



## **Comparative Analysis of Financial Viability and Supply Chain Management of Organic and Conventional Farming in Telangana**

**G. Manasa<sup>1\*</sup>, P. Radhika<sup>1</sup>, Seema<sup>1</sup> and K. Supriya<sup>1</sup>**

<sup>1</sup>Professor Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India.

### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author GM designed the study, managed the literature searches and wrote the first draft of the manuscript. Author KS performed the statistical analysis and wrote the protocol. Authors PR and Seema managed the analyses of the study and guided the whole research study. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Increased awareness about the ill effects of synthetic chemicals in the food chain, the falling dividends from the conventional production system and growing consumer preference for pesticide-free food have paved the way for organic agriculture as an alternative to the conventional system of farming which solely depends on chemicals. The study aims to compare and analyze the financial viability of selected crops viz., paddy and cotton under organic and conventional farming and the analysis of different supply chains involved in the marketing of organic and conventional food products. The present study was carried out in Jangaon district, which is very well known in the organic farming sector of Telangana state. For the study during the period of 2019-20, ten organic and ten conventional farmers had been selected for each selected crop using a simple random sampling technique. Thus, the sample consists of 20 organic farmers and 20 conventional farmers. The data collected from respondents were analysed using the cost concepts, budgeting technique and Acharya's approach according to the objectives. The results indicated that the cost of cultivation of conventional crops are more than organic crops due to the increased usage of expensive chemicals in conventional farming. The farmers realize a high premium price for their organic produce and also high net returns, thus have higher financial viability in organic farming.

\*Corresponding author: Email: [gillamanasa7@gmail.com](mailto:gillamanasa7@gmail.com);

The supply chain of organic produce involving Farmer Producer Organisation (FPO) has high efficiency because it offers the producers a major share in consumer's rupee and establishes a direct link between the producer and consumer. The study has revealed that organic farming gives better income to the farmers, if marketing linkages are established and they can fetch a better price for organic products than conventional products.

*Keywords: Viability; supply chain; organic farming; conventional farming; marketing channels.*

## 1. INTRODUCTION

India is known as the fruit and vegetable basket of the world [1]. The country is home to vast agro-ecological diversity with the world's largest producer of milk, pulses and jute, and ranks as the second-largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruits and cotton. India had developed vast and rich traditional agricultural production knowledge since ancient times and presently finding solutions to the constraints created by overuse of agrochemicals.

Today's modern farming is not sustainable in consonance with economics, ecology, energy and socio-cultural dimensions. Indiscriminate use of chemical fertilizers and pesticides has resulted in various environmental and health hazards along with socio-economic problems. The chemical-based farming system is no more beneficial as it involves high input and low return [2]. Such problems of modern agriculture pushed Indian farming system to revisit organic farming, which aims at cultivating the land and raising crops in such a way as to keep the soil alive and in good condition.

India is bestowed with a lot of potentials to produce a wide variety of organic products due to its various agro-climatic regions [3]. The inherited tradition of organic farming is an added advantage to India. An area of 3.5 million hectares (35,28,638 ha) of land is under organic agriculture in India during the year 2018-19 [4]. India ranks 9<sup>th</sup> in terms of the world's organic agricultural land and ranks 1<sup>st</sup> in terms of the total number of producers globally [5].

According to the World of Organic Agriculture report 2018, India is home to 30 per cent of total organic producers in the world, but accounts for just 2.59 per cent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares [5].

India has achieved 2.607 million tons of organic production in 2018-19, wherein sugarcane, oil

seeds, fibre crops, cereals and millets and pulses contribute major portion and others include cotton, tea, fruits, vegetables, spices, dry fruits, medicinal plants and coffee. Among all the states, Madhya Pradesh has the largest area under organic farming followed by Maharashtra, Rajasthan and Orissa. While in terms of organic production, Maharashtra is the leading producer followed by Madhya Pradesh, Karnataka and Uttar Pradesh. In Telangana state, the total production of organic produce in 2018-19 was found to be 2108.691 metric tonnes [4].

In India, supply chain management (SCM) is at its growing stage in the marketing of agricultural produce. The marketing of agricultural produce is always a challenge due to its perishability, seasonality, bulkiness and the changing consumption patterns of the Indian consumers [6,7]. In addition to the above factors, poor infrastructure, poor equity in supply chain and the conventional small-scale unorganized retail system makes the art of supply chain a challenge in the present scenario [8,9]. Hence, this study was undertaken with the following objectives:

1. To compare and analyze the financial viability of selected crops under organic and conventional farming in Jangaon district of Telangana.
2. To map the supply chains and estimate their efficiency for selected crops under organic and conventional farming.

