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Comparative Economics of Organic and Inorganic Paddy in Amritsar District of Punjab

Sukhchandan Singh, Lavleen Kaur and Amanpreet Singh

PG Department of Agriculture, Khalsa College, Amritsar

Abstract

The study analyzed and compared the cost and profitability of organic and inorganic paddy growers in the Amritsar district. In the present study, three farmers and two institutions practicing paddy's organic farming and 60 inorganic paddy growers were interviewed for the study. Percentages, averages, and multiple regression analysis were used for the analysis of the study. The variable cost of production for organic paddy growers was 15.71 percent less than the yield of inorganic paddy growers but the yield was 26 percent less for organic paddy growers than inorganic paddy growers. Net returns of paddy organic growers were 36 percent higher than the net returns of paddy inorganic growers in the study area.Marketing patterns for organic paddy growers involved advertisements, social networks, or personal contacts which was a major hindrance in organic farming reported by paddy organic growers in the study area. Regression analysis revealed that factors affecting value productivity of paddy organic growers were operated area, labor, FYM, and Agni Astra, and factors affecting value productivity of inorganic paddy growers were laser leveling, plant protection spray, and DAP. The main problems faced by organic paddy growers were lack of proper marketing facilities for organic produce, low yield of organic produce, non-availability of biopesticides, and lack of training/extension facilities. The study suggested that to solve the problem of marketing organic produce, farmers in the nearby areas form an association to market their produce. Separate social network groups can be formed for the organic farmers where the organic farmers can share their experience, problems, and future course of action regarding organic produce. Certification of organic produce may be made easy for paddy organic farmers. The subsidy may be given by the government on inputs of organic farming to lower its cost of cultivation.

Keywords: Paddy, organic, in organic, yield, farm inputs, marketing

JEL Classification: Q10, Q50, Q56

Introduction

Punjab is known as the food bowl of India. It is the largest contributor of wheat and rice to the central pool of food grains. The state has a total geographical area of 50.36 lakh hectares out of which almost 83 percent is under cultivation with a cropping intensity of 189 percent. Agriculture in the state is highly intensive in terms of the use of land, capital, energy, and all other agricultural inputs, including irrigation. With only 1.53 percent of the geographical area of the country, the state contributes 13-14 percent towards the food grain production in the country (GoP, 2018-19). This increase in agricultural production has been at the cost of unsustainable use of resources like land, water, and chemical inputs, the externalities of which are being felt now. The adverse effects of intensive use of chemicals (fertilizers as well as pesticides) in agriculture have been realized more than ever before in terms of escalating costs, decelerating soil fertility, etc. The Malwa region of Punjab of the country, is facing an unprecedented crisis of environmental health linked to indiscriminate, excessive, and unsafe use of pesticides, fertilizers, and poor groundwater quality. The region has been described as India's "cancer capital" due to an abnormally high number of cancer cases, which have increased 3-fold in the last 10 years. The state, in turn, uses 17 percent

Corresponding author email: laveleenkaur@khalsacollege.edu.in

of the total pesticides applied in India. The high use of pesticides, along with environmental and social factors, is responsible for the high concentration of pesticide residues in the food chain of this region (Singh *et al*, 2017).People support now chemical-free agricultural production using organic manure and inputs. Some farmers have even started adopting organic farming in the state, though on a smaller scale.

Organic farming is a method of a farming system which primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (bio-fertilizers) to release nutrients to crops for increased sustainable production in an eco-friendly pollution-free environment (Narayanan, 2005; Makadia and Patel, 2015). Conventional agriculture goes better with large holdings, organic farming functions better in small farms. As the farm size increases, the advantages of organic rotation become less visible. On a smaller scale, organic farming was more profitable and productive than conventional farming (Gupta and Verma, 1997).

The potential of organic farming in generating socially and environmentally beneficial effects is enormous. However, it is essential to assess its performance in terms of its economics which ultimately influences the adoption of any technology. Organic farming could give higher or equal yields of different cropping systems compared to chemical farming after an initial period of three years (Ramesh *et al*, 2005). The so-called transition effect, in which the yield declines in the first 1-4 years of transition to organic agriculture, follows a yield increase when soils develop the adequate biological activity. Comparative economics of Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) has favored OFS, in terms of both higher yield as well as profitability (Thakur and Sharma, 2005). However, much work has not been done on various economic aspects of organic farming/produce with regards to input-use patterns, potential yield, profitability to farmers, etc. in the state. Therefore, the present study was taken up with the following specific objectives in Amritsar district of Punjab to study the socio-economic characteristics of respondents, to study the productivity and profitability of organic and inorganic paddy cultivation in Amritsar district and to identify various factors affecting the value productivity of organic as well as inorganic paddy in this district.

