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ECONOMICS OF CONVENTIONAL AND PARTIAL ORGANIC FARMING SYSTEMS AND IMPLICATIONS FOR RESOURCE UTILIZATION IN PUNJAB (PAKISTAN)

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Abstract. The study aimed to compare profitability and resource used efficiency of organic and conventional farming systems. The data is collected from Sheikhupura district for the Rabi season crops both from conventional and organic farming systems and 15 farmers from each system are interviewed. The organic farming system is found to be more profitable under the assumption of zero opportunity cost of family labourers. However, conclusion reversed when family labour is evaluated at average market wage rate. In profit maximization of organic farming system with Linear Programming (LP) approach indicates that irrigation is a limiting factor, where policy planners need to focus. It implied that potential exists in organic farming system that can be explored by improving the availability of canal water. However, in profit maximization of conventional farming system with LP, the shadow price of land is observed to be highest followed by canal water, implying that land and canal water are crucial factors to increase the profitability of poor farmers in conventional farming system. This clearly depicts that conventional farming system has exhausted and no further potential exists for improvement in profit without increasing the area.

I. INTRODUCTION

In the last few decades, rapid population growth and income growth jointly put pressure on food demands which have been met by enhancing agri-

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cultural productivity. Beside population and income growth, per capita food consumption has approximately increased by 18 percent compared to that of 30 years ago (Alexandratos, 1995), clearly indicating the contribution of research in agricultural sector.

The major increase in food supply has taken place due to introduction of Green Revolution initiated in the mid sixties by research centers operating under the umbrella of Consultative Group on International Agriculture Research (CGIAR) system. The new varieties introduced by these centers are input intensive. The input-intensive farming deteriorated the soil quality, lost of topsoil on farms and accumulated pesticides in the ground water (Worthington, 2001).

The studies conducting on experimental data are showing that yield is declining in the long-run even on experimental fields where scientists are trying their best to maintain the soil fertility (Flinn and De Datta, 1994). In some cases evidences are showing that yield is getting stagnant due to intensive and mono-cropping pattern (Cassman and Pingali, 1995; Ali, 1996; Byerlee and Siddiq, 1994). These problems are considered especially important in the wheat-rice belt, the breadbasket of northern India and Pakistan which covers over 12 million ha and provides food security for some 500 million people (Hobbs and Morris, 1996). If resources continue to degrade with the same pace as literature is suggesting then it could be a serious threat to the future food security. The recognition of these problems and their production capacity has led to the quest for sustainable agricultural systems.

The term ‘conventional farming system’ is referred to a production system which employs a full range of pre- and post-plant tillage practices (*e.g.,* disk plowing, cultivation), synthetic fertilizers, and pesticides and it is characterized by a high degree of crop specialization. By contrast, organic farming is characterized by a diversity of crops with no chemical and pesticide.

The rising level of environmental hazards from conventional farming system (due to pesticide and fertilizer use) made it attractive for farmers to adopt more sustainable organic farming type of system. Organic farming is a type of sustainable land use that works entirely without synthetic fertilizers and pesticides and systematically enhances the agro-ecological system. Organic farming has become a significant element in policies promoting food safety and environmental quality of food production in Europe, because it rules out the use of mineral fertilizers and other chemicals such as pesticides and herbicides (Zanoli and Gambelli, 1999) and moreover, consumers are well aware from the dangers of food produced by conventional farming system. Hence, they are willing to pay high prices for the food items produced by organic farming system. Therefore, growth rate of organic farming is 20-30% in the World (Panhwar, 2004). In the long run, organic farming offers advantages compared to conventional farming because it not only promises higher yields but also ensures higher yield security, reduces dependence on external input and thus makes poor households less crisis-prone. These are weighty arguments, especially in marginal locations (Parrot and Marsden, 2002). Organic farming is labour intensive and therefore, total operating costs all depend on the prices and opportunity costs of labour. This is exactly opposite of the situation in the industrialized countries where wage rate is extremely high and hence, offers a chief advantage of organic farming in developing countries (Rosen and Larson, 2000).

There is a long debate on the profitability of conventional and organic farming systems, and it generated uncertainty among farmers especially in under developing countries about the adoption of highest income generating farming system. The present study will attempt to address these issues. The main objective of the current study is to compare the profitability, land use pattern and shadow prices of resources in conventional and organic farming systems. The results will help to resolve the debate by providing empirical evidences and further it will help in designing justifiable policies.

