



# An Economic Analysis of Organic Farming for Sustainable Agriculture and Facing the Constraints by Organic Farmers of Uttarakhand

Dr. Awadhesh Narayan Shukla<sup>1,\*</sup>, Dr. Sarju Narain<sup>2</sup> and Dr. Ajay Kumar Tripathi<sup>3</sup>

<sup>1</sup>Assistant Professor, Agricultural Economics, Brahmanand P.G. College Rath, Hamirpur, U.P., India

<sup>2</sup>Associate Professor Agril. Extension, Brahmanand P.G. College, Rath-210431, Hamirpur, U.P., India

<sup>3</sup>Assistant Professor, College of Agriculture, G.B. Pant University of Agriculture & Tech. Pantnagar-263145, Uttarakhand.

\*Corresponding author: [dr.shuklaan@gmail.com](mailto:dr.shuklaan@gmail.com)

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**Abstract**— *Introduction: Agriculture is carried out mainly through three types of farming systems namely, natural farming system, inorganic farming system and organic farming system characterized by the different types of inputs and agricultural management practices used for cultivation of land and production of crops. Context: Green revolution brings several changes in agriculture production system via inorganic farming which promotes unsustainable practices for ecosystem and human health. Therefore organic farming practices are more prefer by farmers for obtaining better price. Objectives: In this context it is necessary to find out the economics of major crops grown under Organic Farming System and identify the constraints of production in hilly region of Uttarakhand as compare to Inorganic friendly farmers. Method: A purposive study was conducted in district Tehri - Garhwal and Almora under hill state of Uttarakhand. The result is based on the randomly selected 120 farmers (60 Organic Farming System Farmers and 60 Inorganic Farming System Farmers) interview. The costs of production of different crops have been worked out by using the standard cost concepts with suitable statistics. Results & Discussion: The gross as well as net income or profit of different crops increased significantly by two to three times under organic farming system whereas they remained stagnant and even declined under inorganic farming system over the years. The costs of production of crops per hectare and per quintal under organic farming system are lower than under inorganic farming system. Gross and net incomes or profits are nearly 2 times higher under organic farming systems. Overall organic farming system produces more and sustainable agriculture output with less energy, low cost and fewer resources with many constraints.*



**Keywords**— *organic farming, Economic Analysis, Constraints, Sustainable Agriculture.*

## HIGHLIGHTS

- Organic farming System having less cost of production per hectare and per quintal as compare to Inorganic Farming System. Therefore, gross and net incomes were nearly two times higher under organic farming systems.
- Organic farming system produces safer and sustainable agriculture output with fewer resources utilization.

- Constraints related to scarcity of bio based production inputs and Poor knowledge about Organic certification were the pinpointed by the farmers.

## I. INTRODUCTION

Agriculture and food security are the most important concern in 21st century. Agriculture is carried out mainly through three types of farming system namely

natural farming system inorganic farming system and organic farming system characterized by the different types of inputs and Agriculture management practices used for cultivation of land and production of crops. The natural farming system is considered as a primitive and extensive farming system giving low production and income. It is found that inorganic farming system over the years burns the soil organic matter and soil microorganisms rendering lifeless and unfertile nature of soil. This had resulted in stagnation and declining in the yield of crops. The chemical inputs used in inorganic farming system are costly and lead to contamination and pollution of natural resources like soil water air and other natural resources of ecosystem and also harm to health of living being including human. As our health is directly connected to the health of the food we eat an ultimately to the health of the soil (Lockie, *et.al*, 2006). As such, there is a strong feeling world-over that the solution of this problem and ills of the inorganic farming system now lies in organic farming. According to the FAO, organic agriculture is a system that relies on ecosystem management rather than external agricultural inputs such as synthetic fertilizers and pesticides. India backed by a legacy of organic farming markets and there is an urgent need to promote organic farming in order to increase exports. The increasing demand for organic food products in developed countries and the extensive support for organic farming by the Indian government (Chandrashekhara, 2010) may be seen as the key driver for this development. Attitude is one of the constructs which is very difficult to measure directly. Several psychometric methods of measurement of attitudes have been developed over a period with various advantages and limitations. In the quest to make Ladakh, an organic Union Territory, and several efforts are already in progress. (Huria et al. Indian Res. J. Ext. Edu. 23 (3), July-September, 2023)