Wachter et al. [10] have done a comparative study on productivity, economic performance and soil quality of conventional, mixed and organic dry land farming systems in Eastern Washington states. Researchers have collected data on four contrasting farming systems for five years and revealed that net returns of organic hay were higher than organic mixed crop, which were higher than mixed crop-life stock. The returns for conventional farming were the lowest. Soil profile showed negative trends in conventional and mixed crop but not in organic farms. Study has concluded that integrating perennial crops, such as alfalfa and forage grasses into organic

farming can build soil quality as well as improve the profits [10].

Shelke et al. [11] conducted a study on comparative economics of cost and returns of organic tomato production with inorganic production in Kolar district of Karnataka. Findings revealed that cost of production of inorganic tomato was higher than organic tomato production. The gross return of organic tomato production was higher compared to inorganic tomato production. The net return on organic farm was Rs. 211588.78 and was Rs. 189426.64 on inorganic farms [11].

Meshram et al. [12] have done a study on cost benefit analysis and marketing of brinjal vegetable in Bhandara district. Study found different marketing channels for brinjal vegetable. It is identified that channel-I i.e. producer to consumer was the best channel for marketing of selected vegetables. But very less quantity of produce was sold through this channel. The price spread for brinjal in all selected channels was around 40 per cent except the channel-I. The marketing efficiency was calculated using three different methods viz; Conventional method, Shepherd method and Acharya method. Study revealed that the efficiency will decline with the increase in the number of intermediaries [12].

Kamal et al. [13] had done a study to compare the economics of organic and conventional vegetable production in Kathmandu valley. The sample consisting of thirty farmers each involved in commercial organic and conventional vegetable farming were selected randomly. The estimated per year cost of cultivation of vegetables in inorganic farm (NPR 100562) was higher than in organic farm (NPR 69170). The gross return per year for organic vegetable farming (NPR 101536) was lower in comparison to that of conventional vegetable farming (NPR 135747). The benefit cost ratio (BCR) was seen higher in organic farming (1.47:1) when compared to conventional farming (1.35:1). The study concluded that organic vegetable farming was more profitable than the conventional vegetable farming in Kathmandu valley [13].

## 2. MATERIALS AND METHODS

The study was carried out in Jangaon district, which is very well known in the organic farming sector of Telangana state. The study was conducted in the year 2019-20. Rice and cotton crops had been selected, as they are grown

extensively under both organic and conventional farming in this district. For this study, ten organic and ten conventional farmers had been selected for each selected crop using a simple random sampling technique [14]. Thus, the sample consists of 20 organic farmers and 20 conventional farmers. The primary data was collected through survey method, by personally interviewing the respondents using the pretested schedule [15]. The cost concepts and budgeting technique was used to estimate costs and returns involved in paddy [16] and cotton [17]. The profitability and viability of the farming systems is analysed using various concepts like benefit cost ratio, farm business income and farm investment income [18]. The details on supply chains, marketing costs, marketing margins, price spread and marketing efficiency for different organic and conventional produce were analysed using Acharya's approach [19].

## 3. RESULTS AND DISCUSSION

### 3.1 Costs Involved in the Cultivation of Paddy and Cotton Under Organic and Conventional Farming

The comparative cost of cultivation per hectare of paddy was found higher under conventional farming (Rs. 100358.08) compared to organic farming (Rs. 96899.68). The share of variable cost in the total cost of paddy cultivation in organic and conventional farming was 70.06 per cent (Rs. 67883.61) and 71.29 per cent (Rs. 71544.62) respectively. The proportion of fixed cost in the total cost of cultivation was 20.85 per cent (Rs. 20207) and 19.62 per cent (Rs. 19690) in the organic and conventional farming respectively.

The comparative cost of cultivation per hectare of cotton was found higher under conventional farming (Rs. 114206.4) compared to organic farming (Rs. 100501.33). The proportion of variable cost in the total cost of cultivation was 78.70 per cent (Rs. 79099.85) and 81.23 per cent (Rs. 92769) in the organic and conventional farming respectively. The share of fixed cost in the total cost of cotton cultivation in organic and conventional farming was 12.20 per cent (Rs. 12265) and 9.68 per cent (Rs. 11055) respectively.

Cost concepts in organic farming of paddy and cotton were found in detail. The cost A1 for organic paddy and cotton was Rs. 57448.12 and

Rs. 76129.85 respectively. Similarly, the cost B1 for organic paddy and cotton was Rs. 53522.26 and Rs. 77244.85 respectively. Cost B2 for organic paddy and cotton was Rs. 71522.26 and Rs. 86844.85 respectively. The cost C3 for organic paddy and cotton was Rs. 96899.68 and Rs. 100501.33 respectively.

