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RESEARCH PAPER

Production and marketing management of organic and inorganic dry chilli in Dharwad district

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ABSTRACT

The present study was conducted in Dharwad district, the major dry chilli producing district of north Karnataka. For the study, 10 organic farmers and 50 inorganic farmers were selected randomly in the study area. The estimated per hectare cost of cultivation of organic and inorganic dry chilli was Rs. 50,342.61 and Rs. 56,337.72, respectively. Average yield of organic chilli was 6.87 tonnes as against 10.75 tonnes in inorganic dry chilli per hectare. The per quintal of dry chilli prices in organic and inorganic were Rs. 19,565 and Rs. 15,150, respectively. The gross returns of inorganic dry chilli were Rs. 1,62,862.50 per hectare as against Rs. 1,34,411.55 for organic dry chilli. The net returns of inorganic dry chilli (Rs. 1,07,524.78) were higher than that of organic dry chilli (Rs. 84,068.94). The B: C ratio for inorganic dry chilli was 1.90 as against 1.85 for organic dry chilli. It was observed that only two marketing channels were using, channel-I was more marketing efficiency compared to channel-II. Most of the farmers were using channel-I.

KEY WORDS : Cost and returns of organic, Inorganic dry chilli, Price spread, Channels, Cultivation of chilli, Marketing efficiency

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The portuguese brought chilli from Brazil to India during the year 1584. Chilli is a fruit of the plants '*Capsicum annuum*' and '*Capsicum frutecens*' that come from the genus 'capsicum,' belonging to the family of 'Solanaceae,' which also includes tomato and potato. These fruits are small in size and known for their sharp acidic flavour and colour. Currently, chillies are used throughout the world as a spice and also in the making of beverages and medicines. Chilli is said to be the first ever domesticated crop in America. At that time, chillies were cultivated by the farmers together with a primary crop to protect the primary crop from any damage that the birds could do. Chillies gained popularity in the American continent for flavouring and have been largely cultivated since then. When America was discovered and the Spaniards and Portuguese explored the South American continent, this pungent-flavoured fruit gained much more recognition. Christopher Columbus, the founder of America, was one of the first Europeans

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who encountered and consumed chilli and called it pepper due to the similarity in taste. Crushing the dried pods gave chilli powder, which was later identified as a substitute of 'peppercorn.' The chilli crop came to the Asian continent as late as the 16th century with the identification of new sea routes by the Portuguese and the Spanish explorers. It became popular in the whole of Asia rapidly and native Asians started cultivating this crop as well. The south Asian climate suited this vegetable crop and since then a large percentage of chilli production has shifted. Chilli is one of the most important commercial spice crops of India. It is grown almost throughout the country. There are more than 400 different varieties of chillies found all over the world. It is also called as *pepper, hot pepper, cayenne pepper* etc. Its botanical name is *"Capsicum annuum"*. The world's hottest chilli *"Naga jolokia"* is cultivated in hilly terrain of Assam in a smalltown Tezpur, India.

India produces a wide range of spices. At present area is 789 thousand hectare and production is around 1,628 Metric tonnes and different spices hold a prominent position in the world spice production. Because of the varying climates from tropical to sub-tropical and temperate almost all spices grow splendidly in India. In reality almost all the states and union territories of India grow one or the other spices. Dry chilli has a great potential for value addition such as oleoresin, essential oils ,capsaicin, capsanthin (for pharmaceutical and food industry as natural colour) etc. which has gained importance in global market besides using as a dried flacks or ground powder products. Capsaicin from king chilli is chemically a condensation product of 3 hydroxyl, 4- methoxy benzyamine and decylenic acid (N venilly1-8-methy-6-nonenamide, $C_{18}H_{27}NO_3$). Capsaicin has significant physiological action and has carminative, tonic, simulative and cancerous properties. It is also reported that capsaicin is used externally for the treatment of tonsillitis, diphtheria and snake bite besides relieving cold, sore throat, and rheumatism and stomach disorder.

Spices are very common in Indian cuisine and varieties of spices are used every day. In the daily food or snack preparations, spices like red chilli powder, turmeric powder or black pepper powder are used regularly. Many special vegetables or snacks are prepared with the help of spices or value-added spices and use of such spices is increasing in individual households and restaurants, during many social and religious functions etc.