The paper is organized as follow. The following section describes the data collection and methodological procedure. Section III delineates the results and discussion. Section IV discuss about conclusion and demonstrate policy suggestions.

II. DATA COLLECTION AND METHODOLOGY

DATA COLLECTION PROCEDURE

The random sampling technique is employed in the selection of conventional and organic farms. A sample of 30 farms is selected consisting of 15 each from conventional and organic farms in Rabi season in the district of Sheikhupura in 2008. One farm from each category (organic and non-organic) is selected as a representative farm to apply linear programming approach that will reflect the situation of organic and non-organic farming systems. It is observed that in most of the cases organic farmers are not adopting 100 percent organic practices and therefore, comparison is made only between partial organic and conventional farming practices. Pre-testing has made it possible to improve the questionnaire according to the required situation.

METHODOLOGY

Different techniques are available for different kind of analysis. If the objective is to see the contribution of different inputs in production process then production function is assumed to be a strong tool for analysis but it has constraints to deal with multiple output case where different outputs are not homogeneous and cannot be added up to make single dependent variable. In multiple output case Linear Programming is assumed to be one of the strong and most suitable techniques to analyze and compare the results in different production practices. Therefore, present study employed LP model to compare two production systems (partial organic and conventional).

LINEAR PROGRAMMING

The Linear Programming (LP) provides simultaneously optimal solutions for the various activities (in the primal problem) and show prices of all commodities and resources (in dual problem). The primal method solves the problem as formulated, *e.g.*, maximizing the value of an objective function subject to fixed quantities of inputs, while dual turns the problem around and minimizes the value of each resource constraint subject to the values of the activities comprising the primal function. For empirical analysis linear programming technique is employed to maximize net farm returns (profit after deducting costs) under given constraints for the selected farm in both organic and conventional farming systems as discussed with detail in (Taha, 1982) and given below:

Max Net Profit

$$Y = \sum_{j=1}^{n} C_j X_j \tag{1}$$

Subject to

$$Y = \sum_{j=1}^{n} a_{ij} X_j \leq b_i, \qquad i = 1, 2, 3 \tag{2}$$

Equation (2) for each specific resource (labour, water, and capital) can be elaborated as follows:

Subject to the following resource constraints:

Rabi land constraint $= \sum_{j=1}^{n} L_j X_j \leq L$

Water constraint $= \sum_{j=1}^{n} W_j X_j \leq W$

Capital (cash) constraint $= \sum_{j=1}^{n} K_j X_j \leq K$

Non-negativity $= X_j \geq o$

Where,

Y = Net profit to fixed farm resources.

C_j = The profit for the j^{th} activity, where j^{th} activity stands for j^{th} crop in the production process, *i.e.* if farmer is growing '*n*' crops then there will be total '*n*' activities and the value of *j* will be from 1 to *n*.

X_j = The level of j^{th} activity.

a_{ij} = The amount of i^{th} input (Family labour, capital, water and land) required in j^{th} activity.

b_i = The total available quantity of i^{th} input.

L = Rabi land available.

L_j = Land needed for the j^{th} activity.

K_j = Capital (cash) needed for the j^{th} activity.

K = Total available cash (capital).

W = Water available

W_j = Water needed for the j^{th} activity.

The profit maximizing plans are estimated through linear programming by using Quantitative Systems for Business (QSB).

Per acreage costs in conventional and organic farming systems are estimated by including cash costs (costs of seed, fertilizer, pesticide, hired labour and other operations). Non-cash cost (family labour) is not included in the analysis under the assumption that family labour is surplus in the study area and has no opportunity costs. The revenue is estimated by multiplying the total production with market price of the output and the value of output consumed at home is also included in the revenue and is evaluated at the market price. The Net Returns Per Rupee Invested (NRPRI) are estimated by dividing net profits with total cash costs.

III. RESULTS AND DISCUSSION

ECONOMIC COMPARISON OF TWO FARMING SYSTEMS

The costs of production, total revenues, Gross Margins (GM) and Net Returns Per Rupee Invested in Rabi crops are estimated on per acreage basis for conventional and organic farming systems in the study area. The comparison of costs and benefits for both systems is not very useful because it does not reflect a clear situation that which one is preferable to the other. Therefore, Net Returns Per Rupee Invested (NRPRI) are estimated and considered as basis for comparison. The Net Returns Per Rupee Invested (NRPRI) for organic and conventional farming systems are reported in Table 1.