Cost A1 for conventional paddy and cotton was Rs. 57448.12 and Rs. 90219 respectively.

Similarly, the cost B1 for conventional paddy and cotton was Rs. 59238.12 and Rs. 91224 respectively. Cost B2 for conventional paddy and cotton was Rs. 76738.12 and Rs. 99724 respectively. It was revealed that the overall cost of cultivation i.e., cost C3 was highest in all selected crops grown in conventional farming when compared to that in organic farming. The Cost C3 for conventional paddy and cotton was Rs. 100358.08 and Rs. 114206.4 respectively.

**Table 1. Comparative cultivation cost of paddy and cotton in organic and conventional farming (per hectare)**

S. no	Particulars	Paddy		Cotton	
		Organic farming	Conventional farming	Organic farming	Conventional farming
<b>Variable costs (INR)</b>					
1.	Seeds	2563	2901	1440	5500
2.	Farmyard manure	8182	6916	8182	7500
3.	Tank silt	2042	-	204	-
4.	Vermicompost	2780	-	2780	-
5.	Biofertilizers	2000	-	5259	-
6.	Biopesticide	159	-	15000	-
7.	Chemical fertilizers	-	6006	-	9600
8.	Plant protection chemicals	-	2895	-	25500
9.	Human labour	36568	34496	11520	10100
10.	Bullock labour	3400	5092	3500	5500
11.	Machine labour	4314	5186	17040	13000
12.	Miscellaneous charges	3372	3372	9000	10000
13.	Interest on working capital	4440	4680	5175	6069
Total variable cost (VC)		67884	71545	79100	92769
<b>Fixed cost (INR)</b>					
1.	Depreciation	320	350	1500	1500
2.	The rental value of land	18000	17500	9600	8500
3.	Land revenue	50	50	50	50
4.	Interest on fixed capital @ 10%	1837	1790	1115	1005
Total fixed cost (FC)		20207	19690	12265	11055
<b>Total cost (FC + VC)</b>		88091	91235	91365	103824
Managerial cost @ 10% of the total cost		8809	9123	9136	10382
<b>The total cost of cultivation</b>		96900	100358	100501	114206

**Table 2. Cost concepts involved in organic and conventional farming (Rs./ha)**

S. no	Cost concepts	Organic farming		Conventional farming	
		Paddy	Cotton	Paddy	Cotton
1.	Cost A1	51685	76130	57448	90219
2.	Cost A2	51685	76130	57448	90219
3.	Cost B1	53522	77245	59238	91224
4.	Cost B2	71522	86845	76738	99724
5.	Cost C1	70091	81765	73735	95324
6.	Cost C2	88091	91365	91235	103824
7.	Cost C3	96900	100501	100359	114206

### 3.2 Financial Viability of Selected Crops Under Organic and Conventional Farming

#### 3.2.1 Yield, price, returns and cost of cultivation of organic and conventional crops

The comparative per hectare average yield of paddy in conventional farming (67 q) was comparatively higher than that in organic farming (52 q). The average producer price per quintal of organic paddy was Rs. 2800, which was found to be higher than that of conventional paddy which worked out to be Rs. 2000 per quintal. It was found that the organic paddy always fetches premium price compared to the conventional paddy [20].

The comparative per hectare average yield of cotton in conventional farming (35 q) was comparatively higher than that of organic farming (31 q). The average producer price per quintal of organic cotton was Rs. 6364, which was found to be higher than that of conventional cotton, which worked out to be Rs. 5550 per quintal, as the organic cotton, fetches premium price when compared to the conventional cotton.

#### 3.2.2 Measure of farm profitability and viability in organic and conventional farming

The measure of farm profitability and viability in organic and conventional farming of paddy and cotton is depicted in Table 4, which reveals that the gross returns per hectare obtained in organic cultivation were higher compared to conventional farming. Farm business income was found to be higher in organic farming of paddy (Rs. 93915) and cotton (Rs. 107054) in comparison to that in conventional farming of paddy (Rs. 76552) and cotton (Rs. 104031).

It was revealed that the farm investment income was high in organic cultivation of paddy (Rs. 68537) and cotton (Rs. 107486) when compared

to conventional farming of paddy (Rs. 52932) and cotton (Rs. 89548). The net return in organic farming of paddy was Rs. 48700 and Rs. 33642 in conventional farming. Similarly, it was Rs. 96771 in organic cotton and Rs. 80044 in conventional cotton cultivation.

