*"To Forget how to Dig the Earth and to Tens the Soil is to Forget Ourselves" ……. Mahatma Gandhi.*

# CHAPTER III: RESEARCH METHODOLOGY

## 3.1 Introduction:

After reviewing the literature in the previous chapter, this chapter discusses the research methodology adopted for the study. It also briefly describes the basis of selection of organic crops, research design, sample design, data collection tool, and data analysis technique used in the study.

## 3.2 Objectives of the Study:

The following are the objectives of the study:

1. To identify the network structure of the value chain of selected organic crops in Assam.
2. To find the value addition at each phase by all chain actors.
3. To identify and examine various constraints and opportunities for upgrading the value chain of the selected organic crop.
4. To analyse the governance and institutional features of the value chain.
5. To make a comparative analysis of the value chain of government and non-government-sponsored organic firms.

The first four objectives (1,2,3 and 4) are crop-specific and apply to five selected organic crops: organic pineapple, organic pumpkin, organic non-basmati rice, organic red rice, and organic turmeric. The fifth objective is firm-specific and compares the value chain of government and non-government-sponsored organic firms.

## 3.3 Value Chain Framework Considered for the Study

As the organic food sector in India is developing and dominated by non-value-added products (Yes Bank & Ingenus Strategy and Creative Research,2016), a value chain analysis framework for developing countries developed by Trienekens (2011) and Ruben et al. (2007) is considered for this study. In this framework, the value chain is characterized by its network structure, governance structure, identification of constraints & opportunities, and the way values are added. Based on this approach, the following four parameters are considered for this study.

*i. Mapping of the value chain*: To clearly understand the flow of products, services, marketing channels, and price spread among various actors.

*ii. Value chain upgradation*: This involves value addition by various actors and upgrading strategies.

*iii. Identification of Constraints and Opportunities in Upgrading the Value Chain*: This involves the identification of various constraints related to market information, resources, and infrastructure for upgrading the value chain.

*iii. Governance structure*: This involves rules and regulations, relationships, linkage, the flow of information, and trust among actors in the chain.

### 3.4 Area under Study – Assam

Assam is a state in north-eastern India, south of the eastern Himalayas, along the Brahmaputra and Barak River valleys. Assam's land area is 78,438 $km^2$ (30,285 sq mi). Geographically, the state extends between 22°19' and 28°16' north latitude and 89°42' and 96°30' east longitude between the Eastern Himalayan foothills and the Patkai and Naga Hill Ranges. The state is bounded on the north by Bhutan and Arunachal Pradesh, on the east by Nagaland and Manipur; on the south by Meghalaya, Tripura, Mizoram, and Bangladesh; and on the west by West Bengal via the Siliguri Corridor, a 22-kilometer (14-mile) wide strip of land that connects the state to the rest of India often called as “Chicken Neck” (*Assam State Disaster Management Authority*, 2023). The climate of Assam is classified as tropical monsoon, and most of the state's agricultural production depends on rain brought by the southwest monsoon. The average temperature in the state ranges from 4°C to 19°C in the winter and from 26°C to 37°C in the summer, with high humidity. The average rainfall in the state is about 2900 mm, with the maximum precipitation during June and July. The state's average rainfall ranges from 1600 mm to 4300 mm and varies across the states. Nearly 70 percent of the population of Assam is directly dependent on agriculture as a source of income, and another 15 percent of the population is directly dependent on allied activities for its means of subsistence. Assam is predominately rural, and its economy is predominately agricultural.

Assam's rich soil, abundant rainfall, and favorable climatic conditions make it an ideal location for growing a wide range of horticultural crops. According to data from the Department of Agriculture and Farmers Welfare, 2021, Assam reported 334.500 ha thousands

of land under horticultural cultivation(*Area: Horticulture Crops: Vegetables: Assam | Economic Indicators | CEIC*, n.d.). In Assam, the horticulture industry focuses on numerous crops and activities, including fruits, vegetables, spices, floriculture, potato, onion, medicinal and aromatics, mushroom cultivation, fruits and vegetable preservation and processing. In addition, it addresses beekeeping, food processing, micro-irrigation, post-harvest management, and cold-chain development. The agriculture, forestry, and fishing contribute 19 percent of the state's gross domestic product, which is the highest percentage compared to other sectors in the state, such as service, manufacturing, etc. With a GSDP of Rs. 4.38 lakh crore (2022-23), Assam ranks 17$^{th}$ among the states of India. The contribution of the GSDP of Assam to the nation's GDP at current prices is estimated at 1.6 percent for the FY 2022-23 *(State Income Statistics | Directorate of Economics and Statistics | Government Of Assam, India, 2024).*

Assam ranks 3$^{rd}$ among the Northeastern states with a share of 11.62% of total organic land in Northeast India preceded by Sikkim and Meghalaya with a share of 38.05% and 12.10% respectively (APEDA, 2022). The land of Assam is naturally organic by default, as fertilizer consumption is extremely low in this region. The usage of chemical fertilizer and pesticides per hectare of land is found to be 56 kg and 0.04 kg as compared to the national average which is 106 kg and 0.44 kg (Bonia, 2019). Considering the majority of the land in Assam is organic by default, the organic farming scenario is scaling up gradually with the initiative of the government and private players.

### 3.5 Selection of Organic Crops (For Objectives 1, 2, 3, and 4)

The purpose of this study is to examine the current state of the organic food sector value chain in Assam, which is primarily unorganized and still in its early stages of development. The central sector scheme launched by the Ministry of Agriculture and Farmers Welfare, Mission Organic Value Chain Development for North Eastern Region (MOVCD- NER) was used as the basis for selecting organic crops for the study as it is the primary initiative promoting organic farming in Assam. In MOVCD-Assam, nine districts (ten clusters) with specific crops and areas are identified by the Government of India. The scheme aims to establish crop commodity-specific organic value chains and address gaps in organic crop cultivation, wild crop harvesting, organic animal management, and processing, handling, and marketing of organic agricultural goods (MOVCD, n.d). The details of the ten clusters with specific crops and areas are shown as below table.