TABLE 1

Economic Comparison of Various Crops in Conventional and Organic Farming Systems

Types of crops	Organic Farming System				Conventional Farming System			
	Cost per acre (Rs.) (1)	Revenue per acre (Rs.) (2)	Net returns per acre (Rs.) 3 = (2–1)	Net returns per rupee invested 4 = 3/1	Cost per acre (Rs.) (5)	Revenue per acre (Rs.) (6)	GM per acre (Rs.) 7 = (6–5)	Net returns per rupee invested 8 = 7/5
Wheat	6308	13576	7268	1.2	7860	17085	9225	1.2
Vegetables	2760	10600	7840	2.8	6608	22392	15784	2.4
Fodder	3470	16000	12530	3.6	4389	17556	13167	3.0

The results indicated that NRPRI from wheat are same for both organic and conventional farming systems mainly because cost of production and yield both are low in organic farming system. NRPRI from Rabi season vegetables in organic and conventional farming systems are estimated to be 2.8 and 2.4, respectively while NRPRI from Rabi fodder in organic and conventional farming systems are 3.6 and 3.0, respectively. It is observed that NRPRI is higher for all crops in organic farming system compared to conventional farming system, implying that it is more profitable to invest in organic farming system than conventional farming system in Rabi season crops. It is due to the fact that organic farming system employs less cash input which leads to generate higher NRPRI for organic farming system.

However, it should be noted that our results valid under the assumption of zero opportunity cost of family labour and it may not be true for other areas. Hence, conclusion established here may not be valid for other areas. Therefore, a comprehensive study needs to be conducted covering different regions and cropping patterns of Pakistan.

We have also done analysis after including family labour cost (opportunity cost estimated at market wage rate) to give a clear indication to the policy maker. The results reported in Appendix I depict that in each crop conventional farming system becomes more profitable compared to organic farming system.

A comparison is made between organic and conventional farming systems in terms of profitability, land use pattern and shadow prices of different inputs (in Rabi season) that would help to highlight the farmer's constraints in production process. It could help to develop some policy mechanism to improve their productivity. The comparison of different aspects is given below.

COMPARISON OF PER DAY PROFITABILITY

Different crops have different duration and therefore, long duration crops (Rabi fodder, sugarcane etc) generate significantly high profits. During net profit maximization process LP allocates all resources to the high profit generated crops (long duration crops). This problem is handled by using per day net profits rather than the total profit from a crop in LP maximization process. The total maximum per day profits of both organic and conventional farming systems are estimated by determining the quantity of resources that need to be allocated to each crop through linear programming approach. The optimum level of resources determined by LP is different than what farmers are practicing. We have employed Quantitative Systems for Business (QSB) software to run LP.

Fodder crop requires negligible inputs and thus it appears to be more profitable compared to all other crops. Hence, during the maximization process, LP has allocated almost 75 percent of the total cropped area to the fodder crop but it does not match with the reality. If all farmers started to grow fodder then there will be huge surplus of fodder and fodder prices will drastically go down due to limited market of fodder. Hence, we put restriction that area allocated to fodder crop should not be exceeded from 30 percent of total cropped area in Rabi season because 30 percent is the average area allocated to fodder in our sample size. Similarly, we also put restriction on area allocated to vegetable crops because vegetable crops are more profitable than grain crops (rice, wheat) and without restriction LP allocates significantly higher number of acres to vegetable crops. Since, vegetables in Pakistan are consumed almost 50 percent less than the recommended level (Ali and Abedullah, 2002), implying that area under vegetable crops could be doubled to improve the profitability of farmers. By keeping these facts in mind we put upper restriction on the area allocated to vegetable crops double than the average of our sample size. In this way, maximum profit is estimated through LP under three different conditions:

TABLE 2

Comparison of Profitability and Land Use Pattern in Organic and Conventional Farming Systems

