11 ??1960] used all human-labour except those associated with plough unit in value terms. ??harma and Sharma23 [2000], Hanumantha Rao8 ??1965], Rajkrishna17 ??1964], Singh24 ??1975] and Eswara Prasad6 ??1988] have used all human-labour in terms of man-days. We also include human-labour as an explanatory variable but from it exclude those labourers who are engaged in traditional irrigation work and are associated with bullock units. Variable is specified in terms of rupees.

iii. HYV Seeds A few writers have used seeds as explanatory variable in their functions. Prasad14 ??1973], Debnarayan ??arker and Sudptia De5 [2004] used seeds as a separate explanatory variable in his study terms of expenditure on seeds. We also include seeds in our functions, the prices of seeds are determined at the prevailing market price of the seeds at the seeding time.

9 iv. Irrigation

Assured and effective irrigation which has been one of the most important factors in the production function studies. Rajkrishna17 ??1964], Timothy and Krishna ??oorthy27 [1990] has specified this variable in terms of expenses on irrigation. We also specify it in the same term. Expenses on irrigation include permanent of wages to labourers used in traditional system of irrigation, water charges paid to the Government for the use of state tube-wells, hire-price of the water received from private tube-wells and pumping sets. Expenses also include accounting prices for the water received from farmers own pumping sets and tube-wells.

10 v. Fertilizer

Fertilizer is one of the most important components in Agricultural Production. Parikh13 ??1996] and Shan22 ??1969] ??ythili and Shanmugam12 [2000] have used chemical fertilizers as separate variable, while Basak and ??houdhary2 [1954-1957] has included manure along with chemical fertilizers as an explanatory variable. ??adav and Gangwar29 [1986] considered various categories of chemical fertilizers as independent explanatory variables. In the present study, though category-wise chemical fertilizer is not taken, chemical fertilizers and pesticides and natural fertilizers are specified as separate variables, and taken in value terms. While expenses on chemical fertilizer are the actual expenses, help of accounting price has been taken to determine the expenses on traditional fertilizers, like seen manure, compost burnt of waste goods and cow-dewing.

vi. Plant Protection Plant protection measures are included as explanatory variable. Prasad14 ??1973] and ??adal and Singh1 [2001] taken them in terms of expenditure on their use. In our study also this variable is specified in terms of actual expenditure.

V.

11 Model Specification

By studying the Marginal Value Products of factors of production, we can assess by their relative importance of factors of production. Marginal Value Product of Xi, the ith input is estimated by the following formula:( ) ( ) ( ) i i i X . M . G Y . M . G X MVP ? =

Where, G.M. (Yi) and G.M. (Xi) represent the geometric means of output and input respectively, ?i is the regression Co-efficient of ith input.

12 VI.

13 Results and Discussions a) Kaligiri Mandal

A comparison of marginal value product and marginal cost of an input gives a valid estimation of its (inputs) efficiency in the allocation production process. Hence, the ratios of marginal value products and factor cost* pertaining to Kaligiri mandal were depicted in table 1 for all six-groups under study. i.

14 Small Farms

From table 1, it is observed that the ratios of Marginal Value Products (MVP) and Marginal Cost (MC) of human-labour, chemical fertilizers and pesticides and other plant protection methods are greater than unity and it indicates the underutilization of the variables. The ratios of bullock-labour, expenditure on tractor, HYV

seeds and manures are less than unity, there by indicating over utilization of the said variables. Hence in small farms, the technological input variables chemical fertilizers and pesticides and other plant protection methods were underutilized whereas expenditure on tractor and HYV seeds were over utilized.

ii.

15 Medium Farms

The ratios of MVP and MC of the variableshuman-labour, chemical fertilizers, manures and pesticides and other plant protection methods are observed to be greater than unity. Hence, the medium size farmers are under utilizing the above factors. The ratios of bullock-labour, expenditure on tractor and HYV seeds are less than unity. Therefore, one can say that the medium size farmers are utilizing bullock-labour, expenditure on tractor and HYV seeds excessively.

Table **??** : Ratios of Marginal Value Products of Input Factor to their Marginal Cost iii.

16 Large Farms

In case of the factors human-labour, chemical fertilizers, manures and pesticides and other plant protection methods, the MVP and MC ratios are found to be greater than unity. It indicates under utilization of human-labour, chemical fertilizers, manures and pesticides and other plant protection methods. The ratios of MVP and MC of bullock-labour, expenditure on tractor and HYV seeds are observed to be less than unity. It is noticed that the excessive utilization of these variables bullock-labour, tractor expenditure and HYV seeds.

In the case of small farms while bullock-labour, expenditure on tractor and HYV seeds are marginally underutilized, use of human-labour, chemical fertilizers and pesticides and other plant protection methods are deficient. Hence the pattern of resource use in small farm needs some modification, particularly, in application of human-labour, chemical fertilizers and pesticides and other plant protection methods which may be increased. In the case of medium farms, bullock-labour, expenditure on tractor and HYV seeds are marginally underutilized, use of chemical fertilizers, manures and pesticides and other plant protection methods are deficient. Hence, the pattern of resource use in medium farms needs some modification in particularly, application of chemical fertilizers, manures and pesticides and other plant protection methods may be increased. In the case of large farms, use of humanlabour, chemicals fertilizers, manures and pesticides and other plant protection methods are insufficient. The pattern of resource use in large farms needs some modification, particularly, application of bullock-labour, HYV seeds, expenditure on tractor and they may be raised.

