"Every major food company now has an organic division. There's more capital going into organic agriculture than ever before" ----------Michael Pollan (American author and journalist).

CHAPTER IV: NETWORK STRUCTURE OF THE VALUE CHAIN

4.1 Introduction

This chapter identifies the network structure of the value chain of five organic crops (organic pineapple, organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric). This chapter is divided into six main sections. In the first section of the chapter, socio-demographic variables of farmers (demographic profile, source of income, land holding pattern, involvement in organic farming, distance from market and main road, source of training, source of vermicompost, average land holding size) of five districts are shown with frequency distribution. In the second section of the chapter, the network structure of the value chain of organic pineapple is discussed. The third, fourth, fifth, and sixth sections of this chapter discuss the mapping and network structure of organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric respectively. As mentioned in the research methodology chapter, variables to identify the network structure of the value chain are marketing channel, production and price information, product flow, price spread, and source of credit flow.

4.2 Socio-Economic Profile of the Respondents

This section discusses the demographic and economic profile of the farmer growing five organic crops: organic pineapple, organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric. The details of demographic and economic variables like educational qualifications, gender, marital status, age, family size, and farmers' income are shown in tabular form for five organic crops. In addition to this, basic information related to organic farming activities like years of involvement in organic farming, distance from market and high road, sources of training, sources of vermicompost, and average land holding size of farmers of five selected organic crops is shown in this section.

4.2.1 Demographic Profile of the Respondents

(a) Educational Qualifications of the Organic Farmers: For the Cachar district (organic pineapple), the majority, i.e., 38.70% of the farmers, have educational qualifications up to secondary followed by higher secondary, with 33.33%, and primary level with 21.30%. Only

1.37% of the respondents have educational qualifications up to a degree and above. In the Nalbari district (organic pumpkin), the majority, i.e., 57.30% of the farmers, have educational qualifications up to the secondary level, 1.30% of the respondents have educational qualifications up to higher secondary, and 2.70% possess qualifications of degree and above. In Sonitpur district (organic non-basmati rice), the majority, i.e., 54.70% of respondents, are of secondary level, followed by primary level with 25.30% and higher secondary level with 18.70%. None of the respondents qualify for more than a degree or above. In the Dhemaji district (organic red rice), the majority, i.e., 52% of the farmers have educational qualifications up to the secondary level, followed by the farmers with qualifications up to the primary level, which is 25.30%. In Golaghat district (organic turmeric), the majority, i.e., 45.30% of the farmers, have educational qualifications up to secondary, followed by higher secondary with 40% of the farmers. Only 8% of the farmers have educational qualifications up to a degree and above. The details of the demographic profile of the farmers are shown in the table below.

Table 22*: Showing Demographic Profile (Educational Qualification) of the Farmers in Percentage.*

Educational Qualification	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Illiterate	5.30	2.70	1.30	-	-
Primary	21.30	36.00	25.30	10.70	6.7
Secondary	38.70	57.30	54.70	52.00	45.30
Higher Secondary	33.33	1.30	18.70	36.00	40.00
Degree and above	1.37	2.70	-	1.30	8.00
Total	100	100	100	100	100

Source: Compiled by the author.

(b) Gender of the Organic Farmers: From the study it was found that the majority of the organic farmers in five selected districts are male. However, the percentage of women farmers is high for organic turmeric in Golaghat district which is around 29.30%. The details of the gender of the organic farmers for five selected crops are shown in the below table.

Table 23*: Showing Demographic Profile (Gender) of the Farmers in Percentage.*

Gender	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Male	82.70	89.30	94.70	85.30	70.70
Female	17.30	10.70	5.30	14.70	29.30
Total	100	100	100	100	100

Source: Compiled by the author.

(c) Marital Status of the organic farmers: All the sample farmers engaged in organic red rice and organic turmeric cultivation are married. For organic pumpkins, 12% of the organic farmers are found to be unmarried. The details of the marital status of the organic farmers for five selected crops are shown in the table below.

Table 24*: Showing Demographic Profile (Marital Status) of the Farmers in Percentage.*

Gender	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Married	96.00	88.00	97.30	100.00	100.00
Unmarried	4.00	12.00	2.70	-	-
Total	100	100	100	100	100

Source: Compiled by the author.

(d) Age Profile of the Organic Farmers: The highest mean age is found among the organic red rice farmers which is 47.28 and the lowest average age is found among the organic pineapple farmers with a mean age of 42.45. The details of the age of the farmers of organic pineapple, organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric are shown in the table below.

Table 25*: Showing Demographic Profile (Age) of the Farmers in years*

Age of the respondents	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Average age	42.45	43.65	46.42	47.28	41.93
Minimum age	30.00	30.00	32.00	35.00	30.00
Maximum age	58.00	63.00	58.00	60.00	56.00

Source: Compiled by the author.

(e) Family Size of the Organic Farmers: The average family size is found to be highest for organic non-basmati rice farmers which are around 5.28 followed by organic pineapple farmers which is around 5.14. The details of the average family size of the farmers of five selected organic crops are shown in the below table.

Table 26*: Showing Demographic Profile (Family Size) of the Farmers in Numbers*

Family size of the respondents	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Average family size	5.14	5.00	5.28	4.94	4.80
Minimum	1	3	3	3	3
Maximum	8	8	7	7	6

Source: Compiled by the author.

4.2.2 Economic profile and Basic organic farming Information of the Farmers

(a) Source of Income of the Organic Farmers: Among organic pineapple farmers, around 56.00% are engaged in agriculture, and 44.00% have mixed income sources. For farmers of organic pumpkin in the Nalbari district, the majority, i.e., 90.70% of the farmers, reported agriculture as their main source of income, followed by 9.30% of respondents who are engaged in a mix of agriculture, business, and service. For organic non-basmati rice, the majority, i.e., 54.70%, have agriculture as the main source of income, and 45.30% have mixed income sources. In the Dhemaji district, 65.30% of the farmers are engaged solely in agriculture, and 34.70% depend on mixed sources of income. In the Golaghat district, the majority, i.e., 73.30%, of the farmers are engaged in agriculture as a prime source of income, followed by 26.70% of the farmers who adopt a mixed approach as a source of income. The details of the source of income of the organic farmers in the five districts are shown in the below table.

Table 27: ***Showing Source of Income of the Organic Farmers in Percentage.***

Source of income	**Organic Pineapple**	**Organic Pumpkin**	**Organic Non-Basmati Rice**	**Organic Red Rice**	**Organic Turmeric**
Agriculture	56.00	90.70	54.70	65.30	73.30
Business	0	0	0	0	0
Service (off-farm wages)	0	0	0	0	0
Mix	44.00	9.30	45.30	34.70	26.70
Total	100	100	100	100	100

Source: Compiled by the author.

(b) Involvement in Organic Farming by Farmers and Distance from Market: The average years of involvement with organic farming are found to be highest for organic turmeric growers (Golaghat district), which is 10.98 years, followed by organic red rice growers (Dhemaji district) with 8.93 years. The average years of organic farming experience by farmers of organic pineapple (Cachar district) and organic non-basmati rice (Sonitpur district) is found to be 7.04 years and 6.12 years respectively. The average distance from the market is found to be highest in the organic red rice area, which is 8.93 km, and the average distance from the market is found to be highest in the organic turmeric area (Golaghat district), which is around 30.30 km. The distance from the high road to farmland for organic pumpkin growers and organic non-basmati rice is found to be 11.94 km and 11.38 km, respectively. The details of average years of involvement in organic farming, distance from the market, and high road for growers of five selected organic crops are shown in the following table.

Table 28: ***Showing Average Years Involvement in Organic Farming (in years) and Distance (km)***

Variables	Organic Pineapple	Organic Pumpkin	Organic Non-Basmati Rice	Organic Red Rice	Organic Turmeric
Average years of involvement in organic farming	7.04 years	5.98 years	6.12 years	8.93 years	10.98 years
Average distance from the nearby market	7.72 km	8.57 km	9.10 km	9.13 km	6.20 km
Minimum distance from nearby market	1.00 km	3.00 km	4.00 km	4.00 km	3.00 km
Maximum distance from nearby market	16.00 km	19.00 km	20.00 km	20.00 km	8.00 km
Distance from the High Road	8.64 km	11.94 km	11.38 km	17.04 km	31.30 km
Minimum distance from the high road	1.00 km	4.00 km	2.00 km	8.00 km	26.00 km
Maximum distance from the high road	20.00 km	23.00 km	20.00 km	30.00 km	38.00 km

Source: Compiled by the author.

(c) Sources of Training Received by Farmers on Organic Cultivation: All the farmers received various training on organic cultivation and standards from FPCs. Krishi Vigyan Kendra (KVK, under Assam Agricultural University) also plays a pivotal role in providing training facilities to organic farmers. For organic pineapple in the Cachar district, 56% of the pineapple growers received training from extension officers, 69.30% of the respondents received training from various NGOs, 38.70% received training from farmer associations, and 61.30% of the farmers received training from KVKs. For organic pumpkin (Nalbari district), 98.70% of the respondents received various training from extension officers in that cluster, 97.30% received training from the farmers association, and 54.70% of the growers received training from KVKs. In the Sonitpur district, for organic non-basmati rice growers, 56% of the farmers received training from extension officers, and 42.70% received training from KVKs. Only 9.30% and 5.30% of the farmers engaged in organic non-basmati rice received training from the farmers associations and NGOs, respectively. For organic red rice growers in Dhemaji district, 58.70% of the farmers received training from KVKs, and 53.30% received it from extension officers. Only 8% and 4% of the farmers received training facilities from NGOs and farmer's associations, respectively, in the Dhemaji district. For organic turmeric growers in Golaghat district, 84% of the farmers received training from

various NGOs and around 41.30% received training from KVK. The details of various sources of training received by farmers on organic cultivation are shown in the table below.

Table 29: ***Showing Sources of Training Received by Farmers on Organic Cultivation (In Percentage)***

Sources of training	**Organic Pineapple**		**Organic Pumpkin**		**Organic Non-Basmati Rice**		**Organic Red Rice**		**Organic Turmeric**	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Extension officers (Dept. Horticulture)	56.00	44.00	98.7	1.30	56.00	44.00	53.30	46.7	100	0
NGOs	69.30	30.70	0	0	5.30	94.70	8.00	92.00	16.00	84.00
FPCs	100	0	100	0	100	0	100	0	100	0
Farmers Association	38.70	61.30	97.30	2.70	9.30	90.70	4.00	96.00	100	0
KVKs (under Assam Agricultural University)	61.30	38.70	54.70	45.30	42.70	57.30	58.70	41.30	58.70	41.30

Source: Compiled by the author.

(d) Source of Vermicompost used by Farmers: All the farmers received government assistance to construct vermicompost plants on their own. In addition, some farmers bought it from the market and other farmers to markup the deficit. Around 41% of the organic pineapple growers bought vermicompost from the open market, and 5% of the respondents borrowed it from other farmers. For organic pumpkin growers, 14% bought vermicompost from the open market, and 23% bought it from other farmers. For organic turmeric growers, around 42.70% of them bought vermicompost from the market in addition to what they received from Government schemes and from self-made. The details of the source of vermicompost used by farmers in five districts are shown in the below table.

Table 30: ***Showing Source of Vermicompost used by Farmers (In Percentage)***

Sources of Vermicompost	**Organic Pineapple**	**Organic Pumpkin**	**Organic Non-Basmati Rice**	**Organic Red Rice**	**Organic Turmeric**
Self-made (Govt. Scheme)	100	100	100	100	100
Open market	41	14	24	21.30	42.70
Other farmers	5	23	0	0	0
Others	0	0	0	0	0

Source: Compiled by the author.

(e) Average Land Holding Size of the Organic Farmers

The average land holding size is found highest with organic pumpkin growers, which is 1.58 ha, followed by organic pineapple growers, and organic non-basmati growers with 1.47 ha and 1.32 ha, respectively. The average land holding size per farmer is found to be the least for organic turmeric growers, which is 1.05 ha. The details of the average land holding size of the organic farmers in bigha and hectare are shown in the table below.

Table 31: ***Showing Average Land Holding Size of the Organic Farmers***

Farmers	**Average organic land (In bigha)**	**Average organic land (In hectares)**
Organic pineapple growers	11.02 bigha	1.47 hectares
Organic pumpkin growers	11.80 bigha	1.58 hectares
Organic non-basmati rice growers	9.94 bigha	1.32 hectares
Organic red rice growers	7.97 bigha	1.06 hectares
Organic turmeric growers	7.90 bigha	1.05 hectares

Source: Compiled by author

4.3 Network Structure of the Value Chain of Organic Pineapple (Cachar district)

This section discusses the network structure of the organic pineapple. At first production and revenue per hectare of organic pineapples are computed based on primary data. In addition to this, total, month, and grade wise production data, revenue and prices for A, B, and C variety of organic pineapples are also shown in tabular format. Marketting channels, product flow, price spread and sources of credit for organic pineapple farmers are shown in respective following sub-sections.