<table>
<tr><th rowspan="4">Types of crops</th><th colspan="4">Organic farming system</th><th colspan="4">Conventional farming system</th></tr>
<tr><th rowspan="2">**Existing column 1**</th><th colspan="3">Optimum</th><th rowspan="2">**Existing column 2**</th><th colspan="3">Optimum</th></tr>
<tr><th>Cond-1</th><th>Cond-2</th><th>Cond-3</th><th>Cond-1</th><th>Cond-2</th><th>Cond-3</th></tr>
<tr><th>Acres</th><th>Acres</th><th>Acres</th><th>Acres</th><th>Acres</th><th>Acres</th><th>Acres</th><th>Acres</th></tr>
<tr><td>Wheat</td><td>3.73</td><td>3.61</td><td>3.24</td><td>3.24</td><td>4.06</td><td>3.25</td><td>2.48</td><td>2.66</td></tr>
<tr><td>Vegetables</td><td>0.35</td><td>0.35</td><td>0.96</td><td>0.7</td><td>0.48</td><td>0.48</td><td>1.13</td><td>0.96</td></tr>
<tr><td>Fodder</td><td>1.1</td><td>1.1</td><td>1.28</td><td>1.4</td><td>0.96</td><td>0.96</td><td>1.35</td><td>1.33</td></tr>
<tr><td>Cropped area</td><td>5.5</td><td>5.06</td><td>5.48</td><td>5.34</td><td>5.5</td><td>4.69</td><td>4.96</td><td>4.95</td></tr>
<tr><td>Profit/day</td><td>385</td><td>378</td><td>445</td><td>438</td><td>524</td><td>462</td><td>575</td><td>549</td></tr>
</table>

Condition 1 = Profit estimated by imposing condition on area allocated to fodder and vegetable matching with the farmer's actual practice but leaving the land for wheat free.

Condition 2 = Profit estimated without any restriction

Condition 3 = Profit estimated under the assumption that area allocated to fodder is 30 percent of total cropped area and to vegetables it is double of existing area.

1. Putting restrictions in such a way that LP matched with the farmer's average area allocated to fodder and vegetable crops.
2. Profit without imposing any restriction on acreage allocation in LP.

3. Putting restrictions on area allocated to fodder (30 percent of total cropped area) and vegetable (double of the existing situation, *i.e.* double of the area allocated under condition 1) as described above.

These three conditions are reported in Table 2.

When we put restriction on area allocated to vegetable and fodder crops matching with actual practice but the area for wheat is left free to allocate by LP process (condition 1) then estimated per day profits are Rs. 378 and Rs. 462 from organic and conventional farming systems, respectively. The LP generated less per day profit compared to actual profits achieved by farmers but making the land surplus equal to 0.432 acres. It clearly indicates that farmers are getting little high profit in actual practice compared to profit in condition 1 at the cost of low marginal contribution of each input. Now someone can raise the question that why have we restricted area for fodder and vegetable by leaving area for wheat free and why have we not left the area for vegetable or fodder crops free by restricting area for wheat? Since, vegetable and fodder both are high revenue generating crops and LP allocates all area to these crops by allocating zero area to wheat crop. That is why area for wheat crop has not been restricted in the analysis because it is the lowest revenue generating crop among all three but plays important role in food basket.

The per day profits drastically increase to Rs. 445 and Rs. 575, from organic and conventional farming systems, respectively under the assumption that there is no restriction on acreage allocation (condition 2). Implying that if market could absorb unlimited fodder then per day profits could be increased by 15 and 9 percent, respectively from organic and conventional farming systems. Under the assumption that each cropping system consists of 120 days then total profit per acre from organic and conventional farming systems could be increased by Rs. 7200 and Rs. 6120, respectively. However, it is not rational to allocate more area to fodder crop as suggested by LP because farmers know that supply-demand mechanism will lead to decline the fodder prices drastically. By imposing restrictions on acreage allocation (condition 3) as discussed above, per day profits would increase to Rs. 438 and Rs. 549 compared to actual practices of Rs. 378 and Rs. 462 from organic and conventional farming systems, respectively. The results of condition 3 indicate that in reality it is possible to enhance farmer’s per day profit by 14 and 5 percent from organic and conventional farming systems, respectively compared to the existing farmer’s practices by allocating more area to the vegetable crops. In other words profit from organic and conventional farming systems could be increased by Rs. 6360 and Rs. 3000, respectively compared to actual farmer's practices.

COMPARISON OF LAND USE PATTERN AND SHADOW PRICES

Land utilization is an important decision to improve the profitability from farming business because allocation of land to different crops depends on the availability of financial resources. With no financial constraint more land will be allocated to high profit generating crops but in the presence of financial constraints farmers will select the crops that require less cash by sacrificing some amount of their profits. In our case maximum available land is 5.5 acres (average farm size in both organic and conventional farming systems) which is used to estimate the results reported in Table 2. The area of 5.5 acres is assumed to be farmer's land constraint in our case because land constraint is important factor in determining the land allocation to different crops as well as optimum net returns from different farming activities.