**Table 13:** ***Showing Details of Cluster, Organic Crops, and Land Area.***

| **Sl. No.** | **District Name** | **Cluster** | **Crop** ***(Proposed)*** | **Area (Ha)** *(Proposed)* |
|---|---|---|---|---|
| 1 | Golaghat | Padum Pathar | Ginger/ Turmeric | 500 |
| | | Bokakhat | Turmeric/ Red rice | 500 |
| 2 | Kamrup | Sonapur | Ginger/ Turmeric | 500 |
| 3 | Kokrajhar | Titagiri | Ginger/ Turmeric | 500 |
| 4 | Chirang | Panbari | Ginger/ Turmeric | 500 |
| 5 | Dhemaji | Butikor areas | Red rice | 500 |
| 6 | Majuli | Pokajora areas | Red rice | 500 |
| 7 | Sonitpur | Bihaguri | Okra, Ridge Gourd, and Ginger | 500 |
| 8 | Nalbari | Balitara | Pumpkin | 500 |
| 9 | Cachar | Lakhipur | Pineapple | 500 |

**Source:** MOVCD- NER.

Golaghat, Kamrup, Kokrajhar, and Chirang districts are identified with common crops which is either ginger or turmeric. From the four districts, the turmeric crop is selected from the Padum Pathar cluster of Golaghat district as Golaghat district has the highest land area for turmeric cultivation. The details of the basis for the selection of organic turmeric is shown in the table below.

**Table 14*****: Showing Details of the Basis for the Selection of Organic Turmeric***

| **Sl. No.** | **District** | **Cluster** | **Crop** | **Land Holding (Ha)** *(Directorate of Economics and Statistics, 2015-16)* | | **Remarks** |
|---|---|---|---|---|---|---|
| 1 | Golaghat | Padum Pathar | Ginger/ Turmeric | Ginger | 951.00 | *Organic Turmeric* from the Padum Pathar cluster is selected due to its highest land coverage among four districts |
| | | | | **Turmeric** | **1359.00** | |
| 2 | Kamrup | Sonapur | Ginger/ Turmeric | Ginger | 96.00 | |
| | | | | Turmeric | 139.00 | |
| 3 | Kokrajhar | Titagiri | Ginger/ Turmeric | Ginger | 417.00 | |
| | | | | Turmeric | 677.00 | |
| 4 | Chirang | Panbari | Ginger/ Turmeric | Ginger | 440.00 | |
| | | | | Turmeric | 500.00 | |

**Source:** (Agricultural Statistics | Directorate of Economics and Statistics | Government Of Assam, India, 2015).

Dhemaji, Majuli, and Bokakhat cluster of Golaghat districts are recognized with red rice, and Dhemaji district is selected from the same based on the highest land coverage. The details of land coverage of red rice are shown in below table.

**Table 15:** ***Showing Details of the Basis for the Selection of Organic Red Rice.***

| **Sl. No.** | **District** | **Cluster** | **Crop** | **Land Holding (Ha)** *(Directorate of Economics and Statistics, 2015-16)* | **Remarks** |
|---|---|---|---|---|---|
| 1 | Dhemaji | Butikor areas | **Red rice** | **9540.00** | Organic red rice is selected from the Dhemaji district with the highest land holding. |
| 2 | Majuli | Pokajora areas | Red rice | 3294.00 (Undivided Jorhat) | |
| 3 | Golaghat | Bokakhat | Red rice | 1773.00 | |

**Source:** (Agricultural Statistics | Directorate of Economics and Statistics | Government of Assam, India, 2015).

The Bihaguri cluster of Sonitpur district although planned for organic vegetable cultivation, however it got certification for non-basmati paddy (356.56 ha), organic pumpkins (40.41 ha), organic potatoes (36.13 ha), and tomatoes (29.17 ha), and from the same, non-basmati organic paddy is selected for the highest land coverage (The details of the certification of Bihaguri cluster is shown in annexure 6). Pumpkin and pineapple are selected as the sole crops from the Nalbari and Cachar districts.

Based on the above criteria, the study selected five organic crops from fiv district under MOVCD scheme which are: organic pineapple from Cachar district, organic pumpkin from Nalbari district, organic non-basmati rice from Sonitpur district, organic red rice from Dhemaji district, and lastly organic turmeric from Golaghat district.

### 3.6 Research Design for Objectives 1,2,3 and 4

The present study is descriptive and exploratory and adopted both quantitative and qualitative research designs. The details of the sample design, sampling technique, and sample size are discussed below.

#### 3.6.1. Sample Design

***a. Elements:*** The population element is the unit of the population from which information is derived. All the certified organic farmers, i.e., 5000 under MOVCD, is consider as sampling elements (Reddy, 2018). All the commission agents, wholesalers, retailers, processors, and

Farmer Producer Companies / Organizations that are part of the chain are considered for the study.

***b. Sampling Frame:*** List of organic farmers cultivating five specified crops in five districts (Nalbari, Cachar, Sonitpur, Dhemaji, and Golaghat) under the MOVCD scheme.

***c. Sampling Unit:*** Certified organic farmers are considered sampling elements for farmers. Wholesalers, commission agents, and retailers who are part of the chain to trade products from the organic farmers are considered as sampling elements for "wholesalers", "commission agents", and "retailers". Farmer Producer Companies of five selected districts under the MOVCD scheme are taken as sample units. MOVCD scheme is a major initiative to promote organic farming in large scale in Assam. Ten clusters are identified with specific crops to develop a commodity-specific organic value chain.

***d. Extent***: The study's scope includes five organic crops chosen from five districts (Nalbari, Silchar, Sonitpur, Dhemaji, and Golaghat) under the MOVCD scheme. The present study's description and analysis of the value chain are only limited to the organic crop value chain in of Assam, India and does not attempt to compare organic and inorganic crop value chains.

***e. Time:*** The period for data collection is 2020-21 to 2021-22.

### 3.6.2 Sampling Technique

***(a) For Organic Farmers:*** For sampling allocation, a multistage sampling technique has been adopted for adequate representation of samples from each cluster. A sample of 375 farmers was selected from five clusters (75 from each cluster). The voluntary cooperatoor method is used to select organic farmers from each Farmer Interest Group. Voluntary Cooperator is used for crop reporting systems to obtain rapid information regarding pricing, cost, crops, and other variables (FAO, 1998).

***(b) For Traders:*** For traders, due to the non-availability of a sampling frame, the snowball technique is used through key informants in the market to trace various wholesalers, commission agents, and retailers engaged in the chain of organic crops.

***(c) FPC***: The census method is used for five organic FPCs formed in five districts.

### 3.6.3 Sample Size Computation

***(a) Organic Farmers:*** For the computation of sample size for the certified organic farmers, the Kothari (2004) formula is used due to the finite nature of the population. Various studies related to marketing channels and supply chains of agricultural commodities used the same formula to compute the sample size for farmers. The study by Awoke and Molla (2019) and Waise (2023) related to the market chain analysis of potatoes and the supply chain of onions in Ethiopia also used the Kothari (2004) formula to determine the sample size of farmers in the chain and 100 samples of farmers are considered. The study by Mou (2023) related to the adaption strategies of farmers in drought-prone areas of Bangladesh used the Kothari (2004) formula and considered 303 households as the sample size. The details of sample size determination for the present study by using Kothari (2004) formula is shown below:

$$n = \frac{Z^2 \times p \times q \times N}{e^2 (N-1) + Z^2 \times p \times q}$$

$$n = \frac{1.96^2 \times 0.50 \times 0.50 \times 5000}{0.05^2 (5000-1) + 1.96^2 \times 0.50\ 0.50}$$

Where,

n = Sample size for the finite population
N = Size of the population
p =Sample proportion (assumed to be 50%, .50)(Brooks, n.d.)
q= 1-p
e = margin of error considered is 5% for this study
Z ($\grave{\alpha}/2$) = Z score i.e., at 5% level of significance, z is 1.96

From the above formula sample size of the organic farmers is found to be = 356.