Different varieties are grown for vegetables, spices, condiments, sauces and pickles. Chilli occupies an important place in Indian diet. It is an indispensable item in the kitchen, as it is consumed daily as a condiment in one form or the other. Among the spices consumed per head, dried chilli fruits constitute a major share. If some varieties of chillies are famous for red colour because of the pigment 'Capsanthin,' others are known for biting pungency attributed to 'capsaicin.' India is the only country which is rich in many varieties with different quality factors.

METHODOLOGY

The study was conducted in Dharwad district. The study was based on both primary data. Primary data were collected through personal interview method from farmers, village merchants, wholesalers and retailers with the help of well structured and pre-tested questionnaire exclusively designed for the study. The sampling technique followed was random sampling technique. From Dharwad district two taluks like Kundagola and Navalgunda were selected based on the highest area under dry chilli production. In the next stage 5 villages were selected randomly from each one of the selected taluks. In the next stage 5 farmers were selected from each village and also 5 organic dry chilli growers were selected randomly from each taluk. Similarly, to elicit marketing information about dry chilli crop, 5 village merchants, 5 wholesalers cum - commission agents and 5 retailers from each taluk were selected randomly. Thus, the total sample size was 90. Tabular analysis was followed for analysis of the data. The primary data collected from the farmer respondents and traders related to details of the objectives. The data pertained to the agricultural year 2016-17.

ANALYSIS AND DISCUSSION

The average quantities of inputs used per hectare of organic dry chilli production were presented in Table 1 and indicates that the quantum of seeds used by sample farmers were 1.65 kg of seeds per hectare. The amount of FYM used was 12.50 tonnes per hectare by sample farmers. The amount of green leaf manures used was 44.23 kg and amount of bio pesticides 92.46 kg and pachagavya used was 15.02 lit per hectare by sample farmers. Panchagavya was used as a spray and it

controls the disease and bio pesticides were using in this because it's purely organic production. Varmicompost was used 1.80 tonnes per hectare by sample farmers. The sample farmers employed about an average 86.04 man days of human labour per hectare of dry chilli cultivation. Human labour usage was higher mainly because, dry chilli crop requires a more number of men and women labour in various activities like sowing, harvesting, weeding operation, etc. The bullock labour used by respondents was found to be 14.05 bullock pair days and machine labour used by respondents was 5.73 machine hours per hectare of organic dry chilli cultivation. Machine hour usage was very high compared to bullock pair days per hectare, mainly due to technological advance in farm equipments.

The average quantities of inputs used per hectare of inorganic dry chilli production were presented in Table 1 and indicates that quantum of seeds used by sample farmers were 1.80 kg of seeds per hectare. The amount of FYM used was 11.52 tonnes per hectare by sample farmers. The amount of inorganic fertilizer used was 488.52 kg per hectare, the amount of plant protection and chemicals by the respondent's was 3.55 lit per hectare of dry chilli cultivation, respectively. Plant protection and chemicals was more used in sprayers and it controls the disease and fertilizer also influenced the increasessing yield and also protects from pest and disease. Thus, total production of dry chilli was increasing in inorganic dry chilli production. The sample farmers employed about on an average 92.17 man days of human labour per hectare of dry chilli cultivation. Human labour usage was higher mainly because, dry chilli crop requires a more number of men and women labour in various activities like sowing, harvesting, weeding operation, etc. The bullock labour used by respondents was found to be 16.49 bullock pair days and machine labour used by respondents was 6.78 machine hours per hectare of inorganic dry chilli cultivation. Machine hour usage was very high compared to bullock pair days per hectare, mainly due to technological advance in farm equipments. Same result was reported by Admelo (2017).

