Original Research Article

Organic and Conventional Cultivation and Marketing of Vegetables in the Nilgiris District

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ABSTRACT

Aims: To find out the cost of cultivation, marketing costs, marketing margins, price spread, marketing efficiency and constraints faced by organic and conventional Carrot and Potato growing farmers.
Study design: Multistage Sampling was used.
Place and Duration of Study: The Nilgiris district in Tamil Nadu was chosen for the research. A primary survey was conducted to gather first-hand information related to the study.
Methodology: The costs and returns, the Acharyas-Agarwal's method and Shepherd's method of Marketing efficiency and the Response priority index were used in this study.
Results: The cost of cultivation of organically and conventionally grown carrot were Rs.5,83,449.67 and Rs.6,05,565.72 with B: C ratios of 3.83 and 2.31 respectively. The cost of cultivation of organically and conventionally grown potato were Rs.4,62,563.40 and Rs.5,14,160.56 with B: C ratios of 2.55 and 1.83 respectively. Organic vegetable marketing was done through producer-retailer-consumer and producer-consumer channels. For conventional vegetables, producer-wholesaler-trader-retailer-consumer and producer-retailer-consumer were the marketing channels. The Acharyas-Agarwal's and Shepherd's method of marketing efficiencies in channel-I and II for organic carrot were 1.97, 7.37, 13.07 and 13.07 respectively. In conventional, marketing efficiencies in Channel – I and II of carrot were 0.98, 2.16, 1.52 and 3.47. The marketing efficiencies measured by the Acharyas-Agarwal's and Shepherd's method in channel I and II of organically grown potato were 1.71, 7.59, 15.97, and 15.97 respectively and for conventially grown potato, they were 1.21, 2.36, 152 and 3.08. The major constraints faced by organic and conventional farming farmers were lack of awareness on certification procedures and pests and disease incidence respectively.
Conclusion: As major inputs were prepared in the field, the cost of cultivation for organically grown carrot and potato is lower than for conventionally grown carrot and potato. They have high B: C ratios since organic produce fetches a higher price than conventional produce. The B: C ratio for conventional carrot indicates higher returns than potato. The channel – II in organic and conventional marketing has higher effiencies as they have less intermediaries.

Keywords: [organic cultivation, cost and returns, marketing channels, marketing efficiency, response priority index, carrot, potato, constraints]

1.INTRODUCTION

Organic Agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and good quality of life for all involved. In 2020, there were more than 4,21,000 hectares or 0.7 per cent of the global vegetable area under organic management. Australia had the largest organic area of 35.7 million hectares. In 2020, over 74.9 million hectares of organic

agricultural land, including in-conversion areas, were recorded. IFOAM research indicates that there were 3.4 million or more organic growers worldwide in 2020. The majority of organic farmers were found in Asia followed by Africa, Europe and Latin America with fifty six per cent, twenty-four per cent, twelve per cent and one per cent respectively [1]. The total area and production under organic farming in India were 26,57,889.33 hectares and 3468991.98 MT respectively. India occupied rank 9th in the area under organic farming. Tamil Nadu's total organic farm area and production in 2020- 21 were 14,086.32 hectares and 24,068.86 MT respectively. [2]. The total organic area in the Nilgiris was 1,577 hectares. [3]

Vegetables are significant components of Indian agriculture and nutritional securit because of their short duration, high yield, nutritional richness, economic viability, and potential to produce on-farm and off-farm jobs, Our country has varied agro-climates with unique seasons, allowing us to grow a diverse range of vegetables.. Our country is blessed with diverse agro-climates with distinct seasons, making it possible to grow a wide array of vegetables. The India's area, production and productivity of vegetables in 2020-21 were 1,08,59,000 hectares, 20,04,45,000 MT and 18.5t/ha respectively. India ranked 2nd position in area and production after China. Tamil Nadu remained first in the productivity of vegetables in India. Tamil Nadu ranked 7th in vegetable area, production and productivity with 3,34,946.45 ha, 82,02,896.48 MT and 24.4MT/ha in 2020-21. [4]

