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A Comparative Cost Analysis of Organic and Conventional Farming in Koraput District of Odisha

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ABSTRACT

The paper is based on a comparative study of cost and production dynamics for organic and conventional farm practices in selected villages of Koraput district of Odisha. The data used in the paper were collected from 360 sample farm households in four blocks of the district; two dominated by organic mode of farming such as Koraput and Kundra and other two dominated by conventional farming namely Semiliguda and Nandapur. With the help of descriptive statistics, the paper finds higher costs in farming units using inorganic inputs than units adopting organic farming practices. Moreover, total marketable surplus, price of produce, sales proceeds, net return and profit margins are higher in case of organic farming. These findings not only substantiate the arguments in favour of organic farming, the paper also makes a case for proactive policies to encourage marginal and small farmers towards enabling them participate in the food economy in a better and rewarding manner.

Keywords: Comparative cost analysis, agricultural production, organic farming.

JEL Classification Codes: D24, Q12, Q16

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I. INTRODUCTION

Although the sectoral contribution of agriculture in the national income is on the decline in India, the role of the sector in providing livelihoods to a majority of the workforce and its critical importance in shaping the growth prospects of both manufacturing as well as service sectors through the forward and backward linkages can never be underestimated (Sahoo & Sethi, 2012; Marden, 2014). The performance of non-agricultural sector is very sensitive to the outcomes of the agricultural sector. It is estimated that a 1per cent change is agricultural production results in 1.2 per cent change in non-agricultural production (Marden, 2014). However, such an important sector has been given lesser importance in policy priorities and the workforce involved in the agricultural sector has witnessed continuous distress. In an emerging economy like India, the gross value added in non-agricultural sector at constant prices has increased more than 36 fold between 1950-51 and 2019-20 compared to a mere 5 fold increase in GVA from agricultural sector during the same period(RBI, Various years). Given that around half of the workforce is still drawing their livelihoods from the agricultural sector, the condition of the households dependent on agriculture has worsened. With the advent of modern agricultural practices with increased use of chemical fertilisers and pesticides, the cost of agricultural production has increased and with the opening up of the economy the market for the produce have become more unpredictable, adding to the distress of the farmers in India. The rampant cases of farmer suicides and agrarian crisis highlighted in the academic literature as well as media during last three decades only reflects a manifestation of the distress faced by the farming community. There has also been a growing recognition of this distress at the policy level, as evident from the call for doubling farm income through improved practices and suitable interventions by the governments at different level. At the same time, the consumer groups are also becoming aware on the negative impacts of chemical fertilisers and pesticides on quality of food produced and there is an increasing trend of preference for organically grown food. However, issues like cost, level of production, marketable surplus and economies of scale make a choice between organic farming and farming with chemical fertilizers (hence, conventional farming) difficult for farmers. There are many benefits of organic farming, which can overcome the problems of inorganic farming. Organic farming aims to increase long-term soil fertility, control pests and diseases without harming the environment, ensure clean and safe water, use resources which the farmer already has and produce nutritious food. These are the basic reasons behind the publicity and adoption of organic farming. Worldwide 1.8 million farmers in 162 countries grow organically more than 37 million hectares of agricultural land. Australia is the country with the largest organic agricultural area (12 million hectares) followed by Argentina (3.8 million hectares) and the United States of America (1.9 million hectares). But in India, organic farming is practiced only in 0.50 million hectares of land (Kumar, 2014).The basic reason behind the less proportion of organic farming in India is the lack of awareness among the farmers about the benefits of organic farming and lack of awareness among the consumer about the organic products.

It is in this context that the present paper seeks to make a comparison between cost, output and profitability of farms adopting organic and conventional methods of farming in selected blocks of Koraput district in Odisha. The paper is

divided into four sections. In the forthcoming section, we present a review of the contemporary literature dealing with the relevant issues. In the subsequent sections we have presented the methods of analysis and the key results.

II. THE REVIEW OF LITERATURE

The debate over the relevance and supremacy of practicing agriculture without use of chemical fertilisers and pesticides is not new. Loosely coined as "organic farming", the practice refers to a decentralised form of agricultural practice that relies on nature dependent sustainable techniques and maintains soil fertility through biological processes, use of composts, mixed cropping, crop rotation, biodiversity and strict restraints from the use of synthetic inputs. On the other hand, the dominant practice of conventional farming is an entirely different and centralised paradigm that depends heavily on the use of artificial fertilisers and pesticides, inorganic inputs, genetically engineered plant materials and heavy exploitation of natural environment. In the process, the practice of conventional farming not only harms the environment, it also serves unhealthy products to the consumers (TANU, 2016; Zheng, Karam, Zawawi, & Rajoo, 2016; Siddique, Hamid, Tariq, & Gul, 2014; Prasad, 2005).