Data Sources and Methodology

The study was mainly confined to the Amritsar district. Paddy crop was selected as it occupies almost 40 percent of the gross cropped area of Punjab. Paddy (Basamti) - PUSA 1121 variety was chosen for the present study.

The list of farmers/institutions adopting organic farming was taken from Kheti Bhawan Amritsar. Overall there were five farmers/institutions adopting paddy organic farming. As the sample size for organic paddy was too small the whole population was selected. There were three farmers and two institutions who practiced organic farming in paddy. Only those farmers/institutions were selected who were practicing organic paddy farming commercially. Those farmers were not selected who adopted organic paddy farming for domestic use only. Two institutions i.e. Khalsa College, and Bhagat Puran Singh Farm were practicing organic paddy farming for many years. Khalsa College, Amritsar was practicing paddy organic farming since 2014 and Bhagat Puran Singh Farm was practicing organic paddy farming since 2006. Three farmers who were practicing organic farming were practicing for eight years, five years and four years respectively.

For comparative analysis between organic and inorganic paddy, a random sample of sixty inorganic growers were chosen. Two blocks i.e. Verka and Atari were selected. From selected two blocks further two villages Dhodiwind and Dhaul Kalan were selected randomly. From selected villages, farmers producing inorganic paddy were selected at the third stage. Overall sixty farmers were chosen from two villages. Farmers were not selected on the basis of farm categories. They were selected randomly irrespective of their farm size. Both primary and secondary data were used in the study.

The primary data information about the size of operational holding, human labor, seed, fertilizer, pesticides, insecticides, machinery, area, production, the productivity of paddy crop was collected from the selected organic and inorganic farmers and also the data related to the age, education and family size were taken into account to study socio-economic characteristics of the selected farmers. The secondary data on Punjab agriculture were taken from Statistical

Abstract of Punjab, Statistical Abstract of India, Economic Survey, and other published reputed sources.

The data regarding inputs were analyzed by using tabular methods to study the productivity and profitability of organic and inorganic paddy in the Amritsar district of Punjab. For achieving the third objective i.e. to identify various factors affecting value productivity of organic as well as inorganic paddy in Amritsar, the Cobb-Douglas function was used which is specified below:

$$\log Y = \log A + b_1 \log x_1 + b_2 \log x_2 + \ldots\ldots\ldots + b_n \log x_n + u$$

Results and Discussion

In the crop production process, the output is the integrated result of several inputs involved in different preparations. Therefore to study the economics of any enterprise, it is necessary to evaluate the share of various components in total expenditure involved in the production process.

In this Table, an attempt has been made to work out the expenditure on different variable inputs in the production of organic paddy by the respondents. The cost of seed, farmyard, manure, vermi-compost, Agni Astra, waste decomposer came out to be Rs 310, Rs 1490, Rs 480, Rs 224, Rs 62 for selected organic farmers. The cost of laser leveling came out to be Rs 400 per year for sampled organic growers. The marketing cost for organic paddy was Rs 450. The cost of tractor use was Rs 1985 per acre which involved all the operations such as preparatory tillage, ridge making, etc. The cost of labor came out to be Rs 2455 which came out to be 18 per cent of total input involved in paddy cultivation. Labor cost was higher on organic farms because most of the farm operations were done manually which included intercultural practices, field preparations, fertilizer application, pesticide application, etc. The average variable cost came out to be Rs 13196 for selected organic farmers.

The share of transplanting cost, laser leveling cost, tractor cost, and seed cost in total variable cost of paddy production among organic and inorganic farmers were same in the study area. In the case of organic paddy, cost of labour was highest i.e. Rs 2455 per acre and it was higher by Rs 1355 than sample inorganic paddy growers (Table 1). Herbicides were not used in organic paddy. Pesticides were used by inorganic farmers and Agni astar were used by organic farmers. The cost of Agni astar was less by Rs 2046 by organic farmers than the cost of pesticides used by inorganic farmers. Waste decomposer was used by organic farmers and it cost Rs 62 per acre only whereas fungicide was used instead by inorganic farmers which cost Rs 1780 per acre in the study area. Farmyard manure was used by organic farmers which cost Rs 1490 for organic growers whereas Rs 1291 was the cost of urea and DAP by inorganic farmers. Urea and DAP are available to inorganic farmers on subsidy by the government. There was not much difference in Vermi-compost cost used by organic farmers and micro-nutrients cost used by inorganic farmers in the study area. Harvesting cost was high among organic paddy growers than inorganic paddy growers. It was higher among organic farmers as some organic farmers/institutions harvest the crop manually. Marketing cost was also higher among organic paddy growers as farmers have to market the produce in the far away areas. For inorganic paddy traditional system of marketing was used. The main difference in the cost of production among organic and inorganic paddy growers was of inputs used such as herbicides, pesticides, fungicides, etc.