According to ministry of Agriculture Government of India the country is divided into three categories in which Uttarakhand State has been placed in first category where the consumption of chemical fertilizers is less than the other states. The state has a large number of certified organic farmers who are supported by the promotion of organic farming as well as with the help of a well developed organization structure for marketing of organic crop products. The total area under organic farming in Uttarakhand is about 16158.86 hectare. The farmers have already made a significant contribution in the field of organic farming and farmer to farmer transfer of technology helps in domestic and export market potential for organic products. Conversion to small organic farms is more profitable and would lead to sizeable increases of food production worldwide. (Satyajeet *et. Al.* 2018). In this

regards it is necessary to understand the production economics and constraints of the organic farming system. However, the work done and know edge available on economics of production of organic produce in general and for the produce of hills in particular. In this context it is necessary to find out the following research objectives in the districts Almora and Tehri-Garhwal of Uttarakhand.

1. To study the Comparative economics of major crops grown under Organic Farming System (OFS) *vis-à-vis* Inorganic Farming System (IFS) over the years.
2. To find out the major constraints faced by farmers of the study area.

## II. METHODOLOGY

The purposive study was conducted in hill state of Uttarakhand. The data from farmers have been collected from tahsil Chamba of district Tehri - Garhwal and tahsil Almora from district Almora to work out the economics of production of crops and find out the constraints faced by farmers in the study area. Total 120 farmers (60 OFS Farmers and 60 IFS Farmers) for research work were selected from five villages in tehsil Chamba and five villages from tehsil Almora by the random sampling technique with probability proportion to the total households. In the study area maize, wheat, rajmah and pea crops were grown both under organic farming system and inorganic farming system with recommended package of practices.

The data have also been collected, analyzed and presented. The study was carried out for the year during 2018-19, 2019-20 and 2020-21. The costs of production of different crops have been worked out by using the standard cost concepts as follows.

Cost<sub>A1</sub>: All actual expenses in cash and kind incurred in production by the producer. The items covered in Cost A<sub>1</sub> are:

1. Cost of hired human labor.
2. Cost of hired bullock labor.
3. Cost of owned bullock labor.
4. Cost of hired machine power
5. Cost of home produced /purchased seed
6. Cost of plant protection chemicals
7. Cost of home produced /purchased manure.
8. Cost of fertilizer.
9. Depreciation on farm machinery, equipments and building.
10. Cost of irrigation.

### III. RESULTS

A comparative economics of crops grown under organic farming system vis-à-vis inorganic farming system are presented in table-1. Maize in kharif and wheat in rabi season are the most important crops grown by the farmers in the hills. Maize and wheat cultivation was followed by the cultivation of peas and rajmah as well as intercropping of rajmah and peas, respectively. In addition to these crops; vegetable crops were also grown in the study area. It is found that the yield, total production, income and profit of crops increased under organic farming system over the years. The gross as well as net income or profit different crops increased significantly by two to three times under organic farming system whereas they remained stagnant and even declined under inorganic farming system over the years. Furthermore, organic products fetch very high premium prices in the market from the consumers which are often as high as 2 to 3 times more than that of the inorganic produce which makes organic farming a high profitable enterprise.

11. Land revenue, land development tax and other taxes.
12. Interest on working capital
13. Miscellaneous expenses

Cost A<sub>2</sub>: Cost A<sub>1</sub>+ rent paid for leased in land

Cost B<sub>1</sub>: Cost A<sub>1</sub>+ interest on the value of owned capital assets (excluding land)

Cost B<sub>2</sub>: Cost B<sub>1</sub>+ imputed rental value of owned land (Net of land revenue) and rent paid for leased in land.