Vegetables are important sources of proteins, vitamins, minerals, dietary fibre, micronutrients, phytochemicals, and antioxidants in our daily diet. They are not only nutritious, but they also include a variety of phytochemicals, such as antioxidants and anti-carcinogenic substances (e.g. flavonoids, glucosinolates and isothiocyanates). Dieticians recommend eating 300g of vegetables every day. When ingested in sufficient quantities, increase appetite and include a good amount of fibre. Furthermore, it neutralises the acids produced during the digestion of fatty and proteinous foods, provides healthy roughage that promotes digestion, and contributes in the prevention of heart disease.

The Nilgiris District is situated at the north western part of the State in the Western Ghats and surrounded by the Coimbatore and Erode District in the east, Kerala State in the west and Karnataka State in the north. It is located at an altitude of 2000mts. The average minimum and maximum temperatures are 4^{0}c and 23^{0}c respectively. Organic farming is a solution for preventing soil erosion and preserving the heritage of the district. The scope certificate for the Nilgiris has been issued for making the district organic. The district is a horticultural district which occupies a special significance in the hilly regions of Tamil Nadu. It is the home for all hill zone cultivated crops such as vegetables, fruits, flowers, spices and plantation crops. The Nilgiris district has its major area under cultivation of Tea, Coffee, Potato, Carrot, Cabbage, Garlic, Pepper, Ginger, Beans, Banana, Mandarin orange, Gerbera and Carnation. Carrot(*Daucus carota*) and potato (*Solanum tuberosum*) are selected for the study based on their wider cultivation area of 8,15.74 ha and 3,725.49 ha respectively.[3]

2.METHODOLOGY

2.1 Sampling design and method of Data collection

The sample carrot and potato growing farmers were spread over three blocks Ooty, Coonoor and Kotagiri of the Nilgiris except for Gudalur which makes up the entire district. It was based on the primary data collected during the months of April-May 2022. Multistage sampling was adopted for the selection of district, blocks and villages based on the large area of cultivation. For the selection of sample respondents in each village, simple random sampling was used. The respondents are interviewed with a pre-prepared interview schedule and the total sample size constitutes 120 farmers. Of these, there were 60 conventional carrot and potato farmers and 60 organic carrot and potato farmers. 50 market

intermediaries consisting of traders, wholesalers and retailers of organic and conventional vegetables are interviewed.

2.2 Tools of analysis

2.2.1. Cost and Returns

The cost concepts as per CACP approach were used to find out the cost incurred in per hectare cultivation of carrot and potato organically and conventionally. The different concepts were explained below [5,6,7]

Cost A1 = It includes the value of hired human labour, the value of bullock labour (owned and hired), machine power (owned and hired), the value of seeds, the value of manures (owned/purchased), the value of fertilizers, the value of plant protection chemicals, irrigation charges, depreciation of implements and farm buildings, land revenue and interest on working capital.

Cost A2 = Cost A1 + Rent paid for leased in land
Cost B1 = Cost A2 + Interest on owned fixed capital
Cost B2 = Cost B1 + Rental value of owned land
Cost C1 = Cost B1 + Imputed value of family labour
Cost C2 = Cost B2 + Imputed value of family labour
Cost C3 = Cost C2 + 10% cost of C2

In case of organic, the value of manures, bio-fertilizers and other plant-protection bio-inputs are commonly taken as organic inputs for easier calculation. The Net return is obtained by subtracting the cost of cultivation from the gross return and expressed in Rs./ha. The Gross return is calculated by multiplying the total quantity of yield by the price/kg of product. The total cost of cultivation is the cost C3 obtained by using cost concepts. The Net return is calculated as follows,

Net Return = Gross return – Total cost of cultivation

The Benefit-Cost Ratio (BCR) is found for finding the success of the farm business. It is the ratio of gross return and cost of cultivation. It can be expressed as under,

$$\text{Benefit Cost Ratio (BCR)} = \frac{\text{Gross return (Rs./ha)}}{\text{Cost of cultivation (Rs./ha)}}$$

The B:C ratio calculated from cost of cultivation arrived by cost concepts as per CACP approach reflects all explicit and implicit costs incurred during cultivation.