Comparative analysis of cost and return from organic and inorganic paddy cultivation shows that the productivity of organic paddy was 15 quintals as compared to 21 quintals of inorganic paddy (Table 2). The price received for organic paddy was Rs 4050 per quintal as compared to Rs 2700 per quintal for inorganic paddy. The study revealed that all the three farmers had received return over for the period of three years. Instead of selling paddy they sold rice for Rs 110 in packings of two kg, five kg, depending upon the need of the consumers. The marketing of paddy was a challenging task for farmers. But the Organic rice was easily marketed by Khalsa College. Bhagat Puran Singh farm who practiced organic farming did not market their produce as the produce was utilized by the various branches of institution spreading over Amritsar, Manawala, Pandori, Jalandhar, Chandigarh, Goindwal, and Sangrur.

Gross returns were Rs 69162 for organic growers and Rs 56700 for inorganic paddy growers. The absolute difference in gross returns was Rs 12462. The total variable cost of organic paddy was Rs 2502 less than inorganic paddy growers. Net returns were higher by Rs 14966 in organic paddy than inorganic paddy.

In Punjab, the certification of organic produce

Table 1. Comparative cost of production for organic paddy and inorganic paddy in Amritsar district

Variables	Organic paddy	In-organic paddy	Absolute	Percent
Transplanting	3100 (23.49)	3100 (19.45)	0	0.00
Laser leveling	400 (3.03)	400 (2.51)	0	0.00
Labour	2455 (18.60)	1100 (6.90)	1355	123.18
Tractor	1985 (15.04)	1980.45 (12.42)	0	0.00
Seed	310 (2.35)	321.51 (2.01)	-11.51	3.57
Herbicides	0	1225.01 (7.68)	-1225.01	0.00
Pesticide/Agni astar	224 (1.69)	2270 (14.24)	-2046	90.13
Waste decomposer/ Fungicide	62 (0.45)	1780 (11.17)	-1718	96.51
Urea+ DAP/FYM	1490 (11.29)	1291.12 (8.10)	198.88	15.40
Vermi-compost/ Micronutrient	480 (3.68)	580.25 (3.64)	-100.25	17.27
Harvesting	1700 (12.88)	1180.35 (7.40)	-519.65	44.02
Transportation	540 (4.09)	505.10 (3.16)	34.9	6.90
Marketing cost	450 (3.41)	200.41 (1.25)	249.59	124.53
Total variable cost	13,196 (100.00)	15934.2 (100.00)	-2399.2	15.05

Figures in the parenthesis indicate the percentage of the total

was given by Punjab Agro. Two organic farmers got certification by Punjab Agro for selling their produce in the market (Table 3). One of the farmer sold his produce without a certification from Punjab Agro. Khalsa College was not a certified producer of organic produce whereas Bhagat Puran Singh farm got certification for organic farming.

All the three farmers marketed their products through social media, advertisements, Kisan hut, and through their contacts. Khalsa College Amritsar sold their organic produce through a shop located in the college campus itself. Bhagat Puran Singh farm did not sell their produce as all of it was consumed at their Pingalwara centers all over Punjab.

The multiple linear regression model was used to specify the factors affecting the value productivity of organic and inorganic paddy in the study area. Different independent variables were considered for regression analyses. The different explanatory variables were operated area, laser levelling, labor, tractor, seed, FYM, plant protection spray, Agni astar, urea, micronutrient, DAP, and harvesting (Table 4).

Organic paddy

The coefficient of multiple regression R^2 for organic paddy was 0.944 indicating that 94 percent variations in the organic paddy yield were explained by the independent variables taken together in the model. The analysis revealed that the 1 per cent increase in expenditure of labor, FYM, and agni astra, would increase the value productivity by 0.119, 0.289, 0.727,

Table 2. Return from organic and inorganic paddy cultivation

Particulars	Organic paddy	Inorganic paddy	Absolute difference	Percent
Productivity (q/acre)	15.4	21	-5.6	26.66
Price received (Rs/q)	4050	2700	1350	50
Gross return (Rs/acre)	69,162.5	56,700	12,462.5	21.97
Total variable cost	13,430	15934.2	-2504.2	15.71
Net returns (Rs/acre)	55,732	40,765.8	14966.2	36.71

Table 3. Certification status and marketing of organic produce by organic farmers/institutions in Amritsar district

Farmers	Certification status	Marketing pattern
Organic grower 1	Certified (Punjab agro.)	Social groups, Advertisements, personal contacts
Organic grower 2	Certified (Punjab agro.)	Social groups, Advertisements, Kisan hut
Organic grower 3	Not certified	Whatsapp group, personal contacts
Institutions		
Bhagat Puran Singh farm	Certified (Punjab agro.)	Consumed on Bhagat Puran Singh centres
Khalsa college	Not certified	Shop located on the Khalsa college farm, Advertisement

and 0.190 respectively showing a significant impact on value productivity. The regression coefficient of other variables viz. laser leveling, tractor, seed, and harvesting have not shown any significant impact on the value productivity of organic paddy.

