"The demand for organic food is growing at a remarkable rate. Consumers have made it clear that they want organic produce and every sector of the food chain is responding, with the kind of results we have just seen" ………Charles III (King of the United Kingdom).

Chapter V: VALUE ADDITION AT EACH PHASE BY ALL CHAIN ACTORS.

5.1 Introduction

This chapter measures value addition at each stage for five organic crops (organic pineapple, organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric). This chapter is divided into five main sections. The first section examines organic pineapple value addition, while the second, third, fourth, and fifth sections discuss the value addition of organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric, respectively. Variables considered to measure the value addition of five organic crops are farmer's net price, quantum of value addition by various chain actors, marketing margin, marketing efficiency, value-adding activities, value chain upgradation, and sources of technological upgradation. In addition, the cost of cultivation and farmer's income is computed for five selected organic crops. The cost of cultivation is computed by ABC cost measures and costs are computed for various heads which are as cost A_1, cost A_2, cost B_1, cost B_2, cost C_1, and cost C_2. In the income computation part, various sub-heads are computed, which are gross income, net income, farm business income, own farm income, farm labor income, and income per rupee.

5.2. Value Addition of Organic Pineapple.

This section discusses the degree of value addition of organic pineapple. At first, the cost of cultivation is computed by ABC cost measures. Income is computed under various heads like gross income, net income, farm business income, own farm income, farm labor income, and finally income per rupee is calculated. After analyzing cost and income, the margin and cost incurred by chain actors in various activities, the degree of value addition, and marketing efficiency for various channels are computed. In addition to this, value chain upgradation strategies used by farmers, FPC, wholesalers, and retailers are shown. To give a glimpse of the value addition of organic pineapple, a case study on Sunny Enterprise in the Lakhipur area, Cachar district is also discussed.

5.2.1 Cost of Cultivation of Organic Pineapple by Farmers

From the study, cost A_1 per hectare is found to be Rs. 144548.43, and cost A_2 is found to be Rs.145277.67. The costs B_1, B_2, C_1, and C_2 are found to be Rs. 146358.63, Rs. 155369.63, Rs.147634.81, and Rs. 156753.36, respectively. Among the various heads of the cost, it was found that the majority of the cost is incurred by "Farm yard manure" with a share of 23.90%, followed by "Biofertilizers" and "Biopesticides" with a share of 18.55% and 16.20%, respectively. The details of the cost of cultivation of organic pineapple are shown in the below table.

Table 46: *Showing Cost of Cultivation of Organic Pineapple per hectare and Contribution of Various Items of Costs in Total Cost.*

Sl. No.	Particulars	Per Hectare (Rs)	Contribution in total cost (Cost C_2) in percentage
1	Hired labor (1.i. + 1.ii.)	9451.28	6.02
	1. i. Hired men's labor	9425.85	6.01
	1. ii. Hired women's labor	25.43	0.01
2.	Hired/Owned machine labor	108.45	0.06
3	Suckers*	7208.04	4.59
4	Farm Yard Manure	37464.8	23.90
5	Green Manure	9350.83	5.96
6	Vermicompost	14310.9	9.12
7	Biofertilizers	29092.3	18.55
8	Biopesticides	25398.9	16.20
9	Irrigation	-	-
10	Mulching	300.06	0.19
11	Interest on working capital	872.74	0.55
12	Land revenue	747	0.47
13	Depreciation	791.72	0.50
	Cost A_1 (1 to 13)	**144548.30**	**92.21**
a.	Rent paid for the leased in land	729.37	0.46
	Cost A_2 : (Cost A_1 + a)	**145277.67**	92.67
b.	Interest on fixed capital	1080.96	0.68
	Cost B_1 : (Cost A_2 + b)	**146358.63**	93.36
c.	Rental value of the owned land	9011	5.74
	Cost B_2 : (Cost B_1 + c)	**155369.63**	**99.11**
d.	Imputed value of family labor (di + dii)	1383.73	0.88
	d.i. Imputed value of family men's labor	1276.18	0.81
	d.ii. Imputed value of family women's labor	107.55	0.06
	Cost C_1: (B₁ + d)	**147634.81**	**94.18**
	Cost C_2 : (Cost B_2 + d)	**156753.36**	100

Source: Compiled by the author.

* Note on the computation of cost incurred in sucker.

As pineapple is a perennial crop (gives yield for a longer time), the cost of sucker used during initial plantation is considered for cost computation. In the study by (Paul et al., 2017), it was found that the mean age of pineapple plants in Northeast India is 20-25 years. However, it was found that the pineapple yield is highest in the 6-12 years category.

Considering the average years of farmers practicing organic cultivation and yield, we took 12 years as the optimum yield year as the farmers used to plant new suckers by replacing the old suckers. So, for the study, the sucker cost is computed with the assumption as given below and charged to the cost of production.

Sucker plant required per bigha = 6000
Sucker plant per hectare= 6000 x 7.47 = 44820
Price of sucker = Rs. 1.93 (average price of the sucker is considered)
Sucker cost: 44820 x 1.93 = Rs. 86502.60
Sucker cost per hectare per year= Rs. 86502.60 /12
                                   = Rs. 7208.55.

5.2.2   Income Computation of Organic Pineapple Per Hectare

The gross income per hectare is found to be Rs. 459422.00, which is computed by adjusting the income received from by-products and post-harvest losses. The net income per hectare of organic pineapple is found to be Rs. 302668.64, and farm business income is found to be Rs. 314873.70. Own farm income, which is computed by deducting cost A_2 from gross income, is found to be Rs. 314144.33, and farm labor income per hectare of pineapple is found to be Rs. 304052.37. The income per rupee per hectare of pineapple production is Rs. 2.93, which indicates that for each rupee of cost, farmers are earning Rs. 2.93 as revenue or income. The details of the income computation of organic pineapple are shown in the following table.

Table 47: *Showing Income Computation of Organic Pineapple Per Hectare*

Particulars	Per Hectare (Rs.)
Gross Income: (Main product $\times$ Price of main product + By-product $\times$ Price of by-product) – Post-harvest losses =(Total Revenue from sales of organic pineapple in June, July, August, and December + Revenue earned from selling of sucker) – Post-harvest losses. *G.I.(Per farm)= (($T_{JA} \times P_{JA} + T_{JB} \times P_{JB} + T_{JA} \times P_{JA} + T_{JuA} \times P_{JuA} + T_{JuB} \times P_{JuB} + T_{JuC} \times P_{JuC} + T_{Aa} \times P_{Aa} + T_{Ab} \times P_{Ab} + T_{Ac} \times P_{Ac} + T_{D} \times P_{D}) + (T_{S} \times P_{S}) - (T_{ph} \times P) / 75* = ((110294 + 53154.7 + 33157.5 + 136313 + 65105.10 + 38333.4 + 57755.1 + 27793.9 + 16286.6 + 32400 + 119911) – 12748.70) G.I. (Per Hectare) $=((T_{JA} \times P_{JA} + T_{JB} \times P_{JB} + T_{JC} \times P_{JC} + T_{JuA} \times P_{JuA} + T_{JuB} \times P_{JuB} + T_{JuC} \times P_{JuC} + T_{AA} \times P_{AA} + T_{AB} \times P_{AB} + T_{AC} \times P_{AC} + T_{DX} \times P_{D}) + T_{S} \times P_{S} - T_{PH} \times P)/110.643$ = (77214.9 + 37866.1 + 23912.2 + 92401.3 + 44132 + 25984.6 + 39149.8 + 18840.3 + 11040 + 21962.6 + 81282)-8641.87)	459422.00
Net Income: (Gross Income- Cost C_2)	302668.64
Farm Business Income: (Gross Income –Cost A_1)	314873.70
Own Farm Income: (Gross Income- Cost A_2)	314144.33
Farm Labor Income: (Gross Income- Cost B_2)	304052.37
Income per Rupee: (Gross Income/ Cost C_2)	2.93

Source: Computed by author.

Whereas,

T_{JA}, T_{JB}, T_{JC} = Total pineapple produced in the month of June for the A, B, and C categories.
P_{JA}, P_{JB}, P_{JC} = Price of pineapple in the month of June for A, B, and C categories.
$T_{JuA}, T_{JuB}, T_{JuC}$ = Total pineapple produced in the month of July for the A, B, and C categories.
$P_{JuA}, P_{JuB}, P_{JuC}$ = Price of pineapple in the month of July for A, B, and C categories.
T_{Aa}, T_{Ab}, T_{Ac} = Total pineapple produced in the month of August for the A, B, and C categories.
P_{Aa}, P_{Ab}, P_{Ac} = Price of pineapple in the month of August for A, B, and C categories.
Ts = Total Suckers sold
P_S = Price Per Sucker.
T_{PH} = Post Harvest Losses
P = Average price of pineapple month-wise and grade-wise.
Average cost of production per organic pineapple = Average production cost per hectare / Average organic pineapple production per hectare.
Average production cost per hectare = Rs. 156753.36
Average organic pineapple production per hectare = Rs. 22488.50
Average cost of production per organic pineapple= 156753.36/22488.50
= Rs. 6.97

5.2.3 Cost and Margin Incurred by Chain Actors in Organic Pineapple Value Chain

From the survey, the total farm-level cost was found to be Rs. 6.97 per pineapple, and the net production cost per pineapple was found to be Rs. 7.35. Farmers sell organic pineapple through various chain actors which are commission agents, wholesalers, and FPC. The highest margin is found for direct sales with Rs. 13.90, followed by Rs. 12.65 for trades with FPC. The margin is found to be Rs. 10.15 and Rs. 6.53 for sales through commission agents and wholesalers respectively. The margin on trade through wholesalers is generally low as compared to other actors because most farmers have contracts with wholesalers during the flowering season, and are therefore, unable to benefit from market prices. Commission agents purchased the pineapple at Rs. 17.50 from farmers and spent Rs.1.16 per pineapple on various non-value-adding activities. Commission agents with a margin of Rs. 2.04 sell the pineapple to wholesalers at Rs. 20.70 per pineapple. Wholesalers spend Rs. 0.86 per pineapple on various basic value-adding activities like transportation and storage and sell the same to retailers at Rs. 23.80 with a margin of Rs.2.24. Retailers, on the other hand, bought the pineapple at Rs. 23.80 from wholesalers and incurred Rs. 1.00 per pineapple for various basic value-adding activities and sold the same to consumers at Rs. 27.80 with a margin of Rs.3.00 per pineapple. The study found that the value-adding process is done mostly by farmers with production, cleaning, and grading activities. The activities of market intermediaries like commission agents, wholesalers, and retailers are mostly non-value-adding process activities like holding, storage, loading, unloading, and necessary non-value-added process activities like transportation which are essential in the chain but do not lead to any value creation. The details of value addition of organic pineapple in the hands of farmers, commission agents, wholesalers, and retailers are shown in the following table.

Table 48: *Showing Cost and Margin Incurred by Farmers, Commission Agents, Wholesalers, and Retailers in the Organic Pineapple Value Chain.*

Category	Particulars	Amount in Rs (Per piece)
I	Farmers (n = 75)	
	1. Production Cost	
Organic Chain	a. Cost A_1 (Includes all production cost excluding imputed cost and rent paid for the leased land) (Cost $A_{1/}$ 22488.00)	6.42
	b. Cost A_2 (Cost A_1 + Rent paid for leased land)	6.46
	c. Cost B_1 (Cost A_2 + Interest on fixed capital)	6.50
	d. Cost B_2 (Cost B_1 + Rental value of own land)	6.90
	e. Cost C_1 (Cost B_1 + Imputed value of family labor)	6.56
	f. Cost C_2 (Cost B_2 + Imputed value of family labor)	6.97
	Total production cost (Cost C_2)	6.97
	Post Production Cost	
	a. Total farm level costs	6.97
	b. Post-harvest loss (due to damage of organic pineapple)	0.38
	I. Net Production cost (a + b)	*7.35*
	Margin 1: (Farmers sold to commission agents),(IIi -I)	10.15
	Margin 2: (Farmers sold directly to wholesalers),(IIii-I)	6.53
	Margin 3: (Farmers sold directly to consumer) (IIiii -I)	13.90
	Margin 4: (Through FPC)	12.65
	II. Producer's price:	
	i. Producers price for commission agents	17.50
	ii. Producer's price for wholesalers (Direct sales to wholesalers on contract basis)	13.88
	iii. Producer price for consumers (Direct sales)	21.25
	iv. Through FPC	20
II	Commission agents (Paikars) (N =10)	
Conventional Chain (Organic pineapple is mixed with the non-organic)	a. Purchase Price	17.50
	b. Assembling and Grading	0.16
	c. Transportation Cost	0.27
	d. Loading and Unloading labor charges	0.09
	e. Storage Cost	0.07
	f. Other cost	0.02
	g. Total Assembling cost (b to f)	0.64
	h. Losses (Due to damages)	0.52
	i. Net cost at Commission agent level (g +h)	*1.16*
	j. Total Cost (a+ i)	*18.66*
	k. Margin	2.04
	Commission Agents price	20.70
III	Wholesalers (N = 10)	
Conventional Chain (Organic pineapple is mixed with the non-organic)	a. Purchase price (from commission agents)	20.70
	b. Transportation Cost	0.11
	c. Loading and Unloading labor charges	0.10
	d. Storage cost	0.10
	e. Other cost	.01
	f. Total wholesale level cost (b +e)	0.32
	g. Losses (Due to damages)	0.54
	h. Net cost at wholesale level (f +g)	0.86
	i. Total cost (a+h)	21.56

	Table 48 (Continued)		
	j. Margin		2.24
	k. Wholesaler's price		23.80
Category	Retailers (N =20)		
	a. Purchase Price		23.80
	b. Assembling and Grading		0.03
	c. Transportation Cost		0.16
	d. Loading and Unloading labor charges		0.10
	e. Storage Cost		0.05
	f. Other cost		0.03
	g. Total Assembling cost (a to f)		0.37
	h. Losses (Due to damages)		0.63
	i. Net cost at retailer's level (g + h)		1.00
	j. Total cost (a + i)		24.80
	k. Margin		3.00
	Retailers Price/ Price paid by consumers		27.80

Source: Compiled by the author

5.2.4 Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Pineapple Value Chain.