Cost C<sub>1</sub>: Cost B<sub>1</sub>+Imputed value of family labor.

Cost C<sub>2</sub>: Cost B<sub>2</sub>+ Imputed value of family labor.

Cost C<sub>2</sub>\*: Cost C<sub>2</sub> worked out at actual wage rate or statutory minimum wage rate, whichever is higher.

Cost D: Cost C<sub>2</sub>\*+ 10 per cent of Cost C<sub>2</sub>\* (on account of managerial functions performed by farmer. The consumption of cost of production was done on the basis of the input and output prices prevailing in the study area during the period of study.

Table 1: Comparative Economics of crops grown under Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) over the years.

Particulars	2018-19		2019-20		2020-21	
	OFS	IFS	OFS	IFS	OFS	IFS
<b>Maize</b>						
Cost A <sub>1</sub>	8327.85	10284.81	8371.82	10343.09	8657.09	10451
Cost B <sub>1</sub>	8827.52	10901.89	8874.12	10963.67	9176.51	11078.06
Cost B <sub>2</sub>	11881.52	14069.89	12138.12	14233.67	12546.51	14358.06
Cost C <sub>2</sub>	14686.52	16627.89	15045.12	17344.67	15708.51	17622.06
Yield (qt/ha)						
Grains	41.8	39.1	56.4	46.4	58	45.2
Straw	80.3	76.6	109.3	85.5	110	88.7
Price obtained by the farmers Rs./qt.						
Grain	840	480	910	550	950	610
Straw	140	125	150	125	170	135
Gross Income	46354	28343	67719	36207.5	73800	39546.5
<b>Net Income or profit (Rs/ha)</b>	<b>31667.48</b>	<b>11715.11</b>	<b>52673.88</b>	<b>18862.83</b>	<b>58091.49</b>	<b>21924.44</b>
<b>Total Cost/ha</b>	<b>14686.52</b>	<b>16627.89</b>	<b>15045.12</b>	<b>17344.67</b>	<b>15708.51</b>	<b>17622.06</b>
<b>Total Cost/qt</b>	<b>351.35</b>	<b>425.27</b>	<b>266.76</b>	<b>373.81</b>	<b>270.84</b>	<b>389.87</b>
<b>Wheat</b>						
Cost A <sub>1</sub>	9995.95	12543.84	11380.08	1776.97	10841.77	12633.62
Cost B <sub>1</sub>	10535.7	11176.47	12086.36	12423.6	11432.27	13331.64
Cost B <sub>2</sub>	20149.62	21861.33	22540.6	23476.3	25505.79	27596.02