4.3.1 Production, Revenue, and Prices of Organic Pineapple.

The flowering season of the organic pineapple starts in January and February. The harvesting and selling started in mid-June and continued to August. Moreover, off-season flowering for some pineapple plants starts in September and products are mostly sold in the local market due to low production and demand. Organic pineapples are mostly sold in fresh form and without any value addition. Farmers segregated the pineapple into three grades, i.e., A (14 inches and more), B (10 to 14 inches), and C (less than 10 inches), and the price is set accordingly. The survey found that farmers fetch the highest price (Rs. 22.18) for A-grade organic pineapple in June and the price decreases over the month as supplies flow into the

market. The average pineapple production in numbers per farmer is found to be around 33176. The average number of pineapples sold in June is around 9569, for July it is 14253 and for August it is around 9354.

The harvesting of off-season pineapples is primarily done in December and sold in the local market. Around 3649 off-season pineapples are sold in December, and farmers fetch Rs. 8.81 prices per piece of pineapple. The price of organic pineapple varies by month and per grade. Farmers receive Rs. 22.18, Rs. 19.45, and Rs. 17.06 for A, B, and C grades of pineapple in June. For July, the average price per pineapple was Rs.18.38, Rs. 15.98, and Rs. 13.64 for A, B, and C grades of pineapple respectively. For August, the average price per pineapple was Rs.12.97, 10.61, and Rs. 8.18 for A, B, and C varieties of pineapple. The average revenue for the A, B, and C grades of pineapple for June is found to be Rs. 110294, Rs.53194, and Rs. 33158, respectively. The average revenue is higher for A, B, and C grades of pineapple for July as compared to June and August, which is Rs. 136313, Rs.65105, and Rs. 38333, respectively. The average revenue for the A, B, and C grades of pineapple for August is Rs.57755, Rs. 27794, and Rs. 16287 respectively. For December, the average revenue is found to be Rs. 32400.

Organic pineapple growers received the highest price in June as supply is limited and consumer prefers to taste the new seasonal fruit and are willing to pay high prices. The price per pineapple however decreases in July and August as supply flows in the market. The average revenue per farmer is found to be highest for July as compared to June and August due to high production.

The details of the price, production, and revenue of A, B, and C grade pineapple received by farmers from direct sales, sales through commission agents, and wholesalers are shown in the following table.

Table 32: ***Showing Total, Monthly, and Grade-wise Production Data, Revenue, and Prices of A, B, and C Variety of Organic Pineapple.***

Descriptive Statistics							
	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation
Pineapple Total Production(pieces)	75	52500.00	10000.00	62500.00	2488180.00	***33175.73***	12803.45
June Total pineapple (pieces)	75	17110.00	2000.00	19110.00	717660.00	***9568.80***	3921.85
June A pineapple (pieces)	75	11600.00	1000.00	12600.00	370169.00	***4935.58***	2314.77
June A price (Rs.)	75	15.00	15.00	30.00	1732.00	***22.18***	4.73
June A revenue (Rs)	75	289520.00	28000.00	317520.00	8543252.00	***110294***	59418.95
June B pineapple (Pieces)	75	4800.00	500.00	5300.00	203600.00	***2714.66***	1097.16
June B price (Rs.)	75	15.00	13.00	28.00	1540.00	***19.45***	4.44
June B revenue (Rs.)	75	119500.00	13000.00	132500.00	4189600.00	***53154.70***	26774.64
June C pineapple (pieces)	75	4250.00	250.00	4500.00	143891.00	***1918.54***	1020.87
June C price (Rs.)	75	14.00	12.00	26.00	1358.00	***17.06***	4.24
June revenue C (Rs.)	75	104250.00	3750.00	108000.00	2645712.00	***33157.50***	21358.31
July Total Pineapple(pieces)	75	30300.00	4000.00	34300.00	1068952.00	***14252.69***	6248.18
July A output (pieces)	75	20800.00	2000.00	22800.00	556652.00	***7422.02***	3918.54
July A price (Rs.)	75	13.00	13.00	26.00	1379.00	***18.38***	4.24
July A revenue (Rs.)	75	482400.00	42000.00	524400.00	10223512.00	***136313.49***	82568.88
July B output (pieces)	75	7400.00	1000.00	8400.00	303845.00	***4051.26***	1823.25
July B price (Rs.)	75	12.00	12.00	24.00	1199.00	***15.98***	4.045
July B revenue (Rs.)	75	180000.00	12000.00	192000.00	4882880.00	***65105.06***	35631.67
July C output (pieces)	75	5060.00	500.00	5560.00	208455.00	***2779.40***	1254.59
July C price (Rs.)	75	12.00	10.00	22.00	1023.00	***13.64***	3.95
July C revenue (Rs.)	75	93500.00	6500.00	100000.00	2875004.00	***38333.38***	21764.47
August total Pineapple (pieces)	75	21800.00	2200.00	24000.00	701568.00	***9354.24***	5020.52
August A output (pieces)	75	11000.00	1000.00	12000.00	346422.00	***4618.96***	2575.99
August A price (Rs.)	75	14.00	8.00	22.00	973.00	***12.97***	3.73
August A revenue (Rs.)	75	139000.00	15000.00	154000.00	4331630.00	***57755.06***	31967.50
August B output (Pieces)	75	7500.00	500.00	8000.00	202480.00	***2699.73***	1576.45
August B price (Rs.)	75	14.00	6.00	20.00	796.00	***10.61***	3.45
August B revenue (Rs.)	75	69000.00	3000.00	72000.00	2084540.00	***27793.86***	16889.63
August C output (Pieces)	75	7750.00	250.00	8000.00	152666.00	***2035.54***	1309.72
August C price (Rs.)	75	14.00	4.00	18.00	614.00	***8.18***	3.04
August C revenue (Rs.)	75	48000.00	2000.00	50000.00	1221496.00	***16286.61***	11234.38
December output (Pieces)	75	7000.00	1000.00	8000.00	273700.00	***3649.33***	2017.717
December price (Rs.)	75	9.00	5.00	14.00	661.00	***8.81***	1.59
December revenue (Rs.)	75	77000.00	7000.00	84000.00	2430000.00	***32400.00***	19154.24

Source: Compiled by the author.

4.3.2 Per Hectare Production, Revenue, and Share of A, B, and C Grades of Pineapple

Most farmers enter contract agreements with wholesalers during flowering time on some financial terms and thus can not avail the benefit of market price during harvesting. Farmers sell pineapple mostly in three ways, i.e., direct sales, sales through commission agents, and direct sales to wholesalers. The majority of the pineapples are sold to wholesalers on contract agreements. The average pineapple production per hectare is 22662, and out of this, the "A" variety of pineapple has the lion's share, which is about 50%, followed by "B" and "C" varieties, which is 28.74% and 20.56%. The average per hectare revenue is found to be Rs. 398035.00. The details of contributions of "A", "B", and "C" in total sales, per hectare pineapple production and revenue are shown in the below table.

Table 33: ***Per Hectare Production, Revenue and Share Grade of Pineapples.***

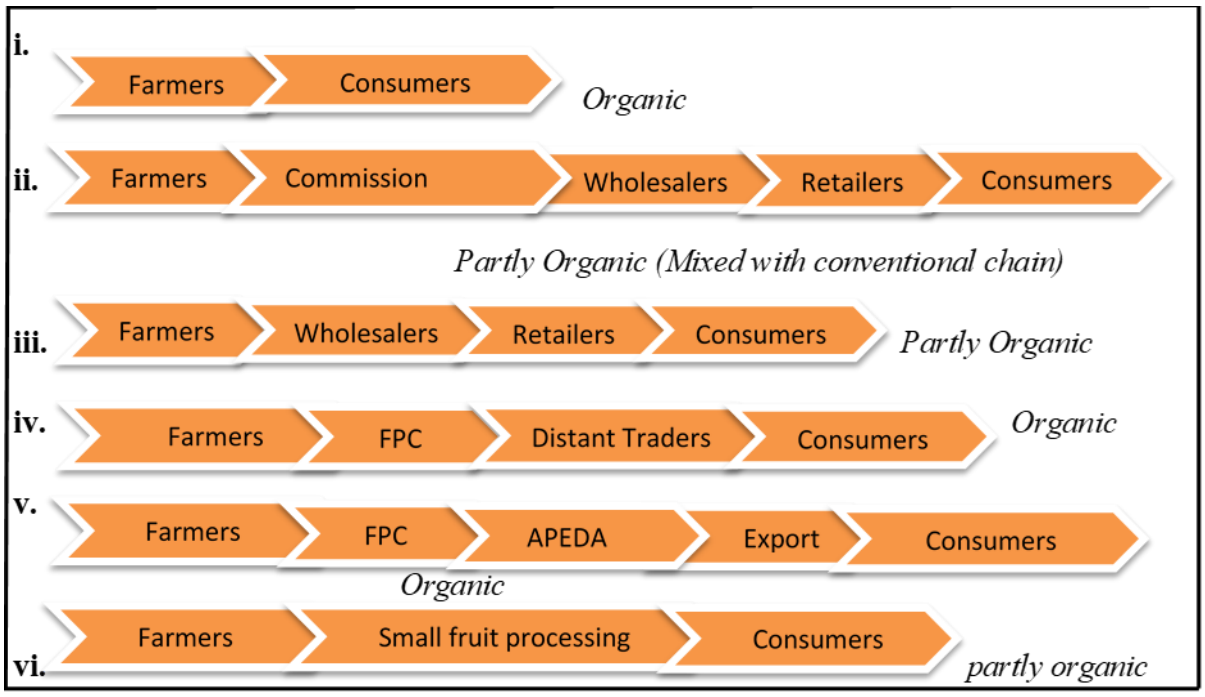
Particulars	N	Minimum	Maximum	Mean	Std. Deviation
Average land size (Ha)	75	.54	2.95	1.47	.58086
Pineapple production per Ha(Pieces)	75	17430.00	31363.33	22662	2801.77420
Share of A-grade pineapple (%)	75	39.29	70.00	50.60	5.72798
Share of B-grade pineapple (%)	75	20.34	35.71	28.74	3.31094
Share of C-grade pineapple (%)	75	3.33	30.56	20.56	4.68596
Total revenue (Rs.)	75	194000.00	1451000.00	579035.01	261677.38159
Per hectare revenue (Rs.)	75	246510.00	722598.00	398034.96	113032.12662

Source: Compiled by the author.

4.3.3 Marketing Channels of Organic Pineapple.

The survey identifies six marketing channels for organic pineapple in the Cachar district of Assam. Products are labeled under the name of FPC, "Hmar Agro Organic Producer Limited", and are mainly sold to wholesalers, and through direct sales to the local market/street side. Only in the case of exports and supplies to distant traders, trades are executed through FPC, and the channel is fully organic. Organic pineapples are also sold to the local food processing industry as raw material, and finished products from the same are sold without any organic certification logo. From the study, it was found that channels (ii), (iii), and (vi) are partly organic chains (mixed with the conventional chain) whereas, channels (i), (iv), and (v) are complete organic chains. In the partly organic chain, organic produce of the farmers is mixed with conventional products by traders and organic products lose their traceability. The details of the six marketing channels are shown in the below figure.

Figure 9: ***Showing Marketing Channels of Organic Pineapple***



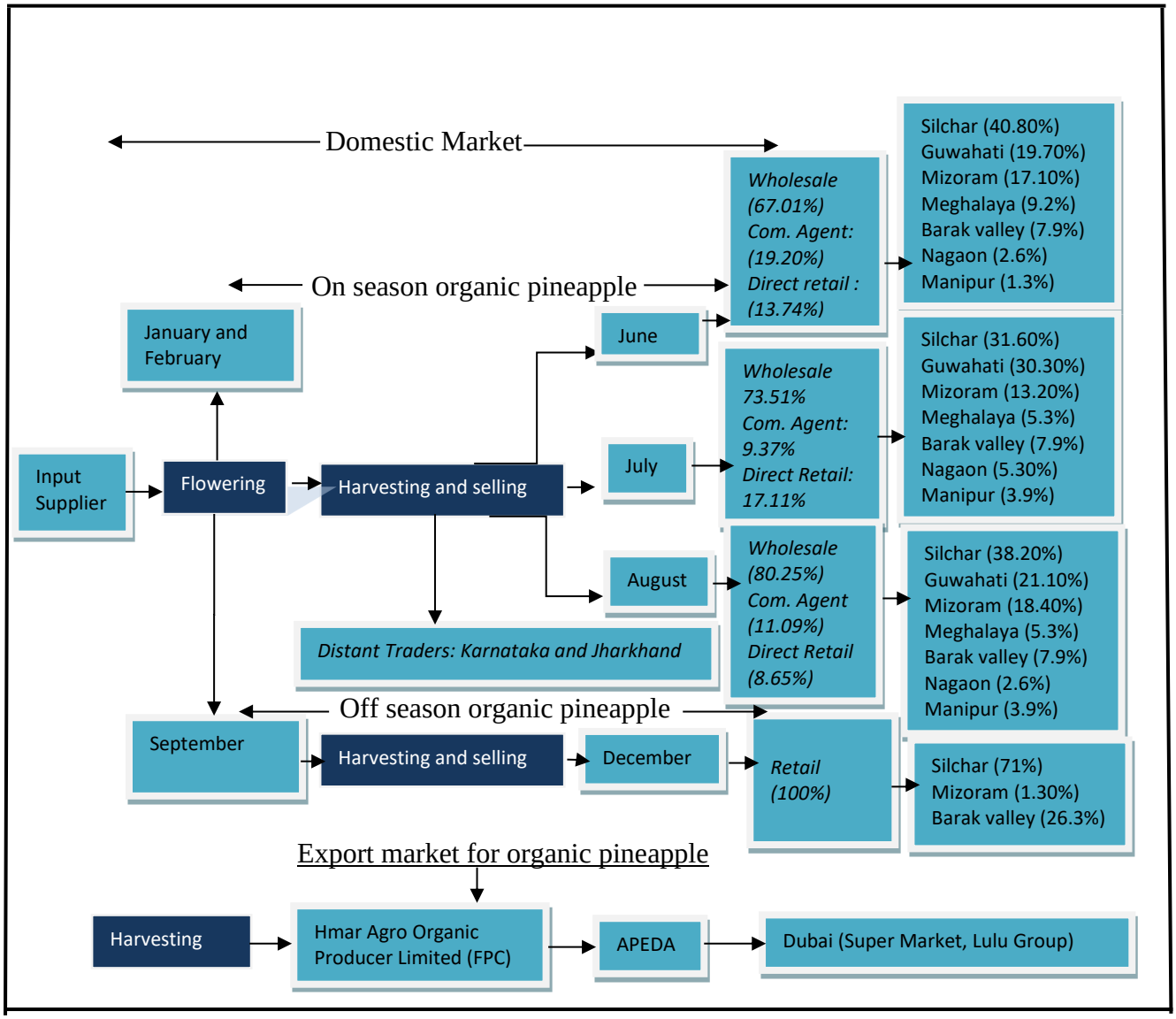
Source: Compiled by author.

