

# Economics of organic and inorganic farming in Satara District, Maharashtra

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## Abstract

The present study examines the relative economics of the selected crops under organic and inorganic farming in Satara district, Maharashtra in India. Adverse effects of inorganic farming practices not only on the farm sector, but also on the health of all living things and thus on the surroundings have been well recognized in the world.

**Objectives:** The major objective of this study is to find out (i) the area, production and productivity of organic and inorganic farming in study area of Satara district (ii) To examine the relative economics of selected crops under organic and inorganic farming in Satara district (iii) To study the input use pattern of selected crops in sample area.

**Methods/Statistical analysis:** This study is purely based on primary data collected from the Satara district of Western Maharashtra. The researchers have selected total 400 farmers and three crops namely jowar, sugarcane and turmeric for the present study. Per acre productivity of selected organic and inorganic crops in sample area is estimated.

**Findings:** The productivity of organic jowar was 8.95 quintals/acre, organic sugarcane was 55.80 tons/acre and organic turmeric was 25.2 quintal/acre in sample area of Satara district. However productivity of inorganic crops that is jowar was 9.10 quintal/acre, sugarcane was 63.76 tons/acre and turmeric was 27.90 quintals/acre. The overall productivity of jowar, sugarcane and turmeric was high in inorganic farming than organic farming. Moreover price of organic jowar and turmeric was more than inorganic jowar and turmeric in the market. Organic producers are facing the problems of marketing of organic produce. There is also problem of awareness of organic products among the buyers. Organic producers do not receive reasonable price to their produce in the market.

**Application/Improvement:** The present study is helpful to measure the productivity and profitability of selected organic and inorganic crops. It can be applied to design the specific schemes and policy for organic farmers to improve their farm productivity and livelihoods.

**Keywords:** Organic Farming, Sustainable Agriculture Development.

## 1. Introduction

Agriculture sector is a fundamental sector of overall development. In a developing country like India, agriculture sector plays a significant role in ensuring food security, raw materials, livelihoods and providing impetus to the growth of industrial and service sector. Therefore, agriculture sector is backbone of Indian economy. As per the 2<sup>nd</sup> advance estimates of production of food grains, the country achieved a record production of food grains estimated at 281.37 million tons in 2018-19 [1]. India has a wide diversity of crops, among them food grain occupies a major portion of the agriculture. The growth rate of agriculture & allied sector have been fluctuating that is 1.5% in 2012-13, 5.6% in 2013-14, (-) 0.2% in 2014-15, 0.7% in 2015-16, 4.9% in 2016-17 and 3.0% in 2017-18 (The average growth rate of agriculture and allied sector was - during 2012-13 to 2017-18). The share of agriculture & allied sector in total Gross Value Added (GVA) at current prices was 17.4% in 2016-17 [2]. A large proportion of workforce is still depends on the agriculture. Based on Usual Principal Status Approach (UPSA), 46.1% of the persons were estimated to be employed under agriculture in India during 2015-16 [3]. But the numbers of employment in agriculture sector have been continuously declined since past two decades. The global ranking of India was at eight positions in organic agriculture during 2017.

The share of organic agricultural land of India was 1.78% in total world organic agriculture. India has highest organic producers accounting 30.58% in the world [4]. India has 17, 86,494 hectare organic land and its total production was 16, 75,560.70 metric tons in the year 2017-18 [5]. Sikkim is as one of the first organic state of India, announced by Government of India in 2016. The health of the individual is at more risk than ever before because of the chemicals that we ingest into our bodies through the inorganic food we eat [6]. Therefore, there is need to study the organic farming and its impact on input use pattern, production, productivity and profitability of organic crops. The present study also focuses on estimation of productivity and cost-efficiency of organic & inorganic farming.

## 2. Research methodology and Data base

The present study is based on both primary and secondary data. Primary data were collected through structured questionnaire and filed observations from seven blocks of Satara district. On the basis of cluster sampling approach the total blocks of Satara district were grouped in to three clusters, i.e. hilly region, fertile region and drought prone region. The researchers have identified 250 organic farmers and 150 inorganic farmers. In the study area, various crops have been cultivated under organic and inorganic farming. Out of all these crops, researchers have selected three crops namely jowar, sugarcane and turmeric. These crops were selected on the basis of geographical condition and economic value. The duration of primary data is limited to the period of 2018.

## 3. Results and Discussion

### 1. Trends in area, production and productivity of selected crops in Satara District

Out of total organic area of the selected three crops namely jowar, sugarcane and turmeric in the study area, the area under jowar cultivation was 322 acres, organic sugarcane was 404 acres, and organic turmeric was 210 acres in 2018. The production of organic jowar was 2881.90 quintals; organic sugarcane was 22543.84 tons, and organic turmeric was 5292 quintals in sample area of Satara district. The average productivity of organic jowar was 8.95 quintal/acre, organic sugarcane was 55.80 tons/acre and organic turmeric was 25.20 quintal/acre during 2018. Likewise, in case of inorganic farming, area under jowar cultivation was 185 acres, sugarcane 230 acres, and turmeric 138 acres in the study area.