When we maximize the profit function through LP by putting restriction on area for fodder and vegetable crops equal to the area of farmer's practices then LP allocates less area to wheat crop than the farmers actual practice both in organic and conventional farming systems, indicating that farmers could increase their profit just by reducing their area to wheat crop.

The results reported in Table 2 depicts that farmers have actually allocated 0.35 and 1.1 acres to vegetable and fodder crops in organic farming system compared to 0.48 and 0.96 acres in conventional farming system. The results estimated with LP (under condition 1 and reported in Table 2) indicated that farmers are not allocating resources optimally, especially land to wheat crop because maximization is taking place at 3.61 and 3.25 acres but they are actually allocating 3.73 and 4.06 acres to wheat crop in organic and conventional farming systems, respectively.

Without imposing any restriction on acreage allocation, wheat area in organic and conventional farming systems are 3.24 and 2.48 acres, respectively (condition-2), implying that under the assumption of no restriction, area under wheat has decreased by 13 and 39 percent in organic and conventional farming systems, respectively. However, the area for fodder and vegetable crops has increased by 14 and 64 percent in organic farming system and 28, and 57 percent in conventional farming system, respectively. This increased in area for more profitable crops (fodder and vegetable) has led to increase in profitability by 15 and 9 percent in organic and conventional farming systems, respectively compared to the actual farming practices.

Condition second is a situation where no restriction is imposed on area allocation and under this situation LP has allocated the area to fodder and vegetable crops almost more than double and fifty percent higher than the actual farming practices in organic and conventional farming systems, respectively. Since, fodder crop had limited market and higher amount of production would lead to significantly decline in fodder prices. Hence, farmers are allocating only small area to fodder crop. Instead, they are allocating higher area to wheat crop because it had local and international markets.

The shadow prices of various resources, used in different crops of organic and conventional farming systems, are reported in Table 3. The shadow price of resource constraint is the marginal contribution in the objective function when value of that constraint is increased by one unit. The economists prefer to use the terms shadow price, imputed price or more technically dual price to describe the unit worth of a resource. The high value of shadow prices refers to the resource scarcity in the production process.

TABLE 3

Shadow Prices of Resources in Organic and Conventional Farming

Resources	Per day shadow prices of resources in organic farming system (Rs.)			Per day shadow prices of resources in conventional farming system (Rs.)		
	Cond-1	Cond-2	Cond-3	Cond-1	Cond-2	Cond-3
Land area	0.00	0.00	0.00	0.00	27.3	0.00
Availability of cash	0.0096	0.0071	0.0096	0.0098	0.0068	0.0098
Family labour (Hrs)	0.00	0.14	0.00	0.00	0.49	0.00
Canal water (Hrs)	0.00	2.32	0.00	0.00	1.89	0.00

Condition 1 = Profit estimated by imposing condition on area allocated to fodder and vegetable matching with the farmer's actual practice but leaving the land for wheat free.

Condition 2 = Profit estimated without any restriction

Condition 3 = Profit estimated under the assumption that area allocated to fodder is 30 percent of total cropped area and to vegetables it is double of existing area.

The shadow prices of family labour, and irrigation water has increased compared to the actual farming practices (condition 1) but in contrast shadow price of available cash has declined, in organic farming system indicating that under the assumption of no restriction on acreage allocation, canal water and family labour are getting scarce in organic farming system. However, intensity of scarcity of irrigation water is higher than the family labour (Table 3). This implied that in order to increase the profit of organic farming system, irrigation is one of the crucial parameters where policy planners need to focus. The shadow prices of land, family labour and canal water has significantly increased compared to the existing farming practices (condition 1) in conventional farming system. The shadow price of land is the highest followed by canal water, indicating that only increase in area could increase the profitability of conventional farming system. This clearly depicts that conventional farming system has exhausted and no further potential exists for improvement in profit without increasing the area. However, in contrast to conventional farming system, organic farming system has potential for further improvement which could be explored by improving irrigation facilities.