17 b) Muttukur Mandal

A comparison of marginal value product and marginal cost of an input gives a valid estimation of its (inputs) efficiency in the allocation production process. Hence, the ratios of marginal value products and factor cost* pertaining to Muttukur mandal were depicted in table 2 for all six-groups under study. i.

18 Small Farms

From table 2, the ratios of MVP and MC of expenditure on tractor human-labour, HYV seeds, chemical fertilizers, manures and pesticides and other plant protection methods are greater than unity. This indicates the underutilization of these variables. The ratio of MVP and MC of bullock-labour is less than unity, thereby indicating overutilization of these variables. Hence, in small farms the technological input variablesexpenditure on tractor, HYV seeds, chemical fertilizers and pesticides and other plant protection methods were underutilized.

ii.

19 Medium Farms

The ratios of MVP and MC of expenditure on tractor, human-labour, HYV seeds, chemical fertilizers and manures are greater than unity and this indicates the underutilization of these variables. The rations of MVP and MC is less than unity in the case of bullocklabour and pesticides and other plant protection methods. This indicates that the medium size farmers are utilizing chemical fertilizers and pesticides and other plant protection methods excessively.

iii.

20 Large Farms

The ratios of MVP and MC of bullock-labour, expenditure on tractor, human-labour, chemical fertilizers and pesticides and other plant protection methods are greater than unity. It indicates the underutilization of the above variables. The ratios of HYV seeds and manures are less than unity, thereby indicating overutilization of these variables.

In the case of small farms, human-labour, HYV seeds, chemical fertilizers and pesticides and other plant protection methods are deficient. Hence, the pattern of resource use in small farms needs some modification, particularly, application of human-labour, HYV seeds, chemical fertilizers and pesticides and other plant protection methods may be increased. In the case of medium farms bullock-labour, chemical fertilizers and

pesticides and other plant protection methods are marginally utilized, use of expenditure on tractor, human-labour, HYV seeds and manures are deficient. Hence the pattern of resources use in medium farms needs some modification, particularly , application of expenditure on tractor, human-labour, HYV seeds and manures may be increased. In the case of large farms, while HYV seeds and manures are marginally utilized, use of bullock-labour, expenditure on tractor, humanlabour and pesticides and other plant protection methods are deficient. Hence the pattern of resource use in large farms needs some modification, particularly, application of bullock-labour, expenditure on tractor, human-labour and pesticides and other plant protection methods may be increased.

21 c) Pellakur Mandal

A comparison of marginal value product and marginal cost of an input gives a valid estimation of its (inputs) efficiency in the allocation production process. Hence, the ratios of marginal value products and factor cost* pertaining to Pellakur mandal were depicted in table 3 for all six-groups under study. ii.

22 Medium Farms

The ratios of MVP and MC of all variables bullock-labour, expenditure on tractor and pesticides and other plant protection methods are observed to be less than unity and hence the medium size farms are overutilizing the above said variables. Whereas humanlabour, HYV seeds, chemical fertilizers and manures are found to be greater than unity. Hence, these variables are underutilized.

iii.

23 Large Farms

The ratios of MVP and MC of human-labour, chemical fertilizers, manures and pesticides and other plant protection methods are found to be greater than unity. This indicates underutilization of human-labour, chemical fertilizers, manures and pesticides and other plant protection methods. The ratios of MVP and MC of bullock-labour, expenditure on tractor, and HYV seeds are observed to be less than unity. This indicates that the large size farmers are utilizing bullock-labour, expenditure on tractor and HYV seeds excessively.

In the case of small farms while HYV seeds, chemical fertilizers are marginally underutilized, use of expenditure on tractor, human-labour, manures and pesticides and other plant protection methods are deficient. Hence the pattern of resource use in small farms needs some modification, particularly , expenditure on tractor, human-labour, manures and pesticides and other plant protection methods may be increased. In the case of medium farms while bullock-labour, expenditure on tractor and pesticides and other plant protection methods are overutilized, use of humanlabour, HYV seeds, chemical fertilizers, manures and pesticides and other plant protection methods are deficient. Hence the pattern of resource use in medium farms needs some modification, particularly, application of human labour, HYV seeds, chemical fertilizers and manures may be increased. IN the case of large farms use of human-labour, chemical fertilizers, manures and pesticides and other plant protection methods are deficient. Therefore the pattern of resource use in large farms needs some modification, particularly, application human-labour, chemical fertilizers, manures and pesticides and other plant protection methods may be increased and bullock-labour, expenditure on tractor and HYV seeds and are may be decreased.