Table 1. Crop-wise area, production and productivity of selected crops in Satara District

Crop	Details	Organic Farming				Inorganic Farming				Total (5+10)
		Drought Prone	Hilly	Fertile	Satara District	Drought Prone	Hilly	Fertile	Satara District	
Jowar	Area (acre)	322 (100.00)	-	-	322 (100.00)	185 (100.00)	-	-	185 (100.00)	507
	Production (quintal)	2881.90 (100.00)	-	-	2881.90 (100.00)	1683.50 (100.00)	-	-	1683.50 (100.00)	4565.40
	Productivity (quintal/acre)	8.95	-	-	8.95	9.10	-	-	9.10	9.00
Sugar cane	Area (acre)	-	72 (17.82)	332 (82.18)	404 (100.00)	-	56 (24.34)	174 (75.66)	230 (100.00)	634
	Production (ton)	-	3752.64 (16.65)	18791.20 (83.35)	22543.84 (100.00)	-	3323.60 (22.66)	11341.32 (77.34)	14664.92 (100.00)	37208.74
	Productivity (ton/ acre)	-	52.12	56.6	55.80	-	59.35	65.18	63.76	58.68
Turmeric	Area (acre)	-	152 (72.38)	58 (27.62)	210 (100.00)	-	101 (73.19)	37 (26.81)	138 (100.00)	348
	Production (quintal)	-	3967.20 (74.97)	1324.80 (25.03)	5292.00 (100.00)	-	2954.25 (76.74)	895.40 (23.26)	3849.65 (100.00)	9141.65
	Productivity (quintal/acre)	-	26.10	22.84	25.20	-	29.25	24.20	27.90	26.26

The total production through inorganic method of cultivation of jowar was 1683.50 quintals, sugarcane 14664.92 tons, and turmeric 3849.65 quintals in reference period. The overall productivity of jowar was 9.10 quintals/acre; sugarcane was 63.76 tons/acre and turmeric 27.90 quintals/acre under inorganic farming during same period. The data reveals that, average productivity of jowar, sugarcane and turmeric was high under inorganic farming than organic farming in study area of Satara district during 2018.

## 2. Benefit-cost analyses of selected crops in sample area of Satara District

### 2.1. Input use pattern of jowar (Rabbi)

Rabbi jowar (September-October season) is mainly cultivated for food and fodder production. The jowar crop takes averagely three to four months to get the yields since sowing period as shown in Table 1.

### 2.2. Cost of cultivation of jowar in sample area

#### 1. Operational cost of Jowar

To cultivate organic jowar, on an average, 70 days human labour (Male 44 and Female 26 days), 1 day bullock labour and 6 days machine labours have used for land preparation, application of manure, pesticide & insecticide, sowing and harvesting accounting the total cost of ₹16,650 (43.45% to operational cost) per acre.

Table 2. Cost of production of jowar in Satara District in 2018 (Per Acre)

S. No	Cost	Organic Jowar(₹)	Inorganic Jowar(₹)
I	Operational Cost (1 to 12)	34292.11(89.72)	32792.72(89.30)
1	Human Labour (1.1 + 1.2)	14900 (43.45)	13050 (39.80)
1.1	Hired (Male= 8500, Female= 3150)	11650 (33.97)	10450 (31.87)
1.2	Family (Male= 2500, Female= 750)	3250 (9.48)	2600 (7.93)
2	Bullock Labour (2.1+2.2)	250 (0.73)	250 (0.76)
2.1	Hired	250 (0.73)	250 (0.76)
2.2	Owned	-	-
3	Machine Labour (3.1 + 3.2)	1500 (4.37)	1500 (4.57)
3.1	Hired	1500 (4.37)	1500 (4.23)
3.2	Owned	-	-
4	Hired Animal & Machinery Charges (4.1+4.2+4.3)	6950 (20.27)	6950 (21.19)
4.1	Bullock (Pair)	750 (2.19)	750 (2.29)
4.2	Tractor (Ploughing/Snowing/ Other cultivation work)	4850 (14.14)	4850 (14.79)
4.3	Harvester (Harvesting)	1350 (3.94)	1350 (4.12)
5	Seeds	300 (0.87)	250 (0.76)
6	Fertilizer	1126.90 (3.29)	1615 (4.92)
7	Manure (Dung /Ghanjivamrut)	6405 (18.68)	5000 (15.25)
8	Pesticide/Insecticides	1512 (4.41)	2050 (6.25)
9	Irrigation & Electricity Charges	386 (1.13)	536 (1.63)
10	Miscellaneous	200 (0.58)	700 (2.13)
11	Interest on Working Capital (4 Month)	618.21 (1.80)	747.72 (2.28)
12	Crop Insurance Premium	144 (0.42)	144 (0.44)
II	Fixed Cost (13 to 17)	3931.20 (10.28)	3931.20 (10.70)
13	Rental Value of Owned Land	1713.50 (4.50)	1713.50 (4.50)
14	Rent Paid Leased in land	0	0
15	Land Revenue, Cess & Taxes	10 (0.03)	10 (0.03)
16	Depreciation of Farm Builds & Implements	273.70 (0.72)	273.70 (0.72)
17	Interest on Fixed Capital	1934 (5.08)	1934 (5.08)
III	Total Cost of Cultivation (I + II)	38223.31 (100)	36723.92 (100)
IV	Marketing Cost (18 to 20)	1160 (100)	1160 (100)
18	Packaging Cost	360 (31.03)	360 (31.03)
19	Transportation Cost	600 (51.72)	600 (51.72)
20	Sales Expenses in Market Committee	200 (17.24)	200 (17.24)
V	Total Cost of Production (III + IV)	39383.31	37883.92