2.2.2.Price spread :

For the assessment of farmers' share in consumers' rupee and the marketing efficiency of different channels in the selling of organic and conventional carrot and potato, price spread and efficiency calculating methods of Acharyas-Agarwal's approach and Shepherd's approach are used [8].

The price spread is found by,

$$F_S = \frac{F_P}{C_P} X\ 100$$

F_S = farmers' share in consumers rupee

F_P = farmers' price

C_P = consumers' price

2.2.3.Marketing efficiency :

The Marketing efficiency by Acharyas and Agarwal's approach is calculated by [9,10],

ME = FP/ (MC+MM)

Where,

ME = marketing efficiency expressed as a percentage

FP = price received by the farmer
MC = Total marketing cost
MM = Net marketing margin
The Shepherd's Method of calculating efficiency is

ME = (V/I – 1)

Where,
ME = Marketing efficiency
V = Price paid by the consumer (value of goods purchased)
I = Total Marketing Cost

2.2.4.Response priority index :

For analyzing the constraints faced by farmers and intermediaries, the Response-priority index (RPI) was constructed as a product of the proportion of responses (PR) and priority estimate (PE) where PR for the ith constraint is the ratio of the number of responses for a particular constraint to the total responses as per equation [11,12],

$$(RPI)_I = \sum_{j=1}^{k} f_{ij} X_{[(k+1)-j]} / \sum_{i=1}^{1} \sum_{j=1}^{k} f_{ij}$$

Where,
RPI_I= Response priority index for ith constraint,
fij = number of responses for the jth priority of the ith constraint (i= 1, 2……, l; j= 1,2,3…..k),
$\Sigma_{j=1}^{k} f_{ij}$= total number of responses for the i^{th}constraint
K = Number of priorities (1- Strongly agree, 2-Agree, 3-Moderate, 4- Disagree, 5- Strongly disagree),
$X_{((k+1)-j)}$ = scores for the j^{th} priority
$\Sigma_{i=1}^{k}\Sigma_{j=1}^{k} f_{ij}$ = the total number of responses to all the constraints

Larger the RPI higher was the importance for that constraint.

3. RESULTS AND DISCUSSION

3.1 Cost and Returns

The cost of cultivation of organically grown carrot was Rs.5,83,449.67, with a B:C ratio of 3.83. The price available at the time of study was taken for calculating returns. Untreated conventional seeds were allowed for organic farming, therefore carrot seeds of different brands like Romance, Zubera, Techila, Natuna, and Korada were purchased and used. 3.75kg/ha of seeds were required for the production of carrots. However, due of nematode infestation in the soil, the farmers used more than recommended. 100g of carrot seeds were contained in 1 packet, which can cost up to 5000 depending on the brand. The organic farmers prepared the majority of the inputs on-farm, reducing their reliance on external sources and, as a result, the total cost reduced. The organic inputs used were Panchakavya, Dasakavya, Jeevamirtam, Agniasthram, Vermicompost, vermiwash, Neem cake, Neem seed kernel extract, Neem cake, *Metarhizium anisopliae, paecilomyces lilacinus, Trichoderma viride, Bacillus subtilis, Pseudomonas fluorescens,* Rhizobial culture, Azophos, VAM etc. They were delivered to plants via the roots and leaves at weekly intervals. The carrot cultivation required between 300 and 375 workers per hectare. The organic practices varied from farmer to farmer depending upon his knowledge and experience.