The degree of value addition and marketing efficiency is computed for various marketing channels of the organic pineapple value chain. In channel I, farmers directly sell organic pineapple to consumers at roadside and local markets at Rs 21.25 per pineapple. For channel II, the highest degree of value addition is found with retailers at 12.60%, followed by commission agents and wholesalers at 11.65% and 10.82%, respectively. Farmers receive the highest share of consumer prices which is around 62.94%, followed by retailers with a share of 14.38%. The share of commission agents and wholesalers is around 11.52% and 11.16%, respectively, in consumer price. The marketing margin for commission agents, wholesalers, and retailers in channel II is found to be Rs.2.04, Rs. 0.94, and Rs. 3.00, respectively, indicating a high share of margin by retailers among other intermediaries. Similarly, the degree of value addition and share in consumer price is found to be high with retailers in channels I & II, which is around 12.60% and 14.38% respectively. Similar to the findings of the study by Karim and Biswas (2010) in the vegetable supply chain of Bangladesh, in the present study finds that actors in the chain only perform the non-value-adding process and necessary non-value-adding activities, without any value-adding activities. The margin, degree of value addition, and price spread are mostly determined by the difference in selling and buying prices.

The study shows that marketing efficiency for channels II and III is 1.69 and 0.99, respectively. Marketing efficiency is high in channel II due to the high price realization of farmers and other actors of the chain, as pineapples are sold at market price. In channel III,

products are sold directly to wholesalers on a contract basis, for which farmers could not benefit from the prevailing market price. In channel III, marketing efficiency is 0.99, and price spread is 49.92%, both of which are low compared to channel II. The wholesaler has the highest margin at Rs.7.76 per pineapple, followed by retailers at Rs. 3.00. In wholesalers' hands, the degree of value addition is found to be 55.93%, which is mostly the margin of selling and buying price and not the actual value processing for organic products. Farmers, wholesalers, and retailers each have a 49.92%, 35.68%, and 14.38% share of the consumer price in the same channel. The degree of value addition, price spread, and marketing efficiency are shown in the table below.

Table 49: *Showing Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Pineapple Value Chain (Rs. per 100)*

Sl. No.	Items	Farmer	Commission Agents	Wholesaler	Retailer	Consumer
Channel I (Direct sales, farmers to consumers)						
1	Sale Price (Direct sales)	-	-	-	-	2125
Channel II (Through commission agents, wholesaler and retailers) (Partly Organic)						
1	Sale Price	1750	2070	2380	2780	
2	Purchase Price	-	1750	2070	2380	2780
3	Price difference (1-2)		320	310	400	
4	Cost		116	86	100	
5	Margin (3-4)		204	224	300	
6	Degree of value Addition (5/2 × 100)		11.65%	10.82%	12.60%	
7	Share in consumer's price	62.94% (1750/2780 ×100)	11.52% (320/2780 ×100)	11.16% (310/2780 ×100)	14.38% (400/2780 ×100)	0% (2780/2780 ×100)
8	Marketing Efficiency (Price Received by farmers/ MC+MM): 1.69					
9	Price Spread: (2780-1750) = 1030. In percentage =1750/2780 × 100 = 62.94%					
Channel III (Through wholesalers and retailers) (Partly Organic)						
1	Sale Price	1388		2380	2780	
2	Purchase Price			1388	2380	2780
3	Price difference (1-2)			992	400	
4	Cost			86	100	
5	Margin (3-4)			906	300	
6	Degree of value addition (5/2 × 100)			65.27%	12.60%	
7	Share in consumer's price	49.92%		35.68%	14.38%	0%
8	Marketing Efficiency: (Price Received by farmers/ MC+MM) = .99					
9	Price Spread: (2780-1388)= 1392. In percentage = 49.92%					

Source: Compiled by the author. (***Price spread***: Price spread is the difference between price paid by the consumer and price received by the producer (Sahoo & Sarangi, 2018). PS = Pf / Pc x 100
Where, P.S.: Price Spread; Pf: Price received by the producer; Pc: Price paid by the consumer)

5.2.5 *Value Added Products from Pineapples, a Case of Sunny Enterprise, Lakhipur, Silchar.*

The value chain of organic pineapple is in the infant stage as the products are sold in fresh form and without any value processing like canned pineapple, pineapple pulp, pineapple juice, and frozen pineapple concentrate. A small quantity of organic pineapple is sold to a local micro food processing enterprise named "Sunny Agro Industry Pvt. Ltd" in the Lakhipur area of Cachar district in Assam. The enterprise manufactures various value-added fruit processing products like pineapple squash, orange squash, pickles, pineapple jams, etc, and sells the same to local and district markets through various retailers. With four employees including two food technicians, Sunny Enterprises manufactures various value-added products from pineapples to cater to the local demand. Annually around 12,000 quantities of fresh organic pineapple are purchased by the firm and finished products are marketed under the brand name "Sunny" without using any organic logo. The marketing channel of the enterprise is half organic as only the fresh pineapple purchased from the farmers are organic but it did not follow and maintain the standard for organic production in compliance with NPOP (National Programme for Organic Production). According to NPOP, a manufacturer must develop an organic production and handling plan to maintain the quality and integrity of the organic product. Various aspects of organic standards for organic fruit processing such as pest control, ingredients, processing methods, packaging, labeling, storage, and transport are not followed by sunny enterprises, and products are sold without the NPOP logo. In the product profile of the enterprise, the price of one liter of pineapple squash is sold to wholesalers at Rs. 80 and for consumers, the price is Rs. 100. The pineapple jams are priced at Rs.50, Rs.70, and Rs.90 for 250, 400 and 500 gram of bottle respectively. Around 40,000 bottles of 160ml size bottle of pineapple are produced annually at Rs. 7.60 per bottle and sold to wholesalers at Rs. 8.50 and the consumer price is Rs. 10. In the cost of production, one liter of pineapple squash costs Rs. 70 in total, with a Rs. 10 profit margins. The cost of production per kg of pineapple jam and per liter of pineapple soft drinks is found to be Rs. 132. And Rs. 47.50 respectively. The benefit-cost ratio is found to be highest in pineapple jams which is 1.21 followed by pineapple squash and pineapple soft drinks with 1.14 and 1.11 respectively. The production of pineapple slices and jelly is under the pipeline, and the enterprise plans to comply with the NPOP standard to explore the organic market. Currently, the enterprise lacks in various aspects like production & operation management, manpower shortage, financial constraints. It needs support from the government to transform the same

into an organic enterprise. The details of the production cost are also shown in the below table.

Table 50: *Showing Details of Cost of Production, Margin, and BCR of Pineapple Squash, Pineapple Jam, and Pineapple Drink.*

Pineapple Squash (per liter)		Pineapple Jam (per kg)		Pineapple Soft Drink (per liter)	
Items	*Cost (Rs.)*	*Items*	*Cost (Rs.)*	*Items*	*Cost (Rs.)*
Pineapple	20.00	Pulp	50	Pineapple	15
Sugar	20.00	Sugar	20	Sugar	10
Citric acid (5 g)	7.00	Chemical and preservatives	25	Citric acid (3 gram)	6
Preservatives	10.00	Botte (glass)	17	Chemicals (Sodium banjyode, flavor)	6
Bottle	4.00	Labeling	3	Bottle and Labelling	3.50
Labeling	2.00	Flavour and color	5	Labor	5
Labor	5.00	Labor	10	Other overhead	2
Other overhead	2.00	Other overhead	2	Total cost	47.50
Total Cost price (A)	*70*	*Total cost (A)*	*132*	*Cost of 160 ml (160*47.50/1000) (A)*	*7.60*
Selling price(B)	*80*	*Selling Price (B)*	*160*	*Selling Price (B)*	*8.50*
Margin	10	Margin	28	Margin	.90
Benefit-cost ratio (B/A)	**1.14**	**Benefit-cost ratio (B/A)**	**1.21**	**Benefit-cost ratio (B/A)**	**1.11**

Source: Compiled by the author.

5.2.6 Value chain upgradation of organic pineapple

Mostly organic pineapple is sold in fresh form, and only 0.84% of the organic pineapple is sold to a local micro food processing factory named "Sunny Agro Industry Pvt. Ltd" for value addition. Value-added products like pineapple squash, jam, and drinks are manufactured and sold in local markets without any organic certification logo. As the farmers are getting premium prices by selling the pineapple in fresh form, the B2B market is not well accepted due to its low prices compared to local market prices. Organic pineapples are sold in farm gates and markets with the organic labeling named "Hmar Agro Organic Producer Co. Ltd." All the farmers perform basic value addition technology like cleaning, grading, transportation, and labeling activities. Around 26% of the farmers sold the output by using wooden and bamboo boxes as primary packaging material, and 23% of the farmers used storage facilities. All the farmers use basic production technologies to produce outputs like bio-fertilizer, cutting, post-harvest treatment, etc. Farmers follow three forms of upgrading strategies: product upgradation, process upgradation, and functional upgradation. Product

upgradation includes product types (variety wise), product formulation (quality aspects), and packaging. Process upgradation includes field practices, post-harvest, standards, logistics, equipment, and marketing.

Various marketing activities to promote sales are undertaken by around 93.30% of the farmers. Functional upgradation is taken up in the form of new activities absorbed, new market functions, new logistics performed, and new management functions. Around 92% of the farmers absorbed new activities, 82.70% performed various innovative and new market functions to strengthen the value chain, 42.70% undertook new logistics functions, and 41.30% undertook various new management functions. Farmers got access to technology from various sources like extension services, media, formal education, neighborhoods, and ancestors. All the farmers got technology knowledge from extension services and various formal training programs organized by FPC and the Dept. of Horticulture. The details of upgrading strategies used by farmers, FPC, wholesalers, and retailers are shown in the below table.

Table 51: *Showing Value Chain Upgradation of Organic Pineapple.*

Upgradation strategy/ Activities	Farmers	FPC	Commission Agents	Wholesalers	Retailers
1. Primary production functions like cleaning, grading, cutting, post-harvest mgt., weighting	Yes Bagging:34.7% Storage:30.7%	Grading, Weighting	Grading, Weighting	Grading, Weighting	Grading, Weighting
2. Processing	None	Under Process	None	None	None
3. Transportation	Yes	Yes	Yes	Yes	Yes
4. Packaging/ Labelling	None	Yes	None	None	None
5. Product upgrading					
5. a. Product type	Yes	Yes	None	None	None
5. b. Quality aspect	Yes	Yes	None	None	None
6. Process upgrading					
6.a. Organic standards	Yes	Yes	None	None	None
6. b. Logistics	Yes	Yes	Yes	Yes	Yes
6. c. Equipment	Yes	Yes	None	None	None
6.d. Marketing strategy	Yes: 93.3%	Yes	None	None	None
7. Functional Upgrading					
7. a. New activities absorbed	Yes: 92% No: 8%	Yes	None	None	None
7. b. New market function	Yes: 82.70% No:17.30%	Yes	None	None	None
7. c. New logistics function	Yes:42.70% No: 57.30%	Yes	None	None	None
7.d. New management functions	Yes: 41.30% No:58.70%	Yes	None	None	None
7.e. Outsourcing activities	Yes	Yes	None	Yes	Yes

Source: Compiled by the author.

5.2.7 Technological Upgradation of Value Chain of Organic Pineapple.

All the farmers use basic technology in cultivation and handling activities to upgrade the value chain. All the farmers received technology knowledge from extension services and through formal education to upgrade the value chain. Around 90.70% of the farmers received technology knowledge from generation wise, the farmers are practicing the same method of cultivation and basic packaging as their elder generation performed. Around 40% of the farmers received knowledge of technology from the neighborhood and 13.30% of the farmers received it from the media. The details of the sources of technology with the percentage of the respondents are shown in the table below.

Table 52*: Showing Various Sources of Technology and Percentage of the Respondents.*

Various Sources of Technology	Percentage of the Respondents
Technology knowledge from generation-wise	90.70%
Technology knowledge from the neighbourhood	40%
Technology knowledge received from extension services	100%
Technology knowledge received from the media	13.30%
Technology knowledge received from formal education	100%

Source: Compiled by the author.

5.3. Value Addition of Organic Pumpkin.

This section discusses the degree of value addition of organic pumpkins. Similar to organic pineapple, here also at first, the cost of cultivation and income is computed. After analyzing cost and income, the margin and cost incurred by chain actors in various activities, the degree of value addition, and marketing efficiency for various channels of organic pumpkins are computed and are shown in respective subsections. In addition to this, value chain upgradation strategies used by farmers, FPC, wholesalers, and retailers are shown.