Note: Figures in the parentheses of 1 to 10 serial indicate percentage share to total operational cost, 13 to 17 serial indicate percentage share to total fixed cost and 18 to 20 serial indicate percentage share to total marketing cost.

The cost of hired animal & machinery has incurred ₹6,950 (20.27%). On an average 16 hours of tractor is required for land preparation, sowing, manure transportation, and other necessary agricultural activities, harvester takes 7 hours, 5 kg seeds and 2 tons of organic manures to cultivate per acre of jowar. The total cost of seeds was ₹300 (0.87%), fertilizer ₹1,126.90 (3.29%), manures and ghanjivamrut ₹6,405 (18.68%), crop protection (pesticides/insecticides) ₹1,512 (4.41%), irrigation & electricity ₹386 (1.13%), interest on working capital (7% on variable costs) ₹618.21 (1.80%), miscellaneous cost ₹200 (0.58%) and crop insurance premium ₹144 (0.42%) accounting the total variable cost of organic jowar ₹34,148.11 per acre (89.68% of the total cost of cultivations) in drought prone region of Satara district during 2018 (Table 2).

Considering inorganic jowar production, 61 days human labour (Male 39 and Female 22 days), 1 day bullock labour and 6 days machine labours have used for land preparation, application of manure, pesticide & insecticide, sowing and harvesting which cost has incurred ₹14,800 (45.13% to operational cost) per acre. The cost of hired animal & machinery has incurred ₹6,950 (21.19%). On an average 16 hours of tractor has used for land preparation, sowing, manure transportation, and other necessary agricultural activities. Inorganic farmers have used averagely 5 kg seeds for sowing, 2 ton organic manures, pesticides/insecticides which cost has incurred ₹250 (0.76%), ₹5,000 (15.25%) and ₹2,050 (6.25%) respectively. The cost of irrigation & electricity worked out to be ₹536 (1.63%), interest on working capital (seven percent on variable costs) ₹747.72 (2.28%), miscellaneous cost ₹700 (2.13%) and crop insurance premium ₹144 (0.44%). The total variable cost of inorganic jowar was ₹32,792.72 per acre (89.30% of the total cost of cultivations) in drought prone region of Satara district during the study period.

## 2. Fixed cost of Jowar

The average rental value of owned land was ₹1,713.50 (4.50% to total fixed cost of jowar), land revenue, cesses & taxes was ₹10 (0.03%), and average depreciation of all assets was ₹273.70 (0.72%). Interest on fixed capital at ten percent has worked out to be ₹1,934 (5.08%). The total fixed cost of jowar was ₹3,931.20 (10.28% to total production cost of organic jowar and 10.70% to total production cost of inorganic jowar) in study area of Satara district (Table 2). Total Cost of Cultivation of Jowar: Total cost of cultivation of organic and inorganic jowar per acre worked out to be ₹38,079.31 and ₹36,723.92 respectively in drought prone region of Satara district during 2018.

## 3. Marketing cost of Jowar

Table 2 data depict that, packaging cost has incurred ₹360 for 12 sacks. Majority jowar farmers have sale their production at local markets (block and district market) and organic/general store (Satara city). The transportation cost for 20 Km. from store place to local market and or organic /general store was ₹600. The average sales expenses in market committee (portage, weigh & other cost) have incurred ₹200. Total marketing cost of jowar has worked out to be ₹1,160 per acre in both organic and inorganic farming in study area of Satara district.