Cost C <sub>2</sub>	38495.65	39309.33	40039.33	41120.3	41463.79	42758.02
Yield (qt/ha)						
Grains	44	40	48	45	52	50.00
Straw	85	80	90	81	100	96.00
Price obtained by the farmers Rs/qt.						
Grain	1700	1600	1850	1700	2000	1840.00
Straw	700	700	600	600	750	800.00
Gross Income	134300	120000	142800	125100	179000	168800.00
<b>Net Income or Profit (Rs/ha)</b>	<b>95804.35</b>	<b>80690.67</b>	<b>102760.7</b>	<b>83979.7</b>	<b>137536.2</b>	<b>126042.00</b>
<b>Total Cost/ha</b>	<b>38495.65</b>	<b>39309.33</b>	<b>40039.33</b>	<b>41120.3</b>	<b>41463.79</b>	<b>42758.02</b>
<b>Total Cost/qt</b>	<b>874.90</b>	<b>982.73</b>	<b>834.15</b>	<b>913.78</b>	<b>797.38</b>	<b>855.16</b>
<b>Rajmah</b>						
Cost A <sub>1</sub>	9336.44	12226.48	9585.93	12423.37	10243.61	13129.10
Cost B <sub>1</sub>	9896.62	12960.06	10161.08	13168.77	10858.22	13916.84
Cost B <sub>2</sub>	13061.15	16264.44	13444.52	16736.05	14214.93	17604.04
Cost C <sub>2</sub>	15611.15	19120.44	16096.52	19694.05	17121.93	20460.04
Yield (qt/ha)						
Grains	9.2	14.2	23.2	20.8	24.4	26.6
Straw	18.00	30.00	47.4	43.2	45.8	38.5
Price obtained by the farmers Rs./qt						
Grains	3800.00	2800.00	4300.00	3200.00	4600.00	3500.00
Straw	100.00	100.00	100.00	100.00	120.00	120.00
Gross Income	36760.00	42760.00	104500.00	70880.00	116820.00	97720.00
<b>Net Income or Profit (Rs/ha)</b>	<b>21148.85</b>	<b>23639.56</b>	<b>88403.48</b>	<b>51186.00</b>	<b>99698.07</b>	<b>77260.00</b>
<b>Total Cost/ha</b>	<b>15611.15</b>	<b>19120.44</b>	<b>16096.52</b>	<b>19694.00</b>	<b>17121.93</b>	<b>20460.00</b>
<b>Total Cost/qt</b>	<b>1696.86</b>	<b>1346.50</b>	<b>693.81</b>	<b>946.82</b>	<b>701.71</b>	<b>769.17</b>
<b>Peas</b>						
Cost A <sub>1</sub>	10810.89	13759.94	11518.49	14477.44	13070.82	16019.71
Cost B <sub>1</sub>	11459.54	14585.53	12209.59	15346.08	13855.06	16980.00
Cost B <sub>2</sub>	13583.97	17063.87	14695.07	18230.08	17179.49	20823.73
Cost C <sub>2</sub>	15215.97	18746.87	16430.07	20066.08	19219.49	22761.73
Yield (at/ha)						
Grains	5.8	5.8	13.2	12.2	15.5	12.0
Straw	9.4	9.4	22.3	20.5	28.3	20.00
Price obtained by the farmers Rs./qt						
Grains	6000.00	4700.00	6300.00	5200.00	6550.00	5500.00
Straw	100.00	100.00	100.00	100.00	120.00	120.00

Gross Income	35740.00	28200.00	85390.00	65490.00	104355.00	68000.00
<b>Net Income or Profit (Rs./ha)</b>	<b>20524.03</b>	<b>9453.13</b>	<b>68960.00</b>	<b>45424.00</b>	<b>85135.51</b>	<b>45238.27</b>
<b>Total Cost/ha</b>	<b>15215.97</b>	<b>18746.87</b>	<b>16430.00</b>	<b>20066.00</b>	<b>19219.49</b>	<b>22761.73</b>
<b>Total Cost/qt</b>	<b>2623.44</b>	<b>3232.21</b>	<b>1246.69</b>	<b>1644.75</b>	<b>1239.96</b>	<b>1896.81</b>

The data of table -1 depicted the results related to net profit (Rs. / ha.), total cost /ha. and total cost/qu. in both conditions, i.e. during Organic Farming System and Inorganic Farming System. Result showed the year wise difference among both type of groups indicating cost / ha. and cost/ql. were found more in case of Inorganic Farming System as compare to Organic Farming System. In India, at present, in addition to food grains output of above 250 million tones, more than 400 million tones of organic matter in the form of biological wastes of cereals and

legume plants such as straw and stubbles and another more than one billion tones of annual and perennial crop plants are produced per annum. These biological wastes considered as a bone to increase soil fertility for sustainable agriculture. This plant biomass may be utilized as such or after proper into organic manures. Farmers in India can also use these organic inputs in addition to organic manures for organic farming system and system and sustainable agriculture.

Table 2: Scenario of Net Income (Rs./ha) under Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) of different crops.