5.3.1 Cost of Cultivation of Organic Pumpkins by Farmers.

The average per hectare cost (Cost C_2) for organic pumpkin in the Nalbari district is found to be Rs. 49365.70. In the individual cost component, it was found that biopesticides share the majority of the cost with 18.09% followed by hired/owned machine labor with 14.57%. The details of the cost of organic pumpkin cultivation are shown in the following table.

Table 53: *Showing Cost of Cultivation of Organic Pumpkin by Farmers*

Sl. No.	Particulars	Per Hectare (Rs)	Contribution in total cost (Cost C_2) in %
1	Hired labor (1.i + 1.ii)	1710.37	3.46
	1. i. Hired Men's labor	1708.27	3.46
	1. ii. Hired Women's labor	2.10	.04
2.	Hired/Owned machine labor	7193.30	14.57
3	Seeds	3809.62	7.71
4	Farm Yard Manure	1561.34	3.16
5	Green Manure	673.18	1.36
6	Vermicompost	7146.15	14.47
7	Biofertilizers	3972.64	8.04
8	Biopesticides	8933.46	18.09
9	Irrigation	78.54	0.15
11	Interest in working capital	329.64	0.66
12	Land revenue	286.23	0.57
13	Depreciation	804.36	1.62
	Cost A_1 (1 to 13)	**36498.83**	73.93
a.	Rent paid for the leased in land	362.74	0.73
	Cost A_2 : (Cost A_1 + a)	**36861.57**	74.67
b.	Interest on fixed capital	1726.83	3.49
	Cost B_1 : (Cost A_2 + b)	**38588.40**	78.16
c.	Rental value of the owned land	10382.50	21.03
	Cost B_2 : (Cost B_1 + c)	**48970.90**	99.20
d.	Imputed value of family labor (di + dii)	394.80	0.79
	d.i. Imputed value of family men's labor	394.80	0.79
	d.ii. Imputed value of family women's labor	0	0
	Cost C_1: (B_1 + d)	**38983.2**	**78.96**
	Cost C_2 : (Cost B_2 + d)	**49365.70**	**100**

Source: Computed by author.

5.3.2 Income Computation Per Hectare of Organic Pumpkins.

The gross income per hectare of organic pumpkins is found to be Rs. 164402.00 by adjusting the post-harvest loss. In the computation of gross income, the output obtained from April, May, November, and December is considered. The net income is found to be Rs. 115036.30, and the farm business income is Rs. 127903.13 per hectare. The farm and farm labor income are Rs. 12754.43 and Rs. 115431.10 respectively. The income per rupee is found to be Rs. 3.33, which indicates that farmers receive Rs. 3.33 for one rupee of investment made in the cultivation of organic pumpkin in the Nalbari district of Assam. The details of the income computation of organic pumpkin per hectare are shown in the following table.

Table 54: *Income Computation of Organic Pumpkin Per Hectare.*

Particulars	Per Hectare (Rs.)
Gross Income: (Main product × Price of main Product – Post-harvest losses) = (Total Revenue from sales of organic pumpkin in April, May, and November, December) ***G.I. (Per Hectare)*** $= ((T_A \times P_A + T_M \times P_M + T_N \times P_N + T_D \times P_D) - T_{PH} \times P)/118.54$ $=168612 - 4210$ $=164402$	**164402.00**
Net Income: (Gross Income- Cost C_2)	**115036.30**
Farm Business Income: (Gross Income –Cost A_1**)**	**127903.13**
Own Farm Income: (Gross Income- Cost A_2)	**127540.43**
Farm Labor Income: (Gross Income- Cost B_2)	**115431.10**
Income per Rupee: (Gross Income/ Cost C_2)	**3.33**

Source: Compiled by the author.

Whereas,

T_A, T_M, T_N, T_D = Total organic pumpkin produced in April, May, November, and December.
P_A, P_M, P_N, P_D = Price of organic pumpkin produce in April, May, November, and December.
T_{PH} = Average post-harvest loss
P = Average price of organic pumpkin.

5.3.3. Cost and Margin Incurred by Chain Actors in Organic Pumpkin Value Chain.

To compute the value addition of organic pumpkin by various chain actors, at first cost of production is calculated and then the margin is computed for various marketing channels. The cost A_1 is of organic pumpkin is found to Rs. 2.35 per kg, and after including rent paid for leased land, cost A_2 is found to be Rs. 2.37 per kg. The costs $B_1, B_2, C_1,$ and C_2 are Rs. 2.48, Rs.3.15, Rs. 2.51, and Rs. 3.17, respectively per kg of organic pumpkin. Post-harvest loss per kg of organic pumpkin is Rs. 0.27, and the same is added to total farm level cost, i.e., Rs. 3.17, and net production cost computed is Rs. 3.44 for per kg of organic pumpkin. Farmers receive the highest margin, i.e., Rs. 8.83 through direct sales, followed by sell-through FPC with a margin of Rs. 6.56. Among all the chain actors, the lowest margin is found with wholesalers, with Rs.3.72 per kg, followed by commission agents, which is Rs. 4.35. Commission agents purchased the pumpkin from farmers at Rs. 7.79 per kg, and incurred a cost (Transportation cost, loading and unloading cost) of Rs. 3.19 per kg as and total cost at commission agents is found to be Rs.10.98. Commission agents sold the same to wholesalers at Rs. 13.90 with a margin of Rs. 2.92. Wholesalers purchase the organic pumpkin from commission agents at Rs. 13.90, incur Rs. 1.32 per kg cost at the wholesale level, and sell the same to retailers at Rs. 16.40 with a margin of Rs. 1.18. In the last step, retailers purchase the

organic pumpkin from wholesalers at Rs. 16.40, incur Rs. 2.50 as retailing cost, and sell it to the consumer at Rs. 23.10 with a margin of Rs. 4.20. Among all the chain actors, retailers share the maximum margin which is Rs. 4.20 followed by commission agents and wholesalers with Rs. 2.92 and Rs. 1.18 respectively. From the survey, it was found that the value-addition activities in the hands of commission agents, wholesalers, and retailers are confined only to non-value-added and necessary non-value-added process activities which do not lead to any value creation but are essential for the smooth function of the chain. The nature of the value-adding activities of organic pumpkin is similar to the organic pineapple value chain process activities. Farmers perform value-adding process activities like production and implement product upgrading strategies (product type and quality). The FPC also performs value-adding process activities like packaging when organic pineapples are sold to distant traders. The trader's activities are limited only to non-value-adding process activities like assembling, grading, loading, unloading, storage, and necessary non-value-adding process activities like transportation. None of the actors are found to be involved with value processing and the margin of various actors is determined by the difference between the selling and buying price. The farmers cultivate organic pumpkins by adhering to organic standards and sell the same in fresh forms to various actors in the chain. However, it was found that commission agents, wholesalers, and retailers mix organic pumpkins with other pumpkins and thus organic pumpkins have lost their identity and are sold in conventional chains. Consumers and farmers are not benefiting as the consumer could not trace the organic produce and farmers could not fetch the premium price. The details of margin and cost incurred by various chain actors are shown in the below table.

Table 55: *Showing Cost and Margin Incurred by Farmers, Commission Agents, Wholesalers, and Retailers in Organic Pumpkin Value Chain.*

Category	Particulars	Amount in Rs (Per kg)
I	Farmers (n = 75)	
	1. Production Cost	
Organic Chain	a. Cost A_1 (Includes all production costs excluding imputed cost and rent paid for the leased land) (Cost A_1 / 15531 kg per hectare production)	*2.35**
	b. Cost A_2 (Cost A_1 + Rent paid for leased land)	2.37
	c. Cost B_1 (Cost A_2 + Interest on fixed capital)	2.48
	d. Cost B_2 (Cost B_1 + Rental value of own land)	3.15
	e. Cost C_1 (Cost B_1 + Imputed value of family labor)	2.51
	f. Cost C_2 (Cost B_2 + Imputed value of family labor)	3.17
	Total production cost (Cost C_2)	3.17
	Post Production Cost	

	Table 55 (Continued)	
	a. Total farm-level costs	3.17
	b. Post-harvest loss (due to damage of organic pumpkin)	*0.27***
	I. Net Production cost (a + b)	*3.44*
	Margin 1: (Farmers sold to commission agents),(IIi -I)	4.35
	Margin 2: (Farmers sold directly to wholesalers),(IIii-I)	3.72
	Margin 3: (Farmers sold directly to the consumer) (IIiii -I)	8.83
	Margin 4 : (Through FPC)	6.56
	II. Producer's price:	
	i. Producers price for commission agents	7.79
	ii. Producer's price for wholesalers	7.16
	iii. Producer price for consumers (Direct sales)	12.27
	iv. Through FPC for distant traders	10.00
II Conventional Chain (Organic pineapple is mixed with the non-organic)	Commission agents (Paikars) (N =10)	
	a. Purchase Price	7.79
	b. Assembling and Grading	0.30
	c. Transportation Cost	1.96
	d. Loading and Unloading labor charges	0.30
	e. Storage Cost	0.18
	f. Other cost	0.04
	g. Total Assembling cost (b to f)	2.78
	h. Losses (Due to damages)	0.41
	i. *Net cost at Commission agent level (g +h)*	*3.19*
	j. *Total Cost (a+ i)*	*10.98*
	k. Margin	2.92
	Commission Agents price	13.90
III Conventional Chain (Organic pineapple is mixed with the non-organic)	Wholesalers (N = 10)	
	a. Purchase price (from commission agents)	13.90
	b. Transportation Cost	0.58
	c. Loading and Unloading labor charges	0.14
	d. Storage cost	0.15
	e. Other cost	0.04
	f. Total wholesale level cost (b +e)	0.91
	g. Losses (Due to damages)	0.41
	h. Net cost at wholesale level (f +g)	1.32
	i. Total cost (a+h)	15.22
	j. Margin	1.18
	k. Wholesaler's price	16.40
III Conventional Chain (Organic pineapple is mixed with the non-organic)	Retailers (N =20)	
	a. Purchase Price	16.40
	b. Assembling and Grading	0.40
	c. Transportation Cost	0.95
	d. Loading and Unloading labor charges	0.31
	e. Storage Cost	0.24
	f. Other cost	0.19
	g. Total Assembling cost (a to f)	2.09
	h. Losses (Due to damages)	0.41
	i. Net cost at retailer's level (g + h)	2.50
	j. Total cost (a + i)	18.90
	k. Margin	4.20
	Retailers Price/ Price paid by consumers	23.10

Source: Compiled by the author.

Note: Computation of cost A1 per kg of organic pumpkin

Cost A1 per quintal of organic pumpkin $= \dfrac{Cost\ A1}{Total\ production\ per\ hectare\ in\ quintal}$

Cost A1 = Rs. 36498.83 per hectare

Production of organic pumpkin per hectare in quintal $= \dfrac{Total\ Organic\ pumpkin\ production\ for\ November, December, April\ and\ May}{Total\ Hectare}$

$$= \frac{9252\ +\ 6753\ +1500\ +905}{104.01\ +\ 14.52}$$

$$= \frac{18410\ quintal}{118.53}$$

Organic pumpkin production per hectare in quintal = 155.31 quintal

Cost A1 per quintal $= = \dfrac{Cost\ A1}{Organic\ Pumpkin\ production\ per\ hectare\ in\ quintal}$

$$= \frac{Rs.\ 36498.83}{155.31\ quintal}$$

Organic pumpkin costs A1 per quintal =Rs. 235.00

Organic pumpkin Costs A1 per kg $= \dfrac{235.00}{100} =$ Rs. 2.35

** *Computation of post-harvest loss per kg*

Total post-harvest loss   = Rs. 4,99,150.

Total post-harvest loss per hectare $= \dfrac{499150}{118.53}$ = Rs. 4211.17

Output per hectare in quintal= 155.31 quintal

Output per hectare in kg = 155.31 * 100 = 15531 kg.

Total Post- harvest loss per kg $= \dfrac{4211.7}{15531}$ = Rs. 0.27

5.3.4 Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Pumpkin Value Chain.

For direct sales, farmers sell the organic pumpkin to consumers at Rs. 1227.00 per quintal. For channel II, farmers sell the organic pumpkin to wholesalers at Rs. 716.00 per quintal, and wholesalers sell the same to retailers at Rs. 1640.00 per quintal and consumers at Rs. 2310.00 per quintal. The wholesalers purchased the pumpkins directly from farmers and sold the same to retailers at high prices. The price difference is found to be highest in the hands of wholesalers, which is Rs. 924.00, and for retailers, it is Rs. 670.00. The highest margin is found in the hands of wholesalers with Rs. 792.00, followed by retailers with Rs. 420.00. Highest degree of value addition is found with wholesalers which is 110.61% followed by retailers with 25.60%. Wholesalers share the highest price, which is 40%, followed by farmers and retailers with 31% and 29%, respectively. However, it was found that the price difference and margin are determined mostly by the difference in buying and selling price and without any value processing or value-added products. In channel III, farmers sell organic pumpkins to consumers through commission agents. The highest degree of value addition is found with commission agents, which is 37.48%, followed by retailers and

wholesalers, with 25.60% and 8.48%, respectively. Farmers have the highest share in consumer price which is 33.72% followed by retailers, and commission agents with 29% and 26.42%. The share of wholesalers is only 10.82% of the price paid by consumers. The marketing efficiency for channel III is 0.50, which is high as compared to channel II, i.e., 0.44, as farmers receive high prices from commission agents in channel III. The price spread for channel III is 33.72%, which is higher than that for channel II which is 31%.