Similar research was conducted by Sandeep K. T. (2020), who used a sample size of 200 (50 farmers for each crop) to analyze the entire value chain of mangoes, tomatoes, dried chilies, and coffee. In the study by Sandeep (2018) on the value chain analysis of mangoes, the sample size was determined to be 281 farmers. The study done by S.(2016), on an economic analysis of paddy cultivation, takes into account 219 farmers, of which 122 are farmers who practice inorganic farming, and 97 are farmers who practice organic farming. In the research conducted by K (2014), 160 farmers in Tamil Nadu were sampled to determine the value chain analysis of dry chili.

For equal sample distribution for the five organic crops selected for the study, the present study considers 375 certified organic farmers as the sample, based on the sample size formula and various similar studies. Three organic farmers from one Farmers Interest Group will be taken from each cluster.

(Note: One FIG consists of 20 organic farmers, and in one cluster, 25 FIG are there (Reddy, 2018)

So, from each cluster, 75 organic farmers are selected, and for 5 clusters, the sample size is 375 (75 × 5 =375).

***(b) Wholesalers***: In the absence of a sampling frame ten wholesalers are to be chosen from each district. Within the scope of this research, the term "wholesalers" refers to any individual or entity who buys directly from farmers or commission agents and sells the commodities in the same market or other markets. They sell to retailers, other wholesalers, or processors. Thus, the total number of wholesalers targeted will be 50 for the study (10 wholesalers × 5 districts).

***(c) Retailers****:* In the absence of a sampling frame for the retailer, two retailers are to be chosen against each wholesaler, and it will be 20 from each district. The term "Retailers" includes only those individuals or entities who buy the commodity from commission agents/ wholesalers and sell it to consumers in small quantities (Sandeep, K.T. 2020). Thus, the total number of retailers targeted will be 100 for the study (20 retailers × 5 districts).

***(d) Commission agents:*** In the absence of the sampling frame and data, 10 commission agents are to be chosen from each district. A commission agents normally takes over the physical handling of the produce, arranges for its sale, collects the price from the buyer, deduct his expenses and commission, and remits the balance to the seller (Acharya & Agarwal, 2001). Thus, the total number of the commission agents targeted will be 50 for the study (10 commission agents × 5 districts).

***(d) FPC:*** Under MOVCD, in 2017, ten FPCs are formed for ten clusters namely Bokakhat Agro Organic Producer Company Ltd (Bokakhat cluster of Golaghat district); Padumpathar Agro Organic Producer Company Ltd. (Padum Pathar cluster of Golaghat district); Tetelia Agro Organic Producer Company Ltd. (Sonapur cluster of Kamrup); Bodoland Agro Organic Producer Company Ltd. (Titagiri cluster of Kokrajhar); Panbari Bodofa Agro Organic Producer Company Ltd. (Panbari cluster of Chirang district); Majuli Agro Organic Producer Company Ltd. (Pokajora areas cluster of Majuli district); Hmar Agro Organic Producer

Company Ltd. (Lakhipur cluster of Cachar district); Pagladiya Agro Organic Producer Company Ltd. (Balitara cluster of Nalbari district); Puthimari Agro Organic Producer Company Ltd. (Bihaguri cluster of Sonitpur district); and Dol Agro Organic Producer Company Ltd. (Butikor area cluster of Dhemaji district).

Out of the ten FPCs, five Farmer Producer Companies formed for five selected organic crops (organic pineapple, organic pumpkin, organic non-basmati rice, organic red rice and organic turmeric were considered for the study. Five FPCs considered for the study are Hmar Agro Organic Producer Company Ltd.(organic pineapple for Cachar district), Pagladiya Agro Organic Producer Company Ltd. (organic pumpkin for Nalbari district), Puthimari Agro Organic Producer Company Ltd. (organic non-basmati rice for Sonitpur district), Dol Agro Organic Producer Company Ltd. (organic red rice for Dhemaji district), and Padumpathar Agro Organic Producer Company Ltd. (organic turmeric for Golaghat district).

The details of the sample distribution of various actors for the present study are shown in the table below.

**Table 16:** ***Showing the Crop Wise Selection of Stakeholders for the Study.***

| **Stakeholders** | **Organic Pumpkin (Nalbari)** | **Organic Pineapple (Cachar)** | **Organic Non-Basmati rice (Sonitpur)** | **Organic Red Rice (Dhemaji)** | **Organic Turmeric (Golaghat)** |
|---|---|---|---|---|---|
| Organic Farmers | 75 | 75 | 75 | 75 | 75 |
| Commission agent/ Paikar | 10 | 10 | 10 | Nil | Nil |
| Wholesalers | 10 | 10 | 10 | Nil | Nil |
| Retailers | 20 | 20 | 20 | Nil | Nil |
| Organic FPC | 1 | 1 | 1 | 1 | 1 |
| Total stakeholders | 116 | 116 | 116 | 76 | 76 |

**Source:** Compiled by the author.

**Note:** During the field visit, it was found that organic red rice and organic turmeric are traded directly through the FPC. Thus, samples of wholesalers, commission agents, and retailers for two organic crops (organic red rice and organic turmeric) are not considered.

### 3.6.4 Tools for Data Collection

A structured schedule is used to collect data from various actors in the chain. Two separate schedules are used to collect data from farmers and traders for the first, second, third, and fourth objectives. The schedule details for farmers and traders are shown in annexures 1 and

2 respectively. The schedule consists of various close-ended questions that include dichotomous, multiple-choice, quantitative research, and ranking questions. Garrett's ranking tool is used to identify various constraints in objective three. Farmers and traders are asked to rank various constraints according to their preference and severity. The questions in the schedule are divided into five parts: demographic variables, mapping of the value chain, value addition of various stages of the chain, value chain upgradation, and governance structure. A five-point continous scale (1= lowest and 5= highest) is used to measure the farmer's understanding level of various aspects of information related to the organic food value chain, opportunities in upgrading the value chain, and the level of trust farmers have with other chain actors. A continous scale is used for the study as the same generates interval data and allows to perform of a wide range of statistical procedures (Chyung et al., 2018). The verbal interpretation used by Bringula et al. (2012) to interpret the mean score of a five-point continous scale is used for the present study. The details of the verbal interpretation of the mean score from the five-point interval scale are shown in the table below.