The vegetable consumption in Pakistan is 35 kg/person/annum compared to 155 kg/person/annum in Korea while the minimum recommended level is 73 kg/capita/annum (Ali and Abedullah, 2002). These figures indicate that potential exists to increase the area under vegetable crops but not for fodder crop. Therefore, in order to match the situation with reality, we have used another step and estimated LP in the third round (condition 3) by imposing restrictions on area allocated to fodder and vegetable crops in such a way that fodder crop area is restricted to 30 percent of total cropped area which is higher by 21 percent than the actual practice by assuming that slightly additional amount of fodder could be consumed in the local market. The area allocated to vegetable crop is reserved or fixed at a level equal to three times of the actual area allocated by farmers under the assumption that extra vegetable production could be consumed in local market because of existing huge gap between actual and recommended level of vegetable consumption. Under this restrictive situation (condition 3) which matches with realistic world it is observed that per day profit could be enhanced by 14 and 5 percent from organic and conventional farming systems, respectively compared to the existing farmers' practices by allocating more area to the vegetable crops. Under condition 3, profit would decrease only by 1.6 and 5 percent, respectively for organic and conventional farming systems compared to situation 2 (or condition 2), where no restriction is imposed on area allocation. Further, under condition 3 shadow prices of all inputs are zero except available cash (Table 3), implying that no resource is getting scarce to achieve the profit at a level elicited under condition 3. This indicates that farmer's profit could be enhanced compared to existing farming situation (condition 1) by producing more vegetable without demanding additional water and land. The results generated under condition 3 are more appropriate and realistically applicable compared to the results generated under condition 2 because of the reason discussed above. Under all three conditions profit is higher for conventional farming system compared to organic farming system, indicated that conventional farming system is preferable over organic farming system under given conditions.

However, if consumers would be willing to pay higher prices for organic products like in Europe then situation could be reversed. In present situation consumers could not differentiate between organic and conventional products and therefore, it would be hard to estimate how much they would be willing to pay extra for organic products. In order to make such estimation first consumers should be rational to differentiate between organic and conventional products and they should know the advantages and disadvantages of both products.

IV. CONCLUSIONS AND POLICY IMPLICATIONS

The results indicated that Net Returns Per Rupee Invested (NRPRI) is higher for all crops in organic farming system compared to conventional farming system, under assumption when family labour cost is zero in organic farming system. The high NRPRI in organic farming system is due to less cash inputs. Under the assumption of zero opportunity cost of family labour it is suggested to invest in organic farming system. However, conclusion altered when family labour is evaluated at average market wage rate and conventional farming system becomes more profitable. The optimum per day profit of conventional farming system is relatively higher (when family labour cost is included) than organic farming system which suggests that profit maximization encourages conventional farming system.

It is observed that wheat area has declined in profit maximization process because this is less revenue generating crop. The result indicates that farmers are not allocating resources optimally, especially land to wheat crop because profit maximization is suggesting less area to allocate wheat crop than actually allocated. Wheat is a basic food necessity in Pakistan and probably farmers are allocating more area to wheat crop for the purpose of food security.

The vegetable consumption in Pakistan is 35 kg/person/annum while the minimum recommended level is 73 kg/capita/annum. These figures indicate that potential exists to increase the area under vegetable crops for the improvement in profit but not for fodder crop. The policy makers may focus to enhance the vegetable production and to market them efficiently. It is an evident that re-allocation of resources in organic farming system could lead towards higher profitability. The high shadow prices of canal water in organic farming system indicate that it is the scarcest resource and is a crucial limiting factor in profit maximization. In order to increase the profitability of organic farming system Government should focus to increase the water supply because rice is a high water demanding crop. The high shadow price of land in conventional farming system indicates that improvement in profit is impossible without increasing the area, implying that conventional farming system has exhausted and no further potential exists to increase the profitability.

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APPENDIX I

A Comparison

Operations	Cost of production of various crops in organic farming system when opportunity cost of family labour is included			Cost of production of various crops in conventional farming system when opportunity cost of family labour is included		
	Wheat	Rabi vege-tables	Rabi fodder	Wheat	Rabi vege-tables	Rabi fodder
Land preparation	1880	1310	870	1850	1650	950
Seed	600	600	590	600	800	590
Transplantation	0	400				
FYM	500	400		400		
Fertilizer	1278		1550	2400	2070	2250
Organic spray	0	50		400	900	
Irrigation	150		460	150	388	599
Family labour	468	6900	6750	70	280	150
Causal hired labour	590			860		
Harvesting	1200			1200	1000	
Total cost with family labour cost	6776	9660	10220	7930	6888	4539
Income/Acre						
Yield (Mond)	25.7			29.1		
Price/Mond (Rs.)	450			450		
Total Revenue (Rs.)	13576	10600	16000	17085	22392	17385
Net Profit (Rs.)	7268	7840	12530	9225	15784	12996