Making food grains available in adequate quantity and at affordable prices for the poor has always remained the key objective of agriculture policy in India. With the advent of strategies like the green revolution, India could have achieved a quick growth in food grain production from a mere 50.8 million tons in 1950-51 to 199.4 million tons in 1996 signifying almost four times increase. The green revolution not only marked a shift in agricultural practice through increased use of high yielding varieties of crops, chemical fertilisers and many other modern practices with active support from the government, it also had a remarkable demonstration effect throughout the country(Yadev, 2009; Barr, 1999). However, the benefits of green revolution were short-lived and came with huge social and environmental costs. Though the use of chemical fertilisers and synthetic inputs increased agricultural productivity during green revolution and the aftermath, it also resulted in deterioration of soil quality, water quality and food quality. There is no dearth of literature highlighting the negative impacts of agriculture practice with inorganic and synthetic inputs (Fujita, 1999; Chandini, Kumar, Kumar, & Prakash, 2019; Mondelaers, Aertsens, & Van, 2009).

In a literary debate on the relative merits of organic farming over conventional farming, one would always find that the appeal for organic farming is built around the normative views around the environmental and ecological concerns. But there still are works that focus on the positive arguments to make a case for organic farming. It has been observed in numerous empirical studies that the cost of cultivation in conventional farming is higher than the organic farming. Moreover, it has also been reported that organic farming provides better yields both in terms of quantity and quality. The practice of scientific crop rotation, seed selection, seed treatment with cow urine and through other time tested methods, use of bio-fertilisers and adoption of pant protection methods without using chemical pesticides not only protects the soil from deteriorating, they also ensure natural resistance of crops against various diseases and pests(Debnath, Yadav, Chakma, Datta, Das, & Ngachan, 2014; Tholkappian, 2014; Ghimire & Dhakal, 2013; Mondelaers, Aertsens, & Van, 2009; TePas & Rees, 2014; Thennarasu & Banumathy, 2011; Yakubu, Moses , & Gladys, 2016; Sudheer, 2013; Reddy, 2010).

Unfortunately not much literature on the organic farming focuses on Odisha although the concept as well as the practice is gaining unprecedented popularity among the farmers. The awareness among the consumer groups is also increasing rapidly. Systematic studies on the comparison of economic factors related to organic and conventional farming in Odisha is scant in number. Some studies, however, highlight the huge scope of organic farming in Odisha for bio-fortification of nutrients in food produced, nutritional security and health reasons (Rukmani, Anuradha, Gopinath, & Kannan, 2018; Krishnaprabu, 2020; Dash & Amardeep, 2018).

The present paper seeks to bridge this gap by making a thorough comparison of the economic outcomes of the organic farming with conventional farming in four blocks of the tribal dominated Koraput district in Odisha. Koraput is one of the most backward and tribal dominated districts of Odisha, with agriculture as the mainstay of the majority of population. Although backward in many parameters of development, the district has been recognised by the Food and Agriculture Organization (FAO) of United Nations with the status of Globally Important Agricultural Heritage Systems (GIAHS) in 2012 for traditional agricultural systems being practiced in in the district. The traditional knowledge of farmers to ensure viability of seeds, using organic means to maintain soil fertility, conservation of genetic resources such as landraces of rice and other planting materials, hereditary transmission of knowledge on farming, tradition of maintaining sacred groves for maintaining plant genetic resources in Koraput are widely acknowledged (FAO, 2012; Sood, 2012).

III. DATA AND METHODS OF ANALYSIS

The objective of the study was to make a comparative analysis of cost and production among organic and conventional farming in the Koraput district of Odisha. Out of 14 blocks of Koraput district, two blocks dominated by organic farming namely Koraput and Kundra and other two blocks dominated by conventional farming namely Semiliguda and Nandapur were selected. Snowball sampling technique was used for selecting a total, 360 sample households operating 180 organic and 180 conventional farming units, through a structured questionnaire.

As per the objective of the study, data on various factors such as net sown area, cost of production, total output, output used for self-consumption, planned inventories, price of inputs and output and net return, etc., were collected from sample households for different crop groups like paddy, millets, pulses and vegetables. Analysis was made on the basis of descriptive statistics. Different variables used in this paper to make a comparative cost and revenue analysis are listed and defined as below.