**Table 17:** ***Showing interpretation of mean score of a five-point interval scale.***

| **Weight/Scale** | **Mean Range** | **Verbal Interpretation** |
|---|---|---|
| 5 | 4.51-5.00 | Strongly agree |
| 4 | 3.51-4.50 | Agree |
| 3 | 2.51-3.50 | Moderately agree |
| 2 | 1.51-2.50 | Slightly agree |
| 1 | 1.00-1.50 | Disagree |

**Source :** (Bringula et al., 2012).

For objective five, a case study approach is used to compare the value chain of non-government-sponsored and government-sponsored organic firms. Ten parameters used by Kumari et al.(2021) to compare the value chain of the agricultural value of FPCs are considered for the present study. The ten parameters considered for the present study are technology, infrastructure, customer focus, information, diversified products, awareness and knowledge, capacity building, competitive advantage, pricing, and logistic drivers. Each parameters consists of five subparameter and a structured schedule is used to collect information related to mentioned parameters and subparameters of the value chain. An interval scale of 1 to 5 (1= lowest and 5= highest) is used, and the firm owner/ chairperson is asked to rate the statement on a five-point scale (1 to 5) with justification for his/her rating.

At first, the individual rating scores with a justification of each score for ten parameters of the value chain is provided seperately for non-govt.sponsored and govt. sponsored organic firms. After this, a comparative statement is prepared highlighting the mean score of each parameter scored by each firm, and overall mean score obtained of non-govt. and govt. sponsored organic firms. In addition to this, inter-firm comparision is made for each parameters and ranking of the firm is done based on the overall mean score obtained from ten parameters.

### 3.6.5 Reliability and Validity

A reliability test is not performed as all the questions are mostly dichotomous, multiple-choice, and quantitative research questions.

For the test of validity, content validity is used as it primarily measures the degree to which elements of an instrument are relevant to and represent the concepts and constructs required to measure and fulfill the intended objective. Eight experts were approached, including academicians (significant hold in the Agri-food value chain) and agricultural officers, to give their feedback and comments on the questions asked in the instruments. The minimal number of experts needed for content validation is two, while most recommendations call for at least six experts. According to the study by Yusoff (2019), there should be at least six and no more than ten content validation experts. Based on this recommendation, the present study considers eight experts for content validation (A list of the eight experts with the designation is shown in annexure 4). The instruments consist of four main domains with various statements related to constraints (farmers and traders), opportunities for upgrading the value chain, and the governance structure of the chain.
The degree of relevance is shown below:

(a) The item is not relevant: Labelled as 1.
(b) The item is somewhat relevant: Labelled as 2.
(c) The item is quite relevant: Labelled as 3.
(d) The item is highly relevant: Labelled as 4.

Content Validity Index (CVI) measures the proportion or percentage of judges/ experts who agrees on certain aspects of questions to measure the specific objective. When the Content Validity Index (CVI) is computed for each question or each item, it is called I-CVI (Item wise- Content Validity Index). Ratings of 3 and 4 are considered as content valid while ratings 1 and 2 are content invalid(Barbosa & Cansino, 2022). The acceptable score of I-CVI should be at least 0.83 with six to eight members (Lynn, 1986). Considering this, the cut of

score of four questions from the domain of constraints faced by farmers in the value chain namely the high cost of labor, inadequate supply of organic inputs, policy support, and lack of transportation is found to be below 0.83 and as per the comments/ suggestions from experts, these questions are changed and again sent to an expert for validation. The I-CVI score (Item-wise Content Validity Index) for 11 items in the domain "constraints of farmers in the value chain" is found to be more than 0.83, and thus, it can be concluded that the questions achieved a decent level of content validity. The details of the I-CVI scores of various questions/ items are shown in the table below.

**Table 18:** ***Showing I-CVI Score of Various Items.***

| Sl. No. | Major domain | No. of item | I-CVI Score |
|---|---|---|---|
| 1 | Constraints faced by farmers in value chain | 11 | More than 0.83 |
| 2 | Constraints faced by traders in the value chain | 15 | More than 0.83 |
| 3 | Opportunities in upgrading of value chain | 11 | More than 0.83 |
| 4 | Governance structure | 6 | More than 0.83 |

**Source:** Compiled by the author.

For the constraints faced by traders in the value chain, opportunities in the upgrading of the value chain and governance structure, the I-CVI score for all the items is found to be more than 0.83, and it can be concluded that all the questions in the four-domain achieved a decent level of content validity.

### 3.7 Selection of Non- Government Sponsored Organic Firms for Objective Five.

As the study aims to explore the present scenario of the value chain of organic crops in Assam, in addition to MOVCD-listed crops, six non-government sponsored organic firms are also selected for objective five. The inclusion criteria of the firms are given below:

- Minimum three years of establishment/operation (Established before 1.1.2017).
- Involved in organic food/ cash crop production or processing.
- Certified under NPOP or PGS or any other agency accredited by USDA or European Union.

As FPCs under MOVCD were founded during the period 2015-16 period, non-government-sponsored organic firms/ businesses which are established prior to 1st January 2017 are selected to have comparative analysis. With the same criteria, a list of companies engaged in organic farming activities is selected from the official website of the Ministry of Corporate Affairs, and details are given in the following table.

**Table 19:** ***Showing list of non-government sponsored organic firms.***

| Sl. No. | Company Name | Year of listed in MCA | Business Activity |
|---|---|---|---|
| 1 | Lauhitya Livelihood Private Limited (Brand name: Organic Majuli) | 14/3/2016 | Organic Farming, retail store, contract farming |
| 2 | Agro Organic Food Private Limited | 7/10/2016 | Green organic vegetables, green organic spices. |
| 3 | Dimoria Agro Producer Company Limited | 30/10/2014 | Organic crop, horticulture |
| 4 | Coinonya Farms Producer Company Limited | 31/03/2012 | Organic Ginger |
| 5 | Karbi Farms Producer Company Limited | 31/03/2012 | Organic Turmeric and organic turmeric powder |
| 6 | Jeev Anksh Eco-Products Pvt. Ltd | 11/06/2012 | Organic vegetables, Basmati rice, contract farming, |

**Source:** Ministry of Corporate Affairs, Master List.

Among the six organic firms, the researcher could only contact Jeev Anksh Eco-Products Pvt. Ltd., and the same was selected for the study. The study attempted to contact five other organic firms but was unable to do so. The present study purposively selects three non-government sponsored organic firms to make a comparative analysis of the value chain with five Government sponsored organic firms (for five districts of the study area).