The details of the degree of value addition in fresh organic pumpkins by various chain actors are shown in the table below.

Table 56*: Showing Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Pumpkin Value Chain (Rs. per quintal)*

Sl. No.	Items	Farmer	Commission Agents	Wholesaler	Retailer	Consumer
Channel I (Farmers to Consumers)						
1	Sale Price (Direct sales)	-	-	-	-	1227.00
Channel II (Farmers – Wholesalers - Retailers - Consumers) (Partly Organic)						
1	Sale Price	716.00		1640.00	2310.00	
2	Purchase Price	-	-	716.00	1640.00	2310.00
3	Price differences (1-2)			924.00	670.00	
4	Cost			132.00	250.00	
5	Margin (3-4)			792.00	420.00	
6	Degree of value Addition (5/2 × 100)			110.61%	25.60%	
7	Share in consumer price	31% (716/2310 ×100)		40% (924/2310 ×100)	29% (670/2310 ×100)	0%
8	Marketing Efficiency (Price Received by farmers/ MC+MM) : 0.44					
9	Price Spread: (2310- 716) = Rs. 1594. In percentage = 716/2310×100= 31%					
Channel III (Farmers- Commission agents- Wholesalers-Retailers-Consumer) (Partly Organic)						
1	Sale Price	779	1390	1640	2310	
2	Purchase Price	-	779	1390	1640	2310
3	Price difference (1-2)		611	250	670	
4	Cost		319	132	250	
5	Margin (3-4)		292	118	420	
6	Degree of value Addition (5/2× 100)		37.48%	8.48%	25.60%	
7	Share in consumer's price	33.72% (779/2310 ×100)	26.46% (611/2310 ×100)	10.82% (250/2310 ×100)	29% (670/2310 ×100)	0% (2310/2310 ×100)
8	Marketing Efficiency (Price Received by farmers/ MC+MM): 0.50					
9	Price Spread: (2310-779) = 1531. In percentage =779/2310 × 100 = 33.72%					

Source: Compiled by the author.

Price spread: Price spread is the difference between price paid by the consumer and price received by the producer (Sahoo & Sarangi, 2018).
PS = Pf / Pc x 100 (Where, P.S.: Price Spread, Pf: Price received by the producer, Pc: Price paid by the consumers.

From the above table, it was found that in both channels, the quantum of value addition and margin is determined by the difference between the selling and buying price among actors. No proper value processing activities were found among actors and commission agents, wholesalers, and retailers selling the products in fresh forms. The Farmer Producer Company has yet to start producing value-added products from organic pumpkin and is selling the products in fresh form to distant traders on special orders.

5.3.5 Value Chain Upgradation of Organic Pumpkin

The farmers mostly sell organic pumpkins through conventional chains. Based on special orders, the FPC (Pagladiya Agro Organic Producer Co. Ltd) supplies fresh organic pumpkins as per NPOP standards. However, it was found that none of the actors in the chain is involved in producing value-added products from organic pumpkins like juice, bread, powder, seeds, etc. From the study, it was found that about 44% of the farmers use storage facilities and only 2.7% of the farmers sell the output in bags or use primary packaging materials. Upgrading strategies are performed in three ways, which are product upgrading, process upgrading, and functional upgrading. In product upgrading, farmers adapt the strategies (pest control and maturity) to upgrade the product and quality aspect of organic pumpkin. In process upgrading, around 70.70% of the farmers agree that they maintain organic standards, and around 81.30% invested to improve the logistics aspect of the value chain. None of the farmers uses an innovative marketing strategy. Farmers did not follow any upgrading strategies related to functional activities like new activities absorbed, new market functions, new logistics functions, and new management functions. However, around 93.30% of the farmers outsource certain activities in the chain. The production and processing division of the FPC is in progress, and only the supplies to distant traders are processed through the FPC. The FPC executes the product, process, and functional upgrading activities to have an efficient organic value chain. With proper branding, labeling, and marketing strategy, the value-added products from organic pumpkin have the potential to explore the domestic and global markets. Apart from the FPC, none of the actors in the chain, i.e., commission agents, wholesalers, and retailers, upgrade the product, process, and functional aspects of the chain. The upgradation strategy is confined only to basic and primary activities like cleaning, bagging, storage, and weighting. The details of the value chain upgradation strategy by various chain actors in the organic pumpkin chain are shown in the following table.

Table 57: *Showing Value Chain Upgradation of Organic Pumpkin.*

Upgradation strategy/ Activities	Farmers	FPC	Commission Agents	Wholesalers	Retailers
1. Primary production functions like input & biofertilizer, cutting, post-harvest treatment, cleaning, bagging, storage, weighting	Yes Storage: 44% Bagging: 2.7%	Yes	Yes	Yes	Yes
2. Processing	None	Under Process	No	None	None
3. Transportation	Yes	Yes	No	Yes	Yes
4. Packaging/ Labelling	None	Yes	No	None	None
5. Product upgrading					
5. a. Product type	Yes	Yes	None	None	None
5. b. Quality aspect	Yes	Yes	None	None	None
6. Process upgrading					
6.a. Organic standards	Yes (70.70%)	Yes	None	None	None
6. b. Logistics	Yes (81.30%)	Yes	None	Yes	Yes
6. c. Equipment	Yes	Yes	None	None	None
6.d. Innovative marketing strategy	None	Yes	None	None	None
7. Functional Upgrading					
7. a. New activities absorbed	None	Yes	None	None	None
7. b. New market function	None	Yes	None	None	None
7. c.New logistics function	None	Yes	None	None	None
7.d. New management functions	None	Yes	None	None	None
7.e. Outsourcing certain activities	Yes (93.3%) No (6.7%)	Yes	None	Yes	Yes

Source: Compiled by the author

5.3.6 Sources of Technology for the Farmers of Organic Pumpkin

All the farmers receive information related to technological updates in the cultivation and production of organic pumpkins from extension services and through formal education from FPC. The details of the various sources of technology and percentage of the organic pumpkin respondents are shown in the below table.

Table 58: *Showing Various Sources of Technology and Percentage of Organic Pumpkin Respondents*

Various Sources of Technology	Percentage of the Respondents
Technology knowledge from generation-wise	78.70%
Technology knowledge from neighbourhood	48%
Technology knowledge received from extension services	100%
Technology knowledge received from the media	50.70%
Technology knowledge received from formal education from FPC	100%

Source: Compiled by the author.

5.4 Value Addition of Organic Non-Basmati Rice

In this section, similar to previous organic crops, the cost of cultivation and income is computed. After analyzing cost and income, income per rupee is computed for farmers. The margin and cost incurred by chain actors in the chain, the degree of value addition, and marketing are computed and are shown in respective subsections. In addition to this, value chain upgradation strategies used by farmers, FPC, wholesalers, and retailers are shown.

5.4.1 Cost of Cultivation of Organic Non-Basmati Paddy by Farmers.

The cost of cultivation (Cost C_2) per hectare of organic non-basmati paddy is found to be Rs. 43793.97. In the list of individual costs, the majority of the cost is shared by machine labor, which is around 25.33% of the total cost. In the hired labor part, the share of hired men's labor is around 13.92%, and hired women's labor shares were around 3.07%, respectively. The details of the cost of cultivation with various heads of cost is shown in the table below.

Table 59: *Showing Cost of Cultivation of Organic Non-basmati Rice by Farmers*

Sl. No.	Particulars	Per Hectare (Rs)	Contribution in total cost (Cost C_2) in %
1	Hired labor (1.i + 1.ii)	7443.70	16.99
	1. i. Hired Men's labor	6098.53	13.92
	1. ii. Hired Women's labor	1345.17	3.07
2.	Hired/Owned machine labor	11182.10	25.53
3	Seeds	2799.63	6.39
4	Farm Yard Manure	892.91	2.03
5	Green Manure	327.34	0.74
6	Vermicompost	2110.15	4.81
7	Biofertilizers	2934.45	6.70
8	Biopesticides	2107.54	4.81
9	Irrigation	262	0.59
11	Interest in working capital	819.68	1.87
12	Land revenue	536.00	1.22
13	Depreciation	1808.14	4.12
	Cost A_1 (1 to 13)	**33223.60**	75.86
a	Rent paid for the leased in land	570.04	1.30
	Cost A_2: (Cost A_1 + a)	**33793.64**	77.16
b	Interest on fixed capital	891.25	2.03
	Cost B_1: (Cost A_2 + b)	**34684.89**	79.20
c	Rental value of the owned land	8035.86	18.34
	Cost B_2: (Cost B_1 + c)	**42720.75**	97.54
d	Imputed value of family labor (di + dii)	1073.22	2.45
	d.i. Imputed value of family men's labor	1073.22	2.45
	d.ii. Imputed value of family women labor	0	0
	Cost C_1: (B_1 + d)	**35,758.11**	81.65
	Cost C_2 : (Cost B_2 + d)	**43793.97**	100

Source: Compiled by the author.

From the above table, it was found that, seeds, biofertilizers, biopesticides, and depreciation share around 6.39%, 6.70%, 4.81%, and 4.12%, of the total cost respectively. Cost A_1 which consists of farm-level out-of-pocket cost, shares around 75.86% of the total cost (Cost C_2). The share of cost A_2, cost B_1, cost B_2, and cost C_1 in total cost is 77.16%, 79.20%, 97.54%, and 81.65%, respectively. The rental value of the own land (imputed cost) shares around 18.34% of the total cost. Around 2.45% of the cost is associated with family labor, however, no cost is found related to the involvement of family women in the farming and cultivation practices.

5.4.2 Income Computation of Organic Non-Basmati Paddy Per Hectare.

The gross income after adjusting post-harvest losses is found to be Rs. 77183.70 per hectare. Net income, farm business income, own farm income, and farm labor income computed after adjusting with the respective costs are found to be Rs.33,389.70, Rs. 43960.10, Rs. 43,390.10, and Rs 34,462.90, respectively. The income per rupee is Rs. 1.76, which indicates farmers receive Rs. 1.76 per rupee of investment made in organic non-basmati paddy cultivation, which is low as compared to organic pineapple and organic pumpkin. The details of various incomes of organic non-basmati paddy are shown in the table below.

Table 60: *Showing Various Heads of Income of Organic Non-Basmati Paddy.*

Particulars	Per Hectare (Rs.)
Gross Income: (Main product × Price of main product – Post-harvest losses) = (Total Revenue from sales of organic non-basmati rice – Post-harvest losses) *G.I. (Per Hectare) = $((T \times P) - T_{PH} \times P)/99.46)$* = (7716423-39217.4/99.46)	**77183.70**
Net Income: (Gross Income- Cost C_2)	33389.70
Farm Business Income: (Gross Income –Cost A_1)	43960.10
Own Farm Income: (Gross Income- Cost A_2)	43390.10
Farm Labor Income: (Gross Income- Cost B_2)	34462.90
Income per Rupee: (Gross Income/ Cost C_2)	1.76

Source: Compiled by the author.

Whereas,

T = Total organic non-basmati rice produced by farmers in quintals.
P = Price of organic non-basmati rice received by farmers per quintal.
T_{PH} = Post-harvest loss in quintal.
P = Price of organic non-basmati rice received by farmers per quintal.
Ha = Total land in hectare.

5.4.3 Margin and Cost Incurred by by Various Chain Actors in Organic Non-Basmati Value Chain.

Net production cost per quintal of organic non-basmati paddy is Rs. 913.32 per quintal. Farmers sell paddy through three channels which are: commission agents, rice millers, and the Food Corporation of India. Farmers received the highest margin from the Food Corporation of India, which is Rs. 1006.68, followed by rice millers and commission agents with Rs. 767.93 and Rs. 607.42 respectively. The commission agents purchase the organic non-basmati paddy at Rs. 1520.74 per quintal and sell the same to rice millers at Rs. 1785 with a margin of Rs. 117 per quintal. Commission agents incurred a cost of Rs. 148 per quintal of paddy in various non-value-adding process activities (loading, unloading, storage) and necessary non-value-adding process activities (transportation). Rice millers buy paddy for Rs. 1738.88 per quintal (after adjusting the purchase price from farmers and commission agents, note 5). Milling cost after adjusting the conversion rate of paddy to rice at 65% (note 6) and milling charges are found to be Rs. 2793 per quintal. The organic non-basmati paddy lost its identity as organic in the hands of commission agents and rice millers as they did not maintain a separate chain for organic paddy milling. Rice millers mix the organic paddy with the conventional chain and, after milling, sell the rice to wholesalers at Rs.3150 per quintal. The rice millers also earn Rs. 100 per quintal as revenue from the sales of by-products and net revenue is found to be Rs. 3250 with a margin of Rs. 457 per quintal. Wholesalers purchase the rice at Rs. 3150 per quintal and incur Rs. 101 costs in various activities like transportation, loading, and unloading and sell the same to retailers at Rs. 3450 with a margin of Rs. 199 per quintal. Retailers incur Rs. 62 per quintal as retailing cost and sales the same to consumers at Rs. 3912 with a margin of Rs. 400 per quintal. The highest margin is found with rice millers with Rs. 4.57 per kg followed by retailers with Rs. 4.00 per quintal. The details of the value addition of organic non-basmati rice by farmers, commission agents, wholesalers, and retailers are shown in the following table.