Gross Value of output (all crops) (GVO) = Sales proceeds + value of output for self-consumption + value of closing stock for different purposes including seeds

Total Sales Proceeds (SALES) = Sales proceeds from all crops in a year

Net Operating Income (NOI) = GVO – operating expenses

Cash income (PROFIT) = SALES – Operating Expenses

Turnover Ratio = GVO/ Value of Assets

Net income per acre = NOI/ land owned in aces

Crop intensity index = Gross Cropped Area / total holding

Crop yield index = Total output per acre from a crop by the farmer / Average output per acre from the same crop from the entire sample

System index for crop =Percent contribution of income from the crop / percent contribution in acreage of the crop

Operating Cost ratio = Operating expenses / GVO

IV. RESULTS AND DISCUSSIONS

Table-1 presents the block-wise descriptive statistics related to total holding and net sown area of different crop groups in the study area. It is observed that the mean holding in the Koraput and Kundra blocks where organic farming practices are followed is marginally higher (4.22 and 4.10 acres respectively) compared to Nandapur and Semiliguda blocks (3.78 and 4.01 acres respectively).

Table-1: Crop wise Net Sown Area, Gross Cropped Area and Total Holding in Study Area (in acres)

Variables	Blocks	Statistics			Kolmogorov-Smirnova test for normality		
		Mean	Std. Dev.	Skew.	Statistic	Df	Sig.
Net Sown Area (Paddy)	Koraput	1.74	0.97	0.26	.131	90	.001
	Kundra	1.74	0.99	0.27	.128	90	.001
	Nandapur	1.59	0.89	0.34	.136	90	.000
	Semiliguda	1.58	0.92	0.43	.135	90	.000
Net Sown Area (Millet)	Koraput	1.30	0.75	0.39	.126	90	.001
	Kundra	1.32	0.76	0.38	.119	90	.003
	Nandapur	1.10	0.65	0.58	.147	90	.000
	Semiliguda	1.12	0.66	0.59	.167	90	.000
Net Sown Area (Pulses)	Koraput	0.86	0.43	0.31	.115	90	.005
	Kundra	0.88	0.44	0.28	.109	90	.011
	Nandapur	0.78	0.36	0.30	.144	90	.000
	Semiliguda	0.80	0.39	0.38	.136	90	.000
Net Sown Area (Vegetables)	Koraput	0.54	0.27	0.36	.135	90	.000
	Kundra	0.54	0.27	0.39	.131	90	.001
	Nandapur	0.47	0.23	0.32	.124	90	.002
	Semiliguda	0.48	0.24	0.41	.132	90	.001
Gross Cropped Area	Koraput	4.44	2.30	0.31	.111	90	.008
	Kundra	4.47	2.28	0.30	.095	90	.043
	Nandapur	3.95	2.04	0.32	.095	90	.042
	Semiliguda	3.98	2.14	0.40	.110	90	.009
Total Holding	Koraput	4.22	1.95	0.28	.123	90	.002
	Kundra	4.10	1.93	0.31	.117	90	.004
	Nandapur	3.78	1.66	0.11	.114	90	.005
	Semiliguda	4.07	1.82	0.43	.122	90	.002

Source: Computed from primary data

However, the net sown area under all the crop groups is higher in blocks practicing organic farming compared to blocks practicing conventional farming. In case of paddy, the average net sown area in organic farming blockswas around 1.74 acres compared to conventional farming blocks (around 1.59 acres

in Nandapur and 1.58 acres in Semiliguda). In case of millets the average net sown area in organic farming blocks is 1.3 acres Koraput and 1.32 acres in Kundra which is higher than 1.10 acres in Nandapur and 1.12 acres in Semiliguda.

The net shown area in case of pulses and vegetables also show that the average land under cultivation of these crops is higher in organic blocks compared to conventional farming blocks. Although, the distribution of the sample across blocks is marginally and positively skewed across net sown areas under different crops, the Kolmogorov-Smirnova test for normality show that in all the cases, these distributions are normal within a 95 per cent confidence interval (sig <0.05). From these results, it can be inferred that the areas where organic farming is practiced, the land utilization rate is better compared to areas where conventional farming is practiced. A possible reason for this phenomenon might be because of the high water requirements for the conventional agricultural practices. Since irrigation is an issue in the area under the study, farms practicing organic agriculture find it easier to operate even with less water. This result is consistent with the findings of many contemporary research works on the issue of water economy in organic farming (Sivaranjani & Rakshit, 2019; Pimentel, Hepperlyi, Hanson, Douds, & Seidel, 2005).