Particulars	Three year average of Organic Farming System (OFS)				Three year average of Inorganic Farming System (IFS)			
	Maize	Wheat	Rajmah	Pea	Maize	Wheat	Rajmah	Pea
Net Income (Rs./ha)	47477.61	112033.75	69750.13	58206.51	17500.79	96904.12	50695.18	33371.80

The result depicted from table -2 indicated that net income received from crop grown under organic farming system was found more as compare to inorganic farming system. The variation among wheat is low as compare to maize, rajmah and pea. Organic farming may not lead to higher production and income in the short run as its returns

are of a long term nature. Organic farming system ensures in built capacity to maintain and increase soil health and fertility leading to sustained increase in yield and production and low variability of crops; this results in stabilization and high jump in incomes and sustainable agriculture or food security in the long run.

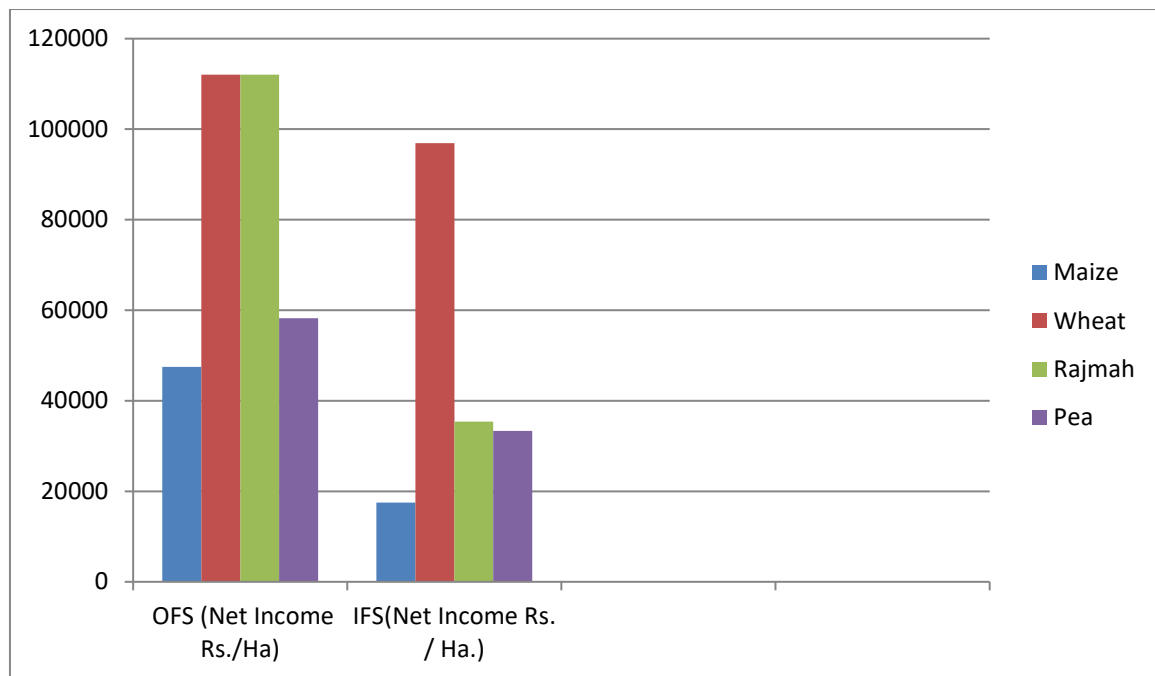


Fig.1. Scenario of Net Income (Rs./ha) under Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) of different crops.

Table 3: Constraints enumerated by the farmers under organic farming system vis-à-vis inorganic farming system:

S. No.	Particulars	Organic Farming System (OFS)			Inorganic Farming System (IFS)		
		<i>f</i>	%	Rank	<i>f</i>	%	Rank
1.	Unavailability of latest scientific Knowledge about Organic concept	44	73.33	VII	37	61.66	VI
2.	Lack of technical knowledge related to scientific soil management	53	88.33	IV	55	91.66	I
3.	Poor knowledge about Organic certification	57	95.00	II	40	66.66	V
4.	Problems in pests and disease management	40	66.66	VIII	52	86.66	II
5.	Unavailability of high yielding Seeds	55	91.66	III	46	76.66	IV
6.	Scarcity of FYM and other organic manures	60	100.0	I	40	66.66	V
7.	Poor knowledge and availability of bio-fertilizers & bio-pesticides	57	95.00	II	47	78.33	III
8.	Extension service in the form of farmers training	47	78.33	VI	33	55.00	VII
9.	Marketing problems	50	83.33	V	20	33.33	VIII