(1) Jeev Anksh Eco-Products Pvt. Ltd. (Established in 2012, Guwahati).

(2) Nahar Organics (Established in 2014, Guwahati).

(3) Pabhoi Greens (Established in 1973, shifted to organic agriculture in 2003, Biswanath Chariali).

The details of the list of non-govt. and govt. sponsored organic firms considered for the study is shown in the following table.

**Table 20:** ***Showing list of selected non-government sponsored organic and government sponsored organic firms.***

| **List of non-Government sponsored organic firms** | | | **Government sponsored organic firms** | | |
|---|---|---|---|---|---|
| *Name* | *Year of est.* | *Place* | *Name* | *Year of est.* | *Place* |
| Jeev Anksh Eco-Products Pvt. Ltd | 2012 | Guwahati | Hmar Agro Organic Producer Co. Ltd. | 2017 | Cachar |
| Nahar Organics | 2014 | Guwahati | Pagladiya Agro Organic Producer Co. Ltd. | 2017 | Nalbari |
| Pabhoi Greens | 2003 | Biswanath Chariali | Puthimari Agro Organic Producer Co. Ltd. | 2017 | Sonitpur |
| | | | Dol Agro Organic Producer Co. Ltd. | 2017 | Dhemji |
| | | | Padumpathar Agro Organic Producer Co. Ltd. | 2017 | Golaghat |

**Source:** Compiled by the author.

The development of agriculture, particularly organic agriculture, is driven by two approaches, i.e., the supply-side approach and the demand-side approach. The supply-side approach is driven by the government or organization and the demand-side approach is driven by motivated individuals or FPOs (de Janvry & Sadoulet, 2020). JeevAnkash Eco Products, Nahar Organics, and Pabhoi Greens are demand-side approach driven, whereas the other five government-sponsored organic firms are supply-side approach driven.

### 3.8 Data Collection

The research is based on both primary and secondary data. The primary data for the study is gathered from the various intermediaries involved in the value chain of selected organic crops in a chosen district. For computation of cost, revenues, and production, average figure is used.

#### *3.8.1 Primary data*

Primary data is collected by a structured schedule from various chain stakeholders with various closed-ended questions. The data was collected for the period 2020-2022. The schedule includes demographic information about organic farmers and traders, information flow, cost of production, value-added activities, value chain upgradation, constraints and opportunities for upgrading the chain, and the chain's governance structure.

### *3.8.2 Secondary Data*

The secondary data have been collected from published sources such as the IFOAM (International Federation of Organic Agriculture Movements), Research Institutes of Organic Agriculture(FiBL), Agricultural and Processed Food Products Export Development Authority(APEDA), Spices Board, Directorate of Horticulture and Food Processing, MOVCD- NER (Mission Organic Value Chain Development for North East Region), Journals, Books, Conference papers, Newspaper article, Ph.D. Thesis, etc is used for the study.

## 3.9 Analytical Tools and Techniques

The techniques used for data analysis and assessing the specific objectives of the current investigation are summarised below.

### 3.9.1 *Descriptive Statistics*

Descriptive Statistics analysis indicates quantitative description and helps us to organize and summarize the data (Holcomb, 2016). A tabular presentation was created in order to assemble an overview of the sample respondents' general characteristics. Statistical measures like ratios, percentages, and averages were calculated, and diagrams were used. The following descriptive tools were used in the present study.

- *Mean:* The mean is the most fundamental and widely used measure of central tendency. Its primary function is to summarise a series of fundamental characteristic and enable data comparison. It is a relatively stable measure of central tendency (Kothari, 2004).
- *Median*: When a series is ordered ascending or descending, the value of the middle item is the median. It splits the series in half, with one half containing all items with values less than the median and the other half containing all values greater than the median (Kothari, 2004).
- *Mode*: The mode is the most frequently occurring value in a series. In a distribution, the mode is the item with the greatest concentration. In general, mode is the size of the item with the most significant frequency (Kothari, 2004).
- *Standard Deviation*: It is the square root of the average of squares of deviations. It is the and most commonly used measure of series dispersion and is commonly

denoted by the symbol 'σ' (pronounced as sigma). The standard deviation (along with several related measures such as variance, coefficient of variation, and so on) is commonly used in research studies and is regarded as an excellent measure of dispersion in a series (Kothari, 2004).

### *3.9..2 Cost of Cultivation*

The cost of cultivation refers to the total cost incurred by the farmer for the cultivation of a crop in a unit area i.e., acre or hectare (ABM: Cost of Cultivation, n.d.). In this study, the cost of cultivation is computed as the total expenses incurred in cultivating various organic crops in one hectare of land in one cropping season. A detailed cost of cultivation on ABC cost measures (Manual on Cost of Cultivation Survey, Ministry of Statistics and Programme Implementation, Government of India) has also been worked out. All types of appropriations and imputations of various costs are made in accordance with the manual's guidelines(Ministry of Statistics and Programme Implementation, 2008).

**Cost-$A_1$**: It is calculated by summing the following costs:

a) Value of hired human labor

b) Value of hired and owned machine labor

c) Value of hired and owned bullock labor

d) Value of manures and fertilizers (owned and purchased value of fertilizers)

e) Value of purchased and owned seed

f) Value of plant protection chemicals used

g) Irrigation charges

h) Interest on working capital

i) Depreciation on farm implements and machinery

j) Land revenue

k) Miscellaneous expenses

**Cost $A_2$**: Cost $A_1$ + Rent paid for leased in land, if any

**Cost $B_1$**: Cost $A_1$ + Interest on fixed capital (excluding land).

**Cost $B_2$**: $B_1$+ Rental value of owned land + Rent paid for leased in land.

**Cost $C_1$**: $B_1$ + Imputed value of family labor.

**Cost $C_2$**: Cost $B_2$ + Imputed value of family labor.

### *3.9.3 Income Concepts used were:*

*Gross Income* = Main product × Price of main Product + by Product × Price of by product

*Net Income* = Gross return – Cost $C_2$

*Farm Business Income* = Gross Income –Cost $A_1$

*Own Farm Income*= Gross Income –Cost $A_2$

*Farm Labor Income* = Gross Income – Cost $B_2$

*Income per rupee* = Gross Income/Cost $C_2$

### *3.9.4 Estimation of Farmer's Net Price, Marketing Margin*

A modified formula described by (Murthy et al., 2007) is used to calculate Farmer's Net Price and Marketing Margin. The value of post-harvest losses is also included in the margin calculation at various stages of marketing.