24 VII.

25 Conclusions a) Kaligiri Mandal

In the case of small farms, on the basis of ratios of MVP and MC of the input factors it is found that the pattern of resource use in small farms needs some modifications, particularly, in the application of technol-ogical factors. Chemical fertilizers and pesticides and other plant protection methods may be increased where as the application of HYV seeds and may be decreased to obtain more output.

In the case of medium farms, on the basis of ratios of MVP and MC of the input factors, it is found that the pattern of resource use in medium farms needs some modifications, particularly, in application of technological factors -chemical fertilizers and pesticides and other plant protection methods may be increased whereas the application of HYV seeds, expenditure on tractor may be decreased to obtain more output.

In the case of large farms, on the basis of ratios of MVP and MC of the input factors it is noticed that the pattern of resource use in large farms needs some modification, particularly in the application of technological factors. The pesticides and other plant protection methods, chemical fertilizers may be increased and expenditure on tractor and HYV seeds may be reduced to obtain more output.

26 b) Muttukur Mandal

In the case of small farms, on the basis of ratios of MVP and MC of the input factors it is found that the pattern of resource use in small farms needs some modifications, particularly, in the application of technological factors -expenditure on tractor, chemical fertilizers, pesticides and other plant protection methods and HYV seeds may be increased to obtain more output.

In the case of medium farms, on the basis of ratios of MVP and MC of input factors it is found that the pattern of resource use in medium farms of Muttukur mandal needs some modifications, particularly in the application of

technological factors. The expenditure on tractor, HYV seeds may be increased whereas application of pesticides and other plant protection methods, chemical fertilizers may be decreased to obtain more output.

In the case of large farms, on the basis of ratios of MVP and MC of the large farms needs some modifications, particularly in the application of technological factors. The expenditure on tractor, chemical fertilizers and pesticides and other plant protection methods may be increased whereas HYV seeds may be decreased to obtain more output.

27 c) Pellakur Mandal

In the case of small farms, on the basis of ratios of MVP and MC of the input factors it is found that the pattern of resource use in small farms needs some modifications, particularly in the application of technological factors. The expenditure on tractor and pesticides and other plant protection methods may be increased where as the application of HYV seeds and chemical fertilizers may be decreased to obtain more output.

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In the case of medium farms, on the basis of ratios of MVP and MC of the input factors it is found that the pattern of resource use in medium farms of Pellakur mandal needs some modifications, particularly in the application of technological factors. The factors chemical fertilizers, HYV seeds may be increased whereas the application of pesticides and other plant protection methods and expenditure on tractor may be decreased to obtain more output.

In the case of large farms, on the basis of ratios of MVP and MC of the input factors it is found that the pattern of resource use in large farms needs some modifications. The use of chemical fertilizers, pesticides and other plant protection methods may be increased whereas HYV seeds and expenditure on tractor may be decreased to obtain more output. [1]

2

Inputs	Description of Inputs	Small Farms MVP	MC	Ratio	Muttukur Mandal Medium Farms MVP	MC	
X1	Bullock-labour	-0.38643	1.000	-0.38643	-1.44425	1.000	-1.44425
X2	Expenditure on Tractor	-1.54688	1.000	-1.54688	3.38376	1.000	3.38376
X3	Human-labour	6.65293	1.000	6.65293	8.67617	1.000	8.67617
X4	HYV Seeds	2.01896	1.000	2.01896	3.03605	1.000	3.03605
X5	Chemical Fertilizers	6.58576	1.000	6.58576	0.80261	1.000	0.80261
X6	Manures	1.67394	1.000	1.67394	2.46767	1.000	2.46767
X7	Pesticide and other Protection Plant Expenditure	3.73766	1.000	3.73766	-0.02256	1.000	-0.02256

Figure 1: Table 2 :

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Inputs	Description of Inputs	MVP			Small Farms MC			Ratio			Pellakur Mandal Medium Farms MVP MC Ratio		
X1	Bullock-labour	1.02091	1.000	1.02091	-2.00063	1.000	-2.00063	0.38195	1.000	0.38195			
X2	Expenditure on Tractor	3.55011	1.000	3.55011	-1.02766	1.000	-1.02766	0.00038	1.000	0.00038			
X3	Human-labour	4.89704	1.000	4.89704				2.12717	1.000	2.12717	1.61219	1.00	
X4	HYV Seeds	-0.64578			1.000.64578			4.24052	1.000	4.24052	0.21371	1.00	
X5	Chemical Fertilizers	-0.88297			1.000.88297			15.43535	1.000	15.43535	7.34598	1.	
X6	Manures	9.40139	1.000	9.40139				2.22012	1.000	2.22012	6.35182	1.00	
X7	Pesticide and other Protection Plant Expenditure	2.05467	1.000	2.05467	-4.06256	1.000	-4.06256	4.41449	1.000	4.41449			

Small Farms

From table 3, we observed that the ratios of Marginal Value Products (MVP) and Marginal Cost (MC) of bullock-labour, expenditure on tractor, human-labour, manures and pesticides and other plant protection

methods are greater
underutilization of t
process. The ratios
fertilizers are less th
lization of these vari

Figure 2: Table 3 :

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