Table 61: *Showing Cost and Margin Incurred by Farmers, Commission Agents, Wholesalers and Retailers in the Organic Non-Basmati Rice Value Chain.*

Category	Particulars	Amount in Rs (Per quintal)	Amount in Rs (per kg)
Organic Chain (Farmers)	Farmers (n = 75)		
	1. Production Cost		
	a. Cost A_1 (Includes all production costs excluding imputed cost and rent paid for the leased land) (Cost A_1 / per hectare production in quintal/kg)	692.86	6.92[1]
	b. Cost A_2 (Cost A_1 + Rent paid for leased land)	704.76	7.04
	c. Cost B_1 (Cost A_2 + Interest on fixed capital)	723.35	7.23
	d. Cost B_2 (Cost B_1 + Rental value of own land)	890.94	8.90
	e. Cost C_1 (Cost B_1 + Imputed value of family labor)	745.73	7.45
	f. Cost C_2 (Cost B_2 + Imputed value of family labor)	913.32	9.13
	Total production cost (Cost C_2)	913.32	9.13
	Post Production Cost		
	a. Total farm-level costs	913.32	9.13
	b. post-harvest loss (due to damage of organic non-basmati rice)	0	0
	I. Net Production cost (a + b)	*913.32*	*9.13*
	Margin 1: (Farmers sold to comm. agents),(IIi -I)	607.42	6.07
	Margin 2: (Farmers sold directly to rice miller),(IIii-I)	767.93	7.67
	Margin 3: (Farmers sold directly to Food Corporation of India), (IIiii -I)	1006.68	10.68
	II. Producer's price:		
	i. Producers price for commission agents [2]	1520.74	15.20
	ii. Producer's price for Rice Miller [3]	1681.25	16.81
	iii. Producer price for Food Corporation of India [4]	1920.00	19.20
II Conventional Chain (Organic non- basmati paddy is mixed with other paddy) Commission agents	Commission agents (Paikars) (N =10)		
	a. Purchase Price	1520.74	15.20
	b. Assembling and Grading	0.00	0.00
	c. Transportation Cost	92	0.92
	d. Loading and Unloading labor charges	28	0.28
	e. Storage Cost	24	0.24
	f. Other cost	4	0.04
	g. Total Assembling cost (b to f)	148	1.48
	h. Losses (Due to damages)	0.00	0.00
	i. Net cost at Commission agent level (g +h)	*148*	*1.48*
	j. Total Cost (a+ i)	*1668*	*16.68*
	k. Margin (k-j)	117	1.17
	l. Commission Agents price to rice millers (j+k)	1785	17.85
Rice millers' charges	Rice Millers average buying price of paddy [5]	1738.88	17.38
	a. Rice equivalent procurement price of non-basmati paddy (@ 65% conversion rate) [6]	2673.00	26.73
	b. Milling charge for processing (including labor and bagging charges)	120	1.20
	c.Total cost incurred by rice millers (a+b)	2793.00	27.93
	d. Rice miller selling price of non-basmati paddy to rice wholesalers	*3150*	*31.50*
	e. Selling of by-products by rice millers	100	1.00

	Table 61 (Continued)		
	f. Net revenue of rice millers (d +e)	3250	32.50
	g. Margin of rice millers (f-c)	457	4.57
III Conventional Chain (Wholesalers)	Wholesalers (N = 10)		
	a. Purchase price (from rice millers)	3150	31.50
	b. Transportation Cost	67	0.67
	c. Loading and Unloading labor charges	18	0.18
	d. Storage cost	10	0.10
	e. Other cost	6	0.06
	f. Total wholesale level cost (b +e)	101	1.01
	g. Losses (Due to damages)	0	0
	h. Net cost at wholesale level (f +g)	101	1.01
	i. Total cost (a+h)	3251	32.51
	j. Margin	199	1.99
	k. Wholesaler's price to rice retailers	3450	34.50
Conventional Chain (Retailers)	Retailers (N =20)		
	a. Purchase Price (From wholesalers)	3450	34.50
	b. Assembling and Grading	0	0
	c. Transportation Cost	40	0.40
	d. Loading and Unloading labor charges	9	0.09
	e. Storage Cost	7	0.07
	f. Other cost	6	0.06
	g. Total retail level cost (a to f)	62	0.62
	h. Losses (Due to damages)	0	0
	i. Net cost at retailer's level (g + h)	62	0.62
	j. Total cost (a + i)	3512	35.12
	k. Margin	400	4.00
	Retailers Price/ Price paid by consumers	***3912***	***39.12***

Source: Compiled by the author.

Note 1
Computation of production cost of organic non-basmati rice in quintal/kg.
Cost A1 per quintal of organic non-basmati paddy $= \dfrac{Cost\ A1}{Total\ production\ per\ hectare\ in\ quintal}$

Cost A1 = Rs. 33223.00 per hectare
 Production of organic non-basmati paddy per hectare in quintal = 47.95 quintal

Cost A1 per quintal $= = \dfrac{Rs.33223.00}{47.95\ quintal}$
Organic non-basmati paddy cost A1 per quintal =Rs. 692.86

Organic non-basmati paddy costs A1 per kg $= \dfrac{692.86}{100} =$ **Rs. 6.92**.
Note 2
Computation of Producers' price for commission agents.
Price in quintal sold to traders in December, January, February, and March/ Total number of farmers sold paddy to commission agents.

$= \dfrac{58260+17360+6500+0}{39+11+4+0}$ = **Rs. 1520.74**
Note 3
Computation of Producers' prices for rice millers.
Price in quintal sold to rice millers in December, January, February, and March/ Total number of farmers sold paddy to rice millers.

$= \frac{0+1600+10150+1700}{0+1+6+1}$ = **Rs. 1681.25**

Note 4

Computation of Producers price for Food Corporation of India (FCI).

Price in quintal sold to FCI in December, January, February and March/ Total number of farmers sold paddy to FCI.

$= \frac{0+9600+5760+0}{0+5+3+0}$ = **Rs. 1920.00**

Note 5

Computation of Rice Miller's average buying price of Paddy

Total price of paddy sold to rice millers by farmers and commission agents / Total number of farmers and commission agents sold paddy to rice millers.

$= \frac{13450+17850}{8+10}$ = **Rs. 1738.88**

Note 6

Paddy cost of rice-millers

The procurement price of paddy converted into milled rice cost equivalent estimated by the following formula with a 65 percent conversion rate.

Paddy price per kg sold to rice millers / Milling recovery at an average of 65%.

$= \frac{17.38}{65\%}$ = **Rs. 26.73**

5.4.4 *Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Non-Basmati Rice Value Chain.*

For channel I, farmers sell organic non-basmati paddy through commission agents. The highest price difference is found with retailers which is Rs. 462.00 per quintal, followed by rice millers with Rs. 404.00 per quintal. Similarly, the highest margin was also found with retailers followed by rice millers with Rs. 400 and Rs. 284, respectively. The highest degree of value addition is found with rice millers with 13.35% followed by retailers with 11.59%. Rice millers procure the paddy from various sources (farmers and commission agents) and processed output is sold to wholesalers with the logo and brand name of various rice millers. The degree of value addition is determined only by the margin and purchase price of the paddy/rice, and the retailer's value addition is only confined to the difference between the buying and selling price. Farmers share the highest shares in the consumer price with 38.87%, followed by retailers with 11.80% share. The share of rice millers, wholesalers, and commission agents in consumer price is 10.32%, 7.66%, and 6.75% respectively.

For channel II, farmers sell the paddy directly to rice millers at Rs. 1681.25 per quintal, which is around Rs.2586.53 per quintal of rice at a conversion rate of 65%, including the milling charges. The highest margin is found with the rice millers with Rs.443.47 followed by retailers with Rs. 400 per quintal. The highest degree of value addition is found with rice millers, with 17.14%, followed by retailers, with 11.59%. Apart from basic value-adding

activities and paddy processing by the rice millers, no value addition was found to strengthen the organic value chain. Organic non-basmati paddy is mixed with conventional paddy, and the actors involved did not maintain any organic standards and don't have any organic certification to handle and process the organic products. The margin and value addition are computed based on the existing conventional value chain, and determined by the difference is between the selling and buying price. Compared to channel I, in channel II, the share of farmers in the consumer price is high, which is around 42.97%, followed by rice millers, which is around 14.39%.

The marketing efficiency for channel I and channel II is found to be 1.01 and 1.26, respectively, as farmers received a higher price from rice millers than commission agents in channel I. The details of the degree of value addition, price spread, and marketing efficiency of the value chain of organic non-basmati paddy/ rice are shown in the table below.

Table 62: *Showing Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Non-Basmati Paddy/Rice Value Chain (Rs. per quintal).*

Sl. No.	Items	Farmer	Comm Agents	Rice miller	Wholesaler	Retailer	Consumer
Channel I (partly organic) (Farmer-Comm. Agent- Rice millers-Wholesaler- Retailers - Consumer)							
1	Sale Price.	1520.74	1785	3150	3450	3912	
2.	Purchase Price		1520.74	2746[1]	3150	3450	3912
3.	Price differences (1-2)		264.26	404	300	462	
4.	Cost		148	120	101	62	
5.	Margin (3-4)		116.26	284	199	400	
6.	Degree of value Addition (5/2 × 100)		7.64%	13.35%	6.31%	11.59%	
7.	Share in consumer price	38.87% (1520.74/3912 × 100)	6.75% (264.26/3912 ×100	10.32% (404/3912× 100)	7.66% (300/3912× 100)	11.80% (462/3912× 100)	0% (3912/3912× 100)
8.	Marketing Efficiency (Price Received by farmers/ MC+MM): 1.01. (1520.74/ (431+1072.26))						
9.	Price Spread: (3912-1520.74) = Rs. 2391.26. In percentage = 1520.74/3912×100= 38%						

Table 62 (Continued)							
Channel II (Partly Organic) (Farmers- Rice millers- Wholesalers- Retailers- Consumers)							
1	Sale Price	1681.25		3150	3450	3912	
2	Purchase Price			2586.53[2]	3150	3450	3912
3	Price differences (1-2)			563.47	300	462	
4	Cost			120	101	62	
5	Margin (3-4)			443.47	199	400	
6	Degree of value Addition (5/2 × 100)			17.14%	6.31%	11.59%	
7	Share in consumer price	42.97% (1681.25/3912 ×100)		14.39% (563.47/3912 ×100	7.66% (300/3912 ×100)	11.80% (462/3912 ×100)	0% (3912/3912× 100)
8	Marketing Efficiency (Price Received by farmers/ MC+MM) : 1.26 (1681.25/283+1042.47)						
9	Price Spread: (3912- 1681.25) = Rs. 2230.75. In percentage = 1681.25/3912×100= 42.97%						

Source: Compiled by the author.

Price spread: Price spread is the difference between the price paid by the consumer and the price received by the producer (Sahoo & Sarangi, 2018).

PS = Pf / Pc × 100, Where, P.S.: Price Spread, Pf: Price received by the producer, Pc: Price paid by the consumer.

Note [1] Computation of purchase price of rice miller for channel I
= Average selling price of the commission agents @ 65% conversion rate.
= (1785 × 100/ 65) = Rs. 2746.
Note [2] Computation of purchase price of rice miller for channel II.
= (1681.25 ×100/65) = Rs. 2586.53.

5.4.5 Value Chain Upgradation of Organic Non-Basmati Rice.

Apart from farmers, none of the actors in the organic non-basmati rice value chain are involved in upgrading strategies. Farmers performed various basic value-adding production functions like cutting, post-harvest treatment, cleaning, etc, and the activities of FPC, named "Puthimari Agro Organic Producer Company Limited" are confined only to supplying inputs, providing various information about the schemes and not involved in any market linkage activities. The details of the upgradation strategies followed by various actors in the organic non-basmati value chain are shown in the following table.

Table 63: *Showing Upgradation Strategies of Various Chain Actors in Organic Non-Basmati Value Chain*

Upgradation strategy/ Activities	Farmers (Yes/No)	FPC	Com. Agents	Rice Miller	Wholesalers (Yes/No)	Retai-lers (Yes/No)
1. Primary production functions like input & bio fertilizer, cutting, post-harvest treatment, cleaning, bagging, storge, weighting	Yes	No (Only confined with supplying inputs)	Yes	Yes	Yes	Yes
2. Processing	None	None	No	Yes (Mix)	None	None
3. Transportation	Yes	None	Yes	Yes	Yes	Yes
4. Packaging/ Labelling	None	None	Yes (Primary)	Yes (With rice miller name)	None	None
5.Product upgrading						
5.a. Product type	Yes: 82.7%	No	None	None	None	None
5.b. Quality aspect	Yes: 28.0%	No	None	None	None	None
6.Process upgrading						
6.a. Organic standards	Yes (50.7%)	No	None	None	None	None
6.b. Logistics	Yes (26.7%)	No	None	None	Yes	Yes
6.c. Equipment	Yes	Yes	None	None	None	None
6.d. Innovative marketing strategy	None	None	None	None	None	None
7. Functional Upgrading						
7.a. New activities absorbed	None	None	None	None	None	None
7.b. New market function	None	None	None	None	None	None
7.c. New logistics function	None	None	None	None	None	None
7.d. New management functions	None	None	None	None	None	None
7.e. Outsourcing certain activities	Yes (28%)	None	None	Yes	Yes	Yes

Source: Compiled by the author.

