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Economics of Organic Turmeric (*Curcuma longa*) Cultivation in Kandhamal District of Odisha

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Authors' contributions

This work was carried out in collaboration between all authors. Author PPS designed the study, wrote the methodology and wrote the first draft of the manuscript. Authors KKS and UM managed the analyses of the study. Authors SM and MS managed the literature searches and preparation of the draft of the paper. All authors read and approved the final manuscript.

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ABSTRACT

Kandhamal is the major turmeric growing district of the state. It is the main cash crop for their economic development. Kandhamal Turmeric is an important product and now become popular in the organic food market of Europe and North America. It has gained a good market share in International and Local market. The local variety grown from time immemorial is having 2-3 per cent cur cumin, 12-15 per cent of oleoresin and 5.3 per cent of volatile oil. The current study was carried out in three blocks of the district to analyze the profitability in organic Turmeric cultivation and to document various constraints faced by the turmeric growers in the study area. The data pertained to the agricultural year 2016-17. The yield per ha of fresh Turmeric was 100 quintals where as dry was 20 q. The average price received by the sample farmers per quintal of dry Turmeric was Rs 4800. The total cost of cultivation was Rs.52,200, whereas for dry turmeric production it was Rs. 55,800. The net returns per hectare of Turmeric cultivation was found to be Rs 40,200 leading to a benefit to

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cost ratio of 1.72. The sample respondents ranked high cost of labour as the greatest constraint in organic turmeric cultivation with a Garrett score of 76.40. The problems ranked as second, third and fourth fifth , sixth and seventh place were personal obligation with traders, financial weakness, lack of technical knowledge, lack of storage facilities , low productivity and non-availability of quality seed respectively. Efforts should be made to introduce labour saving techniques in the study area. To address this problem, mechanization of various operations such as ploughing, sowing, harvesting and drying should be done.

Keywords: Organic; turmeric; marketing; economics; technology.

1. INTRODUCTION

Turmeric (*Curcuma longa L*), the ancient and sacred spice of India known as 'Indian saffron', is an important commercial spice crop grown in India. It is known as the "golden spice" as well as the "spice of life." and is one of the most essential spices used as an important ingredient in culinary all over the world [1] and [2]. The plant is propagated from rhizomes. The rhizomes are ready for harvesting in about 8 to 10 months after planting.

India is the largest producer and exporter of spices in the world and so called the spice bowl of the world'. Turmeric occupies about 6 per cent of the total area under spices and condiments in country. In India turmeric mainly grown in Andhra Pradesh, Tamil nadu, Karnataka, Odisha, West Bengal and Maharashtra [3]. Odisha contributes about 21 per cent of India's turmeric cultivation in terms of area and Kandhamal makes up for over 50 per cent of the state' s share [4].

Over the years the tribal community cultivate the crop organically. Now a days demand for organic commodities is growing and farmers are trying to diversify their production systems accordingly. On the other hand, consumers are becoming more demanding in terms of quality and safety of food commodities [5]. Further there can be huge market for organic instant food products like 'ready to cook' containing the perfect blend of organic spices. But due to various constraints the productivity of the crop is not to the expected level. With this backdrop, the current study was carried out in Kandhamal district with the following objective:

- To study the socio-economic profile of the sample farmers.
- To analyze the labour and input utilization pattern in turmeric cultivation.
- To analyze the profitability in turmeric cultivation.
- To document various constraints faced by the turmeric growers in the study area.

2. MATERIALS AND METHODS

The study was conducted in Kandhamal district of Odisha. Three blocks i.e., Daringbadi, Raikia, K. Nuagaon were selected (on the basis of area and production) for the purpose of study. Data were collected from the primary sources (respondents) with the aid of a structured interview schedule consisting of both open and close ended questions. The data collected was on general characteristics of farmers, land holding, costs, returns, yields, constraints faced in cultivation of Turmeric etc. The primary data from 120 sample respondents pertained to the agricultural year 2016-17. Multistage purposive cum random sampling method was used for selection of districts, block village trader and farmer. Four major turmeric growing villages from each block were selected for the study. Thus, a total of twelve villages from three blocks were selected for the study. From each village ten farmers were randomly selected. Both Farm budgeting and partial budgeting technique was used to estimate the cost and return structure of turmeric cultivation. The benefit cost ratio was calculated for profitability analysis. The documentation of the constraints in cultivation of turmeric in the region was done using Garrett's ranking technique. Garrett's formula for converting ranks into % was given by:

$$\% \text{ position} = 100 * (Rij - 0.5) / Nj$$

Where,

Rij= Rank given for ith factor by jth individual.