4.3.4 Product Flow of Organic Pineapple

Pineapple flowering is started in January – February and harvesting/ selling ranges for three months i.e., June, July, and August. In June, around 67% of the products were sold to wholesalers, followed by 19.20 % to commission agents and around 13% as direct sales to consumers. For July, around 73.51% of the pineapples were sold to wholesalers, followed by direct sales and commission agents with 17.11% and 9.37% of the share, respectively. For August, the majority of the pineapple is sold to wholesalers, which accounts for 80.25%, followed by commission agents and direct sales with 11.09% and 8.65%, respectively. Off-season pineapple flowering starts in September and harvesting/ selling of the same is done in December. The off-season pineapples are sold mainly in Silchar (71%), Barak Valley (26.30%), and Mizoram (1.30%) in retail form by the farmers. In the domestic market, products are sold mostly in Silchar, Guwahati, and other Northeastern states. For special orders from distant states, organic pineapple with proper refrigerated containers is parcelled to various parties by the registered FPC (Hmar Agro Organic Producer Limited). For the export market, organic pineapples are sent to Dubai (Lulu groups) for the year 2022, a joint collaboration of FPC and APEDA (Agricultural and Processed Food Products Export Development Authority). The details of the product flow are shown in the following figure.

Off-season pineapples are sold mostly in retail and the local market at a low price as compared to the on-season organic pineapple. FPC deals with trades with distant traders and exports. Around 10,000 pieces of organic pineapple are sold to distant traders (Bangalore), and 2,000 pieces are exported to Dubai in compliance with the organic standards through APEDA and FPC.

Figure 10: ***Showing Product Flow of Organic Pineapple*****.**



Source: Compiled by the author.

4.3.5 Prices of Organic Pineapple (Grade and Month-Wise) Among Various Chain Actors

Farmers get a premium price in the early harvest of the pineapple, and the selling price is high on direct sales as compared to when trades are executed through commission agents and

wholesalers. The selling price of "A" variety of pineapple for June is Rs. 28.4, which is much higher than sales to commission agents and wholesalers, which are Rs. 23.81 and Rs.20.36, respectively. As trades with wholesalers are made on a contract basis and the price is set before the harvesting season, farmers receive lower prices for sales as compared to direct sales and sales through commission agents. Farmers sell the pineapple to the regional markets in fresh form and are not very inclined to enter the B2B market as farmers are fetching premium prices from the same market. Wholesalers and retailers sold the product and received good returns due to word-of-mouth promotion of "Lakhipur organic Pineapple." Based on demand from distant traders and exporters, farmers receive Rs. 20 per kg of pineapple for sales to Karnataka and Rs. 23 per kg for sales to Dubai. The details of various grades of pineapple with average price per pineapple sold directly to the consumers, through commission agents, wholesalers, and distant traders for June, July, and August are shown in the table below.

Table 34: ***Showing Average Prices of Organic Pineapple (Grade and Month-wise) Among Various Chain Actors.***

Actors	**June (Rs. per piece)**			**July (Rs. per piece)**			**August (Rs. per piece)**		
Farmers to consumer (Direct retail sale)	A	B	C	A	B	C	A	B	C
	28.40	25.40	22.50	24.92	22.53	20.15	18.25	16.12	13.00
Farmers to Commission agents	23.81	20.00	17.62	21.71	19.28	17.14	14.71	12.57	10.71
Farmers to Wholesalers (Contract agreement)	20.36	17.85	15.67	16.41	14.08	11.65	12.06	9.65	7.25
Farmer to FPC (Based on demand from the distant trader and export supplies Karnataka: Rs. 20 per kg and Dubai: Rs. 23 per kg									

Source: Compiled by author.

4.3.6 The Volume of Organic Pineapple Sold to Various Stakeholders (Grade and Month-wise) and Contribution to Total Sales.

Organic pineapples are mainly sold to wholesalers on contract agreements during the flowering season. For June,68.54%, 66.54%, and 66.04% of grade "A", "B", and "C" organic pineapple are sold to wholesalers. The contribution of commission agents in total sales for June is 16.95% for grade "A", 19.23% for grade "B", and 21.42% for grade "C" pineapple. In direct sales by farmers to consumers, grades "A", "B" and "C" shares 14.50%, 14.21%, and 12.52% of total sales for June. For July, the majority of the pineapple is sold to wholesalers,

followed by direct retail sales and sales through commission agents. In sales to wholesalers, the majority of the pineapples sold are grade "A" followed by grade "B", and "C", respectively. Grade "A" shares 76.55%, grade "B" shares 73.04%, and grade "C" shares 70.93% of total wholesale sales for July. For direct sales for July, grades "A", "B", and "C" share 14.46%, 17.41%, and 19.46%, respectively. Similarly, the share of grades "A", "B", and "C" for sales to commission agents in July is 8.98%, 9.54%, and 9.59%, respectively. For August, 81.23% of grade "A", 81.52% of grade "B", and 77.88% of grade "C" pineapple are sold to wholesalers. As wholesalers have a pre-contract agreement with the pineapple growers and buy the pineapple at large volume, the share of grade A, B, and C pineapple is almost the same. However, the share of grade A pineapple is slightly higher as compared to grades B and C. The C-grade pineapples are mostly sold through commission agents and in the local market directly by the growers. The volume of organic pineapple sold to various stakeholders (Grade and month-wise) and its contribution to total sales is shown in the below table.

Table 35: ***Volume of Organic Pineapple Sold to Various Stakeholders (Grade and Month-Wise) and Contribution to Total Sales.***

Months/ Grade	***Farmers to consumer (Direct retail sale)***		***Farmers to Commission agents***		***Farmers to Wholesalers (Contract agreement)***	
	Sales (In No.)	Contribution in total sales (%)	Sales (In No.)	Contribution in total sales(%)	Sales (In No.)	Contribution in total sales(%)
June						
A	53968	14.50%	63096	16.95%	255050	68.54%
B	29200	14.21%	39500	19.23%	136650	66.54%
C	18056	12.52%	30900	21.42%	95240	66.04%
July						
A	80520	14.46%	50000	8.98%	426132	76.55%
B	52900	17.41%	29000	9.54%	221945	73.04%
C	40580	19.46%	20000	9.59%	147875	70.93%
August						
A	29996	8.65%	35000	10.10%	281426	81.23%
B	15200	7.50%	22000	10.86%	165280	81.52%
C	14960	9.79%	18800	12.31%	118906	77.88%

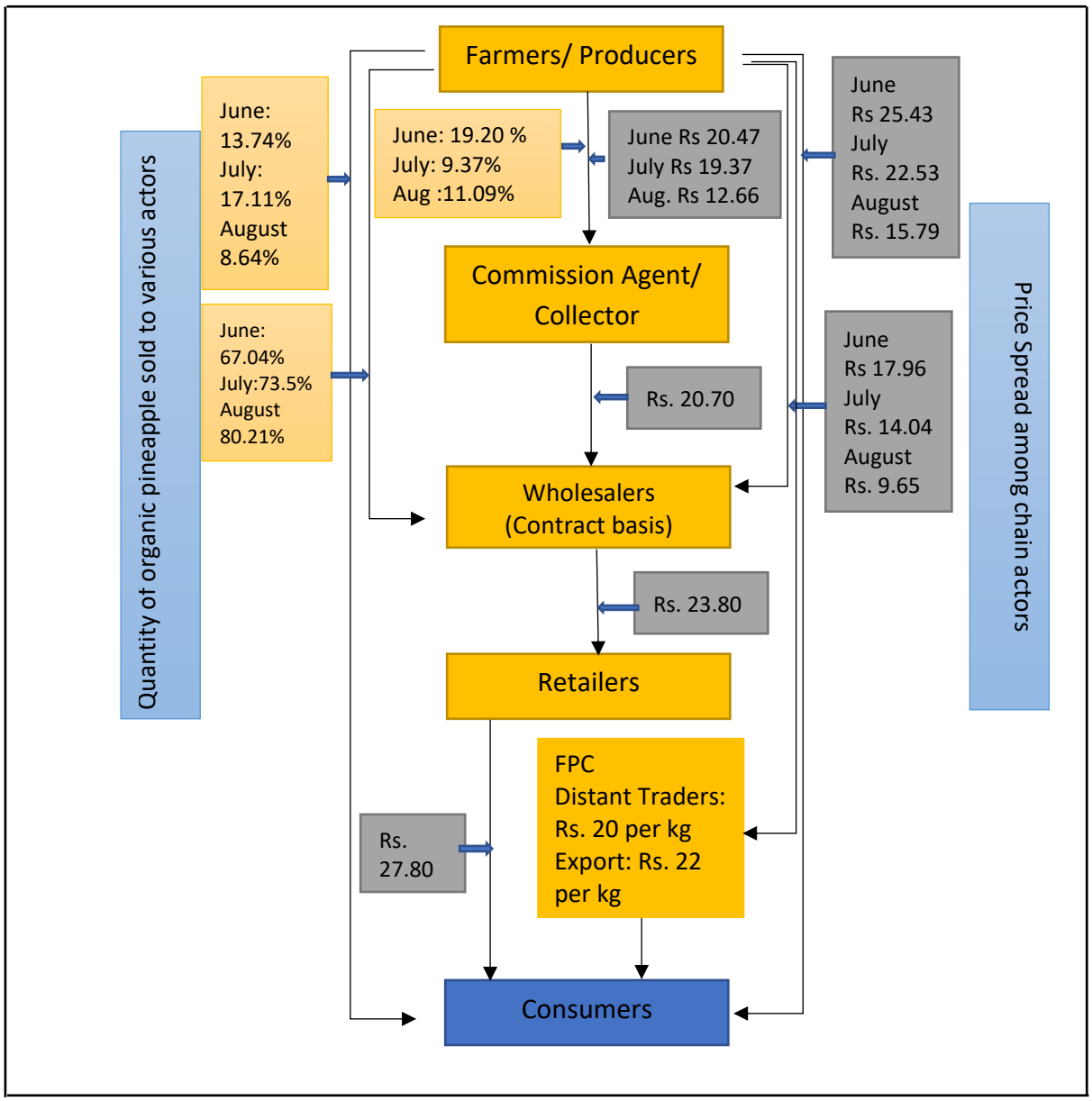
Source: Compiled by the author.

4.3.7 Price Spread Flow and Sales Volume of Organic Pineapple Among Various Chain Actors

For direct sales, farmers receive Rs. 25.43, Rs.22.53, and Rs. 15.79 for June, July, and August, respectively. Around 13.74%, 17.11%, and 8.64% of the pineapples sold directly to consumers for June, July, and August, respectively.

For sales to wholesalers, farmers receive the lowest price in comparison to other actors and account for the highest sales volume. Farmers receive Rs. 17.96, Rs. 14.04, and Rs. 9.65 per piece of pineapple for June, July, and August. In terms of contribution to total sales, wholesalers share around 67.04%, 73.50%, and 80.21% in total sales for June, July, and August. In sales to commission agents, farmers received Rs. 20.47, Rs. 19.37, and Rs. 12.66 for June, July, and August. In terms of sales volume, 19.20%, 9.37%, and 11.09% sold to commission agents for June, July, and August. Commission agents sell the pineapples to wholesalers at Rs. 20.70, and the same is sold to retailers by wholesalers at Rs. 23.80. Retailers sell the same to the final consumer at Rs. 27.80. For trade to distant traders, farmers receive Rs. 20 per kg and Rs. 22 per kg for export. In the study by Abebe et al., (2022) on the value chain analysis of organic tomatoes in Lebanon revealed that direct marketing approach appears best for both consumers and farmers, however, there is a risk associated with farmers as entire produce may not be sold out. Similar to this, in the present study, the margin of farmers is highest with direct sales to consumers as no market intermediaries are involved. However, various forms of direct sales mentioned by (Dan & Jitea, 2023) like weekly basket, online orders is not found in the present study. For direct sales, farmers are mostly sell the organic pineapples in local market and in the street side. The price spread and sales volume of organic pineapple among various chain actors are shown in the following figure.