A deeper analysis of land utilization from cropping intensity in the study area develops some further insights. Table-2 presents the statistics on cropping intensity in the study area. Here, cropping intensity is calculated as a ratio of gross cropped area to total holding under the possession of the households instead of the conventional ratio of gross cropped to net sown area. Although a deviation from the conventional methods of agricultural accounting the cropping index followed here, also provides a wider picture of the underutilization of potential cropping. It is worthwhile the note that although the ratio of GCA/NSA would change the numbers the pattern will not change in the ratio of GCA/Holding and the later would also provide a vague indication of the land remaining unutilized in a particular year. It is observed that the cropping intensity is significantly higher is both the blocks practicing organic agriculture compared to the blocks where conventional farming is practiced. Table-2 provides some interesting findings. As evident from the range of cropping intensity, in both organic and conventional blocks, there are farmers who could not utilize their holding to the fullest. However, the minimum level of cropping intensity in organic farms were above 90 per cent compared to less than 25 per cent minimum level in conventional farming blocks. Similarly, there are some farmers who have utilized their land multiple times to have a cropping intensity of more than 330 per cent in organic blocks compared to a highest level of 172 per cent and 118 per cent in blocks practicing conventional farming. Since the organic farming operations do not have standard practices and largely subjective depending on the motivation and the skills of the farmers, we find the variation in cropping intensity is higher in case of organic farming than the conventional farming blocks. The standard deviation of cropping intensity is much higher in organic farming areas compared to conventional farming areas. We found that the distribution is positively skewed in organic farming blocks and negatively skewed in conventional farming blocks. We can infer here that in organic farming areas more number of farmers experience less than average cropping intensity and therefore a positively skewed distribution. On the other hand in

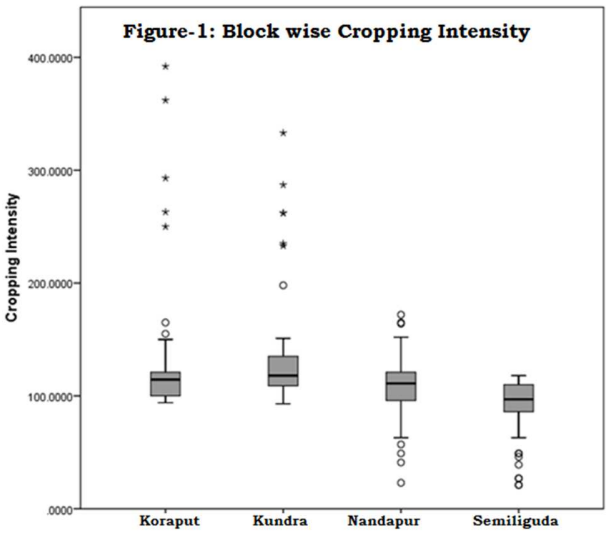
conventional farming areas, the negative skewness would indicate that a majority of the farmers have more than average cropping intensity. The box and whisker plot presented in figure-1 shows that in blocks where organic farming is practiced, there seem to be a lot of extreme outliers who have very high cropping intensity. On the other hand, the outliers in the conventional farming areas are spread across both high and low cropping intensity and at levels much lower than the organic farming areas.

Table-2: Statistics on Cropping Intensity in Study Area

Blocks	Farming Type	Mean	Std. Dev	Min	Max	Skewness
Koraput	Organic	125.8	49.8	94.0	392.0	3.8
Kundra	Organic	130.8	41.5	93.0	333.0	3.0
Nandapur	Conventional	109.6	25.6	23.0	172.0	-0.4
Semiliguda	Conventional	92.5	22.8	21.0	118.0	-1.5

Source: Computed from primary data

A comparison of average cost of production and yield in the study area show us interesting findings from the field. The cost of production (COP) per acre is invariably lower in case of organic farming areas for all crop groups under study. Mean COP for paddy per acre in organic farming blocks is Rs. 11614 compared to Rs. 15395 in case of conventional farming areas. This difference is even stark in case of millets. Compared to the average cost per acre of Rs. 5728 for millet cultivation in organic farming areas, the figure is almost double in case of conventional farming blocks. In case of pulses, there is not much difference in the cost of production and in both these areas pulses are grown during *rabi* season as a cover crop or hedge crop with minimum level of care and expenditure. Still we find that the mean cost of cultivation of pulses in organic farming blocks is lower than the conventional farming fields. Similar is the case with vegetables. Koraput being in the hilly regions get occasional rainfalls during winter and summer. Being largely non irrigated and for the threat of wild animals, the farmers prefer to grow vegetables in small scale only to cater to the needs of self-consumption and local market. Therefore, they do not spend much for vegetable cultivation in our study area. Moreover, a larger part of the fields during winter and summer are utilised for grazing small ruminants like oats and sheep on crop residues of previous crops. Therefore, the utilisation of land for vegetable cultivation is rather low in our study area. Still, we find that there seems to be a marginal difference in the cost of production of vegetables with higher costs in conventional farms. Most of the incremental cost of production in the conventional farms in case of paddy and millets emerge from the use of chemical



fertilisers, pesticides and seeds while the cost of farm operation is almost similar in both types of farms. There is not much difference in the level of mechanisation of the farms of both types. In fact, both types of farming in the study blocks are predominantly labour intensive.