Nj= Number of factors ranked by jth individual.

The per cent position of each rank is converted into scores by referring to the table given by Garret and Woodswordh (1969). For each factor, the scores of individual respondents were added together and divided by the total number of the respondents. These mean scores were arranged in descending order and then ranks were given and most important factors were identified [6].

Table 1. Seasonality of turmeric production in India

MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
Sowing				Growth Stage				Harvesting		Market Arrival	

Source: Karvy Comtrade Ltd., - Seasonal Report on Turmeric, PJ Commodity vent [7]

Table 2. Area, Production of Turmeric in different blocks of Kandhamal district from 2008 to 2016
Area-Million Hectares, Production-Million Tones

Sl. no	Name of the Block	2008-09		2009-10		2010-11		2011-12		2012-13		2013-14		2014-15		2015-16	
		Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
1	Khajuriapada	560	3304	550	3251	560	3310	560	3325	662	6854	670	7241	642	6133	634	5541.16
2	Phiringia	1900	11894	1898	11900	1900	11913	1910	12050	2027	20045	2030	20140	1998	19088	1990	17392.6
3	Phulbani	682	4215	675	4178	690	4271	680	4325	802	8120	810	8546	780	7452	772	6747.28
4	Baliguda	370	2202	370	2211	370	2211	370	2180	495	3896	500	4572	465	4441	457	3994.18
5	Kotagarh	650	3783	648	3817	650	3829	650	3835	760	7102	765	7254	747	7127	739	6458.86
6	Tumudibandha	740	4055	695	3864	695	3864	740	4065	779	6986	782	7583	758	7274	750	6555
7	Chakapad	580	3115	540	2986	540	2986	560	3125	670	6203	675	6523	654	6248	646	5646.04
8	G. Udayagiri	1250	6950	1280	7194	1295	7278	1250	7325	1420	13986	1425	14520	1388	13300	1380	12061.2
9	Raikia	1900	11571	1875	11456	1890	11548	1900	11590	2020	18596	2025	20425	1996	19165	1988	17375.12
10	Tikabali	850	5245	840	5191	850	5253	850	5245	1000	9654	1010	10142	985	9500	977	8538.98
11	Daringbadi	1650	10263	1438	8973	1445	9017	1520	9125	1545	14583	1550	15124	1518	14498	1510	13197.4
12	K. Nuagaon	1580	9670	1606	9965	1615	10021	1625	10075	1730	15475	1735	16752	1710	16318	1702	14875.48
	Total	12712	76267	12415	74986	12500	75501	12615	76265	13910	131480	13977	138822	13641	130544	13545	118383

Source:http://kandhamal.nic.in
and [8]

3. RESULTS AND DISCUSSION

3.1 Socio-economic Profile of the Sample Respondents

The socio-economic profile of the turmeric growers of the study area is presented in Table 3. The average age of the sample organic turmeric growers was found to be 43 years. Among the respondents, 63.33% were illiterate, 24 per cent received primary education, 20 per cent received secondary education and none of them went for post-matriculation studies. About 54.16% of the respondents were having nucleus family and 45.83% were having joint family. The proportion of male members in the family was more than their female counterparts. The average family size of sample turmeric growers was found to be 6.The analysis of the occupational pattern of the sample respondents revealed that, all the sample farmers practiced agriculture as main occupation. The average annual income of the sample farmers was found to be Rs. 62598. The average area under turmeric crop for traditional farmers was 1.57 ha. Similar results were obtained by Singh and Verma in Himachal Pradesh [9]. The major soil type observed among the sample farmers is red sandy. Turmeric crop was grown under rain fed condition.

3.2 Labour Utilization Pattern in Turmeric Cultivation

The labour utilization pattern in turmeric cultivation in the study area is presented in Table 4. Land preparation was done by 5 man days of man labour and 10 pair of bullock labour. Sowing operation was carried out by using 22 man days of man labour and 8 man-days of woman labour. Mulching material collection was done by 17 man days of man labour and 7 days of woman labour.