## 4. Total cost of production of Jowar

The per acre total cost of production of organic jowar (total cost of cultivation + total marketing cost) was ₹39,383.31 in study area during 2018. The percentage share of variable cost to total cost of production was 87.07%, fixed cost 9.98% and marketing cost 2.95%. Likewise, per acre total cost of production of inorganic jowar (total cost of cultivation + total marketing cost) was ₹37,883.92. The percentage share of variable cost to total cost of production was 86.56%, fixed cost 10.38% and marketing cost 3.06%. The data shows that, total cost of production of organic jowar was higher than inorganic jowar in study area of Satara district during study period 2018.

## 5. Gross returns, net return & benefit-cost ratio of Jowar

The gross return, net return & cost-benefit ratio of jowar crop shows in Table 3. Considering organic jowar farming, productivity of jowar was 8.95 quintal per acre and farmers got averagely ₹2,552 price per quintal at local market (1,940 per quintal to 72 farmers) and organic /general store (5,000 per quintal to 18 farmers). The productivity of jowar fodder was 18 quintal per acre and farmers got ₹611.11 price per quintal.

The gross return from per acre jowar production was ₹22,840.40 (67.49%) and jowar fodder was ₹11,000 (32.51%). The gross return worked out to ₹33,840.40 per acre in organic jowar production. The total cost of production of organic jowar was ₹39,383.31 per acre. The net return from organic jowar has worked out to (minus) ₹-5542.91. The benefit-cost ratio of organic jowar was 0.86 found in study area. It means that farmers have invested 1 rupee in organic jowar production; but they bear 0.14 rupee net loss per rupees (Table 3).

Table 3. Gross returns, net return & cost-benefit ratio of jowar in 2018 (Per Acre)

Sr. No	Factor	Details	Organic Jowar	Inorganic Jowar	
1	Gross Return	Jowar			
		Output (in quintal)	8.95	9.10	
		Price (per quintal)	₹2552	₹1850	
		A	Gross Return (output* price)	₹22840.40	₹16835
		Fodder	Output (in quintal)	18	16
		Price (per quintal)	₹611.11	562.50	
		B	Gross Return (output * price)	₹11000	9000
	Gross Return (A + B)	₹33840.40	₹25835.00		
2	Net Return	Total Cost of Production	₹39383.31	₹37,883.92	
		Gross Return	₹33840.40	₹25835.00	
		Net Returns (gross return- total cost )	₹-5542.91	₹-12048.92	
3	Benefit-Cost Ratio	Gross Return / Total Cost	0.86	0.68	

Source: Field Survey 2018

In case of inorganic jowar farming, productivity of jowar was 9.10 quintal per acre and farmers got averagely ₹1,850 price per quintal at local market. The productivity of fodder was 16 quintal per acre and farmers got ₹562.50 price per quintal. The gross return from jowar production was ₹16,835 (65.16%) and fodder was ₹9,000 (34.84%). The gross return worked out to ₹25,835 per acre in inorganic jowar production. The total cost of production of per acre inorganic jowar was ₹37,883.92. The net return worked out to (minus) ₹-12048.92. The data shows that, inorganic jowar growers have bear ₹12,048.92 net loss per acre in jowar production. The benefit-cost ratio of inorganic jowar was 0.68. It means that farmers have invested 1 rupee in inorganic jowar production; but they bear 0.32 rupee net loss per rupees. The data shows per acre total net return of organic jowar is high than inorganic jowar in drought prone region of Satara district during 2018.

### 2.3. Input use pattern of sugarcane in study area of Satara District

Sugarcane has been planted thrice a year in India. Planting seasons of sugarcane are June to August (Adsali), September to October (autumn), and February to March (spring). The maturity of sugarcane is depending upon the variety of sugarcane and sowing period. The sugarcane crop takes averagely twelve to sixteen months to get the yields since plantation period.

#### 1. Cost of cultivation of sugarcane

##### 1.1. Operational cost of sugarcane

To cultivate organic sugarcane, on an average, 90 days human labour (Male 64 & Female 26 days) and 7 days machine labours have used for land preparation, plantation of sugarcane, and application of manure, pesticide & insecticide accounting the total cost of ₹21,650 (21.27%) per acre. The production of organic sugarcane was fully mechanized; therefore the bullock (pair) was not used in sugarcane cultivation. The cost of hired machinery has incurred ₹6,950 (6.83%). On an average 21 hours of tractor is required for land preparation, sowing, manure transportation, and other necessary agricultural activities, 1.5 tons seeds and 4 tons of organic manures to cultivate per acre of sugarcane. The total cost of seeds was ₹7,500 (7.37%), fertilizer ₹17,163.70 (16.87%), manures and ghanjivamrut ₹12,810 (12.59%), crop protection (pesticides/insecticides) ₹1,606.48 (1.58%), irrigation & electricity ₹5,990 (5.89%), interest on working capital (7% on variable costs) ₹5,737.22 (5.64%) and miscellaneous cost ₹1,000 (0.98%) accounting the total variable cost of organic jowar ₹80,407.40 (79.01% of the total cost of cultivations) in cultivation of sugarcane during the period of 2018 in study area (Table 4).