Though the productivity in case of organic farming was found to be lower in comparison to conventional farming, due to high premium price received for the organic produce, the gross income matched the level of the gross income of conventional farming and the net income was higher for organic farmers due to its less cost of cultivation compared to conventional farming wherein there is heavy usage of expensive chemicals in its crop production.

The benefit cost ratio was also found higher in organic farming when compared to the conventional farming system. In paddy, organic and conventional benefit cost ratio was 1.5 and 1.34 respectively. Similarly, organic and conventional cotton benefit cost ratio was 1.96 and 1.7 respectively. All the above results obtained would prove that the organic farming system has higher financial viability and profitability when compared to the conventional farming system.

### 3.3 Supply Chains of Organic and Conventional Crop Products with Costs, Margins, Price Spread and Efficiency

In the study area an FPO, Sahaja Aaharam, takes interest in the marketing of organic produce procured by the farmers and this involvement of FPO in the marketing of organic crop products has helped the farmers to realize premium prices for their organic products compared to conventionally grown crop produce. The FPO procures organically grown crop produce and after processing and packaging, they sell the products to consumers through their organic retail outlets located in the different urban areas of Hyderabad.

**Table 3. Yield, price, returns and cost of cultivation of organic and conventional paddy and cotton crops (Rs./ha)**

S. no	Particulars	Paddy		Cotton	
		Organic	Conventional	Organic	Conventional
1.	Yield (Q/ha)	52	67	31	37
2.	Price (Rs/Q)	2800	2000	6364	5250
3.	Gross returns (Rs./ha)	145600	134000	197273	194250
4.	Cost of cultivation (Rs./ha)	96900	100358	100501	114206
5.	Net returns	48700	33642	96771	80044

**Table 4. The measure of farm profitability and viability in organic and conventional farming (Rs./ha)**

S. no	Particulars	Organic farming		Conventional farming	
		Paddy	Cotton	Paddy	Cotton
1	Gross Returns	145600	197273	134000	194250
2	Farm Business Income	93915	107054	76551.88	104031
3	Farm Investment Income	68537	107486	52931.92	89548.6
4	Net Returns	48700	96771	33641.92	80043.6
5	Benefit cost ratio	1.5	1.96	1.34	1.7

**Table 5. Supply chain in Jangaon for organically grown crop produce**

S. no	Particulars	Paddy (Rs./Qtl)	Cotton (Rs./Qtl)
1.	Producer price	2800	6364
2.	The cost incurred by the producer		
	a) Transportation cost	63	40
	b) Loading and unloading charges	20	20
	c) Commission charges	0	0
	d) Miscellaneous costs	37	40
3.	Total marketing cost incurred by the producer	120	100
4.	Net price received by the producer	2680	6264
5.	FPO purchase price	2800	6364
6.	The cost incurred by the trader		
	a) Transportation cost	250	190
	b) Loading and unloading charges	27	21
	c) Market fee	196	120
	c) Commission charges	90	30
	d) Miscellaneous costs	80	40
7.	The total cost incurred by FPO	580	561
8.	Sale price received by FPO	5400	7875
9.	FPO margin	2020	850
10.	Total marketing cost	700	661
11.	Total marketing margins	2020	900
12.	Consumer price	5400	7875
13.	Producer's share in consumer's rupee	51.86	80.81
14.	Marketing efficiency	1.02	4.01

The commission charges paid during the marketing of organically cultivated crop produce were eliminated because the Farmer Producer Organization procures the crop produce directly from the farmers and sells to consumers. As against this, the commission has to be paid to the conventionally cultivated crop produce by the farmers to the middlemen as they send their produce to the market.

### 3.3.1 Supply chain in Jangaon for organically grown crop produce - Channel I: Organic Producer – FPO (Farmer Producer Organization) – Consumers

It was observed that the farmers were selling their organic crop products to an FPO (Farmer Producer Organization). Based on the demand of

the organic products, the Farmer Producer Organization and the farmers make a prior agreement on the supply of the required quantity of organic crop products. The producer's share in consumer's rupee was found more for organic crop products if the products are marketed through this channel.

The details regarding the marketing costs, margins, price spread, producer's share in consumers rupee and marketing efficiency are presented in Table 5. It is observed that in this supply chain of organic produce there is only one intermediary found in between the producers and consumers i.e., Farmer Producer Organization. The sale price received by the producer for organic paddy was Rs. 2800 per quintal and for organic cotton was Rs. 6364 per quintal. The

total marketing cost incurred by producer per quintal was Rs. 120 for paddy and Rs. 132 for cotton.