Table 3. Socio economic characteristics of sample respondents (n=120)

Sl. no.	Particulars	Unit	Number of farmers	Percentage of total
I	**Age group of the farmers**	Number		
	Below 35 years		17	14.16
	36 - 45 years		53	44.16
	46 – 55 years		38	31.66
	Above 55 years		12	10
	Average age		43	
II	**Education**	Number		
	Literate		76	63.33
	Primary		24	20.00
	Secondary		20	16.66
III	**Family Type**	Number		
	Nucleus		65	54.16
	Joint		55	45.83
IV	**Family size**	Number		
	Small (2-4)		26	21.66
	Medium (4-6)		78	65
	Large (>6)		16	13.33
	Average family size		6	
VI	**Agriculture as occupation**	Number		
	Main		72	60.00
	Subsidiary		48	40.00
VII	**Average Annual Income**	Rupee		
	Main		62598	
	Subsidiary		38695	
VIII	**Average area under Turmeric**			
	Traditional farmer	Hectare	1.57	

After that mulching was done by 7 days of woman labour and 3 man days of man labour.Weeding was done by 4 man days of man labour and 6 man-days of woman labour. Harvesting was carried out by 10 man days of man labour. Cleaning and grading were done by utilizing 2 man days of man labour and 4 days of woman labour. For production of dry turmeric finger an extra 20 days of man labour are required. For fuel material collection 4 man days of woman labour and for boiling and drying operations a total of 10 man days of man labour and 6 man days of woman labour are utilized. Thus, a total of 135 man days of labour were utilized per ha of Turmeric cultivation. Out of the major cost in the production of fresh turmeric, the highest cost is incurred in labour cost with 73.19% share of total cost of production of fresh turmeric, this is due to lack of modern technology and labour saving techniques. Therefore, to reduce the cost of cultivation the use of labour saving technologies and devices such as mechanised farm implements needs to be made available to farmers [10].

Table 4. Labour utilization pattern in turmeric production (Per Hectare)

Description	Man days	Total days
Land preparation	5	5
Ploughing (by bullocks)	10	20
Sowing	10 X 3 Days	30
Mulch collection	12 X 2 Days	24
	500 bundle	
Mulching	10 X 1 Day	10
Weeding	5 X 2 Days	10
Harvesting (digging)	1250(10)	10
Cleaning and grading	3 X 2 Days	6
For production of raw turmeric		**115**
Fuel	4	4
Boiling	5 X 2 Days	10
Drying	2 X 3 Days	6
For production of dry turmeric		**135**

3.3 Input Utilization Pattern in Turmeric Cultivation

The resource poor farmers in the study area don t use any input except seed (20 q/ha) of the previous year. This might be due to lack of technical knowledge. Even they don t use any irrigation for their crop, they only depend upon rain water, which ultimately reduces the fingure yield. They are unaware about use of any organic input like organic manure, bio fertilizer, pesticides etc which can boost their yield. It was revealed from the study that majority of farmers were not applying FYM or organic manure [2]. Hence, there is a need to create awareness in the farmers about the use of organic manures. The demonstrations need to be conducted to educate the farmers to adopt recommended application of organic manure.

3.4 Cost and Returns Structure in Turmeric Cultivation

The cost and returns structure in Turmeric cultivation (per ha) is presented in Table 5. Of the total cost, the expenditure incurred on labour accounted for about 73.19 per cent of the total cost of cultivation, followed by seed cost 26.81 per cent. Among the fixed costs, the highest share was contributed by rental value of owned land .The total cost of cultivation of the turmeric growers was found to be Rs 52200. the total cost of dried turmeric production of the sample traditional farmers was (Rs. 522 /q). Yield of Turmeric crop in case of traditional Turmeric farmers was 100 quintals per ha. After processing (boiling and drying) which yields into 20 q / ha .But the average price received by them were Rs48/kg. The net returns per quintal of dried Turmeric production was found to be Rs 40200.Similar results were obtained by Radha and Choudhry [11] and Santosh [12] in their study on cost of commercial production and seed production of cotton in Kurnool district of Andhra Pradesh.