The cost of cultivation for conventionally grown carrot incurred cost of Rs.6,05,565.72 with a B:C ratio of 2.31[13]. Depending on the farmers' machinery, the required machine power can take anywhere between 3 and 10 hours. The tiller was used by the majority of farmers, and it takes about 10 hours. Depending on the farmer's practises,

the farmyard manure might be applied once a year or every half-year. A shipment of FYM that weighed about 15 tonnes costs on an average of Rs. 30,000, and the distance it must travel raised the price. Fertilizer was mixed and distributed by the Nilgiris cooperative marketing society (NCMS). For carrots, a total of 12 to 15 bags of fertilizer known as No 4 (made by NCMS) with an NPK ratio of 6:12:6 were used. [14]. It had been shown that farmers also used micronutrient blends. Twice weekly irrigation was administered and Irrigation was not used when it was raining heavily. High rainfall increased the need for plant protection chemicals since it made pests and diseases like root rot more common. The tubers had spherical shape due to the nematode infestation in soil. The quality, colour and tuber form determined the price of carrot.

The cost of cultivation of organically grown potato was Rs.4,62,563.40 with B:C ratio of 2.55. The organic potato farming farmers used organic inputs as explained in organic carrot cultivation for crop nutrition, protection etc. The cost of cultivation for conventionally grown potato was Rs.5,14,160.56 with B:C ratio of 1.83. Growing potatoes organically and conventionally required equivalent amounts of seed and labour. The potato farmers either purchased seeds from mandis or used potatoes from the previous harvest. The seed required per hectare was 50 bags for large seed potatoes and 75 bags for small seed potatoes (less germination percentage). The price of per bag potato seeds weighing 45kgs varied according to market situations from Rs.1500 to Rs.2500 on average. The machine power, FYM, irrigation and plant protection measures were followed as explained above for carrot. The overall yield was raised with the use of normally expensive, high-quality potato seeds. The NCMS No.4 fertilizer of 20- 25 bags was required for potatoes. The labour requirements for potato varied from 100 to 125 from sowing to harvest per hectare. Potato tubers lost their economic worth due to greening caused by sunshine exposure. [15] The cost of cultivation for organic and conventional carrot and potato is presented in (Table 1).

Table 1: Cost of cultivation for organic and conventional carrot and potato as per the CACP approach

(Rs/ha)

S.No	Particulars	Carrot		Potato	
		Organic	Conventional	Organic	Conventional
1.	Value of seeds	122329.18 (20.97)	139895.83 (23.10)	99791.68 (21.57)	96333.33 (18.74)
	Value of organic inputs	110554.18 (18.95)		125316.68 (27.09)	
	Value of manures		87666.68 (14.48)		87308.33 (16.98)
	Value of fertilizers		30442.50 (5.03)		62645.83 (12.18)
	Value of chemicals		16325.00 (2.61)		40250.00 (7.83)
	Irrigation charges	12433.33 (2.13)	12095.83 (1.91)	11373.33 (2.46)	12983.33 (2.53)
	Value of machine labour	24035.83 (4.12)	23208.33 (3.83)	26395.00 (5.71)	26761.68 (5.20)
	Value of hired human labour	185048.33 (31.72)	169808.33 (27.04)	84816.68 (18.34)	78283.33 (15.23)
	Depreciation	3468.33 (0.59)	2601.00 (0.43)	3468.33 (0.75)	2601.00 (0.51)