The inorganic sugarcane cultivation, on an average, 32 days hired labour, 29 days family labour and 7 days machine labours have used for land preparation, plantation of sugarcane, application of manure, fertiliser and pesticide which cost has incurred ₹14,400 (19.18%) per acre. The production of inorganic sugarcane is fully mechanized; therefore the bullock (pair) is not used in sugarcane cultivation. The cost of hired machinery has incurred ₹6,950 (9.26%). Inorganic farmers have used averagely 1.5 tons seeds per acre for sowing which cost has incurred ₹7,000 (9.33%). The total cost of fertiliser was ₹6,000 (7.99%). The inorganic farmers have used dung and other manure (NPK) per acre which cost has incurred ₹22,350 (29.78%). For crop protection, pesticides/insecticide has used which cost has incurred ₹4,000 (5.33 percent). The cost incurred on irrigation & electricity by inorganic farmers has ₹7,190 (9.58%). Interest on working capital has worked out at 7% on variable costs and it worked out to be ₹5,666.85 (7.55%) and miscellaneous cost has incurred ₹1,500 (2.0%). The total variable cost was ₹75,056.85 (77.85% of the total cost of cultivations) in inorganic sugarcane crops in study area (Table 4).

## 1.2. Fixed cost of sugarcane

The sugarcane production, average rental value of owned land was ₹14,204.04, land revenue, cesses & taxes was ₹54, and average depreciation of per acre of sugarcane was ₹539.53, and interest on fixed capital at 10% has worked out to be ₹6,563.92. Total fixed cost of sugarcane was ₹21,361.49 (20.99% to total production cost of organic sugarcane and 22.15% to total production cost of inorganic sugarcane) in study area during 2018 (Table 4).

Table 4. Cost of production of sugarcane in 2018 (Per Acre)

Cost	Organic Sugarcane(₹)	Inorganic Sugarcane (₹)
Operational Cost (1 to 12)	80407.40 (79.01)	75056.85 (77.85)
Human Labour (1.1 + 1.2)	19900 (19.55)	12650 (16.85)
Hired (Male= 3250, Female= 3450)	6700 (6.58)	6500 (8.66)
Family (Male= 12750, Female= 450)	13200 (12.97)	6950 (9.26)
Bullock Labour (2.1+2.2)	-	-
Hired	-	-
Owned	-	-
Machine Labour (3.1 + 3.2)	1750 (1.72)	1750 (2.33)
Hired	1750 (1.72)	1750 (2.33)
Owned	-	-
Hired Animal & Machinery Charges (4.1+4.2+4.3)	6950 (6.83)	6950 (9.26)
Bullock (Pair)	-	-
Tractor (Ploughing/Snowing/ Other cultivation work)	6950 (6.83)	6950 (9.26)
Harvester (Harvesting)	-	-
Seeds	7500 (7.37)	7000 (9.33)
Fertilizer	17163.70 (16.87)	6000 (7.99)
Manure (Dung/Ghanjivamrut)	12810 (12.59)	22350 (29.78)
Insecticides & Pesticide	1606.48 (1.58)	4000 (5.33)
Irrigation & Electricity Charges	5990 (5.89)	7190 (9.58)
Miscellaneous	1000 (0.98)	1500 (2.00)
Interest on Working Capital (14months)	5737.22 (5.64)	5666.85 (7.55)
Crop Insurance Premium	-	-
Fixed Cost (13 to 17)	21361.49 (20.99)	21361.49 (22.15)
Rental Value of Owned Land	14204.04 (13.96)	14204.04 (13.96)
Rent Paid Leased in land	0.00	0.00
Land Revenue, Cesses & Taxes	54 (0.05)	54 (0.05)
Depreciation of Farm Builds & Implements	539.53 (0.53)	539.53 (0.53)
Interest on Fixed Capital	6563.92 (6.45)	6563.92 (6.45)
Total Cost of Cultivation (I + II)	101768.89 (100)	96418.34 (100.0)
Marketing Cost (18 to 20)	-	-
Transportation Cost	-	-
Weight Measurement Cost	-	-
Other Expenses	-	-
Total Cost of Production (III + IV)	101768.89	96418.34

### 1.3. Total cost of production of sugarcane

Total cost of cultivation of per acre organic and inorganic sugarcane worked out to be ₹1,01,768.89 and ₹96,418.34 respectively in study area of Satara district (Table 4). The sugarcane harvesting, transport and other expenses were done by the sugar factories (cooperative & private) located in study area. Therefore, farmers do not spend any expenses on harvesting and marketing of sugarcane.