The labour use pattern followed in cultivation of organic dry chilli is presented in Table 2. Total numbers of men labour required was 19.44 man days out of this spraying consumed highest number of man days (6.28 man days) followed by spreading of FYM (3.22 man days), hand weeding (2.43 man days). Total numbers of woman labours required was 66.60 man days in the dry chilli production and maximum proportion of women labour was required compared to men. Harvesting required more women labour (26.50 man days), followed by hand weeding (16.72 man days), sowing (14.54 man days), organic manure application (6.26 man days) the above operations like harvesting, weeding and sowing operations exclusively depend on woman labour. Spreading of FYM (1.52 man days) and transportation of FYM (1.06 man days) these operations generally require less number of human labours compared to sowing and harvesting operations. Total number of bullock labour required were 14.05 in this intercultivation required highest bullock labours 6.23 followed by transportation of FYM 2.32 and harrowing 2.28. The farmers have no other alternative ways to do all these above operations except bullock labour and majority of the sample farmers possessed bullock pairs and they wanted to make use of them efficiently. Total amount of

Table 1 : Inputs utilization pattern in organic and inorganic dry chilli production

Sr. No.	Inputs	Units	Per hectare average quantity in organic dry chilli	Per hectare average quantity in inorganic dry chilli
1.	Seeds	kg	1.65	1.80
2.	Farm yard manure	Tonnes	12.50	11.52
3.	Green leaf manures	kg	44.23	-
4.	Vermicompost	Tonnes	1.80	-
5.	Bio pesticide	kg	92.46	-
6.	Panchagavya	Lit	15.02	-
7.	Chemical fertilizers	kg	-	488.52
8.	Plant protection chemicals	Lit	-	3.55
9.	Human labour	man days	86.04	92.17
10.	Bullock labour	pair days	14.05	16.49
11.	Machine labour	Hours	5.73	6.78

machine labour required was 5.73 in this FYM transportation required highest machine labour 2.55 followed by harrowing 1.60 and ploughing 1.58. Using machine labour means it would take less time compared to bullock labour.

Labour use pattern followed in cultivation of inorganic dry chilli is presented in Table 2. Total numbers of men labour required was 20.88 man days out of this spraying consumed highest number of man days (7.03 man days) followed by spreading of FYM (3.15 man days), hand weeding (3.11 man days). Total numbers of women labour required was 71.29 man days in the dry chilli production and maximum proportion of women labour was required compared to men. Harvesting required more labour (27.75 man days), followed by hand weeding (16.50 man days), sowing (15.65 man days), fertilizer application (7.50 man days), the above operations like harvesting, sowing and weeding operations exclusively depend on woman labour. Transportation of FYM was used 1.56 man days and spreading of FYM 2.58 man days. Total numbers of bullock labours required were 16.49 in this intercultivation required highest bullock labours 7.45 followed by transportation of FYM 2.56 and harrowing 2.08. The farmers have no other alternative ways to do all these above operations except bullock labour and majority of the sample farmers possessed bullock pairs and they wanted to make use of them efficiently. Total number of machine labour 6.78 in this Transportation of FYM required highest machine labour 2.48 followed by harrowing 2.24 and ploughing 2.06. Using machine labour means it would take less time compared to bullock labour. Similar result was reported by Kavitha *et al.* (2013).

The economic aspects of organic dry chilli production presented in Table 3 and indicate that the total cost incurred by the respondents was Rs. 50,342.61 per hectare of dry chilli production in the study area. The cost of cultivation of organic dry chilli was less compared to inorganic dry chilli the reason being was it required less labour investment cost compared to inorganic dry chilli production. The total cost incurred encompasses various costs such as variable cost and fixed cost. Out of this total cost, variable cost (94.59 %) shared maximum proportion when compared to fixed (5.40 %) cost. Out of the total variable cost for human labour shared a major portion (33.35 %), followed by the expenditure made on bullock labour (22.47 %), this reflects increased dependency of sample farmers on human labour because dry chilli production operations like harvesting, weeding and sowing needs more number of human labour. Similarly dependency on bullock labour was more as it was easily available and more economical compared to machine labour. While the expenses made on organic manures like vermicompost (7.13 %) was maximum proportion followed by bio pesticide (2.91 %), green manure (2.02 %) and panchagavya (0.36 %). These were contributing less mainly due to the easy availability of these inputs to farmers in the study area. Panchagavya was prepared by farmers in their homes. Cost of FYM accounts (9.31 %), machine labour (7.80 %) and interest

Table 2 : Labour utilization pattern in organic and inorganic of dry chilli production