	Interest on working capital	17004.78 (2.91)	19177.08 (3.17)	8725.65 (1.89)	14458.15 (2.81)
	Land revenue	25	25	25	25
	Cost A1	474898.96 (81.31)	501245.58 (82.77)	359912.35 (77.81)	421649.98 (82.01)
2.	**Cost A2(cost A1 + Rent paid for leased in land)**	474898.96 (81.31)	501245.58 (82.77)	359912.35 (77.81)	421649.98 (82.01)
3.	Cost A1	474898.96 (81.31)	501245.58 (82.77)	359912.35 (77.81)	421649.98 (82.01)
	Interest on owned fixed capital	2183.33 (0.37)	2074.03 (0.34)	2183.33 (0.47)	2074.03 (0.40)
	Cost B1	477082.29 (81.77)	503319.61 (83.12)	362095.68 (78.28)	423724.01 (82.41)
4.	Cost B1	477082.29 (81.77)	503319.61 (83.12)	362095.68 (78.28)	423724.01 (82.41)
	The rental value of owned land	27266.50 (4.67)	25903.00 (4.28)	27266.50 (5.89)	25903.00 (5.04)
	Cost B2	504348.79 (86.44)	529222.61 (87.39)	389362.18 (84.17)	449627.01 (87.45)
5.	Cost B1	477082.29 (81.77)	503319.61 (83.12)	362095.68 (78.28)	423724.01 (87.45)
	The imputed value of family labour	26060.00 (4.47)	21291.68 (3.52)	31150.00 (6.73)	17791.68 (3.46)
	Cost C1	503142.29 (86.24)	524611.29 (86.63)	393245.68 (85.01)	441515.69 (85.87)
6.	Cost B2	504348.79 (86.44)	529222.61 (87.39)	389362.18 (84.17)	449627.01 (87.45)
	The imputed value of family labour	26060.00 (4.47)	21291.68 (3.52)	31150.00 (6.73)	17791.68 (3.46)
	Cost C2	530408.79 (90.91)	550514.29 (90.91)	420512.18 (90.91)	467418.69 (90.91)
7.	Cost C2	530408.79 (90.91)	550514.29 (90.91)	420512.18 (90.91)	467418.69 (90.91)
	10% of C2	53040.88 (9.09)	55051.43 (9.09)	42051.22 (9.09)	46741.87 (9.09)
	Cost C3	583449.67 (100)	605565.72 (100)	462563.40 (100)	514160.56 (100)
8.	**The Total Cost of cultivation**	583449.67	605565.72	462563.40	514160.56
9.	Total Yield (kg/acre)	40066.68	46841.68	22591.68	27975.00
10.	Gross returns (Rs/ha)	2236922.74	1400566.23	1180867.11	939960.00
11.	Net returns (Rs/ha)	1653473.07	795000.51	718303.71	425799.44

12.	B : C ratio	3.83	2.31	2.55	1.83

Figures in paranthesis indicates percentage

3.2.Marketing Channels and Price spread :

The marketing channels for organic carrots and potatoes include 1)producer-retailer-consumer and 2) producer-consumer. The Organic vegetables are sold to retail outlets like hypermarkets or organic stores located at different places. The persons who are aware of the benefits of organic vegetables were the predominant buyers. The organic retailers bought less quantity of organic produce compared to conventional vegetable quantity bought by conventional retailers because of less demand for organic produce among consumers. The packing and transportation cost of producer in channel-I of organic carrot and potato was added to the retailer. Since the volume of transaction is less, the marketing costs/kg of organic vegetables were higher. Few farmers have their own stores and sell directly.

The marketing of conventional carrot and potato involved two major channels namely 1)producer-trader-retailer-consumer [16] and 2) producer-retailer-consumer. In conventional carrot and potato marketing, the private mandis and NCMS played a major role in selling. Most of the farmers preferred selling through mandis where traders would buy during the auction and in turn sold to retailers in different areas including other districts and neighbouring states. The Nilgiris cooperative marketing society was one of the important auction centres, especially for potatoes located at Mettupalayam. It was established in 1935 exclusively for hill vegetables. The loading and unloading charges and transport distance increased the consumer price of vegetables depending on the place of selling. The farmers had higher returns when they have good quality produce. In conventional channel – I, farmers from the Nilgiris sell at Mettupalayam mandis to traders which is then transported to retailers at various places and ultimately to consumers in different districts and states. In channel-II, the retailers are found in local markets at Nilgiris. They bought vegetables from nearby mandis which incurred very less labour charges for loading and unloading and transportation purposes. The farmers preferred to sell the vegetables in Mettupalayam mandis because traders in the Nilgiris local markets would procure only less quantity of farmers' produce.