#### 3.9.4.1 Farmer's Net Price

The farmers' net price was calculated as the difference between the gross price received and the total marketing costs incurred, including post-harvest losses at various stages of handling the produce. The gross price received by the farmer was used to estimate the loss in value terms of the produce, as they would have realized the same price if there had been no losses. The farmer's net price is expressed mathematically as follows:

$$NP_F = GP_F - \{ C_F + (L_F \times GP_F)\} \quad \ldots\ldots (1)$$

Where,

$NP_F$ = Net price received by the farmers (Rs/ Quintal or per piece).
$GP_F$ = The gross price received by farmers.
$C_F$ = The cost incurred by the farmers during marketing (Rs/ Quintal or per piece).
$L_F$ = The physical loss in produce from harvest till it reaches the market (Quintal or per piece).

#### 3.9.4.2 Marketing Margin

The profits and returns that market intermediaries receive for storage, capital interest, and establishment after adjusting the marketing losses due to handling are included in their

margins. The general expression for estimating the margin of the intermediaries is given below:

Intermediaries Margin: Gross Price (Sale Price) – Purchase Price (Cost Price) – Cost of Marketing – Loss in value during wholesaling.

The formula for the wholesaler's net marketing margin is as follows.

$MM_W = GP_W - GP_F – C_W - (L_W \times GP_W)$ …….. (2)

Where,

$MM_W$ = Net Margin of the Wholesaler (Rs/ Quintal).
$GP_W$ = Wholesalers selling price or purchase price of the retailers.
$C_W$ = Cost incurred by Wholesalers during marketing (Rs/ Quintal)
$L_W$ = Physical loss of the products at the wholesale level. (Rs/ Quintal)
$GP_F$ = The definition of $GP_F$ is shown in equation (1).

When there is more than one wholesaler in the distribution chain (primary wholesaler, secondary wholesaler, etc.), the wholesaler's total margin is the sum of the margins of each wholesaler in the distribution chain.

Mathematically,

$MM_W = MM_{W1} \ldots\ldots + MM_{Wi} \ldots\ldots + MM_{Wn}$

where, $MM_{Wi}$ is the marketing margin of the $i^{th}$ wholesaler.

The Net marketing margin of retailers is given by the equation in below (equation 3):

$MM_R = GP_R – GP_W – C_R – ( L_R \times GP_R )$…….. (3)

Where,

$MM_R$ = Net Margin of the Retailer (Rs/ Quintal)
$GP_R$ = Price at the Retail Market or purchase price of the consumers (Rs/ Quintal)
$C_R$ = Cost incurred by Retailer during marketing (Rs / Quintal)
$L_R$ = Physical loss of the produce at retail level.
$GP_W$ = The definition is same as equation (2).

The first term in equations (1), (2), and (3) represents the gross returns, while the second term represents the cost and loss during various stages of marketing respectively. Thus the total marketing margin of the market intermediaries is calculated as:

$MM = MM_W + MM_R$ ..... (4)

Similarly, the total marketing cost incurred by farmers, wholesalers and retailers are computed as:

$MC = C_F + C_{W+} C_R$ .....(5)

The total marketing loss (ML) in value of produce caused by injury/damage during handling from the point of harvest until it reaches the consumers was calculated using the following equation.

$ML = \{L_F \times GP_F\} + \{L_W \times GP_W\} + \{L_W + GP_R\}$……..(6)

### 3.9.4.3 Marketing Efficiency

The Marketing Efficiency in the study is calculated by using Acharya's Modified Marketing Efficiency Index (MMEI) as follows:

MMEI = FP/ (MC + MM)

Where,

FP = Price received by the farmer
MC= Marketing Cost.
MM = Marketing Margin.

***Some of the other important concepts used in the study:***

**(1) Human labor**: It is based on the wage rate prevalent in the area of study for both male and female workers. The amount to be paid is calculated in rupee equivalents based on the number of man-days utilized. One man's day comprises eight hours. Actual days worked were recorded separately for males and females. In addition, owned and hired labor was also recorded separately. They were then converted into productive man work days. The prevailing wage rate per day for Cachar for men was Rs 400 and for women, it was Rs. 350 for the year 2022. For Nalbari, Sonitpur, Dhemaji, and Golaghat, it was Rs. 300 for men and Rs. 250 for women for the year 2022.

**(2) Bullock labor**: Bullock labor is bullock pair days both owned and hired was charged according to the prevailing market rates.

**(3) Machine power**: Machine power both owned and hired was charged at the prevailing average rates in the study area. The prevailing machine rate is Rs. 500 for organic pineapple (power tiller and small tractor); Rs. 300 for organic non-basmati pady, organic turmeric, and organic red rice; and Rs. 250 for organic pumpkin.

**(4) Material costs**: These include the cost of seeds, bio-fertilizers, farm yard manure, irrigation, biopesticides, plant protection material, etc.

*(a) Seed/ planting material*: The purchased seed material was charged at the actual amount paid and home-produced seed material was charged as per the prevailing market price.

*(b) FYM*: Farmyard manure was charged as per the prevailing market rates during the period of study.

*(c) Bio-fertilizers*: The carrier-based micro-organisms that are used for seed or seedling treatments or mixing with vermicompost in order to enrich soil fertility. It includes Rhizobium, Azatobactor, Azospirullum, Phosphate Solubilizing Bacteria, VAM, and Cellulose degraders. The purchase prices of these inputs were taken as their cost.

*(d) Vermicompost*: The compost is prepared by using agricultural waste materials and earthworms feeding on it to produce excreta which is a rich source of N, P, K, and other micro nutrients. The quantity of vermicompost used in the cultivation is measured in quintals and the cost was evaluated at market price.

*(e) Fertilizers and Plant Protection Chemicals*: The cost of fertilizers and plant protection chemicals was computed at the actual price paid by the respondents.

*(f) Irrigation charges*: Irrigation charges were taken as the actual amount paid for irrigating the crops.

**(5) Interest on working capital**: Charged at the rate of 12.5% per annum for half the period of the crop.

**(6) Depreciation charges**: Depreciation on each capital equipment and machinery owned by the farmers and used for cultivation of land was calculated for individual farmers based on the purchase value using the straight-line method.

*Annual depreciation = Purchase value – Junk value /Economic life span of the asset***.** For this study, the estimated life for the tractor is assumed as 15 years and for other farm machinery, it is 10 years. Scrap value or junk value is assumed as 10% of the purchase price (Iowa State University, n.d.)

**(7) Land revenue**: Actual land revenue paid by the farmers was considered.

**(8) Land rent**: The prevailing land rent for agricultural enterprises was imputed for the sample farmers since all land holdings were observed to be owner-operated.