Overall, the average cost of cultivation per acre of cultivated land was around Rs. 6431 in organic farming fields compared to a much higher cost of Rs. 9133 in case of conventional farming. Converted to a figure of cost of production per acre of land holding, the figures are Rs. 7820 for organic farming areas compared to Rs. 9805 in case of conventional farming areas. It is noteworthy here that the difference in the average cost of production per acre of holding is higher than the average cost of production per acre of land cultivated. This phenomenon is more prominent in organic farming areas because the cropping intensity is much higher in organic farming than the conventional farming areas.

Coming to the discussion on yields, on average, the organic farming fields in our study area typically yield 50 kg more paddy per acre, 30 kg more millets per acre, 80 kg more pulses per acre and 106 kg more vegetables per acre than the conventional fields. In terms of per cent the yield rate is around 5 per cent higher for paddy, 3 per cent higher for millets 21 per cent higher for pulses and 9 per cent higher for vegetables in fields practicing organic farming. It is observed that although marginally, the average yield rate is higher in organic fields. On the other hand, the cost of production is significantly lower in organic fields.

Table-3: Differences in Average Cost of Production and Yield in Study Area

Indicators	Type of farming	Mean	Std. Dev
COP per acre (Paddy)	Organic	11614.4	1698.3
	Conventional	15395.2	1686.2
COP per acre (Millets)	Organic	5727.8	1437.8
	Conventional	10464.8	3972.6
COP per acre (Pulses)	Organic	1179.8	195.2
	Conventional	1202.2	147.2
COP per acre (Vegetables)	Organic	889.6	196.4
	Conventional	949.7	173.2
Total COP per acre of Cultivated land	Organic	6431.3	1051.9
	Conventional	9132.9	987.0
Total COP per acre of Holding	Organic	7820.6	4609.0
	Conventional	9805.0	3945.2
Yield per acre (Paddy)	Organic	1037.5	12.5
	Conventional	987.5	2.5
Yield per acre (Millets)	Organic	917.5	17.5
	Conventional	887.5	2.5
Yield per acre (Pulses)	Organic	447.8	100.0
	Conventional	367.8	144.6
Yield per acre (Vegetables)	Organic	1318.1	866.9
	Conventional	1211.8	997.7

Source: Computed from Primary data from the study area.

In order to understand whether these differences in cost of production and yield rate is statistically significant or by chance of our selection of sample, we undertook an independent sample test for all the cost and yield indicators with the null hypotheses of equality of means and equality of variances. The relevant result of the test with the help of SPSS is presented in Table-4. The results of

Levene's Test for Equality of Variances suggest that in case of cost of production of millets, pulses and vegetables and yield rates of rice and millets we reject the null hypothesis of equality of variance. In case of t-test for equality of means we reject the null hypothesis for all variables except the yield rate of vegetables per acre. We may, therefore, infer here that there is evidence to suggest a statistically significant difference in the mean cost of production of paddy, millet, pulses, vegetables and the overall cost of production per acre. We also infer that there exist statistically significant differences in the average yield rates of paddy, pulses and millets. In case of paddy, the average cost of production is between Rs. 3430 to Rs. 4135 lower in case of organic farms compared to conventional farms in 95 per cent cases. In case of millets, the cost of production is between Rs. 4117 to Rs. 5356 lower in organic farms in the organic farms. Overall, the cost of production per acre of land cultivated is between Rs 2490 and Rs. 2913 lower in organic farms than in farms practicing conventional farming.

Table-4: Independent Sample test for differences in Crop-wise Cost of Production and Yield