For organically grown carrot, the farmers share in consumers' rupee in channel – I and II were Rs.24.42 and Rs.65.00 respectively. The Acharyas-Agarwal's and Shepherd's method of marketing efficiencies in channel-I and II of organic carrot were 1.97, 7.37, 13.07 and 13.07 respectively. In the case of conventionally grown carrot, the farmers share in consumers rupee in Channel – I and II were Rs.13.91 and Rs.9.55 respectively. The Acharyas-Agarwal's and Shepherd's method of marketing efficiencies in channel-I and II of

Table 2 : Marketing channels in selling of organic and conventional carrot
(Rs/kg)

S.No	Particulars	Organic		Conventional	
		Channel - I	Channel - II	Channel – I	Channel – II
1.	**Producer**				
	Producers' Price	55.83	65.00	29.90	35.45
	Packing			0.65	0.65
	Washing	0.94	0.94	0.94	0.94
	Loading and unloading	0.25	0.38	2.39	0.26
	Transport		2.25	0.36	1.88
	Loss	1.40	1.05	0.89	1.05
	Commission*			2.99	3.55
	Marketing cost	2.59	4.62	8.22	8.33
	Net price	53.24	60.38	21.68	27.12
2.	**Wholesaler**				
	Purchase price			29.90	
	Loading and unloading			1.19	
	Transportation			1.67	
	Loss			0.44	
	Marketing cost			3.33	
	Sale price			35.47	
	Marketing margin			2.24	
3.	**Retailer**				
	Purchase price	55.83		35.47	35.45
	Loading and unloading	2.82		0.38	0.38
	Transportation	2.76		1.06	1.00
	Loss	1.42		0.89	0.35
	Marketing cost	7.00		2.33	1.73
	Sale price	80.25		43.81	45.00
	Marketing margin	17.42		6.01	7.82
4.	**Consumer**				
	Consumers price	80.25	65.00	43.81	45.00
	Farmers share in consumers rupee	24.42	65.00	13.91	9.55
	Price spread (in per cent)	69.57	100	68.25	78.78
	Marketing efficiency (Acharyas and Agarwals)	1.97	13.07	0.98	1.52
	Marketing efficiency (Shepherds)	7.37	13.07	2.16	3.47

conventional carrot were 0.98, 2.16, 1.52 and 3.47 respectively.

For organically grown potato , the farmers share in consumers rupee in channel – I and II were 26.36 and 65.67 respectively. The Acharyas-Agarwal's and Shepherd's method of marketing efficiencies in channel-I and II of organic potato were 1.71, 7.59, 15.97 and 15.97 respectively. In the case of conventionally grown potato, the farmers share in consumers rupee in Channel – I and II were 13.83 and 9.00 respectively. The Acharyas-Agarwal's and Shepherd's method of marketing efficiencies in channel-I and II of conventional carrot were 1.21, 2.36, 1.52 and 3.08 respectively. The channels were explained in (Table 2 and 3).

Table 3 : Marketing channels in selling of organic and conventional potato

(Rs/kg)

S.No	Particulars	Organic		Conventional	
		Channel - I	Channel – II	Channel - I	Channel - II
1.	**Producer**				
	Producers' Price	52.27	65.67	33.60	32.20
	Packing			1.16	1.16
	Loading and unloading	0.44	0.67	1.55	0.46
	Transport		2.89	0.67	1.56
	Loss	1.30	0.31	0.09	0.96
	Commission*			3.36	3.22
	Marketing cost	1.74	3.87	6.83	7.36
	Net price	50.53	61.80	26.77	24.84
2.	**Wholesaler**				
	Purchase price			33.60	
	Loading and unloading			2.04	
	Transportation			1.56	
	Loss			0.39	
	Marketing cost			3.99	
	Sale price			39.19	
	Marketing margin			1.60	
3.	**Retailer**				
	Purchase price	52.27		39.19	32.20
	Loading and unloading	3.05		0.67	0.67
	Transportation	3.00		1.78	1.78
	Loss	1.36		0.83	0.30
	Marketing cost	7.41		3.28	2.75
	Sale price	78.63		47.43	41.20