Figure 11: ***Price Spread Flow of Organic Pineapple Among Various Chain Actors***



Source: Compiled by the author.

4.3.8 Service Flow (Source of Credit for Organic Pineapple Farmers) for Organic Pineapple Farmers

All the pineapple growers received financial assistance from the central Government under MOVCD – NER to construct a micro vermicompost plant. Among the farmers, 77% of the respondents received finance from various sources like Micro Finance Institutions, Banks, etc. and 23% didn't receive any credits. Among the farmers who received financial assistance, 79.31% received financial assistance from MFI, 3.44% from Self Help Groups, and 17.25% from commercial banks. From the list of farmers who obtain financial assistance,

56.90% use land as security, and 43.10% use savings as collateral. Among the respondents who did not take any credit, five respondents (29.42%) agree that credit is not required and they invest their cash. The majority, i.e., 70.58%, agree that they are not taking credit as credit terms are not favourable like documentation requirement, high-interest rate, and time spent to avail the credit. The details of the source of credit are shown in the table below.

Table 36: ***Source of Credits for Organic Pineapple Farmers of Cachar District.***

Credit availed	**No. of farmers**	**Percentage**
Yes	58	77.00
No	17	23.00
Total	75	100.00
Source of credit availed by farmers (N = 58)		
Microfinance Institution	46	79.31
Self Help Groups	2	3.44
Money Lenders	0	0
Commercial Banks	10	17.25
Farmers Association	0	0
Non-Government Organizations	0	0
Relatives		
Total	58	100
Collateral used by farmers (N = 58)		
Land Title	33	56.90
Live Stock	0	0
Savings	25	43.10
Total	58	100
Reason for not availing credit (N=17)		
Credit not required	5	29.42
Credit not available	0	0
Credit terms are not favorable (Documentation requirement, high-interest rate, and time spent)	12	70.58
No collateral available	0	0
Total	17	100

Source: Compiled by the author.

4.4 Network Structure of the Value Chain of Organic Pumpkin (Nalbari District)

This section discusses the network structure of organic pumpkins. At first, the production and revenue are computed per hectare of pumpkin cultivation for two seasons separately. Average figures are taken while computing cost and income per hectare. After this, marketting channels, product flow, price spread and sources of credit for organic pumpkin farmers are shown in following sub-sections.

4.4.1 Yield and Selling Price of Organic Pumpkin.

Organic pumpkins are grown in a two-time frame: (i) November/December (planting time) to April/May (harvesting time) and (ii) July/August (planting time) to November/ December (harvesting time). With a motive to fetch a premium price for early harvesting and to reduce the cost of irrigation, the majority, i.e., 80% of the farmers, prefer the July/August to November/December time frame for pumpkin cultivation. These pumpkins are cultivated in a silt-deposited area of the river bank of Pagladiya as the water retention capacity in such an area is less. The remaining 20% of the farmers practice cultivation in the November/December to April/May time frame. From the survey, it has been found that off-season early harvesting of the organic pumpkin fetches a better market price than that of other seasons. Revenue per hectare Rs. 175566.67 for August to November is much higher than November to April which is Rs.142879.31 only.

The comparative data related to production, pumpkin production per hectare, selling price per quintal, total revenue, and revenue per hectare of farmers for these two time periods are shown in the table below**.**

Table 37: ***Showing Details of Average Yield & Selling Price for July/August to Nov./Dec. period***

Production, Selling Price &Revenue	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**
Total production in November (quintal)	61	40.00	400.00	151.67	57.68
Total production in December (quintal)	61	40.00	230.00	110.70	46.19
Pumpkin production per hectare (quintal)	***61***	***97.11***	***179.28***	***154.86***	***18.70***
Selling Price in November per quintal (Rs)	61	900.00	1700.00	1300.00	213.69
Selling Price in December per quintal (Rs)	61	500.00	1400.00	888.52	256.15
Total Revenue in November (Rs.)	61	52000	400000.00	196304	74536.10
Total Revenue in December (Rs.)	61	25000	257600.00	98993.44	52208.09
Revenue per hectare (Rs.)	***61***	***91596.43***	***247008.00***	***175566.67***	***38302.90***

Source: Compiled by the author.

Table 38*: Showing Details of Average Yield and Selling Price Data for Nov./ Dec. to April/May period*

Production, Selling Price &Revenue	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**
Total production in April (quintal)	14	50	170	107.14	38.51
Total production in May (quintal)	14	34	102	64.64	19.22
Pumpkin production per hectare (quintal)	***14***	***119.52***	***246.51***	***177.00***	***4.78***
Selling Price in April (per quintal)	14	550.00	1500.00	800.00	294.17
Selling Price in May (per quintal)	14	500.00	1200.00	817.85	297.17
Total Revenue in April (Rs.)	14	36000.00	240000.00	87928.57	53338.48
Total Revenue in May (Rs.)	14	22000.00	96000.00	53085.71	25340.62
Revenue per hectare (Rs.)	***14***	***71431.88***	***249498.00***	***142879.31***	***55261.79***

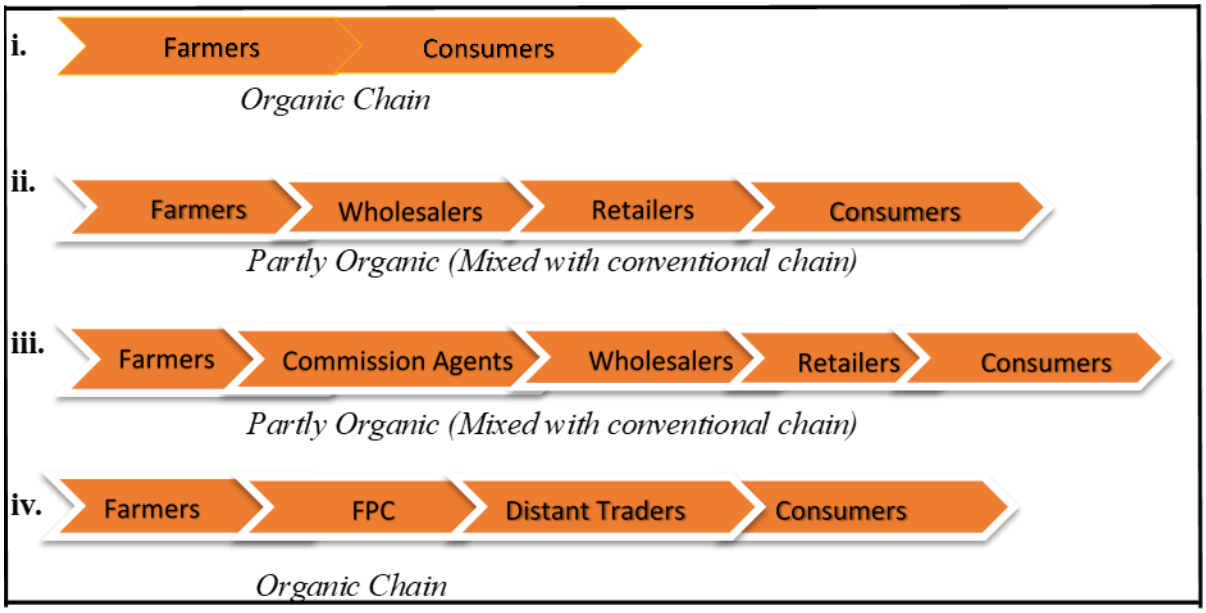
Source: Compiled by the author.

From the above table, it can be concluded that although the per-hectare production is low in the July/August to November/December cycle as compared to the November/ December to April/May, per-hectare revenue is high for the same due to high price realization for early and off-season harvest

4.4.2 Marketing Channels of Organic Pumpkins

Farmers sell organic pumpkins to consumers through four marketing channels. Out of these four channels, two channels (i and ii) are complete organic chains as organic pumpkin is traceable by consumers. For direct sales, as products are sold directly to consumers (channel i) FPC also receives special orders from distant states to supply organic pumpkin, and trade is executed in accordance with organic standards (channel iv). For channels (ii) and (iii), farmers sold organic pumpkins to wholesalers/commission agents, and organic pumpkins lost its traceability as it mixed with conventional chains by the intermediaries. To have a strong and regulated value chain, FPC has to maintain a separate chain for its organic products so that the chain can be traced till the products reach consumers. Four marketing channels identified in the organic pumpkin value chain are shown in the following figure.

Figure 12: ***Showing Marketing Channels of Organic Pumpkin Value Chain.***



Source: Compiled by the author.

4.4.3 Product Flow of Organic Pumpkins

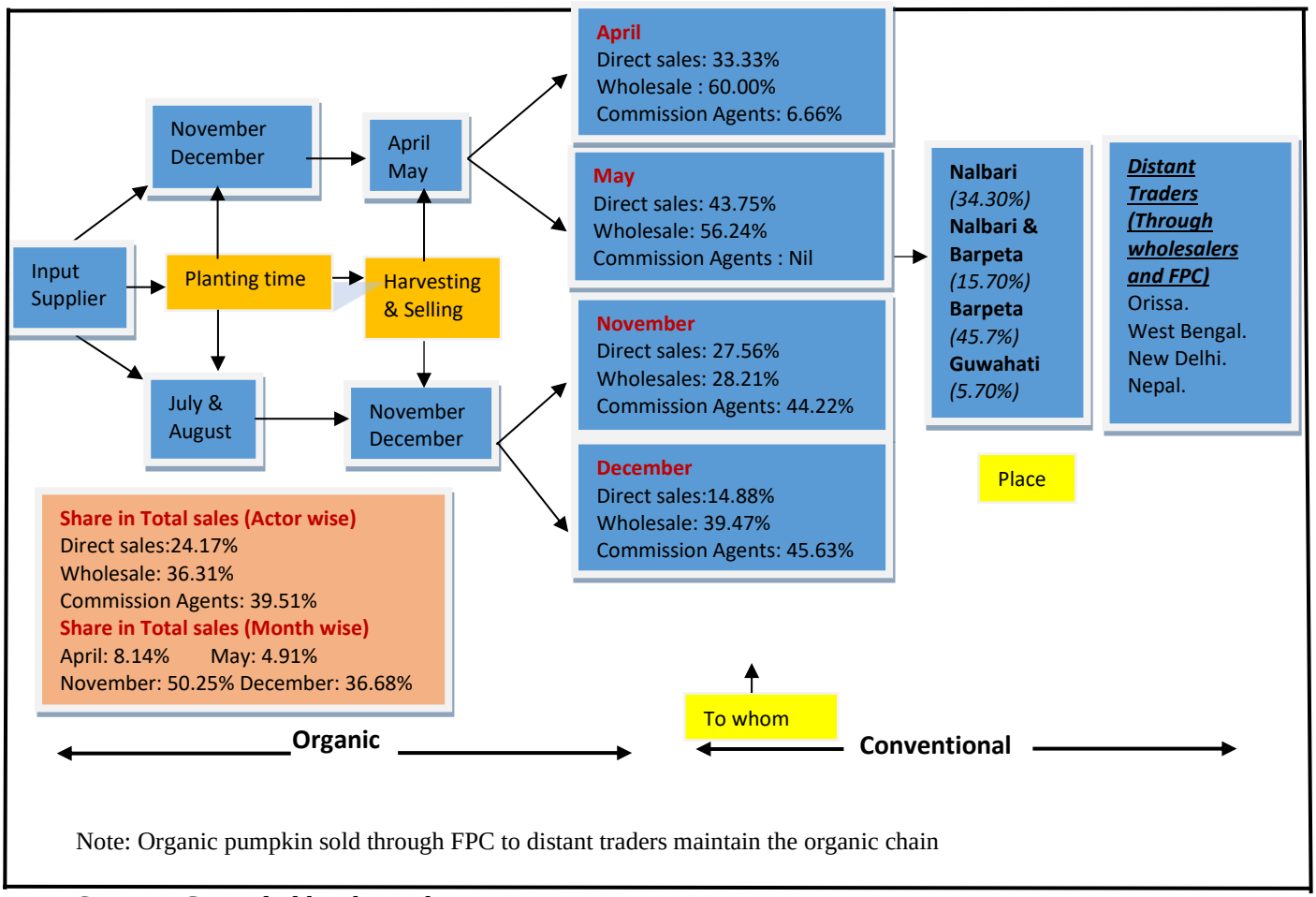
Although farmers are producing certified organic pumpkins, the same is mixed with conventional products in the market. As no organic outlet is set up in the town, the farmers sell it to the traders (wholesalers/retailers) at farm gates or marketplaces. Organic pumpkins are sold without any value addition like packaging, branding, or labeling, the farmers do not benefit from the same for being organic. No separate channel is maintained by traders to market organic products and the same is mixed with conventional chain.

Around 50.25% of the total organic pumpkins are harvested and sold in November, followed by December with a share of 36.68% in total sales. The share of sales in April and May is only 8.14% and 4.91%, respectively. The majority, i.e., 39.51% of the farmers sold organic pumpkins through commission agents, and 36.31% of the farmers sold them through wholesalers. Only 24.17% of the farmers sold the organic pumpkins directly to consumers at the local market or in the main city market. For April and May, farm fresh organic pumpkins are mostly sold through wholesalers, and for November and December, sales are mostly made through commission agents. Around 45.70 % of the total output is sold to the Barpeta wholesale market (Assam), and from this market, products are sold to distant traders in Orissa, West Bengal, New Delhi, and Nepal.