5.4.6 Sources of Technology Knowledge for the Farmers of Organic Non-Basmati Paddy

The survey found that all the farmers received information related to various aspects of technology from FPC and through media. Around 96% of the respondents agree that they received it from generation-wise followed by 90.70% of the respondents who received it from extension services. The details of sources of technology knowledge for the farmers of organic non-basmati paddy are shown in the table below.

Table 64: *Showing Sources of Technology Knowledge for the Farmers of Organic Red Rice*

Various sources of technology	Percentage of the respondents
Technology knowledge from generation-wise	96
Technology knowledge from neighbourhood	1.30
Technology knowledge received from extension services	90.70
Technology knowledge received from the media	100
Technology knowledge received from formal education from FPC	100

Source: Compiled by the author.

5.5 Value Addition of Organic Red Rice

In this section, the cost of cultivation and income is computed for organic red rice. After analyzing cost and income, income per rupee is computed for farmers. The margin and cost, the degree of value addition, and marketing efficeiency is computed and are shown in respective subsections. In addition to this, value chain upgradation strategies used by farmers and FPC are also shown.

5.5.1 Cost of Cultivation of Organic Red Rice

The cost of cultivation (Cost C_2) for organic red rice per hectare is found to be Rs. 26935.00. In the individual cost component, the majority of the cost is shared by hired/owned machine labor (ploughing cost) which is around 24.87% followed by seeds with the share of 18.73%. Hired labor shares about 18.67% of the total cost, however, no cost is found related to hired women labor in the cultivation of organic red paddy. As the red rice is cultivated in low-laying and water-logged areas, farmers did not use any farm yard manure, biopesticides and biofertilizers. The details of the cost of cultivation of organic red rice are shown in the following table.

Table 65: *Showing Cost of Cultivation of Organic Red Paddy by Farmers*

Sl. No.	Particulars	Per Hectare (Rs)	Contribution in total cost (Cost C_2) in %
1	Hired labor (1.i + 1.ii)	5030.52	18.67
	1.i. Hired Men's labor	5030.52	18.67
	1.ii. Hired Women's labor	0.00	0
2.	Hired/Owned machine labor	6701.09	24.87
3	Seeds	5046.28	18.73
4	Farm Yard Manure	0.00	0
5	Green Manure	0.00	0
6	Vermicompost	1986.75	7.37
7	Biofertilizers	0.00	0
8	Biopesticides	0.00	0
9	Irrigation	0.00	0
11	Interest on working capital	398.20	1.47
12	Land revenue	301	1.11
13	Depreciation	1613.50	5.99
	Cost A_1 (1 to 13)	**21077.34**	78.25
a	Rent paid for the leased in land	0.00	0
	Cost A_2 : (Cost A_1 + a)	**21077.34**	78.25
b	Interest on fixed capital	394.44	1.46
	Cost B_1 : (Cost A_2 + b)	**21471.78**	79.71
c	Rental value of the owned land	4515.05	16.76
	Cost B_2 : (Cost B_1 + c)	**25986.83**	96.47
d	Imputed value of family labor (di + dii)	948.16	3.52
	d.i. Imputed value of family men's labor	948.16	3.52
	d.ii. Imputed value of family women's labor	0	0
	Cost C_1: (B_1 + d)	**22419.94**	83.23
	Cost C_2 : (Cost B_2 + d)	**26934.99**	100

Source: Compiled by the author.

5.5.2 Income Computation of Organic Red Paddy

The per hectare gross income for organic red paddy is found to be Rs. 34806.00, and net income is found to be Rs. 7871.00. The farm business income, own farm income, and farm labor income is found to be Rs. 13728.66, Rs. 13728.66, and Rs. 8819.17 respectively. The income per rupee is found to be Rs. 1.29, which indicates that organic red rice farmers receive Rs. 1.29 for one rupee of investment made in the cultivation of organic red paddy. The income per rupee for organic red rice is found to be much lower as compared to organic pineapple, organic pumpkin, and organic non-basmati paddy due to low production per hectare. The details of income computation for organic red paddy are shown in the following table.

Table 66: *Showing Income Computation of Organic Red Paddy*

Particulars	Per Hectare (Rs.)
Gross Income: (Main product × Price of main product – Post-harvest losses) = (Total Revenue from sales of organic red rice – Post-harvest losses) ***G.I. (Per Hectare)* =** $((T \times P) - T_{PH} \times P)/79.73)$ = (2789380 - 14305.50 /79.73)	**34806.00**
Net Income: (Gross Income- Cost C_2)	**7871.00**
Farm Business Income: (Gross Income –Cost A_1**)**	**13728.66**
Own Farm Income: (Gross Income- Cost A_2)	**13728.66**
Farm Labor Income: (Gross Income- Cost B_2)	**8819.17**
Income per Rupee: (Gross Income/ Cost C_2)	**1.29**

Source: Compiled by the author.

5.5.3 Cost and Margin Incurred by Actors in the Value Chain of Organic Red Rice.

All the farmers sales organic paddy to the FPC (Dol Agro Organic Producers Co. Ltd.) at the price of Rs. 2200 per quintal. The net production cost in the hands of the farmers is found to be Rs.1695.09 with a margin of Rs. 504.91 per quintal. After collecting the paddy from the farmers, FPC sell the same in two ways, i.e., direct sales of organic paddy to traders in Haryana and sales of organic red rice to traders in Hyderabad and to local consumers in Dhemaji district. The FPC incurred Rs. 100 per quintal for assembling and packaging the paddy and sell the same to traders in Haryana at Rs.2800 per quintal. The margin per quintal is found to be Rs. 500 per quintal, with the FPC from paddy sales. The FPC also started its own processing unit and supplies organic red rice to traders in Hyderabad (on special orders). The processing cost of paddy per quintal, including milling charges, is found to be Rs. 3984 per quintal. The FPC receives the highest margin, which is Rs. 3016 per quintal, when they supply special orders of organic red rice to Hyderabad, followed by Rs. 2016 per quintal from consumers within the state. The details of the value addition of organic red rice are shown in the following table.

Table 67: *Showing Cost and Margin of Organic Red Rice by Farmers & FPC.*

Category	Particulars	Amount in Rs (Per quintal)	Amount in Rs (per kg)
Farmers (Organic Chain)	Farmers (n = 75)		
	1. Production Cost		
	a. Cost A_1 (Includes all production costs excluding imputed cost and rent paid for the leased land)[1]	1326.43	13.26[1]
	b. Cost A_2 (Cost A_1 + Rent paid for leased land)	1326.43	13.26
	c. Cost B_1 (Cost A_2 + Interest on fixed capital)	1351.27	13.51
	d. Cost B_2 (Cost B_1 + Rental value of own land)	1635.42	16.35
	e. Cost C_1 (Cost B_1 + Imputed value of family labor)	1410.94	14.10
	f. Cost C_2 (Cost B_2 + Imputed value of family labor)	1695.09	16.95
	Total production cost (Cost C_2)	*1695.09*	*16.95*
	i. Total farm-level costs	1695.09	16.95
	ii. post-harvest loss (due to damage to organic non-basmati rice)	0	0
	I. Net Production cost (i + ii)	*1695.09*	*16.95*
	Margin: (Farmers sold paddy directly to FPC (Dol Agro Organic Producers Co.)), (II -I)	504.91	5.04
	II. Producer's price:		
	Price paid by FPC (Dol Agro Organic Producers Co.)	2200.00	22.00
FPC (Organic Chain)	a. Purchase price of organic red paddy by the FPC	2200.00	22.00
	1. Sales of organic paddy		
	b. Assembling and packaging cost	100.00	1.00
	c. Total cost incurred by FPC for organic red paddy(a+b)	2300.00	23.00
	d. FPC selling price for organic red paddy to traders in Haryana	2800	28.00
	Margin to FPC for sales of organic red paddy (d-c)	*500.00*	*5.00*
	2. Sales of organic red rice		
	a. Rice equivalent procurement price of organic red paddy (@ 65% conversion rate)[2]	3384.00	33.84
	b. Milling charge for processing (including labor and bagging charges)	200	2.00
	c. Transportation charges	400	4.00
	d. Total cost incurred by FPC for paddy processing (a+b+c)	3984	39.84
	e. FPC selling price of organic red rice to distant traders (Hyderabad)	*7000*	*70*
	f. FPC selling price of organic red rice to local consumers	*6000*	*60*
	Margin of the FPC for sales of organic red rice (Hyderabad). (e-d)	*3016*	*30.16*
	Margin of the FPC for sales of organic red rice to local consumer. (f-d).	*2016*	*20.16*

Source: Compiled by the author.

Note 1[1]

Computation of production cost of organic red paddy in quintal/kg.

$$\text{Cost } A_1 \text{ per quintal of organic red paddy} = \frac{\text{Cost } A1}{\text{Total production per hectare in quintal}}$$

Cost A_1 = Rs. 21077.00 per hectare
Production of organic red paddy per hectare in quintal = 15.89 quintal

$$\text{Cost } A_1 \text{ per quintal} \quad = \frac{Rs. 21077.00}{15.89 \text{ quintal}}$$

Organic red paddy cost A_1 per quintal =Rs. 1326.43

Organic red paddy Cost A_1 per kg $= \frac{1326.43}{100} =$ **Rs. 13.26**
Cost A_2 per quintal = Rs. 21077/15.89 = Rs. 1326.43.
Cost A_2 per kg   = Rs. 1326.43/100 = Rs. 13.26
Cost B_1 per quintal = Rs. 21471.78/15.89 = Rs. 1351.27
Cost B_1 per kg   = Rs. 1351.27/100   = Rs. 13.51
Cost B_2 per quintal = Rs. 25986.83/ 15.89 = Rs. 1635.42
Cost B_2 per kg   = Rs. 1635.42/ 100   = Rs. 16.35
Cost C_1 per quintal = Rs. 22419.94/ 15.89 = Rs. 1410.94
Cost C_1 per kg   = Rs. 1410.94/ 100   = Rs. 14.10
Cost C_2 per quintal = Rs. 26934.99   = Rs. 1695.09
Cost C_2 per kg   = Rs. 1695.09/100   = Rs. 16.95

Note 2[2]:

Paddy cost of FPC for processing.
Procurement price of paddy converted into milled rice cost equivalent estimated by following formula with 65 percent conversion rate.
Paddy price per kg sold to FPC / Milling recovery at an average of 65%.
$= \frac{22}{65\%} =$ **Rs. 33.84**

5.5.4 *Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Red Rice Value Chain.*

For channel I (organic red paddy sold directly to traders in Haryana), the degree of value addition was found to be 22.72%. The marketing efficiency for this channel is 3.66, and the price spread was found to be 68.57%. In this channel, FPC only assembles and packages the paddy and supplies to the traders. For channel II (FPC processes the paddy and sells organic red rice to traders in Hyderabad), the degree of value addition is found to be 89.12%, which is the highest as compared to channels I and III. The marketing efficiency for channels II and III is found to be 0.93 and 1.29. The price spread for channels II and III is found to be 51.65% and 43.60%. The value addition for channel II is found as FPC performs value-adding process activities (processing, packaging, and labeling) and sells the same at a premium price to Hyderabad The details of value addition, marketing efficiency, and price spread of organic red rice value chain are shown in the following table.

Table 68: *Showing Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Red Rice Value Chain (Rs. per quintal).*

Sl. No	Items	Farmer	FPC	Customer
	Channel I (Organic paddy sold to distant traders in Haryana)			
1	Sale Price.	2200	2800	
2.	Purchase Price		2200	2800
3.	Price differences (1-2)		600	
4.	Cost		100	
5.	Margin (3-4)		500	
6.	Degree of value Addition (5/2 × 100)		22.72%	
7.	Share in consumer price	78.57% (2200/2800 × 100)	21.42% (600/2800×100	0% (2800/2800×100)
8.	*Marketing Efficiency*: (Price Received by farmers/ MC+MM): 3.66. (2200/ (100+500))			
9.	*Price Spread:* (2800-2200) = Rs 600. In percentage = (600/2800×100) = 21.42%			
	Channel II (Organic red rice sold to distant traders in Hyderabad)			
1	Sale Price (Conversion price is considered as buying price from farmers).	3384	7000	
2	Purchase Price		3384	7000
3	Price differences (1-2)		3616	
4	Cost (Processing & Transportation charges)		600	
5	Margin (3-4)		3016	
6	Degree of value addition (5/2×100)		89.12 %	
7	Share in consumer price	48.34% (3384/7000×100)	51.65% (3616/7000×100)	0% (7000/7000×100)
8	*Marketing Efficiency:* (Price Received by farmers/ MC+MM): 0.93 (3384/(600+3016)).			
9	*Price Spread:* (7000-3384) =Rs.3616. In Percentage: (3616/7000×100) = 51.65%.			
	Channel III (Organic red rice sold to consumer within State)			
1	Sale Price (Conversion price is considered as buying price from farmers).	3384	6000	
2	Purchase Price		3384	6000
3	Price differences (1-2)		2616	
4	Cost (Processing & Transportation charges)		600	
5	Margin (3-4)		2016	
6	Degree of value addition (5/2×100)		59.57%	
7	Share in consumer price	56.40% (3384/6000×100)	43.60% (2616/6000×100)	0% (6000/6000×100)
8	*Marketing Efficiency:* Price Received by farmers/ MC+MM): 1.29 (3384/(600+2016))			
9	*Price Spread:* (6000-3384) =Rs.2616 In percentage: (2616/6000×100) =43.60%			

Source: Compiled by the author.