### 1.4. Gross return, net return & benefit cost ratio of sugarcane

According to Table 5, organic sugarcane productivity was 55.80 tons per acre and farmers got ₹3,000 price per ton. The gross return has worked out to ₹1,67,400. The cost of production was ₹1,01,768.89. The net return from sugarcane production has worked out to ₹65,631.11. The benefit-cost ratio of organic sugarcane was 1.64 found in study area. It means that farmers have invested 1 rupee in organic sugarcane production and they have get 0.64 rupee net return per rupees.

Table 5. Gross returns, net return & cost-benefit ratio of sugarcane in 2018 (Per Acre)

Sr. No	Factor	Details	Organic Sugarcane	Inorganic Sugarcane
1	Gross Returns	Output (in ton)	55.8	63.76
		Price(per ton)	₹3000	₹3000
		Gross Return (output* price)	₹167400	₹191280
2	Net Return	Total Cost of Production	₹101768.89	₹96418.34
		Gross Return	₹167400.00	₹191280.00
		Net Returns (Gross Return- Total Cost)	₹65631.11	₹94861.66
3	Benefit-Cost Ratio	Gross Return / Total Cost	1.64	1.98

Source: Field Survey 2018

Likewise, inorganic sugarcane productivity was 63.76 ton per acre and farmers got ₹3,000 price per ton. The gross return has worked out to ₹1,91,280. The cost of production was ₹ 96,418.34. The net return from inorganic sugarcane production has worked out to ₹ 94,861.66. The benefit-cost ratio of inorganic sugarcane is 1.98 found in study area. It means that farmers have invested 1 rupee production and they have get 0.98 rupee net return per rupees in inorganic sugarcane (Table 5). The benefit-cost ratio of sugarcane shows that, net return of inorganic sugarcane was high than organic sugarcane in study area of Satara district during 2018.

### 2.4. Input use pattern of turmeric in research area of satara district

Turmeric is a major cash crop of spice variety. The farmers have completed turmeric plantation from the middle of April to the first week of June. The turmeric crop takes averagely seven to nine months to get the yields since plantation period.

#### 1. Cost of cultivation of turmeric

##### 1.1. Operational cost of turmeric

To cultivate organic turmeric, on an average, 104 days human labour (Male 56 & Female 48 days), and 9 days machine labours have used for land preparation, plantation, application of farm yard manures, pesticides/insecticides and harvesting which cost has incurred ₹23,450 (14.71%) per acre. The cost of hired machinery has incurred ₹29,500 (18.51%). The production of turmeric was fully mechanized; therefore bullock (pair) is not used for farm activity in study area. An average of 28 hours of tractor has used for land cultivation, plantation, transportation and harvester has taken 11 hours to harvesting and polishing turmeric production per acre. Organic farmers have used averagely 10 quintals seeds and 8 tons organic manures per acre for turmeric cultivation. The cost of seeds was ₹35,000 (21.96%), fertilizer ₹20,551.75 (12.89%), manures ₹25,620 (16.07%), pesticides/insecticides ₹1,921.68 (1.21%), irrigation & electricity ₹3,990 (2.50%), interest on working capital (seven per cent on variable costs) ₹6,818.88 (4.28%) and miscellaneous cost ₹500 (0.31%) accounting the total variable cost of organic turmeric ₹1,47,352.31 (92.45% to total cultivation cost) in cultivation of turmeric during the period of 2018 in study area (Table 6).

In organic turmeric production, overall 87 days human labour (Male 42 & Female 45 days), and 9 days machine labours have used crop cultivation works which cost has incurred ₹19,500 (14.05%) per acre. The cost of hired machinery has incurred ₹29,500 (21.26%). An average of 28 hours of tractor and 11 hours of harvester has required in per acre turmeric production. Inorganic farmers have used averagely 10 quintals seeds and 8 tons manure per acre which was ₹32,000 (23.07%) and ₹20,000 (14.42%) respectively. The cost of pesticides/insecticides was ₹9,780 (7.05 percent), fertiliser ₹15,350 (11.06%), irrigation & electricity ₹4,680 (3.37%), interest on working capital ₹6,920.03 (4.99%) and miscellaneous ₹1,000 (0.72%) accounting the total variable cost of organic turmeric ₹1,38,730.03 (92.01% to total cultivation cost) per acre in inorganic turmeric farming (Table 6).