As shown in the following figure, from input supplies to production activities, the organic chain is maintained. However, due to a lack of market linkage, organic products are mixed

with conventional chains by various intermediaries in the chain. The details of the product flow of organic pumpkin are shown the below figure.

Figure 13: ***Showing Product Flow of Organic Pumpkin Value Chain***



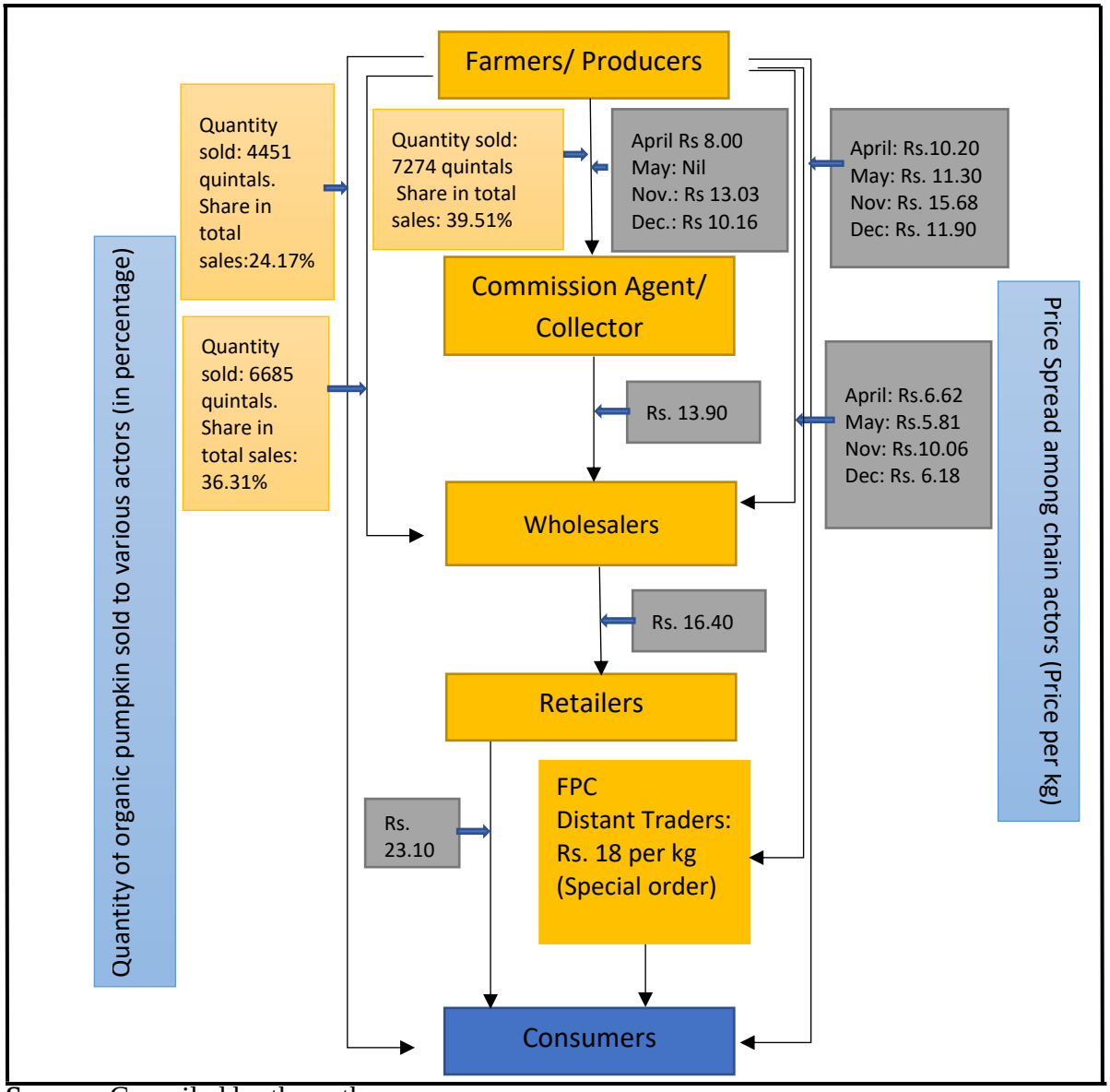
Note: Organic pumpkin sold through FPC to distant traders maintain the organic chain

Source: Compiled by the author

4.4.4 Price Spread Flow and Sales Volume of Organic Pumpkin Among Various Chain Actors

Farmers receive the highest price, which is Rs. 15.68 per kg, with direct sales, followed by sales through commission agents and wholesalers, which is Rs. 13.03 and Rs. 10.06 for November. The retailers buy pumpkin from the farmers at Rs. 13.90 and sell it to wholesalers at Rs. 16.40. The final selling price in the hand of the consumer is Rs. 23.10. It was found that the consumer pays a high price when pumpkin is purchased from retailers as compared to direct sales. In sales volume, around 7274 (39.51%) quintals of organic pumpkin are sold through commission agents, followed by wholesalers and direct sales with 6685 (36.31%) and 4451 (24.17%) quintals, respectively. The details of the price flow of organic pumpkins from farmers to consumers through various actors are shown in the following figure.

Figure 14: ***Showing Price Spread of Organic Pumpkins Among Various Chain Actors***



Source: Compiled by the author.

4.4.5 Service Flow (Sources of Credit for Organic Pumpkin Farmers)

All the growers have received financial subsidies from the central Government scheme MOVCD-NER. Apart from the Government subsidy,82.70% of the farmers have received credit from various sources. Among these, 53.22% took credit from Micro Finance Institutions (MFIs), 27.41% from Self Help Groups (SHGs), 17.75% from commercial banks, and only 1.62% of farmers took credit from money lenders. The majority, i.e.,77.42% of the respondents, are using land titles as collateral security, and 22.58% of the respondents are using livestock for obtaining credit. Among the farmers who did not avail credit, around 61.53% of the respondents agree that they are using their own cash and external credit is not

required for them. The details of the source of credit for organic pumpkin farmers of Nalbari district are shown in the table below.

Table 39*: Showing Sources of Credit for Organic Pumpkin Farmers of Nalbari District*

Credit availed	**No. of farmers**	**Percentage**
Yes	62	82.70
No	13	17.30
Total	75	100
Source of credit availed by farmers (N = 62)		
Microfinance Institution	33	53.22
Self Help Groups	17	27.41
Money Lenders	1	1.62
Commercial Banks	11	17.75
Farmers Association	0	0
Non-Government Organizations	0	0
Relatives	0	0
Total	62	100
Collateral used by farmers (N = 62)		
Land Title	48	77.42
Live Stock	14	22.58
Savings as collateral	0	0
Other item as collateral	0	0
Total	62	100
Reason for not availing credit (N= 13)		
Credit not required	8	61.53
Credit not available	0	0
Credit terms are not favorable (Documentation requirement, high interest rate, and time spent)	5	38.47
No collateral available	0	0
Total	13	100

Source: Compiled by the author.

4.5 Network Structure of the Value Chain of Organic Non-Basmati Rice (Sonitpur district).

This section discusses the network structure of the organic non-basmati paddy/rice. At first, the production and revenue and revenue per hectare are computed. Average figures are taken while computing cost and income per hectare. After this, marketing channels, product flow, price spread, and sources of credit for organic non-basmati farmers are shown in the respective sub-sections.

4.5.1 Yield and Selling Price of Organic Non-Basmati Rice.

The average per-hectare production is 47.95 quintals, and the selling price per quintal of non-basmati rice is found to be Rs. 1594.66. The farmers sell organic non-basmati paddy mainly to three parties: commission agents, rice millers, and the Food Corporation of India. The revenue per hectare is found to be Rs. 76393.00. The details of production, revenue, and prices of organic non-basmati paddy are shown in the table below.

Table 40: ***Showing Production Data, Revenue, and Prices of Organic Non-Basmati Paddy.***

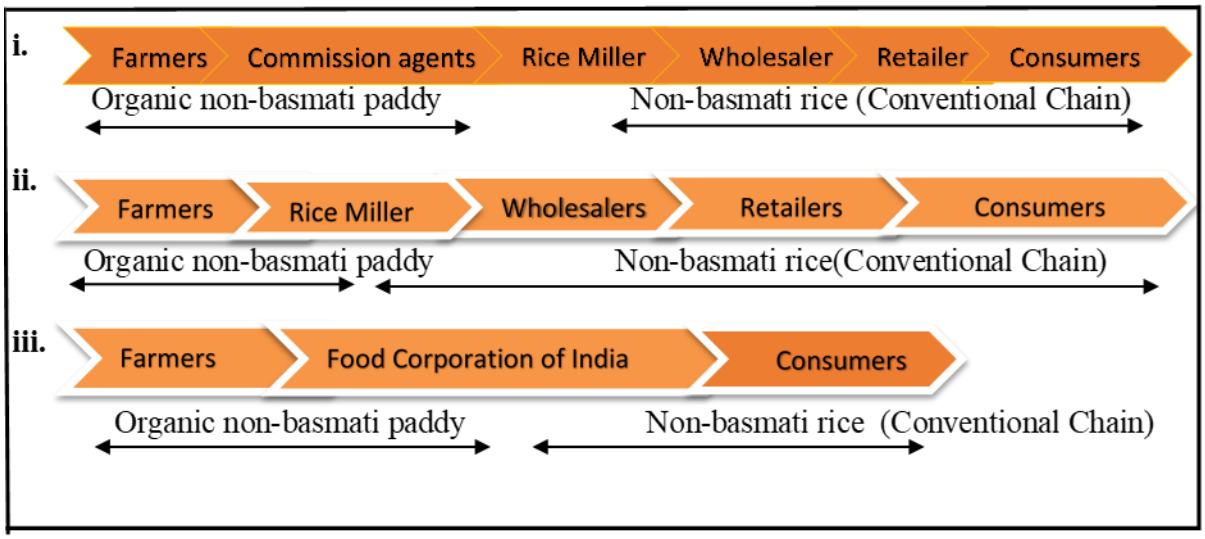
Particulars	**N**	**Min.**	**Max.**	**Mean**	**Std. Dev.**
Total production (quintal)	75	26	180	63.08	26.40
Production per hectare (quintal)	75	45	52.50	47.95	2.33
Selling Price per quintal (Rs)	**75**	**1400**	**1920**	**1594.66**	**152.58**
Total Revenue (Rs)	75	37700	306000	102885	50105
Revenue per hectare (Rs)	75	63000	100800	76393	7445.44

Source: Compiled by the author.

4.5.2 Marketing Channel of Organic Non-Basmati Paddy/Rice.

Three marketing channels are identified for the flow of organic non-basmati rice/paddy from farmers to consumers. In the first channel, farmers sold organic non-basmati paddy to commission agents. Commission agents mix the organic paddy with a conventional chain and sell the same to rice millers. Rice millers process the paddy and sell the rice to wholesalers, who in turn, sell the same to retailers and then to consumers. Although farmers are producing organic-non basmati paddy, the same lost its traceability in the hands of an intermediary as no separate chain is maintained for organic products and processing. In the second channel, farmers sell the organic paddy directly to rice millers for a better price, and rice millers, after processing the paddy, sell it to wholesalers, wholesalers to retailers, and retailers to consumers. Farmers sold the organic paddy to the Food Corporation of India in the third channel and received Rs. 1920 per quintal of paddy. None of the mentioned channels is found to be complete organic and the FPC “Puthimari Agro Organic Producer Company Ltd” is not involved in any market linkage activity to sell the organic produce of the farmers with end-to-end organic chain. The marketing channels for non-basmati rice are shown in the following figure.

Figure 15: ***Showing Marketing Channels for Organic Non-Basmati Paddy/Rice.***



Source: Compiled by the author.