	Marketing margin	18.95		4.96	6.25
4.	**Consumer**				
	Consumers price	78.63	65.67	47.43	41.20
	Farmers share in consumers rupee	26.36	65.67	13.83	9.00
	Price spread (in per cent)	66.48	100	70.84	78.16
	Marketing efficiency (Acharyas and Agarwals)	1.71	15.97	1.21	1.52
	Marketing efficiency (Shepherds)	7.59	15.97	2.36	3.08

3.3.Marketing efficiency :

The marketing efficiency of organic and conventional carrot and potato was given by Acharyas and Agarwal's and Shepherd's method. Organic marketing of vegetables had higher efficiency than conventional marketing. The organic channel – II was more efficient because of the absence of intermediaries unlike channel – I. Organic farmers could take comparatively higher returns as it had less cost of cultivation and more price. In conventional, Channel-II had higher efficiencies for both carrot and potato. Though channel-I more predominant in the selling of vegetables, had less efficiencies as it includes mandi commission charges which is 10% in the case of Private and 7% in NCMS leading to higher marketing costs.

3.4.Constraints in organic and conventional carrot and potato cultivation :

The major constraint specific to organic farming stated by the farmers was getting certification for their farm. This was due to unawareness or improper information dissemination on existing certification agencies, cost of certification, procedures and document maintenance. The pest and disease incidence was unavoidable due to its cool climate. The farmers had to bare the yield loss during the conversion period as the soil needs its time to become nutrient enriched using organic inputs.[17] They were not aware of many of the approved inputs which were allowed to use in the organic farm and they faced difficulties in enriching the soil with micronutrients because of lack of training. Conventional vegetable growers also felt pests and diseases as major issue. The farmers had less returns when they harvested poor quality vegetables due to biotic and abiotic stresses. Inadequate labour supply coupled with high wages for labour and wild animals intrudence are found. The topography and climatic condition of the study area also remained as challenges to the farmers of this district. The constraints were ranked in the table 4 and 5.

Table 4: Constraints faced by organic farmers in the cultivation of vegetables

S.No	Constraints	Index value	Rank
1.	Lack of awareness on certification agencies, procedures, document maintenance.	0.740	1

2.	Pest and disease incidence	0.733	2
3.	Inadequate supply of micronutrient	0.435	5
4.	Lack of knowledge on approved inputs and training	0.481	4
5.	High certification cost and Conversion losses	0.610	3

Table 5 : Constraints faced by conventional farmers in the cultivation of vegetables

S.No	Constraints	Index value	Rank
1.	High rainfall and soil loss	0.545	5
2.	Pest and disease incidence	0.718	1
3.	Loss in quality of the produce due to biotic and abiotic stresses	0.623	2
4.	Wild animals	0.560	3
5.	High wages for labour coupled with less supply	0.553	4

4. CONCLUSION

Organic cultivation has higher returns than conventional as many of the inputs are prepared in the field [18,19,20]. Though the carrot has high cost of cultivation, carrot gives increased profit compared to potato. This is due to increased yield per hectare of carrot. organic farming remains as a one stop solution for farmers profit, environmental and human health. The ooty carrot and potato have their significance across various districts and states for its taste and quality. Advanced technologies are there to assist mankind. But that assistance should be in harmony with nature. The government and other sections of society must follow the steps in a way which mitigates the challenges and increases the welfare of the farmers and others involved in vegetable cultivation and marketing.