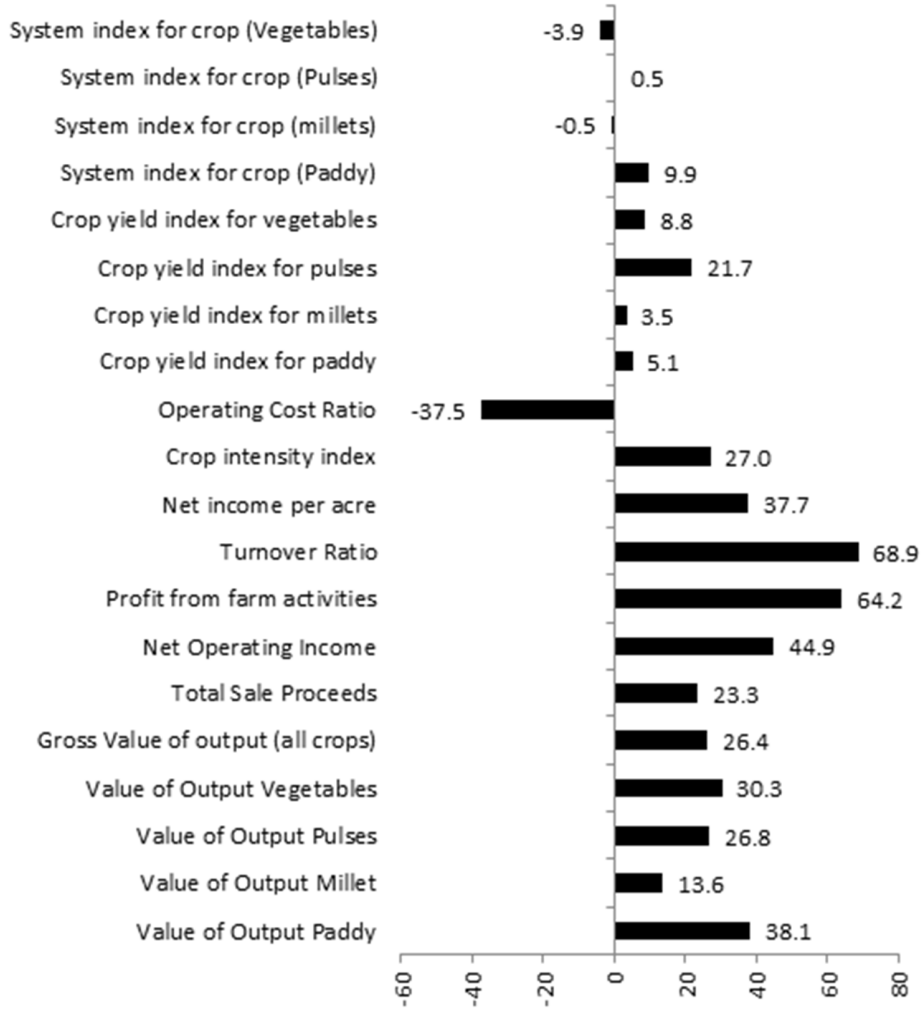
Indicators	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
						Lower	Upper
COP per acre (Paddy)	0.4	0.54	-21.20	358	0	-4131.5	-3429.9
COP per acre (Millets)	100.5	0.00	-15.04	358	0	-5356.3	-4117.7
COP per acre (Pulses)	9.2	0.00	-3.23	358	0.002	-58.2	13.4
COP per acre (Vegetables)	4.2	0.04	-3.08	358	0.002	-98.5	-21.8
COP per acre of Cult. land	0.1	0.80	-25.13	358	0	-2913.0	-2490.1
COP total per acre Holding	1.4	0.24	-4.39	358	0	-2873.7	-1095.1
Yield per acre (Paddy)	98.5	0.00	25.48	358	0	48.1	51.9
Yield per acre (Paddy)	29.5	0.00	22.71	358	0	27.4	32.6
Yield per acre (Pulses)	0.4	0.54	6.10	358	0	54.2	105.8
Yield per acre (Vegetable)	2.0	0.16	1.08	358	0.281	-87.5	300.0

Note: Equal variances assumed

In order to assess the returns and managerial gains and to account for the price differences for organically grown agricultural produce, we undertook the mean comparison of several indicators such as value of output of different crops. The results of mean comparison are presented in Table 5. A summary of these results in terms of per cent of mean difference between organic and conventional farms is presented in figure-2. As we can observe from the figure, the average value of output of paddy is 38 per cent higher in organic farms compared to conventional farms. While the yield rate is higher by only 5 per cent for paddy, such huge difference in the value of output is primarily because of the premium price offered by the consumers for organically grown rice of local varieties. In case of millets, pulses and vegetables also the value of output was higher by 14 per cent, 27 per cent and 30 per cent respectively for farms practicing organic agriculture. In aggregate, the gross value of output is 26 per cent higher in organic farms while total sales proceeds (value of the surplus after accounting for self-consumption and seed inventory) was slightly lower at 23 per cent. This

may be because of the higher proportion of the produce used for seed inventory in organic farming units.