Inorganic paddy

The coefficient of multiple regression R^2 for inorganic paddy was 0.925 indicating that 92 percent variations in inorganic paddy yield were explained by the independent variables taken together in the model. Various determinants of value productivity of inorganic paddy revealed that one percent increase in the cost of laser leveling, plant protection spray and DAP would increase the value productivity of inorganic paddy by 0.419, 1.206, and 0.345 respectively. The regression coefficient of other variables viz. operated area, labor, tractor, seed, FYM, urea, micronutrient, and harvesting have not shown any significant impact on the value productivity of the inorganic paddy.

In the Amritsar district, three farmers and two institutions were practicing organic farming. Problems being faced by sampled inorganic farmers differ among farmers and Institutions in the study area. The main problem being faced by organic farmers were low yield, non-availability of biopesticides, lack of resistant varieties, lack of proper marketing, and late returns, as all the selected organic farmers reported it as a major hindrance in organic farming(Table 5). Regarding problems faced by institutions, insufficient availability of vermi-compost, lack of resistant varieties, and non-availability of bio-pesticides were the major problem being faced by the institutions. The second major problem being faced by institutions were low yield, lack of specific bio-fertilizer for a specific crop, lack of technical knowledge by extension agencies, Organic certification is a very lengthy process, Lack of proper marketing of organic produce, High cost of cultivation, and late returns over 2-3 years.

Conclusion and Policy Implications

The variable cost of production for organic paddy growers was 15.71 percent less than the yield of inorganic paddy growers but the yield was 26 percent less for organic paddy growers than inorganic paddy growers.Net returns of paddy organic growers were 36 percent higher than the net returns of paddy inorganic growers in the study area.The high net return of organic paddy involved difficult and challenging marketing of organic paddy in the study area.Marketing patterns for organic paddy growers involved advertisements, social networks, or personal contacts which was a major hindrance in organic farming reported by paddy organic growers in the study area.Regression analysis revealed that factors affecting value productivity of paddy organic growers were operated area, labor, FYM,

Table 4. Regression analyses for organic and inorganic paddy cultivation by organic growers in Punjab

Dependent variables Value productivity Explanatory variables	**Estimate organic paddy**	**Estimate inorganic paddy**
Constant	15.297(.000)	-2.016(.676)
Operated area	0.119(.029) *	0.23(.275)
Laser Leveling	0.049(.824)	0.419(.009) *
Labour	0.289(.083) *	0.027(.841)
Tractor	0.074(.635)	-0.034(.848)
Seed	0.168(.557)	-0.319(.080)
FYM	0.727(.000) *	-0.011(.856)
Plant protection spray	_	1.206(.002) *
Agni astar	0.190(.022) *	_
Urea	_	-0.591(.014)
Micro nutrient	_	-0.496(.023)
DAP	_	0.345(.006) *
Harvesting	-0.217 (.548)	-0.286(.318)
R^2	0.944	0.925

** represents significance at 5 per cent level, figures in brackets indicate standard errors*

Table 5. Problems faced by Organic growers in the study area

Reason	**Farmers**	**Institutions**
Low yield	3(100)	1(50)
Insufficient availability of vermi-compost	1(33.3)	2(100)
Lack of specific bio-fertilizer for a specific crop	2(66.6)	1(50)
Lack of resistant varieties	3(100)	2(100)
Non-availability of biopesticides	3(100)	2(100)
Lack of technical knowledge by extension agencies	2(66.6)	1(50)
Lengthy certification process	3(100)	2(100)
Lack of proper marketing facilities for organic produce	3(100)	1(50)
High cost of cultivation	1(33.3)	1(50)
Late returns over 2-3 years	3(100)	0(0.0)
Lack of training in organic farming	3(100)	0(0.0)
Total no. of Farmers/Institutions	3	2

Figures in the parentheses indicate percentages to the total

and Agni astra, and factors affecting value productivity of inorganic paddy growers were laser leveling, plant protection spray, and DAP. The main problems faced by paddy organic growers in the study area were lack of proper marketing of facilities for organic produce, low yield of organic produce, non-availability of biopesticides, and lack of training/extension facilities in the study area. The study suggested that to solve the problem of marketing organic produce organic farmers in the nearby areas join together and form an association to market their produce. Separate social network groups can be created for the organic farmers where the organic farmers can share their experience, problems, and future course of action regarding organic produce. Certification

of organic produce should be made easy for paddy organic farmers. The subsidy should be given by the government on inputs of organic farming to lower the cost of cultivation of organic paddy in the study area.

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