**(9) Interest on fixed capital**: Interest on fixed capital was calculated at 10 percent per annum, which is the prevailing rate of investment credit. The items considered under fixed capital are implements and machinery.

### *3.9.5 Garrett's Ranking Technique*

Garrett's ranking technique is used to analyze the constraints faced by various stakeholders in the value chain of selected organic crops in Assam. Respondents were asked to rank (in order of severity) several factors, and the ranks were transformed into scores using Garrett's table (Annexure 5). Based on Garrett's Ranking technique, the respondents were asked to rank various constraints and opportunities based on their impact, which was then converted into a score value and ranked using the following formula.

$$\text{Percent position} = = \frac{100 - (R_{ij} - 0.50)}{N_j}$$

Whereas,

Rij = Rank given for $i^{th}$ item by $j^{th}$ individual.

Nj = Number if items ranked by $j^{th}$ individual.

Using Garrett's Table, the estimated percent position is converted into scores using the table provided by (Garrett & Woodworth, 1969). Then, for each factor, the scores of each individual are added together, and the total score values and mean score values are computed. The factor with the highest mean value is regarded as the most important. Steps followed in the Garrett's Ranking are as follows:

i. Collected data are entered in MS excel.
ii. Data cleaning with minimum, maximum and mode values.
iii. Computing rank-wise and factor-wise frequency. *(Condition: Rank total= Factor total).*
iv. Computing percent position for each rank using the formula of percent position as shown above.
v. Computing rank-wise Garret Mean Score.
vi. Ranking of factors by Garrett Mean Score.

## 3.10 Variables Considered for the Study

To achieve the study's five objectives, variables pertaining to the agricultural value chain are taken into consideration from a variety of literature sources and theories. The details of the objective wise variable consider for the present study is shown in below table.

**Table 21:** ***Showing Variables Considered for the Study.***

| Objectives | Dimensions | Variables | References |
|---|---|---|---|
| Objective 1 | 1.i. Demographic | Gender, Educational qualification, Marital Status, Family size, Occupation, distance from road and market, experience in organic farming, Training received, and Training Provider. | (Sandeep K. T., 2020),(Sandeep, 2018),(M4P 2008, 2008) |
| | 1.ii. Production | Size of the land holding, types of land holding, Source of seed supply, Source of vermicompost, Production (quintal), Time zone (planting/flowering, harvesting, selling). | (Ríos Guayasamín et al., 2016b),(Arora et al., 2013) |
| | 1.iii. Product flow | Form and place of sales of organic product, Marketing channel, Product flow, Price spread. | (Stein & Barron, 2017),(Trienekens, 2011) |
| | 1.iv. Services flow | Source of credit, collateral used. | (Tamasese, 2009a); (M4P 2008, 2008) |
| Objective 2 | Value addition | Farmer's Net Price, Marketing margin, Marketing efficiency, Value adding activities, Value chain upgradation. | (Tamasese, 2009a) (M4P 2008, 2008) (Murthy et al., 2007),(Acharya & Agarwal, 2001) |
| Objective 3 | Constraints and opportunities in VC | Constraints in upgrading value chain, Opportunities in upgrading the value chain. | (Trienekens, 2011);(M4P 2008, 2008) |
| Objective 4 | Governance structure | Relationship & Linkage, Trust, Rules and Regulation, Forms of governance structure, Selling Price determination and information flow. | (Trienekens, 2011) (M4P 2008, 2008) (Sharma et al., 2022) |
| Objective 5 | Comparative analysis of government and non-government sponsored organic firm | Technology, Infrastructure, Customer focus, Information, Diversified products, Awareness and knowledge, Capacity building, Competitive advantage, Pricing, and Logistics drivers. | (Kumari et al., 2021) |

**Source:** Compiled by author

## 3.11 Description of Study Area of Specified Organic Crops

### *3.11.1 Study Area for Organic Pineapple (Cachar District)*

Assam's Cachar district is located in the Southern most of Assam and organic pineapple is cultivated primarily in the Lakhipur subdivision, which covers more than 1500 hectares of land (Time8, 2021, 2021). Pineapple cultivation in this area dates back to 1932, when James

Robert, a Welsh Baptist Pastor, purchased a sapling from Tripura. The pineapple sugar content in Lakhipur subdivision is between 16 and 18 percent, the highest in Northeast India (Ghosh, 2012). A central sector scheme, Mission Organic Value Chain Development, was passed in 2015-16 to strengthen the value chain of organic crops in India's northeastern region. As part of the scheme, 500 hectares of land in Cachar district are being selected to build a complete value chain to explore the domestic and global pineapple markets. A farmer producer company named "Hmar Agro Organic Producer Company Ltd" was established in 2017 under the MOVCD scheme for the benefit of cultivators and to develop a complete organic value chain with proper market linkage (*Hmar Agro Organic Producer Company Limited*, n.d.). In Northeast India, kew, giant kew, and queen varieties of pineapple are mostly grown *(Pineapple Varieties in India, Seasons, and Economic Importance | ABC Fruits, 2022)*. In the Lakhipur sub-division, kew pineapples are grown and classified into three sizes: large (over 14 inches diameter), medium (14 inches-10 inches diameter), and small (less than 10 inches diameter)(*Pineapple Supplier in India - Buy Pineapple*, n.d.).

### *3.11.2 Study Area for Organic Pumpkin (Nalbari District)*

Nalbari district is located 51 km south of the state capital Dispur and it shares a border with Baksa District to the North, and Kamrup District to the South. Agriculture is the backbone of the rural economy and the only means of life for the households living in the Nalbari district, located in the Pagladia river's lower stream. Previously infertile land along the banks of the huge Pagladia River is now a thriving pumpkin farm. Sankardev Jaibik Krishi Farm and Jyoti Farmers Club, two of the region's most prominent agricultural operations, lead the pumpkin revolution. It's great news for the State's farmers that stores and markets in neighboring districts, and even other states are buying pumpkins by the truckload. Success in growing pumpkins has led to the formation of a farmer producers' company called “Pagladia Agro Organic Producer Company” within the Mission Organic Value Chain Development of the Government of Assam's Department of Horticulture and Food Processing to promote value addition in organic pumpkin (Kalita, 2010). At present, 500 farmers in 35 Farmers Interest Group (Approximately 14 farmers in each FIG) are actively producing organic pumpkins in the same district.