Labour operation	Frequency of operation	Organic chilli				Inorganic chilli			
		Men	Woman	Bullock labour	M/L	Men	Woman	Bullock labour	M/L
Ploughing	2	-	-	1.08	1.58	-	-	1.20	2.06
Harrowing	1	-	-	2.28	1.60	-	-	2.08	2.24
Transportation of FYM	1	1.05	1.06	2.32	2.55	2.08	1.56	2.56	2.48
Spreading of FYM	1	3.22	1.52	-	-	3.15	2.58	-	-
Sowing	1	2.12	14.54	2.14		2.12	15.65	3.20	
Fertilizer application	1	-	-	-	-	1.15	7.50	-	-
Organic manure application	1	2.18	6.26	-	-	-	-	-	-
Inter cultivation	1	-	-	6.23	-	-	-	7.45	-
Hand weeding	2	2.43	16.72	-	-	3.11	16.50	-	-
Spraying	2	6.28	-	-	-	7.03		-	-
Harvesting	4	2.16	26.50	-	-	2.24	27.75	-	-
Total		19.44	66.60	14.05	5.73	20.88	71.29	16.49	6.78

Note: Human labour= Man days, Bullock labour= Pair days, Machine labour= ML (Hr)

on working capital (7.00 %) costs per hectare of organic dry chilli production. Expenditure made on seeds (2.14 %) costs per hectare of dry chilli production in the study area.

Fixed cost contributed 5.40 per cent to the overall cost of production. Among the total fixed cost, the depreciation of farm implements (4.17 %) was major cost this is because which was considerably high since the farm implements usage in the recent past few years. Among all the total fixed costs, interest on fixed capital (0.51 %) and lastly land revenue (0.12 %) contributed a minor share among the total fixed costs per hectare of chilli production in the study area. The yield and returns realised by the respondents of dry chilli production farmers indicate that the average yield of the dry chilli was 6.87 quintals per hectare. Yield was less compared to the inorganic dry chilli because in Dharwad district respondent's adopted the organic dry chilli production since last two years. The gross return obtained per hectare by the respondents was Rs. 1,34,411.55 per hectare. The net return per hectare of dry chilli cultivation obtained by the sample farmers was Rs. 84,068.94. Even though the price of organic dry chilli production was high but returns was less mainly because of yield was less in organic dry chilli. The table also indicated that the obtained B: C ratio was 1.85. The benefit cost was more than one which indicates that dry chilli cultivation is financially more beneficial.

The economic aspects of inorganic dry chilli production presented in Table 3 and indicate that the total

Table 3: Cost and returns of organic and inorganic of dry chilli production

Sr. No.	Particulars	Organic dry chilli		Inorganic dry chilli	
		Cost	Percentage	Cost	Percentage
Variable cost					
1.	Seeds	1,080.75	2.14	1,215.45	2.15
2.	Farm yard manure	4,687.50	9.31	4,325.99	7.67
3.	Green manuaring	1,110.72	2.02	-	-
4.	Vermi compost	3,592.50	7.13	-	-
5.	Bio pesticide	1,467.58	2.91	-	-
6.	Panchagavya	185.06	0.36	-	-
7.	Chemical fertilizers	-	-	5,728.10	10.16
	Urea	-	-	690.25	1.22
	DAP	-	-	1,989.13	3.53
	Phosphate	-	-	1,536.32	2.72
	Complex	-	-	1,512.40	2.68
8.	Plant protection chemicals	-	-	2,808.33	4.98
9.	Human labour	16,789.89	33.35	18,071.74	32.07
10.	Bullock labour	11,313.76	22.47	12,738.38	22.61
11.	Machine labour	3,927.51	7.80	4,677.09	8.30
12.	Interest on working capital @ 8 %	3,527.46	7.00	3,969.20	7.04
	Total variable cost	47,620.73	94.59	53,534.28	95.02
Fixed cost					
1.	Land revenue	65	0.12	65	0.11
2.	Depreciation of farm implements	2,100.56	4.17	2,156.66	3.82
3.	Interest on fixed capital 12 %	259.86	0.51	266.59	0.47
	Total fixed cost	2,721.88	5.40	2,803.44	4.97
	Total cost of cultivation	50,342.61	100	56,337.72	100
	Yield (qtl/ha)	6.87	-	10.75	-
	Price (Rs./qtl)	19,565	-	15,150	-
	Gross return	1,34,411.55	-	1,62,862.50	-
	Net return	84,068.94	-	1,07,524.78	-
	B:C Ratio	1.85	-	1.90	-