Table 6. Cost of production of turmeric in 2018 (Per Acre)

Sr. No	Cost	Organic Turmeric(₹)	Inorganic Turmeric (₹)
I	Operational Cost (1 to 12)	147352.31(92.45)	138730.03 (92.01)
1	Human Labour (1.1 + 1.2)	21200 (13.30)	17250 (12.43)
1.1	Hired (Male= 4250, Female= 6300)	10550 (6.62)	9100 (6.56)
1.2	Family (Male= 9750, Female= 900)	10650 (6.68)	8150 (5.87)
2	Bullock Labour (2.1+2.2)	-	-
2.1	Hired	-	-
2.2	Owned	-	-
3	Machine Labour (3.1 + 3.2)	2250 (1.41)	2250 (1.62)
3.1	Hired	2250 (1.41)	2250 (1.62)
3.2	Owned	-	-
4	Hired Animal & Machinery Charges (4.1+4.2+4.3)	29500 (18.51)	29500 (21.26)
4.1	Bullock Pair	-	-
4.2	Tractor (Ploughing/Snowing/ Other cultivation work)	11500 (7.21)	11500 (8.29)
4.3	Harvester (Harvesting)	18000 (11.29)	18000 (12.97)
5	Seeds	35000 (21.96)	32000 (23.07)
6	Fertilizer	20551.75 (12.89)	15350 (11.06)
7	Manure (Dung/Ghanjivamrut/Other)	25620 (16.07)	20000 (14.42)
8	Pesticide/Insecticides	1921.68 (1.21)	9780 (7.05)
9	Irrigation & Electricity Charges	3990 (2.50)	4680 (3.37)
10	Miscellaneous	500 (0.31)	1000 (0.72)
11	Interest on Working Capital (9 months)	6818.88 (4.28)	6920.03 (4.99)
12	Crop Insurance Premium	-	-
II	Fixed Cost (13 to 17)	<b>12039.50 (7.55)</b>	<b>12039.50 (7.99)</b>
13	Rental Value of Owned Land	7989.80 (5.01)	7989.80 (5.01)
14	Rent Paid Leased in land	0.00	0.00
15	Land Revenue, Cesses& Taxes	54.00 (0.03)	54.00 (0.03)
16	Depreciation of Farm Builds & Implements	303.50 (0.19)	303.50 (0.19)
17	Interest on Fixed Capital	3692.20 (2.32)	3692.20 (2.32)
III	Total Cost of Cultivation (I + II)	159391.81 (100)	150769.53 (100)
IV	Marketing Cost (18 + 20)	5000 (100)	5000 (100)
18	Packaging Cost	1200 (24.0)	1200 (24.0)
19	Transportation Cost	3600 (72.0)	3600 (72.0)
20	Sales Expenses in Market Committee	200 (4.0)	200 (4.0)
V	Total Cost of Production (III + IV)	164391.81	155769.53

Source: Field Survey 2018

## 1.2. Fixed cost of turmeric

In fixed cost of turmeric farming, average rental value of owned land was ₹7,989.80 (5.01%), land revenue, cesses & taxes was ₹54 (0.03%), and average cost per acre of turmeric was ₹303.50 (0.19%). Interest on fixed capital at ten percent has worked out to be ₹3,692.20 (2.32%). The total fixed cost was ₹12,039.50 (7.55%) in turmeric cultivation in study area of Satara district (Table 6).



### 1.3. Total cost of cultivation of turmeric

The total cost of cultivation has worked out to be ₹1,59,391.81 and ₹1,50,769.53 per acre in organic and inorganic turmeric respectively in study area during study period 2018.

### 1.4. Marketing cost of turmeric

Table 6 depict, the packaging cost of turmeric was ₹1,200 (24% of total marketing cost) for 40 sacks and transportation cost was ₹3,600 (72% of total marketing cost) for 120 km from store place to Sangali market. The average sales expenses in market committee have incurred ₹200 (4.0% of total marketing cost). Total marketing cost has worked out to be ₹5,000 per acre of turmeric crop in study area during 2017-18.

### 1.5. Total cost of production of turmeric

The total cost of production (cultivation cost + marketing cost) of organic turmeric crop was ₹1,64,391.81 per acre in study area. The percentage share of variable cost in total cost of production was 89.63%, fixed cost 6 percent and marketing cost 3.04%. Likewise in inorganic turmeric production, total cost of production of turmeric was ₹1,55,769.53 per acre. The percentage share of variable cost in total production cost was 89.06%, fixed cost 7.73% and marketing cost 3.21%. According to cost of production, per acre total cost of production of turmeric was more in organic turmeric farming (₹164391.81) compared to inorganic turmeric farming (₹155769.53).

### 1.6. Gross returns, net return & cost-benefit ratio of turmeric

The Table 7 shows that, organic production of turmeric (halkund) was 25.2 quintal, Bagal Tuber (Bagal Gadde) 10 quintal and Sora Tuber (SoraGadda) production 2 2 quintal per acre and farmers got average per quintal price ₹8,900, ₹3,500 and ₹20,000 respectively in study area during 2018. The gross return from turmeric (halkund) was ₹2,24,280 (74.94% of total gross return), Bagal Tuber was ₹35,000 (11.69% of total gross return) and Sora Tuber was ₹40,000 (13.37% of total gross return). The gross return from organic turmeric crop has worked out to ₹2,99,280. The total cost of production was ₹1,64,391.81. The net return from turmeric production has worked out to ₹1,34,888.19 per acre. The benefit-cost ratio of organic turmeric is 1.82. It means that farmers have invested 1 rupee in production of organic turmeric and they got 0.82 rupee net return per rupees (Table 7).