5.5.5 Value Chain Upgradation of Organic Red Rice

In the value chain of organic red rice, only two actors are involved i.e., farmers and the FPC (Dol Agro Organic Producers Co.), and the FPC particularly handles the value addition activities. All the farmers perform various primary production, functions, and only 17.30% of the farmers have storage facilities for their produce. Around 70.70% of the farmers upgrade the product type and 45.30% upgrade the quality aspects under product upgrading strategies. The organic standard must be maintained across the organic value chain, yet only 52.00% of farmers admit to having followed the organic standards. In functional upgrading aspects, farmers perform various activities related to new market functions, new activities absorbed, and outsourced certain activities. The FPC (Dol Agro Organic Producer Co. Ltd.) performs value-adding activities related to product upgrading, process upgrading, and functional upgrading. FPC trying to develop the quality and various types of value-added products from red rice like red rice flour in cake, bread, and cookies by the NPOP standard. In the process upgradation aspect of the chain, FPC is involved in improvement in logistics to supply organic produce for distant traders by the organic standards. The details of the upgradation strategy used by the farmers and FPC are shown in the table below.

Table 69: *Showing Upgrading Strategy Used by Farmers and FPC*

Upgradation Strategy/ Activities	Farmers	FPC
1. Primary production functions like input & biofertilizer, cutting, post-harvest treatment, cleaning, bagging, storage, weighting	Yes *Storage:* Yes: 17.30% No: 82.70%	Yes
2. Processing	None	Yes
3. Transportation	None	Yes
4. Packaging/ Labelling	None	Yes
5. Product upgrading		
5. a. Product Type	Yes: 70.70%	Yes
5. b. Quality aspect	Yes: 45.30%	Yes
6. Process upgrading		
6.a. Organic standards	Yes: 52.00%	Yes
6. b. Logistics	No	Yes
6. c. Equipment	Yes:48.00%	Yes
6.d. Innovative marketing strategy	None	Yes
7. Functional Upgrading		
7. a. New activities absorbed	Yes:81.30%	Yes
7. b. New market function	Yes:49.30%	Yes
7. c. New logistics function	None	Yes
7. d. New management functions	None	Yes
7. e. Outsourcing certain activities	Yes:26.70%	Yes

Source: Compiled by the author.

From the above table, it was found that the FPC also undertook various activities related to functional upgradation of the chain like, new activities absorbed (expansion and upgradation of processing unit), new market functions (like participation in trade fairs, exploring export consumer), new logistic functions, new management functions, and outsources some activities to develop an efficient organic food value chain.

5.5.6 Sources of Technology Knowledge for the Farmers of Organic Red Paddy

All the farmers received technology knowledge from the FPC and around 90.70% of the farmers agreed that they received it from extension services. Around 77.33% of the farmers agree that they received it generation-wise and 30.70% of the farmers received it from the neighborhood. The details of the source of the technology are shown in the table below.

Table 70: *Showing Sources of Technology for Organic Red Rice Farmers*

Various sources of technology	Percentage of the respondents
Technology knowledge from generation-wise	77.33
Technology knowledge from the neighbourhood	30.70
Technology knowledge received from extension services	90.70
Technology knowledge received from the media	20.00
Technology knowledge received from formal education from FPC	100

Source: Compiled by the author.

5.6 Value Addition of Organic Turmeric

In this section after analyzing cost and income, income per rupee is computed for farmer of organic turmeric in Golaghat district of Assam. The margin and cost, the degree of value addition, and marketing effieciency is computed and are shown in respective subsections. In addition to this, value chain upgradation strategies used by farmers and FPC are also shown.

5.6.1 Cost of Cultivation of Organic Turmeric

The cost of cultivation (Cost C_2) for organic turmeric per hectare is found to be around Rs. 71680.00. In the individual cost component, the majority i.e., 36.60% of the total cost is shared by organic turmeric rhizomes (planting material), followed by hired/owned machine labor with the share of 12.45%. On average, 140.05 kg of organic turmeric rhizomes at Rs. 25 per kg is used per hectare to cultivate of organic turmeric. Farmers used vermicompost, bio-fertilizers, biopesticides, and mulching to enhance productivity. The cost of vermicompost per hectare is Rs.8548.50 which is about 11.92% of the total cost. The costs A_1, Cost A_2, Cost

B_1, Cost B_2, and Cost C_1 per hectare are found to be Rs.59677.00, Rs. 60587.62, Rs. 61397.32, Rs. 66668.82, and Rs 66407.00, respectively. The details of the cost of cultivation of organic turmeric are shown in the table below.

Table 71: *Showing Cost of Cultivation of Organic Turmeric by Farmers.*

Sl. No.	Particulars	Per Hectare (Rs)	Contribution in total cost (Cost C_2) in %
1	Hired labor (1.i + 1.ii)	4028.20	5.61
	1.i. Hired Men's labor	4028.20	5.61
	1.ii. Hired Women's labor	0.00	0
2.	Hired/Owned machine labor	8927.90	12.45
3	Organic Turmeric Rhizomes (Roots for planting)	26236	36.60
4	Farm Yard Manure	896.71	1.25
5	Mulching	1597.8	2.22
6	Vermicompost	8548.5	11.92
7	Biofertilizers	77.213	0.10
8	Biopesticides	609.42	0.85
9	Irrigation	1158.00	1.61
11	Interest in working capital	1265.90	1.76
12	Land revenue	264.00	0.36
13	Depreciation	2039.00	2.84
	Cost A_1 (1 to 13)	**59677.00**	83.25
a	Rent paid for the leased in land	910.62	1.27
	Cost A_2 : (Cost A_1 + a)	**60587.62**	84.52
b	Interest on fixed capital	809.7	1.12
	Cost B_1 : (Cost A_2 + b)	**61397.32**	85.65
c	Rental value of the owned land	5271.50	7.35
	Cost B_2 : (Cost B_1 + c)	**66668.82**	93.01
d	Imputed value of family labor (di + dii)	5009.68	6.98
	d.i. Imputed value of family men's labor	3567.88	4.97
	d.ii. Imputed value of family women's labor	1441.80	2.01
	Cost C_1: (B_1 + d)	**66407.00**	92.64
	Cost C_2: (Cost B_2 + d)	**71678.50**	100

Source: Compiled by the author.

5.6.2 Income Computation of Organic Turmeric

The gross income after adjusting the post-harvest losses per hectare is found to be Rs.203234.00, and the net income per hectare is Rs. 131555.00. The income per rupee is found to be Rs. 2.83, which indicates farmers earn Rs. 2.83 for one rupee investment made in organic turmeric cultivation. Farm business income, own farm income, and farm labor income are found to be Rs. 143557.00, Rs. 142646.00, and Rs.136565.00 respectively. The details of income computation for organic turmeric are shown in the table below.

Table 72: *Showing Income Computation of Organic Turmeric Farmers*

Particulars	Per Hectare (Rs.)
Gross Income (Per hectare): (Main product $\times$ Price of main product – Post harvest losses)/ Total hectare = (Total Revenue from sales of organic turmeric – post harvest losses) ***G.I. (Per Hectare)* =** $((T \times P) - T_{PH} \times P)/79.06)$ = (16187700 – 120020 /79.06)	**203234.00**
Net Income: (Gross Income- Cost C_2)	**131555.50**
Farm Business Income: (Gross Income –Cost A_1**)**	**143557.00**
Own Farm Income: (Gross Income- Cost A_2)	**142646.38**
Farm Labor Income: (Gross Income- Cost B_2)	**136565.18**
Income per Rupee: (Gross Income/ Cost C_2)	**2.83**

Source: Compiled by the author.

5.6.3 Cost and Margin Incurred by Actors in the Value Chain of Organic Turmeric.

Padumpathar Agro Organic Producer Company Limited purchases organic turmeric at Rs. 1830.70 per quintal from farmers. The FPC sells organic turmeric in three forms, i.e., fresh organic turmeric (turmeric rhizomes/ planting material), dry organic turmeric fingers, and organic turmeric powder. The net production cost per quintal of turmeric by farmers'is found to be Rs. 653.26, and the margin per quintal is Rs. 1177.44. The FPC engages in various value-added activities in response to the various types of output. Organic turmeric rhizomes are sold to various FPCs and farmers in Northeast India at Rs. 2500 per quintal with a margin of Rs. 370.00 per quintal. The FPC has the necessary equipment for the value addition of organic turmeric such as a boiler, dryer, processing plant, and packaging unit. After various value-adding activities (boiling and drying) of dried organic turmeric fingers, the per quintal cost is found to be Rs. 10150.50. The FPC sells the same at Rs. 13000.00 and fetches a margin of Rs. 2850 per quintal. Organic turmeric powder is also produced by the FPC with its brand name "PAOPCL", with proper packaging and labeling by the organic standards. At present, the FPC is producing organic turmeric powders in three sizes, i.e., 1kg packets, 500-gram packets, and 200-gram packets. The cost of 1kg of organic powder is Rs.184.00 and sells the same at Rs. 250 per kg with a margin of Rs. 66.00 per kg. The organic turmeric powder is mostly sold to Guwahati and Gujrat. The details of organic turmeric value addition are shown in the following table.

Table 73: *Showing Cost and Margin of Organic Turmeric by Farmers & FPC.*

Category	Particulars	Amount in Rs (Per quintal)	Amount in Rs (per kg)
Farmers (Organic Chain)	Farmers (n = 75)		
	1. Production Cost		
	a. Cost A_1 (Includes all production cost excluding imputed cost and rent paid for the leased land)[1]	531.88	5.31[1]
	b. Cost A_2 (Cost A_1 + Rent paid for leased land)	540.00	5.40
	c. Cost B_1 (Cost A_2 + Interest on fixed capital)	547.00	5.47
	d. Cost B_2 (Cost B_1 + Rental value of own land)	594.00	5.94
	e. Cost C_1 (Cost B_1 + Imputed value of family labor)	592.00	5.92
	f. Cost C_2 (Cost B_2 + Imputed value of family labor)	639.00	6.39
	Total production cost (Cost C_2)	*639.00*	*6.39*
	i. Total farm level costs	639.00	6.39
	ii. post-harvest loss (due to damage of organic turmeric: post-harvest loss per hectare/ production per hectare in qtl.). (1600/112.20)	14.26	0.14
	I. Net Production cost (i + ii)	*653.26*	*6.53*
	Margin: (Farmers sold organic turmeric directly to FPC (Padumpathar Agro Organic Producers Co.)), (II -I)	1177.44	11.77
	II. Producer's price:		
	Price paid by FPC (Dol Agro Organic Producers Co.)	1830.70	18.30
FPC (Organic Chain)	*1. Sales of organic turmeric rhizomes (for planting)*		
	a. Purchase price of organic turmeric by the FPC	1830.70	18.30
	b. Assembling and bagging (includes cutting cost)	300.00	3.00
	c. Total cost incurred by FPC for organic turmeric rhizomes (a+b).	2130.70	21.30
	d. FPC selling price for organic turmeric rhizomes	2500	25.00
	Margin to FPC for sales of organic turmeric rhizomes(d-c)	*369.30*	*3.70*
	2. Sales of dry organic turmeric fingers		
	a. Dry organic turmeric fingers equivalent procurement price of organic fresh turmeric (@ 20% conversion rate)[2]	9350.00	93.50[2]
	b. Boiling and drying charges	400.00	4.00
	c. Transportation charges	400.00	4.00
	d. Total cost incurred by FPC for organic dry turmeric fingers (a+b+c)	10150.00	101.50
	e. FPC selling price of organic dry turmeric	13000.00	130
	Margin of the FPC for sales of dry organic turmeric fingers (e-d)	*2850.00*	*28.50*
	3. Sales of dry organic powder		
	a. Turmeric powder equivalent procurement of dry organic turmeric fingers[3]		156.00
	b. Milling charges		10.00
	c. Packaging charges (Including packaging material, labelling and labor charges)		10.00
	d. Selling and distribution cost		8.00
	e. Total cost incurred by FPC for organic turmeric powder. (a+b+c+d)		184.00
	f. FPC selling price for organic dry turmeric powder		250.00
	Margin of the FPC for sales of organic turmeric powder (f-e).		*66.00*

Source: Compiled by the author.

Note: Organic turmeric powder are also sold in packet of 200g, 500g and price is set accordingly.