Table 4 : Marketing cost, margins and price spared in different channels **(Rs./q.)**

Sr. No.	Particulars	Channel-I	Channel-II
1.	Producer price	15,000	15,150
2.	Cost incurred by producer	71.25	236.05
3.	Producer net price	14,928.75	14,913.95
4.	Cost incurred by village merchant	-	557.43
5.	Purchase price of village merchant	-	15,050
6.	Wholesaler purchase price (sale price by village merchant)	14,928.75	15,773.69
7.	Profit of village merchant	-	202.31
8.	Cost incurred by wholesaler	617.69	620.69
9.	Wholesaler selling price	16,096.63	16,769.63
10.	Profit of wholesaler	550.19	375.25
11.	Cost incurred by retailer	258.96	261.99
12.	Consumer price	17,336.03	17,536.87
13.	Profit of retailer	755.44	505.25
14.	Producer share in consumer rupee	87.17	85.57
15.	Price spread	2,196.24	2,514.28
16.	Marketing efficiency 3/15	6.79	5.93

cost incurred by the respondents was Rs. 56,337.72 per hectare of dry chilli production in the study area compared to organic dry chilli production it is having highest cost this was because compared to organic dry chilli cultivation human labour requirement was more in inorganic dry chilli cultivation. Out of the total cost, variable cost (95.02 %) shared maximum proportion when compared to fixed cost (4.97%). Out of the total variable cost, human labour shared a major portion (32.07 %) this reflects increased dependency of sample farmers on human labour because dry chilli production operations like harvesting, weeding and sowing needs more number of human labour. Similarly dependency on bullock labour was high (22.61 %) because it was easily availability and more economical compared to machine labour. The expenses made on chemical fertilizer (10.16 %) cost was higher compared to cost of FYM (7.67 %) this is because higher fertilizer rate, machine labour (8.30 %) and interest on working capital (7.04 %) costs per hectare of organic dry chilli cultivation. Expenditure made on seed (2.05 %) and expense made on plant protection chemicals (4.98) costs was less compared to other variable cost because easy availabilities of these inputs to farmers in the study area.

Fixed cost contributed 4.97 per cent to the overall cost of production. Among the total fixed cost, the depreciation of farm implements (3.82 %) was major cost among all the total fixed costs; this was because now day's usage of farm implements was very high. Interest on fixed capital contributing (0.47 %) and land revenue (0.11 %) contributed a minor share among the total fixed costs per hectare of chilli production in the study area. The yield and returns realised by the respondents of dry chilli cultivated farmers indicate that the average yield of the dry chilli was 10.75 quintals per hectare. The net returns were highest in inorganic dry chilli compared to organic because average yield was highest in inorganic chilli production. The gross return obtained per hectare by the respondents was Rs. 1,62,862.50 per hectare. The net return per hectare of dry chilli production obtained by the sample farmers was Rs. 1,07,524.78. The table also indicated that the obtained BC ratio was 1.90. Inorganic dry chilli was more financial beneficial because it was involving less risk. The similar results were reported by Naik *et al.* (2012).

The marketing cost and margins of intermediaries involved in the marketing of dry chilli in market are given in Table 4, the producer's share in consumer's rupee in channel-I was observed 87.17 per cent with a price spread of Rs. 2,196.24/ quintal. The index of marketing efficiency of the channel-I was found to be efficient. The index of marketing efficiency was found to be 6.79. This channel was found to be most efficient since, the marketing cost was lowest compared to other channels because of involvement of less intermediaries. The channel was most efficient as indicated by measure of

market efficiency.

The marketing cost and margins of intermediaries involved in the marketing of dry chilli in market are given in Table 4, the producer's share in consumer's rupee in channel- II was observed 85.57 per cent with a price spread of Rs. 2,514.28/ quintal. The index of marketing efficiency of the channel-II was found to be less efficient. The index of marketing efficiency was found to be 5.93. Which was less efficient than the channel-I, because in this channel marketing cost of intermediaries was high. Similar results were reported by Jyotish and Dinda (2003) and Rajur *et al.* (2008).

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