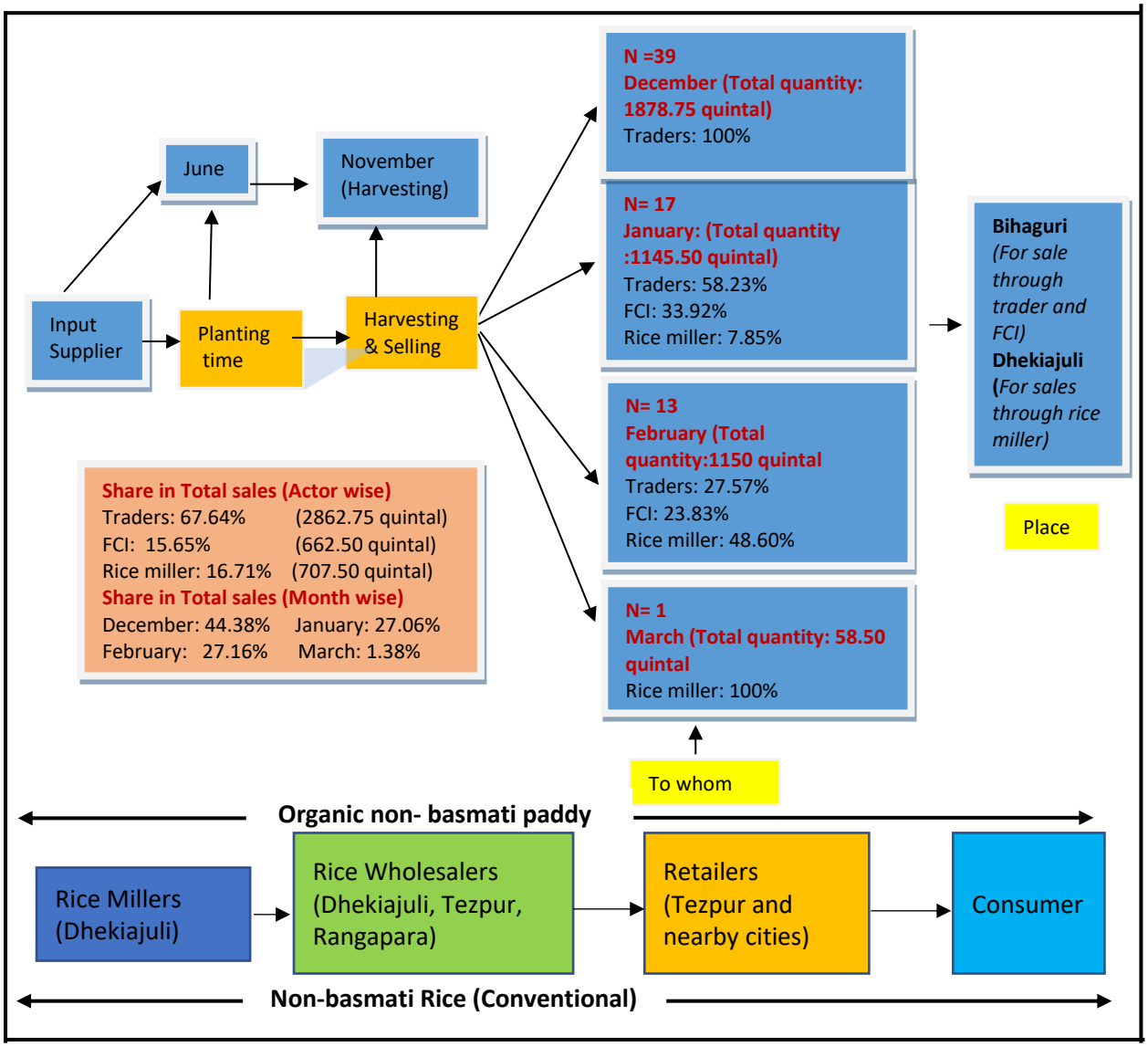
4.5.3 Product Flow of Organic Non- Basmati Paddy/ Rice.

The product flow of organic non-basmati rice can be divided into two groups: one is the flow of organic non-basmati paddy, and the other one is the rice part. Organic non-basmati paddy is cultivated mainly in June and harvested in November. After the harvesting season, sales of the paddy are mostly done in the months of December, January, February, and March, depends on farmer's willingness to sell. Organic non-basmati paddy is sold mostly to three actors, which are commission agents, rice millers, and Food Corporation of India. The study found that around 67.64% of the paddy is sold through commission agents (paikar), 15.65% is sold through Food Corporation of India and 16.71% is sold directly to rice millers. In month-wise shares of total sales, the majority, i.e., 44.38% of the paddy, is sold in the month of December, followed by February, January, and March with shares of 27.06%, 27.16%, and 1.38%, respectively. For the month of December, it was found that respondents sold all the paddy through commission agents (paikar). Around 58.23% of paddy sold to commission agents, followed by FCI with 23.83% and rice millers with 7.85%, respectively, in the month of January. In February, the majority, i.e., 48.60%, of the paddy is sold directly to rice millers, followed by commission agents and FCI with shares of 27.57% and 23.83%, respectively. Only one respondent sold the paddy in March to rice millers.

The commission agents sold the paddy to rice millers in Dhekiajuli. After milling, processing, and packeting, rice millers sold the rice to various wholesalers in Tezpur, Rangapara and Dhekiajuli town. Organic non-basmati paddy lost its traceability when it was sold to commission agents, rice millers, and FCI, as no separate chain is maintained to process and

market the organic rice. Wholesalers sold the rice to retailers using conventional chains and retailers sold the same to consumers. Farmers get the same price as conventional farming paddy as no separate value chain is maintained to market organic products. The details of the product flow of organic non-basmati paddy from planting to selling place are shown in the below figure.

Figure 16: ***Showing Product Flow of Organic Non-Basmati Paddy/ Rice.***



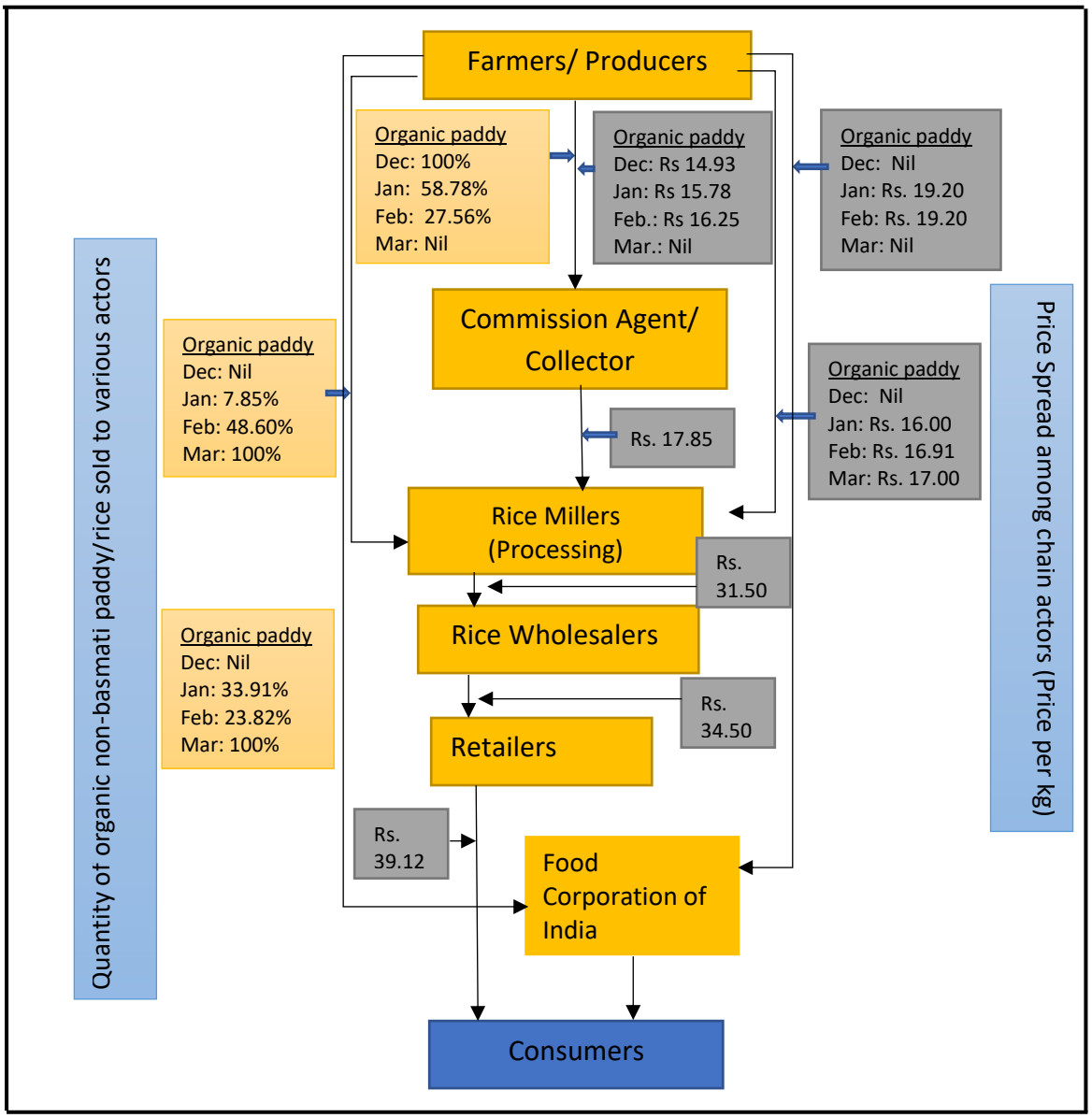
Source: Compiled by the author

4.5.4 Price Spread Flow and Sales Volume of Organic Non-Basmati Rice/Paddy Among Various Chain Actors.

The survey found that the price of organic non-basmati paddy increases gradually and farmers fetch high prices when the paddy is stored and sold after the harvesting time. For December, January, and February, farmers receive Rs. 14.93. Rs. 15.78 and Rs. 16.25 per kg

of paddy sold to commission agents. Farmers receive the highest price, which is Rs. 19.20 per kg for sales to the Food Corporation of India, and the price is set as per government rules. For sales directly to rice millers, farmers receive Rs. 16.00, Rs. 16.91, and Rs. 17.00 for January, February, and March, respectively. Commission agents sold the paddy (organic and non-organic) to rice millers at Rs. 17.85 per kg. Rice millers process the paddy and sell rice (non-organic) to wholesalers at Rs. 31.50, and wholesalers sell the same to retailers at Rs. 34.50. The final consumers pay Rs. 39.12 per kg of rice. The price spread flow of organic non-basmati paddy/rice is shown in the figure below.

Figure 17: ***Showing Price Spread Flow of Organic Non-Basmati Paddy/Rice Among Various Chain Actors***



Source: Compiled by the author.

4.5.5 Service Flow (Source of Credit for Organic Non-Basmati Paddy Farmers)

All the farmers received government subsidies to construct a vermicompost plant and to buy inputs. Around 60% of the farmers opted for credit from external sources apart from government subsidies. In the external sources of credit, the majority, i.e., 64.44% of the farmers, opted for credit from microfinance institutions followed by commercial banks with 33.33% of the farmers. In collateral used by farmers, the majority, i.e., 88.88% of the farmers, use the land as collateral to obtain credit. Among the farmers not availing any credit, around 66.67% of the farmers agreed credit facility was not available for them and 26.7% did not take credit as credit terms are not favorable. The details of the source of credit for farmers of organic basmati paddy/ rice are shown in the below table.

Table 41: ***Showing Sources of Credit Among Organic Non-Basmati Paddy Farmers.***

Credit availed	**No. of farmers**	**Percentage**
Yes	45	60
No	30	40
Total	75	100.00
Source of credit availed by farmers (N = 45)		
Microfinance Institution	29	64.44
Self Help Groups	0	0
Money Lenders	0	0
Commercial Banks	15	33.33
Farmers Association	0	0
Non-Government Organizations	0	0
Relatives	1	2.23
Total	45	100
Collateral used by farmers (N = 45)		
Land Title	40	88.88
Live Stock	0	0
Savings as collateral	5	8.88
Other item as collateral	0	0
Total	45	
Reason for not availing credit (N=30)		
Credit not required	2	6.67
Credit not available	20	66.66
Credit terms are not favorable (Documentation requirement, high interest, time spent)	8	26.67
No collateral available	0	0
Total	30	100

Source: Compiled by the author.

4.6 Network Structure of the Value Chain of Organic Red Rice (Dhemaji District).

This section discusses the network structure of the organic red rice. At first, the production and revenue and revenue per hectare are computed. Average figures are taken while computing cost and income per hectare. After this, marketing channels, product flow, price spread, and sources of credit for organic red rice farmers are shown in the respective sub-sections.

4.6.1 Yield and Selling Price of Organic Red Paddy.

The survey found that the average production per hectare is 15.89 quintal, and the average selling price per quintal is Rs. 2200. The per-hectare production of organic red paddy is much lower than that of other varieties of paddy. The revenue per hectare is found to be Rs. 34958. The details of production, revenue, and selling price for organic red paddy of Dhemaji district is shown in the table below.

Table 42: ***Showing Production Data, Revenue, and Prices of Organic Red Paddy.***

Particulars	**N**	**Min.**	**Max.**	**Mean**	**Std. Dev**
Total production (quintal)	75	10	27	16.90	3.43
Production per hectare (quintal)	75	12	21	15.89	1.71
Selling Price per quintal (Rs)	**75**	**2200**	**2200**	**2200**	**0.00**
Total Revenue (Rs)	75	22000	59400	37191.73	7558.08
Revenue per hectare (Rs)	75	26400	46200	34958	3765.44

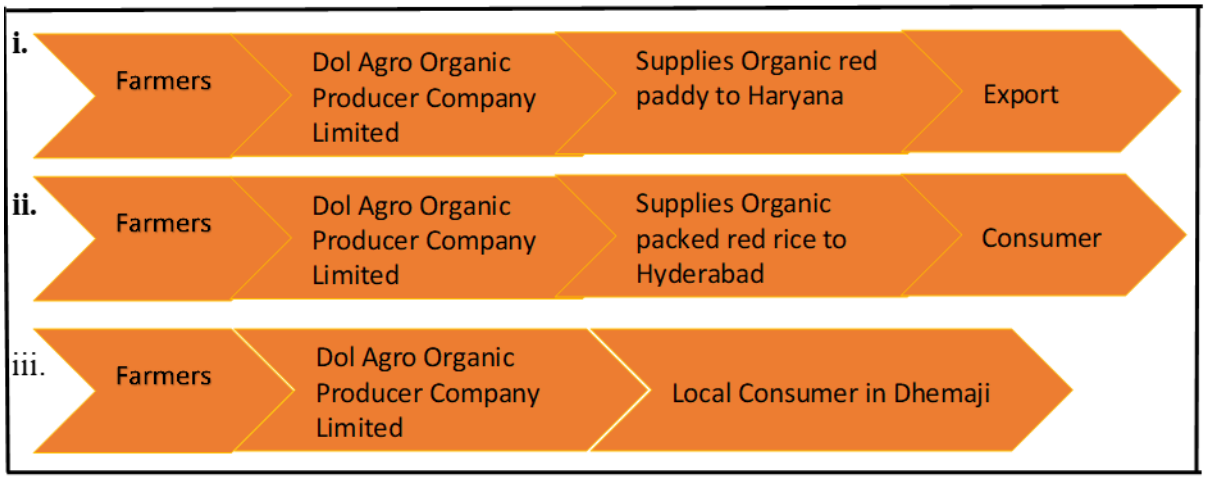
Source: Compiled by the author.