Note 1[1]

Computation of production cost of organic turmeric in quintal/kg.

$$\text{Cost A}_1 \text{ per quintal of organic turmeric} = \frac{\text{Cost A1}}{\text{Total production per hectare in quintal}}$$

Cost A_1 = Rs.59677.00 per hectare
Production of organic turmeric per hectare in quintal =112.20 quintal.

$$\text{Cost A}_1 \text{ per quintal} = \frac{Rs.59677.00}{112.20 \ quintal}$$

Organic turmeric cost A_1 per quintal =Rs.531.88

Organic turmeric cost A_1 per kg $= \frac{531.88}{100} = $ **Rs.5.31**

Cost A_2 per quintal = Rs.60587.62/112.20 = Rs. 540.00
Cost A_2 per kg $\quad$ = Rs.540/100 = Rs 5.40
Cost B_1 per quintal = Rs. 61397.32/112.20 = Rs. 547.00
Cost B_1 per kg $\quad$ = Rs. 547.00/100 $\quad$ = Rs. 5.47
Cost B_2 per quintal = Rs. 66668.32/ 112.20= Rs. 594.00
Cost B_2 per kg $\quad$ = Rs. 594.00/ 100 $\quad$ = Rs. 5.94
Cost C_1 per quintal = Rs. 66407.00/ 112.20= Rs. 592.00
Cost C_1 per kg $\quad$ = Rs. 592.00/ 100 $\quad$ = Rs. 5.92
Cost C_2 per quintal = Rs. 71678.50/112.20= Rs. 639.00
Cost C_2 per kg $\quad$ = Rs. 639.00/100 $\quad$ = Rs. 6.39

Note 2[2]:

Conversion rate of dry turmeric fingers from fresh turmeric.

From the primary survey, it was found that 5 kg of fresh turmeric is required to produce 1 kg of dry turmeric fingers.
The conversion rate = 1/5* 100 = 20%
Study by (ICAR-IISR, Calicut, n.d.) finds that the conversion rate which ranges between 19% to 23%. Similarly, in the study by (*Vikaspedia Domains*, n.d.) the yield of polished dried turmeric from fresh is found to be ranges from 15% to 20%.
For the present study, conversion rate of 20% is considered.
Organic turmeric price per kg sold to FPC Recovery at 20%.

$$= \frac{18.70}{20\%} = \textbf{Rs. 93.50}$$

Note 3[3]:

Conversion rate of organic turmeric powder from dry turmeric.

Around 1200 gram of dried organic turmeric fingers in required to produce 1 kg of organic turmeric powder.
The conversion rate = 1000g/1200g * 100 = 83.33%.
Organic dried turmeric fingers used to produce 1 kg of organic powder at 83.33% conversion rate is as follows:
=130/83.33% = Rs.156.00

5.6.4 *Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Turmeric Value Chain.*

For channel I, FPC sells the organic turmeric seedling/rhizomes to various FPCS/ turmeric growers in the Northeast region and the degree of value addition was found to be 20.17%. The degree of value addition is confined only to cutting, grading, and bagging activities for

this channel. The details of value addition, marketing efficiency, and price spread of the organic turmeric value chain are shown in the below table.

Table 74: *Showing Degree of Value Addition, Price Spread, and Marketing Efficiency of Organic Turmeric Value Chain (Rs. per quintal).*

Channel I (Organic Turmeric Seedling/ Rhizomes)				
Sl. No	Items	Farmer	FPC	Customer
1	Sale Price.	1830.70	2500	
2.	Purchase Price		1830.70	2500
3.	Price differences (1-2)		669.30	
4.	Cost		300	
5.	Margin (3-4)		369.30	
6.	Degree of value Addition (5/2 × 100)		20.17%	
7.	Share in the consumer price	73.22% (1830.70/2500 × 100)	26.77% (669.30/2500×100	0% (2500/2500×100)
8.	*Marketing Efficiency*: (Price Received by farmers/ MC+MM): 2.73. (1830.70/(300+369.30))			
9.	*Price Spread:* (2500-1830.70) = Rs 669.30. In percentage = (669.30/2500×100) = 26.77%.			
Channel II (Organic Dry Turmeric Fingers)				
1	Sale Price (Conversion price is considered as buying price from farmers)	9350	13000	
2	Purchase Price		9350	13000
3	Price differences (1-2)		3650	
4	Cost (Processing & Transportation charges)		800	
5	Margin (3-4)		2850	
6	Degree of value addition (5/2×100)		30.48%	
7	Share in consumer price	71.92% (9350/13000×100)	28.07% (3650/13000×100)	0% (13000/13000×100)
8	*Marketing Efficiency:* (Price Received by farmers/ MC+MM): 2.56 : ((9350/(800+2850)).			
9	*Price Spread:* (13000-9350) =Rs.3650. In Percentage: (3650/13000×100) = 28.07%.			
Channel III (Organic Turmeric Powder in kg)				
1	Sale Price (Conversion price is considered as buying price from farmers).	156	250	
2	Purchase Price		156	250
3	Price differences (1-2)		94	
4	Cost (Processing & Transportation charges)		28	
5	Margin (3-4)		66	
6	Degree of value addition (5/2×100)		42.30%	
7	Share in consumer price	62.40% (156/250×100)	37.60% (94/250×100)	0% (250/250×100)
8	*Marketing Efficiency:* Price Received by farmers/ MC+MM): 1.65. (156/(28+66))			
9	*Price Spread:* (250-156) =Rs.94. In percentage: (94/250×100) =37.60%			

Source: Compiled by the author

From the above table, the marketing efficiency for this channel is 2.73, and the price spread was found to be 26.77%. For channel II, FPC processes the raw turmeric using a boiler and dryer and sells organic dry turmeric fingers, and the degree of value addition is found to be 30.48%. The marketing efficiency for channels II and III is found to be 2.56 and 1.65. The price spread for channels II and III is found to be 28.07% and 37.60%. The highest value addition is found in channel III, around 42.30%, and here FPC produces organic turmeric powder.

5.6.5 Value Chain Upgradation of Organic Turmeric

In the value chain of organic turmeric, only two actors are involved i.e., farmers and the FPC (Padumpathar Agro Organic Producers Co.), and the FPC is involved in various value-adding process activities which includes processing and pacakging. All the member farmers sell the fresh organic turmeric to FPC and FPC sells the turmeric in three forms which are as fresh turmeric seedling, semi-processed turmeric, and processed turmeric powder. The FPC is well equipped with adequate infrastructure like a boiler, dryer, assembling center, input collection center, transportation facilities, and packaging center to produce value-added products from organic turmeric. Farmers perform various primary production functions in the cultivation and post-harvest treatment of organic turmeric. Farmers are also involved in product and quality upgradation as per the organic standard. The FPC is consistently involved in upgrading the product (organic turmeric powder) and enhancing the quality with proper packaging and labeling by NPOP standards. The FPC also designs innovative marketing strategies like developing websites and using social media for better market presence. To explore the domestic and global markets the FPC is likely to enlist its product in various B2B online market platforms like IndiaMART, ExportersIndia, Tradeindia, and KisanDeal shortly. FPC also undertook various activities related to functional upgradation of the chain, like new activities absorbed (expansion and upgradation of processing unit), new market functions (like participation in trade fairs exploring B2B online market platforms), new logistic functions (inventory management, transportation, warehousing, etc), new management functions (improvement in governance structure, information flows) and outsources some activities to develop an efficient organic food value chain. The details of the upgradation strategy used by the farmers and FPC are shown in the following table.

Table 75*: Showing Upgrading Strategy Used by Farmers and FPC in the Value Chain.*

Upgradation Strategy/ Activities	Farmers (Yes/ No)	FPC
1. Primary production functions like input & biofertilizer, cutting, post-harvest treatment, cleaning, bagging, and weighting.	Yes	Yes
2. Processing	None	Yes
3. Transportation	Yes (Manual cart/Thela)	Yes
4. Packaging/ Labelling	None	Yes
5. Product upgrading		
5. a. Product type	Yes	Yes
5. b. Quality aspect	Yes	Yes
6. Process upgrading		
6.a. Organic standards	Yes	Yes
6. b. Logistics	No	Yes
6. c. Equipment	Yes	Yes
6. d. Innovative marketing strategy	None	Yes
7. Functional upgrading		
7. a. New activities absorbed	None	Yes
7. b. New market function	None	Yes
7. c. New logistics function	None	Yes
7. d. New management functions	None	Yes
7. e. Outsourcing certain activities	None	Yes

Source: Compiled by the author.

5.6.6 Sources of Technology Knowledge for the Farmers of Organic Turmeric

All the farmers received technology knowledge from the FPC and extension officers. Around 69.30% of the farmers agree that they received it from generation and 29.30% of the farmers received it from the neighbourhood. The details of the source of the technology are shown in the following table.

Table 76: *Showing Various Technology Knowledge Received by the Organic Turmeric Farmers*

Various Sources of Technology	Percentage of the Respondents
Technology knowledge from generation-wise	69.30
Technology knowledge from the neighbourhood	29.30
Technology knowledge received from extension services	100.00
Technology knowledge received from the media	9.30
Technology knowledge received from formal education from FPC	100.00

Source: Compiled by the author.

5.7 Comparative Analysis of Net Price, Quantum of Value Addition, Marketing Margin, Marketing Efficiency and Value Adding Activities

The highest net income is found with organic pineapple growers which is Rs. 302668.64 per hectare with income per rupee Rs. 2.93. Among the five organic crops, the net income per hectare for organic red rice growers is low at only Rs. 7871.00. For organic pineapple, organic pumpkin, and organic non-basmati rice, farmers mostly sell the organic products to the conventional channels through various market intermediaries like commission agents, wholesalers, and retailers. As defined by Karim and Biswas (2016), the value-addition activities for these three organic crops are classified into three categories: value-adding process activities, non-value-adding process activities, and necessary non-value-adding process activities. The value-addition activities in the hands of market intermediaries are confined to non-value-adding (storage, assembling, loading, unloading) and necessary non-value-adding process activities (transportation, weighting). None of the market intermediaries are engaged in value-adding activities like processing organic crops and packaging by organic standards. Organic crops/vegetables require a sophisticated value chain, however, in many countries, it is sold in fresh form or with low-value addition. The study by Dan & Jitea (2023) in the organic vegetable value chain in Romania is characterized by low-value addition and actors mostly sell the organic crops in fresh form. In the present study, it was found that the value-addition activities are in the initial phase, and production facilities in the FPC to produce the value-added products from these crops are yet to start. At present, the FPC is supplying fresh organic produce to distant traders based on special orders placed by them. The percentage of value addition by various chain actors for these three organic crops is determined based on the differences in the buying and selling prices and costs incurred by them. The cost incurred by various chain actors is non-value added process activities and necessary non-value added process activities cost and does not include any production or processing related cost. For organic pumpkin, the highest degree of value addition is found with wholesalers at 110.61%, which indicates that wholesalers received the highest margin in organic pumpkin trade. For the organic non-basmati rice value chain, FPC is not involved in market linkage activity and farmers are selling the organic non-basmati paddy through conventional channels. The marketing efficiency for organic pineapple, organic pumpkin, and organic non-basmati rice is determined based on the conventional channel as organic products are mixed with other crops by the chain actors.

For organic red rice and organic turmeric, the value-added activities like processing of organic crops, packaging, and labeling are done by the respective FPCs, and the finished products are sold to distant and local consumers. The FPC purchased the red paddy and turmeric from farmers at market price, processed the organic produce, and supplied the same as semi-finished and finished organic products. The highest degree of value addition is found in channel II for organic red rice with 89.12% as packaged organic red rice sold to traders in Hyderabad at a premium price. However, it was found that the net income and income per rupee for organic red rice are very low as compared to the other organic crops. As the FPC "Dol Organic Farmers Producer Co. Ltd " is fetching a premium price for organic red rice, it should give a better price for organic red paddy growers which in turn will lead to an increase in income per rupee. For organic turmeric farmers receive Rs. 1177.44 (per quintal) as margin and the degree of value addition is found to be highest for channel III with 42.30% (FPC processes organic turmeric and sells the packaged organic powder). The details of net income, income per rupee, highest margin, highest degree of value addition among various actors, and marketing efficiency of various channels are shown in the below table.

Table 77: *Showing Comparative Figures of Margin, Degree of Value Addition, and Marketing Efficiency of Five Selected Organic Crops.*

Variables	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Net Income (Rs. Per Hectare)	302668.64	115036.30	33389.70	7871.00	131555.50
Income Per Rupee (Rs.)	2.93	3.33	1.76	1.29	2.83
Highest Margin (Rs.)	13.90 (Direct sales to Consumer) *(Per Pineapple)*	8.83 (Direct Sales to Consumer) *(Per Kg)*	1006.68 (Through FCI) (Per quintal)	504.91 (Per quintal)	1177.44 (Per quintal)
Highest Degree of Value Addition	12.60% (Retailers)	110.61% (Wholesalers)	17.41% (Rice Millers)	89.12 % (Channel II, *Selling of organic red rice to Hyderabad*)	42.30% (Channel III, *Organic Turmeric Powder*)
Marketing Efficiency	Channel II *(Com. Agent, Wholesaler, Retailers)*: 1.69 Channel III *(Wholesaler, Retailers)*: .99	Channel II*(Wholesalers, Retailers, Consumers):* 0.44 Channel III *(Com. Agent, Wholesaler, Retailers)*: 0.50	Channel I *(Through Comm. Agents):* 1.01 Channel II *(Through Rice Millers)*: 1.26	Channel II: 0.93 Channel III: 1.29 (Channel III, *Rice is sold to consumers within the state*)	Channel II *(Turmeric Dry fingers)*: 2.56 Channel III: 1.65

Source: Compiled by author.

5.8 Chapter Summary

The present chapter discussed the value addition of various actors in the chain. This chapter discussed the cost of cultivation, farmer's gross and net income, quantum value addition by chain actors, degree of value addition, marketing efficiency, price spread, upgrading strategies used by farmers and actors in the chain, and lastly, the source of technology for the value chain of five selected organic crops. The next chapter will analyze and discuss the constraints and opportunities in the five selected organic crop value chains.