Figure-2: Mean difference (in %) of Managerial Parameters of Organic Farms Vis-à-vis Conventional farms



Source: Computed by authors from field data

The net operating income indicated by the difference between the gross value of output and operating expenses is around 45 per cent higher in organic farms than the conventional farms. At the same time profit from farm activities indicated by the difference between sales proceeds and the operating expenses, is 64 per cent higher in organic farms. The turnover ratio which is a ratio of gross value of output to the value of productive assets was 68 per cent higher in organic farms. Net income per acre is 38 per cent higher in organic farms. It can be observed that the increment in net income per acre is less than the increment in profit and the turnover ratio in organic farms (38 per cent compared to 64 per

cent higher profit and 68 per cent higher turnover). This is primarily because of the larger holdings in organic farm units.

Table-5: Managerial Indicators of Farms under Organic and Conventional Regime

Indicators	Type of Farm	Mean	Std. Deviation
Value of Output (Paddy)	Organic	50271	28595
	Conventional	36395	23795
Value of Output (Millet)	Organic	46143	26527
	Conventional	40603	23716
Value of Output (Pulses)	Organic	29819	11447
	Conventional	23510	10465
Value of Output (Vegetables)	Organic	25763	9717
	Conventional	19770	8458
Gross Value of output (all crops)	Organic	151995	70959
	Conventional	120278	58771
Total Sales Proceeds	Organic	87889	41140
	Conventional	71272	35718
Net Operating Income	Organic	122706	55515
	Conventional	84695	41115
Profit	Organic	58599	25818
	Conventional	35690	18171
Turnover Ratio	Organic	17.52	6.97
	Conventional	10.37	8.37
Net income per acre	Organic	33667	14552
	Conventional	24454	11788
Crop intensity index	Organic	128.31	51.24
	Conventional	101.04	48.09
Operating Cost Ratio	Organic	0.183	0.038
	Conventional	0.293	0.046
Crop Yield Index (paddy)	Organic	1.025	0.012
	Conventional	0.975	0.002
Crop Yield Index (millets)	Organic	1.017	0.019
	Conventional	0.983	0.003
Crop Yield Index (Pulses)	Organic	1.098	0.245
	Conventional	0.902	0.355
Crop Yield Index (Vegetables)	Organic	1.042	0.685
	Conventional	0.958	0.789
System index for crop (Paddy)	Organic	0.989	0.105
	Conventional	0.900	0.301
System index for crop (millets)	Organic	0.989	0.105
	Conventional	0.994	0.129
System index for crop (Pulses)	Organic	1.022	0.148
	Conventional	1.017	0.224
System index for crop (Vegetables)	Organic	1.356	0.706
	Conventional	1.411	0.691

The cropping intensity is 27 per cent higher in organic farms and operative cost ratio (i.e., operating expenses / gross value of output) is 37 per cent higher in organic farms. In previous sections we had already discussed the higher yield rates of organic farms. The yield rates are higher in organic farms compared to conventional farms for all the crop groups.

Table-6: Independent Samples Test for Difference in Managerial Parameters for Organic and Conventional Farming

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	Sig. (2-tailed)	95% Confidence Interval of the Difference	
					Lower	Upper
Value of Output Paddy	8.97	0.00	5.00	0.00	8422.4	19328.3
Value of Output Millet	2.72	0.10	2.09	0.04	323.7	10755.40
Value of Output Pulses	1.89	0.17	5.46	0.00	4036.1	8583.10
Value of Output Vegetables	3.81	0.05	6.24	0.00	4104.6	7881.30
Gross Value of output (all crops)	7.92	0.01	4.62	0.00	18211.8	45223.10
Total Sale Proceeds (All Crops)	4.48	0.04	4.09	0.00	8630.2	24602.50
Net Operating Income (All Crops)	17.51	0.00	7.38	0.00	27884.1	48136.60
Profit from All Crops	20.33	0.00	9.74	0.00	18281.4	27537.10
Turnover Ratio	21.31	0.00	8.81	0.00	5.6	8.70
Net income per acre	0.78	0.38	6.60	0.00	6467.8	11958.00
Crop intensity index	5.63	0.02	6.97	0.00	19.6	34.56
Operating Cost Ratio	1.98	0.16	-24.56	0.00	-0.1	-0.10
Crop Yield Index-Paddy	22.80	0.00	52.48	0.00	0.0	0.10
Crop Yield Index-Millet	27.90	0.00	22.71	0.00	0.0	0.00
Crop Yield Index-Pulses	0.36	0.55	6.11	0.00	0.1	0.30
Crop Yield Index-Vegetables	1.99	0.16	1.08	0.28	-0.1	0.20
System index for crop (Paddy)	65.63	0.00	3.74	0.00	0.0	0.14
System index for crop (millets)	0.00	0.99	-0.45	0.66	0.0	0.02
System index for crop (Pulses)	1.34	0.25	0.28	0.78	0.0	0.05
System index for (Vegetables)	0.74	0.39	-0.75	0.45	-0.2	0.09

Note_ DF=358

Source: Computed by authors from field data

Figure-2 also gives us the information on the difference of system indices of organic and conventional farming for different crops. As mentioned in the section on methodology, we compute the system index of a crop as a ratio of the contribution of the crop to total farm income in per cent to the land resource use by the crop in per cent.