3.5 Constraints Faced in Turmeric Cultivation in the Study Area

The major constraints faced in cultivation of Turmeric in the study area are presented in Table 6. The study revealed that the major problems faced by the growers in production are high cost of labour, non-availability of quality seed, lack of technical knowledge, financial obligation, inadequate market information and low productivity. The sample respondents ranked high cost of labour as the greatest constraint with a Garrett score of 76.40. The problems ranked at second, third and fourth place were personal obligation with traders, financial weakness, lack of technical knowledge and lack of storage facilities with Garrett scores of 71.24,70.20,56.90 and 48.03 respectively.

Table 5. Cost and returns structure in turmeric cultivation (per Hectare)

Sl. no	Description	Quantity	Total	Type of labour		Unit	Rate	Total	Paidout Cost
Cost of production of fresh turmeric									
A	**Land renting**							0	
B	**Inputs**								
1	Seed	20	20			Quintal	700	14000	
C	**Labour**			**HIRED**	**OWN**				
1	Land preparation	5	5	0	5	Man-days	100	500	0
2	Ploughing(by bullocks)	10	20	20	0	Pairs	150	3000	3000
3	Sowing	10 X 3 Days	30	6	4	Man-days	100	3000	1800
3	Mulch collection	12 X 2 Days	24	8	4	Man-days	100	2400	1600
		500 bundle		8	2	Per bundle	4	2000	1600
4	Mulching	10 X 1 Day	10	5	5	Man-days	100	1000	500
5	Weeding	5 X 2 Days	10	1	4	Man-days	100	1000	200
6	Harvesting(digging)	1250(10)	10	5	5	Per container	20	25000	12500
7	Cleaning and grading	3 X 2 Days	6	0	3	Man-days	100	300	0
				Total production of fresh turmeric				100 q	
				Grand total cost of fresh turmeric				52200	21200
				Loss in percentage				1.5%	
				Cost of production (per kg) of fresh turmeric				Rs 5.20	
Additional cost for making dried turmeric (by boiling and drying) at farm level									
9	Fuel	4	4	0	4	Per acre	400	1000	0
10	Boiling	5 X 2 Days	10	2	3	Man-days	200	2000	400
11	Drying	2 X 3 Days	6	0	2	Man-days	100	600	0
				Total production of dried turmeric from 1 ha (in q) land				20 q	
				Grand total cost for dried turmeric				3600	400
				Loss in percentage				1.5%	
				Cost of production (per kg) of dried turmeric				Rs 5.58	
		Price of dry turmeric per quintal							4800
		B: C Ratio							1.72

Table 6. Constraints faced by turmeric growers in the study area

Sl. no	Constraints	Score	Rank
1	High cost of labour	76.40	I
2	Personal obligation with traders	71.24	II
3	Financial weakness	70.20	III
4	Lack of technical knowledge	56.90	IV
5	Lack of storage facilities	48.03	V
6	Low productivity	39.97	VI
7	Non availability of quality seed	38.13	VII
8	Inadequate market information	37.70	VIII

4. CONCLUSION

Turmeric is one of the most important spice crops grown in Kandhamal district; however the productivity is continuously decreasing year by year. Thus, there is need to increase the productivity to fulfill the domestic requirement and for export. Turmeric cultivation is capital intensive and needs more investment. The tribal farmers of the study area are incapable to invest the required inputs and unable to bear more risks. It has been observed that technological interventions like rhizome treatment, soil application of bio control agent, crop rotation, mulching, and plant protection measures increased rhizomes yield by 20- 25per cent at farmer's field and with the application of irrigation, yield increased by 20-30 percent, but the farmers are not applying irrigation to the crop. To enhance the productivity, eco friendly production technologies among the farming community are the need of the hour. The indigenous technical knowledge acquired by the farmers need to be tested and refined with the modern techniques of crop cultivation. Organic turmeric cultivation in Kandhamal was found to be economical with a B:C ratio of 1.72. Efforts should be made in the selection and production of improved seed from local cultivars having high curcuma content, identification of appropriate quantity and time of irrigation, training on application of organic input should be provided. From the study it was revealed that price of dry turmeric with minimal processing fetches more price than raw turmeric. Therefore, the farmers need to be encouraged to take up processing by themselves by giving them subsidy and/or loan for establishing the small scale processing units. Government should help the farmers to establish small scale mini processing plant, so that farmer will get maximum share in consumer rupee [13]. The role of Regulated market committee should be strengthened for marketing of Turmeric through provision of better market infrastructure facilities at the RMC level to ensure remunerative prices to the farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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