### *3.11.3 Study Area for Organic Non-Basmati Paddy (Sonitpur District)*

Sonitpur district of Assam is located in the north bank plain agro-climatic zone of the state. with a geographical area of 2.72 lakhs hectares (*District Agricultural Office | Sonitpur | Government Of Assam, India*, n.d.). The district’s economy of the district is primarily

agriculture-based with around 80% of its population directly or indirectly depending on agriculture and allied activities (NABARD, 2016). The educated youths of the greater Puthimari area are cultivating chemical-free rabi crops which are primarily organic on the bank of river Brahmaputra under the Bihaguri Development Block of Sonitpur district. Since 2004. The same practice of cultivating chemical-free crops and involvement in vermicompost preparation activities by the farmers in that locality led to gaining popularity in the production of organic crops in the district and Assam (Sentinel Digital, 2017). In 2017 " Puthimari Agro Organic Farmer Producer Company Limited" was formed to promote organic agriculture in this region under the MOVCD scheme (MOVCD, n.d.).

### *3.11.4 Study Area for Organic Red Rice (Dhemaji District)*

Geographically, the Dhemaji district is positioned between the Brahmaputra on the north and the foothills of Arunachal Pradesh on the northeast. The economy is mainly Agri based and chief agricultural products are rice, sugarcane, mustard, sericulture, fishing etc. The district is a low-lying district, and floods are a regular phenomenon in the district. As various areas in the district remain waterlogged during the paddy cultivation season, deep-water rice cultivation, which is called red rice or "Bao Dhan" is mostly done by the farmers. Red rice is more nutritious than white and brown rice, is a good source of vitamins B1, B2, B6, and contains moderate iron and calcium (NIFTEM, n.d.). The red rice market, especially the organic red rice market, is witnessing significant growth globally, driven by increasing demand for more healthier and nutritious food options. In 2013, the District administration of Dhemaji, in collaboration with Nature Bio Food Ltd in Haryana, exported 300 tonnes of red rice to the USA(Sarma, 2013). To promote organic red rice production, marketing, and branding "Dol Agro Organic Producer Company Limited" was established under the MOVCD scheme in 2017.

### *3.11.5 Study Area for Organic Turmeric (Golaghat District)*

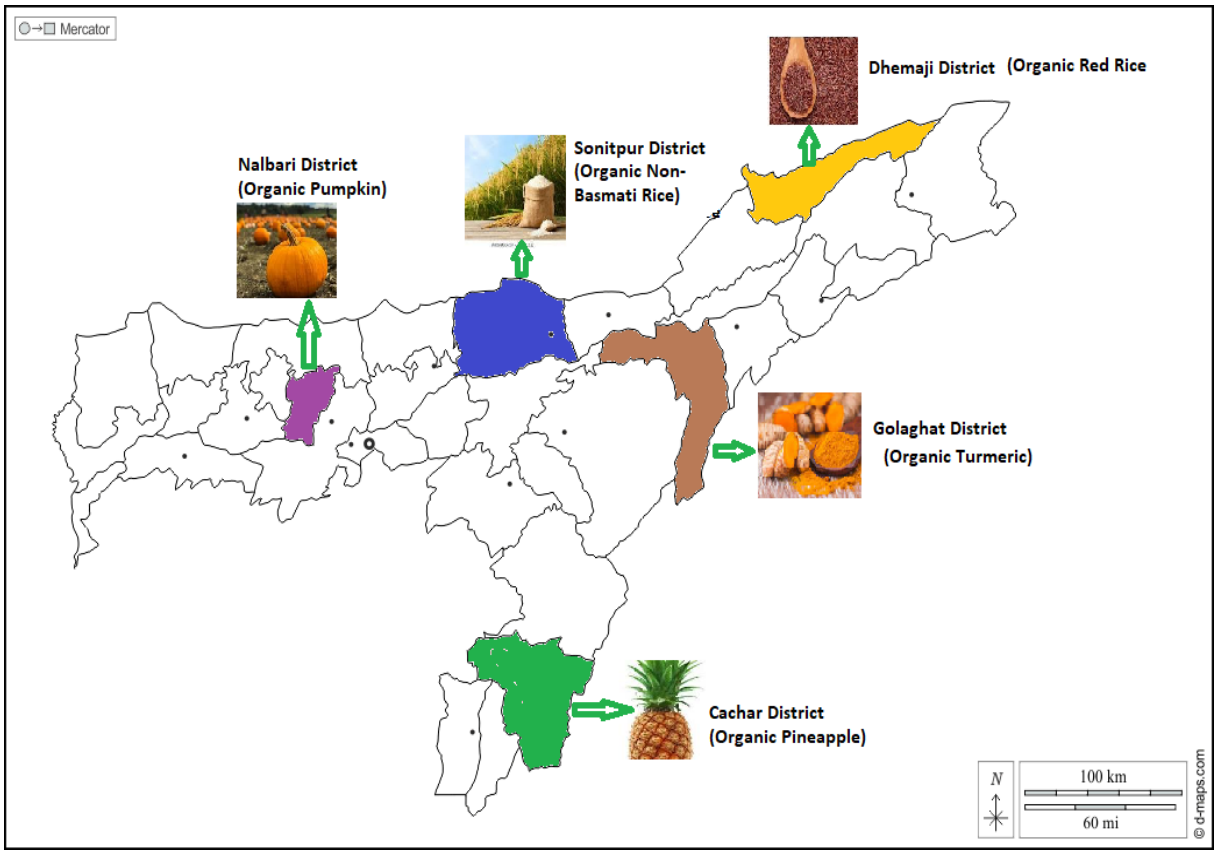
Located on the southern bank of the Brahmaputra River, the river Brahmaputra surrounds Golaghat district to the north, the state of Nagaland to the south, Jorhat district to the east, and Nagaon and Karbi Anglong district to the west *(Agriculture Department | Golaghat District | Government of Assam, India, n.d.)*. The agroclimatic condition is suitable for the cultivation of various spices, oils seeds, and plantation crops. Organic turmeric and red rice are mostly cultivated in the Padumpathar and Bokakhat areas of the district. Two FPCs named "Padumpathar Agro Organic Producer Company Limited" and "Bokakhat Agro Organic Producer

Company Limited" and "Bokakhat Agro Organic Producer Company Limited" is established in the year 2017 under the MOVCD scheme.

### 3.12 Map Location of Selected District of Five Organic Crops for the Study.

The details of the map location of five selected organic crops for five districts are shown in the below figure.

**Figure 8:** ***Showing Map Location of Selected District of Five Organic Crops.***




**Source:** Author's creation.

### 3.13 Chapter Summary

The present chapter discussed the research methodology adopted for the study. This chapter discusses the sample size, sampling technique, data collection, and data analysis technique for according to the objective of the study. Various variables considered for the study are presented and a brief summary is provided for each of the five selected districts. Lastly, five selected organic crops from five selected districts are shown using a map. The next chapter will analyze and discuss the first objective, which is the network structure of the organic crops value chain.