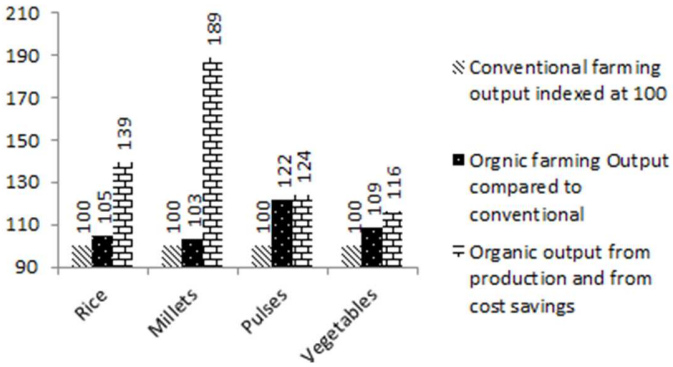
$$System\ Index\ for\ crop(x) = \frac{Income\ from\ the\ crop\ (x) as\ \%\ of\ total\ farm\ income}{Land\ devoted\ for\ the\ crop(x) as\ \%\ of\ total\ land}$$

A higher value of the index indicates higher efficiency of the farmer or farming unit in the specific crop. In other words the index measures the income relative to use of land resources. As observed from Table-5 as well as figure-2, the system indices of organic farms for paddy and pulses are higher than the conventional farms and the same for millets and vegetables are lower in organic farms. This indicates that to produce vegetables and millets the organic farms in study blocks use more land than the conventional farms. The reason for this might be the typical practice of having larger spaces between rows of plants in organic farms to facilitate manual pest management and weed management

activities in vegetables and millets. However, further research is needed to study this adequately.

To understand if these differences are statistically significant, we undertook an independent sample test with the null hypotheses of equality of variance and means of indicators of managerial parameters observed in organic and conventional farming units. The results of such exercise with the help of SPSS are presented in Table-6. In case of indicators such as value of output for paddy, ross value of output, total sales proceeds, net operating income, turnover ratio, profits, crop intensity and system index for paddy, we reject the null hypothesis of equality of variance. In case of mean differences, except for crop yield index of vegetables and the system indices for millets, vegetables and pulses, we reject the null hypothesis of equality of means for all the indicators studied. During our literature survey, we also came across many studies that observed that the productivity of organic farms is less than conventional farms. However, many such studies are subjective opinions of the researchers published in popular media (Varanasi, 2019; Lardieri, 2018).

Figure-3: Differences in Output of Crop Groups from Conventional (=100) and Organic Farms



Our study contradicts the myth that organic farming is less productive than conventional farming. In fact the present study found that the yield per acre in organic farms is not only more than conventional farms, if we use the savings made in cost of production for purchasing organically grown products at cost price, the benefits of organic farming will far outweigh the conventional farming. An indicative comparison different crop groups covered in our study is presented in figure-3. Figure-3 shows that while the actual output differential in paddy is only 5 per cent in favour of organic farming, if we use the cost savings for procuring organic paddy at cost price, then the difference is 39 per cent in favour of organic farms. In other crop groups also we observed huge benefits in organic farms compared to conventional farms.

V. CONCLUSION

The primary objective of the paper was to present a comparative analysis of cost and production among organic and conventional farming in selected blocks of Koraput district of Odisha. The findings of the study showed that organic farming has a distinctive advantage over the conventional farming in terms of reduced costs and increased returns. In the analysis made in the forgoing, we have observed that not only the returns are higher because of premium price, even the output was higher in organic farming compared to conventional farming. The study undertaken in Koraput for the crop groups such as paddy, millets, pulses and vegetables contradicts the myths related to lower productivity of organic farms. The higher profit and income of the farmers practicing organic farming in our study area indicates that in places where traditional methods of farming are still under use, instead of promoting indiscriminate use of chemical

fertilisers and synthetic pesticides for increasing productivity, efforts should be made to introduce and impart knowledge on emerging ideas and inputs related to organic farming. The study concludes that there is sufficient evidence to suggest supremacy of organic farming on account of reduced cost of production and huge potential for increased returns from agriculture.

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