4.6.2 Marketing Channels of Organic Red Rice

Three marketing channels are identified for marketing organic red rice from the Dhemaji district. In the first channel, Dol Agro Organic Producer Company buys organic red paddy from farmers and supplies the same to traders in Haryana. The trader in Haryana processes the paddy in compliance with organic standards and then exports the organic red rice in accordance with organic labeling and logo to the United Kingdom. In the first channel, FPC only sells the organic paddy to a trader in Haryana; no processing is done at the FPC level. For the second channel, FPC purchased the organic paddy from farmers, processed it, and sold the organic red rice in compliance with organic standards to rice traders in Haryana. In the third channel, FPC sold processed organic red rice to local customers in the Dhemaji district of Assam. In all the channels, the end-to-end organic chain is maintained from the

input supplier to the consumers. The marketing channels of organic red rice for the Dhemaji district are shown in the figure below.

Figure 18: ***Showing Marketing Channels of Organic Red Rice***

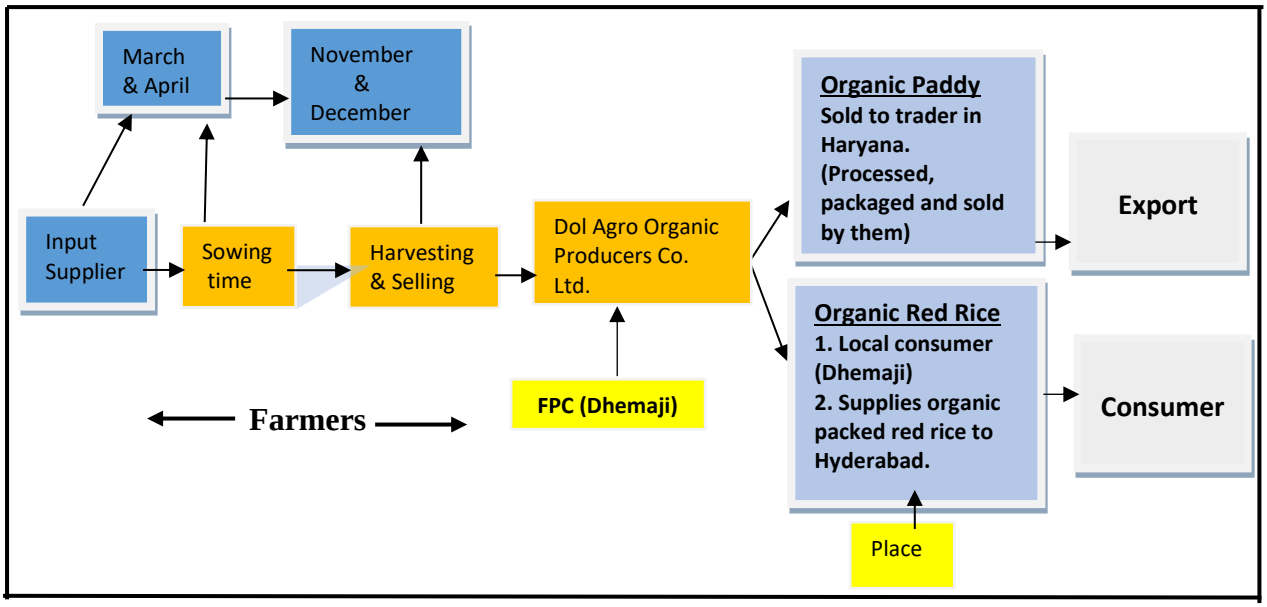


Source: Compiled by the author

4.6.3 Product Flow of Organic Red Rice

The seeds of organic red rice are sown from mid-March to mid-April and harvested during November and December. The organic paddy is sold to the FPC named "Dol Agro Organic Producers Company", and farmers receive the market price for the same. The FPC markets the output in two ways, i.e., it sells organic red paddy to traders in Haryana and sells organic red rice to traders in Hyderabad. The trader from Haryana purchases the organic red paddy, processes it, and exports it using their brand name. Red rice was marketed to Hyderabad in compliance with organic standards. However, the supply to Hyderabad depends on the special orders placed by the traders to FPC and the same is not regular. Processed organic red rice with proper labeling of organic logo is also sold directly to local consumers in the Dhemaji district of Assam. The details of the product flow of organic red rice are shown in the following figure.

Figure 19*: Showing Product Flow of Organic Red Paddy/ Rice*

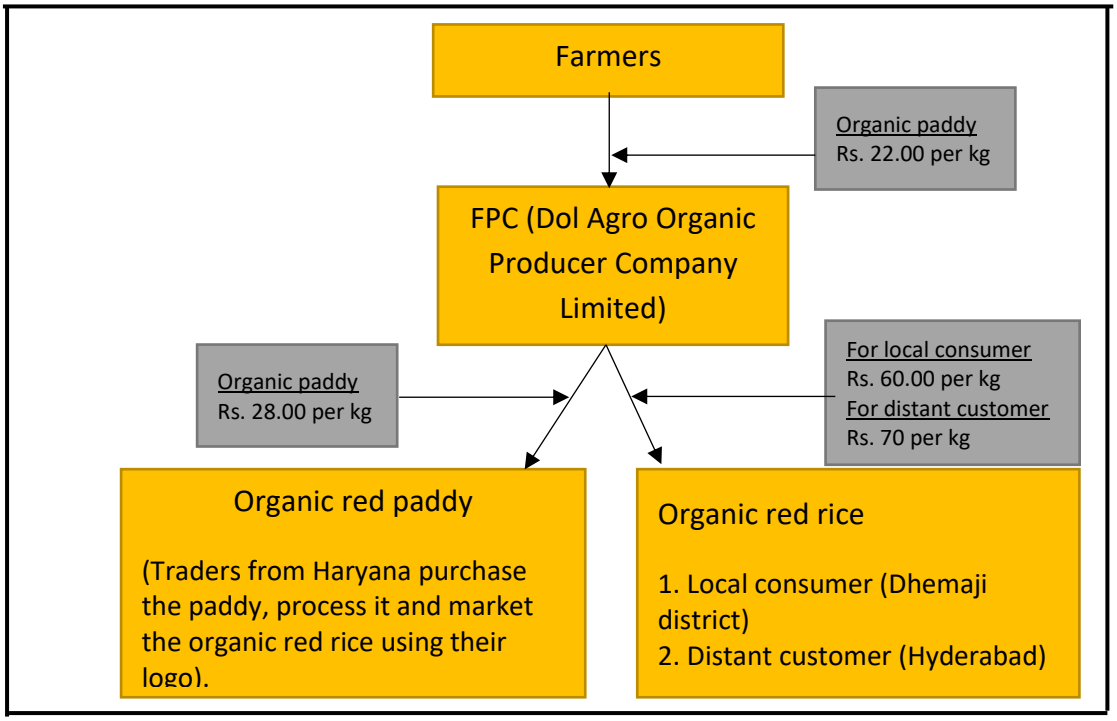


Source: Compiled by the author.

4.6.4 Price Spread of Organic Red Rice/Paddy

Farmers sell organic red paddy to FPC "Dol Agro Organic Producers Co. Ltd" at Rs. 2200 per quintal or Rs. 22.00 per kg. FPC sells products in two forms, i.e., organic red paddy and organic red rice. Organic red paddy is sold to traders in Haryana at Rs. 28.00 per kg, and traders process and market the finished product using their brand name. Apart from these, the FPC also processes the paddy and markets the organic red rice using the logo of "Dol Agro Organic Producers Co. Ltd" and sells it to local and distant consumers. Local consumers are mostly from the Dhemaji district of Assam and purchase the packed red rice from the FPC directly at Rs. 60.00 per kg. Based on the demand, FPC supplied packed organic red rice in compliance with organic standards to Hyderabad and received Rs. 70 per kg. The price spread of organic red rice of Dhemaji district is shown in the following figure.

Figure 20: ***Showing Price Spread Flow of Organic Red Rice Among Various Chain Actors***



Source: Compiled by the author.

4.6.5 Service Flow (Source of Credit for Organic Red Paddy Farmers)

In the source of credit, it was found that around 58.70% of farmers receive credit from various sources apart from the government subsidy and 41.30% of the farmers did not receive any external credit. Among the farmers who received credit, 38.64% received credit from various microfinance institutions and 56.82% received credit from commercial banks. The majority of the farmers, i.e., 88.62% of the farmers, used land titles as collateral to obtain credit. Among the farmers who did not avail credit, 20 farmers (64.52%) did not take credit as it was not available, and nine farmers (29.03%) did not avail of credit as terms were not favorable. The details of the source of credit for farmers engaged in organic red paddy cultivation are shown in the following table.

Table 43: ***Showing Sources of Credit of Organic Red Paddy Farmers.***

Credit availed	**No. of farmers**	**Percentage**
Yes	44	58.70
No	31	41.30
Total	75	100.00
Source of credit availed by farmers (N = 44)		
Microfinance Institution	17	38.64
Self Help Groups	2	4.54
Money Lenders	0	0
Commercial Banks	25	56.82
Farmers Association	0	0
Non-Government Organizations	0	0
Relatives	0	0
Other Sources	0	0
Total	44	100
Collateral used by farmers (N = 44)		
Land Title	39	88.62
Live Stock	1	2.29
Savings as collateral	4	9.09
Other item as collateral	0	0
Total	44	100
Reason for not availing credit (N=31)		
Credit not required	2	6.45
Credit not available	20	64.52
Credit terms are not favorable (documentation requirement, high interest, time spent)	9	29.03
No collateral available	0	0
Total	31	100

Source: Compiled by the author.

4.7 Network Structure of the Value Chain of Organic Turmeric (Golaghat district)

This section discusses the network structure of the organic turmeric. At first, the production, revenue and revenue per hectare are computed. Average figures are taken while computing cost and revenue per hectare. After this, marketing channels, product flow, price spread, and sources of credit for organic turmeric farmers are shown in the respective sub-sections.

4.7.1 Production and Selling Price of Organic Turmeric.

The survey found that the average production of organic turmeric per hectare is 17.97 quintals, the average selling price per quintal is Rs. 1830.66, and the revenue per hectare is

Rs.205560.00. The details of production, revenue, and selling price for organic turmeric in Golaghat districts are shown in the below table.

Table 44*: Showing Production Data, Revenue and Prices of Organic Turmeric.*

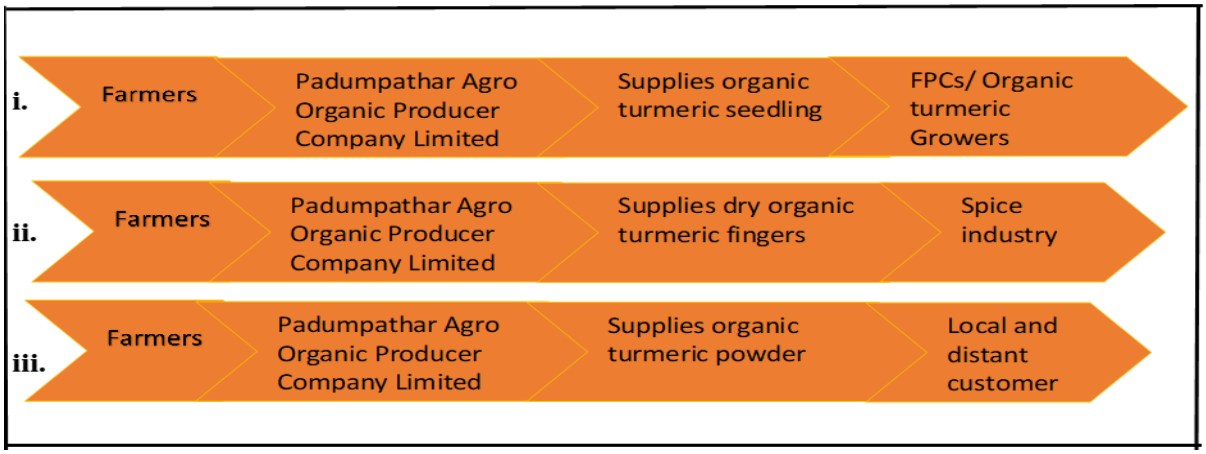
Data related to Production, Revenue & Selling	N	Min.	Max.	Mean	Std. Dev
Total production (quintal)	75	65	420	117.97	44.66
Production per hectare (quintal)	***75***	***90***	***150***	***112.20***	***16.37***
Selling Price per quintal (Rs)	75	1600	2000	1830.66	134.53
Total Revenue (Rs)	75	122400	7140000	215836	79758.35
Revenue per hectare (Rs)	***75***	***153000***	***300000***	***205560***	***35149.74***

Source: Compiled by the author.