Table 7. Gross returns, net return & benefit-cost ratio of turmeric in 2018 (Per Acre)

S. N	Factor	Details	Organic Turmeric	Inorganic Turmeric	
1	Gross Return	Turmeric (Halkund)	Output (in quintal)	25.20	27.90
			Price(per quintal)	₹8900	₹8500
		A	Gross Return (output* price)	₹224280	₹237150
			Bagal Tuber	Output(in quintal)	10
		Price(per quintal)		₹3500	₹3200
		B	Gross Return (output* price)	₹35000	₹ 25600
			Sora Tuber	Output(in quintal)	2
		Price(per quintal)		₹20000	₹18000
C	Gross Return (output* price)	₹40000	₹36000		
	Gross Return ( A+ B+ C )	₹299280	₹298750		
2	Net Return	Total Cost of Production	₹164391.81	₹155769.53	
		Gross Return	₹299280.00	₹275940.00	
		Net Return (Gross Return- Total Cost)	₹134888.19	₹142980.47	
3	Benefit-Cost Ratio	Gross Return / Total Cost	1.82	1.92	

Source: Field Survey 2018

In case of inorganic turmeric farming, per acre total output of inorganic turmeric (halkund) was 27.90 quintal, Bagal Tuber (Bagal Gadde) 8quintalandSora Tuber (Sora Gadda) 2 quintal and farmers got average price per quintal was ₹8,500, ₹3,200 and ₹18,000respectively at local market. The gross return from turmeric (halkund) was ₹2,37,150 (79.38% of total gross return), Bagal Tuber ₹25,600 (8.57% of total gross return) and Sora Tuber was ₹36,000 (12.05% of total gross return).

The gross return from inorganic turmeric production has worked out to ₹2,98,750. The total cost of production was ₹1,55,769.53. The net return from inorganic turmeric production has worked out to ₹1,42,980.47 per acre. The benefit-cost ratio of inorganic turmeric was 1.92. It means that inorganic farmers have invested 1 rupee in turmeric production and they got 0.92 rupee net return per rupees (Table 7). According to benefit-cost ratio of per acre turmeric production, farmer's net return of inorganic turmeric is high compare to net return of organic turmeric.

#### 4. Conclusion and Policy implications

The organic farming method was more labour intensive than inorganic farming. The total cost of cultivation of jowar, sugarcane and turmeric crops in organic farming was higher than inorganic farming. The expenditure on fertilizers and pesticides/insecticides was lower in organic farming than inorganic farming. The organic jowar and turmeric was received higher prices than inorganic products. Out of total organic farmers, 90.40% organic farmers have experience of organic practices less than five years. It means that, organic farmers have been cultivating their farm activity on organic methods since last one to five years. Moreover, inorganic farming uses of chemical pesticides and fertiliser yields negative effects on production of organic farming. Therefore, the overall productivity of organic farming was less than inorganic farming in study area during 2018. The organic agriculture has positively affected on improvement and sustains quality of natural resources (soil, water and air). The application of organic farming has better economic and environmental benefits to farmers for enhancement of their standard of life. It is necessities to formulate and implements of various policies, programmes and strategies for promote organic agriculture in order to realise its full potential. Few important suggestions have been made on the basis of field work observations, interviewed of organic farmers & group leaders, which has summarized as follows.

1. It's necessary to develop educational programs for increase public awareness about organic farming and its products. Government should introduce new subject of organic farming in curriculum and start from school education. In addition, government, non-governmental organizations and social organizations should propagate the benefits of organic farming and its products.
2. Government should establish and start independent and separate 'organic Green Channels' for marketing of organic products.
3. The farmer producer organization involves of collective of growers especially small and marginal farmers so as to form an effective alliance to collectively address many challenges of agriculture sector such as improved access to investment, technology, inputs and markets. Therefore, organic farmers should establish farmer producer organizations for better income from organic farming.
4. To avoid the adverse effect of the inputs of inorganic farming, organic farmers should build protective walls of grass, bamboo and shewari in their farm.
5. Processing industries are essential for value addition of organic product. Organic farmers should come together and run various agro-based processing industries for the development and expansion of organic farming. Government should provide financial and technical assistance to such processing industries.
6. Government should make special provision for organic farming in the budget. Under this budget, implement various schemes, programmes and plan for farmers to encourage to farmers for adoption and implementation of organic practices.
7. Organic farmers should establish own organizations at national, state, district, block and village level. These organizations should help to organic farmers in the development of organic farming practices, supply of organic inputs, availability market and marketing facilities.

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