REFERENCES

1. FiBL & IFOAM organics international. Statistics & emerging trends 2022. Accessed 11th July 2022. Available: https://www.ifoam.bio/why-organic/organic-landmarks/definition-organic
2. APEDA. Accessed 12th July 2022. Available : https://apeda.gov.in/apedawebsite/organic/data.htm#Summary_Statistics_2021
3. Statistical handbook of Nilgiris 2020-21. Department of Statistics, Nilgiris.
4. Indiastat. Accessed 12th July 2022.
5. Saraswat V, Sharma S, Patel KS, Singh IP. Economics of brinjal production in South Gujarat. *Economic Affairs*. 2014;*59*(2): 231-241. Available : 10.5958/J.0976-4666.59.2.021
6. Choudhary H, Bisht D, Badal PS, Singh V, Shah R, Saryam M. Profitability of Vegetables in Hill Agriculture: An Economic Analysis. *International Journal of Current Microbiology and Applied Sciences*. 2017;*6*(8):1674-1682. Available:https://doi.org/10.20546/ijcmas.2017.608.201
7. Kumar A, Rohila AK, Pal VK. Profitability and resource use efficiency in vegetable cultivation in Haryana: Application of Cobb-Douglas production model. *Indian Journal of Agricultural Sciences*. 2018;*88*(7):153-157.
8. Sekhar C, Prahadeeswaran M, Nagaraj R. Garlic trading – A potential agribusiness venture in India. Journal of Horticulture. 2014;1(3). Available: http://dx.doi.org/10.4172/2376-0354.1000118

9. Indhumathi C, Senthilkumar R, Muralidharan C, Pangayar Selvi R. Study on marketing channels of black pepper in Kolli hills of Namakkal district in Tamilnadu. Asian Journal of Agricultural Extension, Economics & Sociology. 2021;39(11).327-334. Available : 10.9734/AJAEES/2021/v39i1130757
10. Singh RK, Majumdar K, Gupta M. Measurement of Marketing Efficiency of Rice: An Empirical Study of the State of Uttar Pradesh. 2020;459-489.
11. Navaneetham B, Mahendran K, Sivakumar SD. Analysis of constraints for performance improvement of FPCs in Tamil Nadu. *International Journal of Farm Sciences*. 2019;*9*(2), 12-18.
12. Archana K, Srinivasa Rao H, Rambala P. Constraints and Suggestions Perceived by MGNREGA Beneficiaries and Stakeholders in Srikakulam district of Andhra Pradesh. International Journal of Agriculture Sciences. 2019; Vol.11(6):8030-8033.
13. Jitendra Pandey, Ashima Singh. Opportunities and constraints in organic farming: An Indian perspective. Journal of Scientific Research. 2012;56: 47-72.
14. Jadav KS, Leua AK, Darji VB. Economic analysis of supply chain of fresh potato in middle Gujarat. Indian J. Agric. Res.2011;45(4):266-274.
15. Sekhar C, Vidhyavathi A, Divakaran A, Vegetable marketing by Nilgiris cooperative marketing society – A paradigm, Int.J.Curr.Microbiol.App.Sci. 2019;8(8).1361-1373. Available : https://doi.org/10.20546/ijcmas.2019.808.159
16. Quadri Javeed Ahmad Peer, Nafees Ahmad, Jassvinder Kaur, Chesti M H, Hakim Shabir Ahmad, Anil Bhat, Bhat B A. Study on economics of potato growing towards livelihood security. African Journal of Agricultural Research. 2013;8(45):5639-5644. Available : 10.5897/AJAR2013.7644
17. Sudheer P. Economics of organic versus chemical farming for three crops in Andhra Pradesh, India. *Journal of Organic Systems*, 2013;*8*(2):36-49. Available : http://www.organic-systems.org/journal/82/8205.pdf
18. Ingrid Bender, Liina Edesi, Inga Hiiesalu, Anne Ingver, Tanel Kaart, Hedi Kaldmae et al. Organic carrot production has an advantage over conventional in quantity as well as in quality. Agronomy:10; 1420. Available : 10.3390/agronomy10091420
19. Harinarayanan UND, Lakshmanan P. Organic Vegetable Cultivation. In E. Yildirim, & M. Ekinci (Eds.), Vegetable Crops - Health Benefits and Cultivation. IntechOpen.2021. https://doi.org/10.5772/intechopen.99744
20. Yadav, S. K., Babu, S., Yadav, M. K., Singh, K., Yadav, G. S., & Pal, S. (2013). A review of organic farming for sustainable agriculture in Northern India. *International Journal of Agronomy*, *2013*. Available : http://dx.doi.org/10.1155/2013/718145