4.7.2 Marketing Channels of Organic Turmeric

Three marketing channels are identified for marketing organic turmeric in the Golaghat district of Assam. Farmers sold fresh organic turmeric/sun dry organic turmeric to the FPC "Padumpathar Agro Organic Producer Company Limited". The FPC marketed turmeric in three forms: organic turmeric seedlings, dry organic turmeric fingers, and organic turmeric powder. Organic turmeric seedlings are mainly supplied to various FPCs and farmers engaged in turmeric cultivation. It is mostly sold to FPCs in Manipur and Nagaland. In Assam, it is sold in various places like Lakhimpur, Kokrajhar, Chirang, Bokakhat, and Dhemaji. In the second channel, dry organic turmeric finger is supplied to spice factories in Guwahati and Siliguri. In the third channel, FPC processes the turmeric and sells the value-added turmeric powder with proper packaging and labeling to distant traders (Gujrat) and local customers (Upper Assam and Guwahati). The marketing channels of organic turmeric from Golaghat district are shown in the figure below.

Figure 21: *Showing Marketing Channels of Organic Turmeric.*

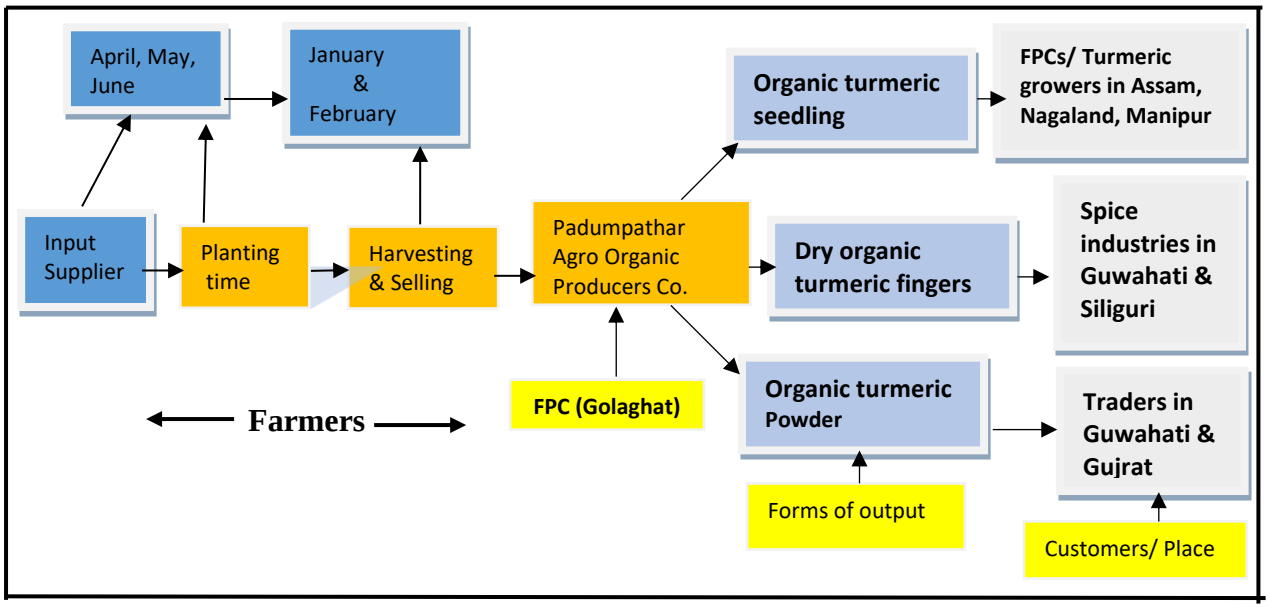


Source: Compiled by the author .

4.7.3 Product Flow of Organic Turmeric

The turmeric seedlings are planted in April, May, and June and harvested in January and February. After harvesting, farmers directly sell the organic turmeric to "Padumpathar Agro Organic Producer Company Limited" at the pre-agreed price, which is slightly above the market price. The FPC markets organic turmeric in three ways, which are (i) organic turmeric seedling (ii) semi-processed organic turmeric fingers/sun-dry organic turmeric fingers, and (iii) organic turmeric powder. Around 10% of the total output is sold as organic turmeric seedlings to various FPCs in Assam, Manipur, and Nagaland. Semi-processed organic turmeric/sun-dry organic turmeric fingers are mostly sold to spice industries in Guwahati and Siliguri, and the same consists of around 20% of the output. Around 70% of the organic turmeric is processed by the FPC to make value-added products which are "organic turmeric powder" with proper labeling, packaging, and as per organic standards. The organic turmeric powder is supplied to Guwahati and Gujrat. The details of organic turmeric's product flow are shown in the figure below.

Figure 22*: Showing Product Flow of Organic Turmeric*



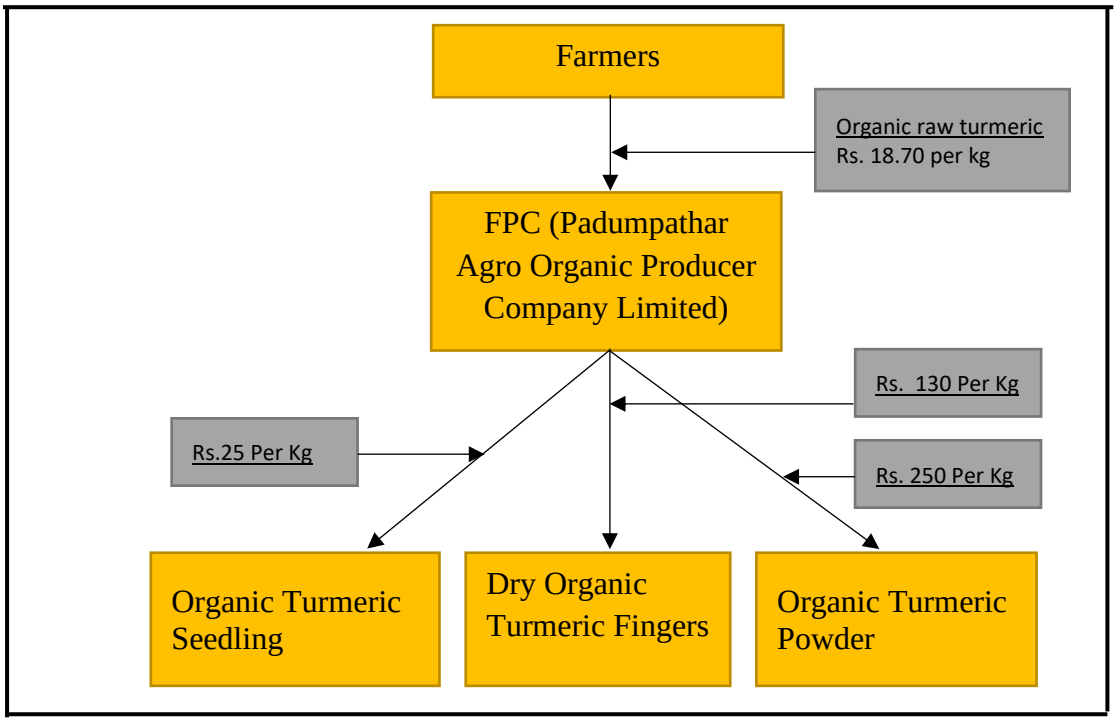
Source: Compiled by the author.

4.7.4 Price Spread of Organic Turmeric

The farmers sell the raw organic turmeric to the FPC "Padumpathar Agro Organic Producer Company Limited" at the average price of Rs. 18.70 per kg. The FPC deals with raw turmeric in three ways: (i) organic turmeric seedling (ii) dry organic turmeric fingers, and (iii) organic turmeric powder. Organic turmeric seedlings are sold to various FPC/ turmeric growers in

Northeast India at an average price of Rs 25 per kg. In the second way, FPC processes the turmeric with a steam boiler and sells the dry organic turmeric fingers at Rs. 130 per kg. Thirdly, FPC produces organic turmeric powder and sells the same at Rs. 250 per kg following the organic standards. The price spread of organic turmeric from the Golaghat district is shown in the below figure.

Figure 23: ***Showing Price Spread Flow of Organic Turmeric Among Various Chain Actors***



Source: Compiled by the author.

4.7.5 Service Flow (Source of Credit for Organic Turmeric Farmers)

The study found that around 81.30% of the farmers obtained credit from various sources and 18.70% of the farmers did not go for external borrowing apart from the Government subsidy. Among the farmers who received credit, the majority, i.e., 72.14% of them, received credit from commercial banks, followed by microfinance institutions with a share of 18.03%. Only 9.83% of the farmers obtain credit from various self-help groups. The majority of the farmers, i.e., 78.69%, use the "land title" as collateral to obtain the credit, followed by "savings" as collateral with a share of 19.67%. Farmers could not avail of credit due to various reasons, and around 8 farmers (57.14%) did not take credit as it was not available, and around 35.71% of the farmers did not require credit and invested their cash. The details of the source of credit for farmers engaged in organic turmeric cultivation are shown in the following table.

Table 45: ***Showing Sources of Credit of Organic Turmeric Farmers.***

Credit availed	***No. of farmers***	***Percentage***
Yes	61	81.30
No	14	18.70
Total	75	100.00
Source of credit availed by farmers (N = 61)		
Microfinance Institution	11	18.03
Self Help Groups	6	9.83
Money Lenders	0	0
Commercial Banks	44	72.14
Farmers Association	0	0
Non-Government Organizations	0	0
Relatives	0	0
Other Sources	0	0
Total	61	100
Collateral used by farmers (N = 61)		
Land Title	48	78.69
Live Stock	1	1.63
Savings as collateral	12	19.68
Other item as collateral	0	0
Total	61	100
Reason for not availing credit (N=14)		
Credit not required	5	35.71
Credit not available	8	57.14
Credit terms are not favourable (documentation requirement, high interest and time spent)	1	7.15
No collateral available	0	0
Total	14	100

Source: Compiled by the author.

4.8 Comparative Analysis of Marketing Channels of the Organic Crops.

The marketing channels for organic red rice and organic turmeric are completely organic, and the end-to-end organic chain is maintained for both products. Farmers sell the organic crops to the FPC (Dol Agro Organic Producer Co. Ltd. and Padum Pathar Agro Organic Producer Co. Ltd.), and these FPCs explore the organic market and sell the products in semi-processed form and as finished organic products with proper packaging and labeling. For organic pineapple and pumpkin, both complete organic chain and partly organic channels (organic products are being mixed with conventional chain/non-organic products) are found. For organic pineapple, three channels maintained end-to-end organic channels: direct sales, selling through FPC (Hmar Agro Organic Producer Co. Ltd.) to distant traders and exporters. However, farmers mostly sell the organic produce to conventional chains through intermediaries as supply to distant traders and exporters is not regular. When organic produce

is traded by market intermediaries, leakage in the chain happens and only a certain percent of organic produce reaches end consumers. The study by Kwikiriza, et al.(2016), found that only 45% of the organic pineapple produced by farmers reaches organic consumers in Uganda. In the present study, for organic pineapple, pumpkin, and non-basmati value chains, market intermediaries like wholesalers, commission agents, and retailers mix the organic pineapple with a conventional chain which results in loss in loss in the value of crops grown organically. Similar problems of mixing organic produce with conventional chains are also encountered in Sikkim, where organic produce is sold to a regulated market in West Bengal which is not designed to handle organic produce (NIAM, 2017). For organic pumpkin, only direct sales and sell executed by the FPC (Pagladiya Agro Organic Producer Co. Ltd) are completely organic. However, the organic pumpkin marketing channels also have the same problem similar to the organic pineapple value chain. As trades through FPC are not regular and due to a lack of organic market linkage, organic products are sold in conventional chains through various market intermediaries. Among various channels, organic farmers benefited mostly from direct sales as they can have more share in consumer price. The study by Abebe et al., (2022) also revealed the farmers' margin is higher in direct sales, however, there is a risk associated as the farmers may not sell the entire stock. The present study finds that, for organic pineapple and pumpkin, farmers received the highest price from direct sales. A short chain with better coordination among chain actors is required to maintain an end-to-end organic chain. Apart from four organic crops: organic pineapple, organic pumpkin, organic red rice, and organic turmeric, none of the marketing channels for organic non-basmati rice is found to be completely organic, as compared to the marketing channels of the other four organic crops. Farmers don’t have any market linkage for organic produce and the FPC “Puthimari Agro Organic Producer Co. Ltd” is not involved in any marketing channel activity to sell the organic produce.

4.9 Chapter Summary

The present chapter discussed the network structure of the value chain of five selected organic crops. This chapter discusses the yield and revenue, marketing channel, product flow, price spread, and information flow in the value chain of five selected organic crops. The next chapter will analyze and discuss the second objective, which is value addition at various phases in the chain by various actors.