These constraints make adoption of scientific organic agriculture difficult, which is environment friendly, more profitable and desirable. There is need for dissemination of the OFS to create more awareness among farmers of its success and all round benefits. The non-availability and scarcity of organic inputs as pinpointed by the farmer must be overcome and solved.

The result obtained from table -3 indicated that both types of farmers including OFS and IFS face various constraints. OFS severely faces the Scarcity of FYM and other organic manures. Rank first and poor knowledge of organic certification as well as Poor knowledge and availability of bio-fertilizers & bio-pesticides. In case of IFS concerning farmers Lack of technical knowledge



related to scientific soil management has rank first followed by Problems in pests and disease management and other constraints.

#### IV. DISCUSSION

##### ***Comparative Economics of crops grown under Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) over the years***

It is found that the yield, total production, income and profit of crops increased under organic farming system over the years. The gross as well as net income or profit from different crops increased significantly by two to three times under organic farming system in case of some crops whereas they remained stagnant and even declined under inorganic farming system over the years. Anurag. Reddy, *et al* (2014) was also reported the impact of the adoption of organic agriculture was positive in terms of profitability and reduction in cost, even though there was a reduction in the yield in all crops.

##### ***Constraints enumerated by the farmers under organic farming system vis-à-vis inorganic farming system:***

The Scarcity of FYM and other organic manures and Poor knowledge and availability of bio-fertilizers & bio-pesticides as well as Poor knowledge about Organic certification are the pinpointed by the farmers must be overcome and solved. The nature and magnitude of constraints on organic farming system and inorganic farming system related farmers of quite different as revealed by high value. Chou, Y.M.*et .al* (2017) reported that scarcity of organic inputs and labor (particularly family labor) was another constraint, as organic agriculture is relatively more labor-intensive than conventional agriculture. Although lower costs attract farmers to adopt organic farming, they are hesitant to adopt it widely due to low yields, higher labor and supervision time requirements and lack of premium price.

#### V. CONCLUSION

The inorganic farming system has characterized by input & cost intensive with economically non-viable and ecologically unsustainable as well as risky in nature. On the other hand, the organic farming system has proved to the effective cure for the ills and problems of inorganic farming system. Uttarakhand is a traditionally organic farming hub where several sustainable agricultural practices are done by local community. In this regards to understand the organic production economics of crops and constraints of the organic farming system is the need of the hour. For this purpose a purposive study was planned in districts Almora and Tehri-Garhwal of Uttarakhand. The

output of the findings envisages that Organic farming System having less cost of production /ha and per quintal as compare to Inorganic Farming System. Therefore farmers' net profit was found more as compare to inorganic farming. Organic friendly Farmers were also faces several constraints including scarcity of FYM and organic manures, Poor knowledge and availability of bio-fertilizers & bio-pesticides, Unavailability of high yielding Seeds, etc. were the major constraints for OFS. In other hand Inorganic Farming System friendly faces other types of constraints. Thus, availability of organic inputs, technology and other resources must for organic farming. It means that the role of government, private players, farmers, agricultural graduates, other policy makers, etc. are increasing to adopt organic farming system. The role of government policies should be aimed at boosting organic farming on a large scale for export of organic products. The laggards of green revolution will be the pioneer of organic farming.

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**Appendix:** The supplementary data, table, graph in jpeg format for online visibility to the readers are submitted as an appendix.

**Authors' contribution:** The corresponding author responsible for identification of problem, conceptualization and development of schedule for survey. The second author participated in contributing to text and the content of the manuscript, including revisions and edits. The third author helps in collection and analysis of data.

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