The net price received by the producer per quintal was Rs. 2680 for paddy and Rs. 6232 for cotton. It is seen that the consumer price for organic crop products were comparatively higher than the conventionally grown crop products. The consumer price for organic paddy was Rs. 5400 per quintal and organic cotton was Rs. 7875 per quintal. The producer's share in consumer's rupee was 51.86 per cent for organic paddy and 80.81 per cent for organic cotton. Market efficiency was 1.02 for paddy and 4.01 for cotton respectively. Thus, it is noticed that this supply chain for organically grown crop produce has higher marketing efficiency compared to that of

conventionally grown crop produce for all the selected crops. The total marketing cost on this channel was Rs. 700 for paddy and Rs. 661 for cotton.

### 3.3.2 Supply chain in Jangaon for conventionally grown crop produce - Channel: Producer – Trader – Wholesaler – Retailer – Consumers

The details of the marketing costs, margins, price spread, producer's share in consumer's rupee and marketing efficiency for the channel were presented in Table 6. It was observed that in this particular supply chain of conventional produce, there are three intermediaries found in between the producers and consumers i.e., trader, wholesaler and retailer.

**Table 6. Supply chain in Jangaon for conventionally grown crop produce**

S. no	Particulars	Paddy (Rs./Qtl)	Cotton (Rs./Qtl)
1.	Producer price	2000	5250
2.	The cost incurred by the producer		
	a) Transportation cost	50	60
	b) Loading and unloading charges	34	32
	c) Commission charges	15	15
	d) Miscellaneous costs	43	41
3.	Total marketing cost incurred by the producer	154	113
4.	Net price received by the producer	1876	5137
5.	Purchase price by the trader at the market	2000	5250
6.	Cost incurred by trader		
	a) Transportation cost	115	110
	b) Loading and unloading charges	17	25
	c) Market fee	47	30
	c) Commission charges	15	15
	d) Miscellaneous costs	95	90
7.	The total cost incurred by the trader	340	270
8.	Trader margin	400	340
9.	The sale price of the trader	2740	5860
10.	The cost incurred by the wholesaler		
	a) Transportation cost	135	120
	b) Loading and unloading charges	17	20
	c) Market fee	25	25
	d) Miscellaneous costs	90	90
11.	The total cost incurred by the wholesaler	210	245
12.	Wholesaler margin	450	160
13.	The sale price of wholesaler	3400	6265
14.	Costs incurred by the retailer	210	130
15.	Retailers margin	450	370
16.	Total marketing cost	914	758
17.	Total marketing margins	1270	870
18.	Consumer price	4200	6765
19.	Producer's share in consumer's rupee	47.62	77.61
20.	Marketing efficiency	1.01	3.16

The sale price received by the producer for conventional paddy was Rs. 2000 per quintal and for conventional cotton, it was Rs. 5250 per quintal. The total marketing cost incurred by the producer was Rs. 154 per quintal for paddy and Rs. 113 per quintal for cotton. The net price received by the producer per quintal was Rs. 1846 for paddy and Rs. 5137 for cotton. The consumer price for conventional paddy was Rs. 4200 per quintal and conventional cotton was Rs. 6765 per quintal. The producer's share in consumer's rupee was 47.62 per cent for paddy and 77.60 per cent for cotton. Market efficiency was 1.01 for paddy and 3.16 for cotton. The total marketing costs in this channel were very high when compared to channel-I by 18 per cent and 15 per cent for paddy and cotton respectively.

#### 4. CONCLUSION

From this research study it was revealed that among the two farming systems, the cost of cultivation of paddy and cotton in the conventional farming system was comparatively higher than the organic farming system. Even though the average yield of crops grown under organic farming was lower compared to those grown under conventional farming, the gross returns in organic cultivation were higher because the organic produce fetches premium price in the market [21]. The benefit cost ratio was also found higher in organic crop cultivation than conventional cultivation revealing that there is higher financial viability for organic farming compared to conventional farming [22].

While coming to the supply chain of crop products, it was observed that marketing channel-I involving the sale of organic products to consumers through FPO, has higher producer share in consumer's rupee with lower marketing cost, and the marketing channel-II for the sale of conventional products to consumers involve traders, wholesalers and retailers as intermediaries, has high marketing cost in comparison to channel-I and has little low producer share in consumer's rupee when compared to channel-I which is being followed by organic produce cultivating farmers in the study area. It was also revealed that, the marketing efficiency was high for channel-I compared to the channel-II.

It can be concluded that organic farming gives better income to the farmers, if marketing linkages are established and they can fetch a

better price for organic produce than conventional produce [23].

#### CONSENT

As per international standard informed and written participant consent has been collected and preserved by the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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