Economic Evaluation of Farmer Producer Organisations in Sikkim

A Thesis Submitted

To

Sikkim University

In Partial Fulfilment of the Requirement for the

Degree of Doctor of Philosophy

By

Rajiv Gurung

Department of Economics

School of Social Sciences

Under the Supervision of

Prof. Manesh Choubey

Department of Economics

Sikkim University

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DEDICATION

DEDICATED TO

BABA, AAMA

&

ALL SMALLHOLER FARMERS AROUND THE WORLD

इल, सामदुर, तादोंग - 737102
क, सिक्किम, भारत
03592-251212, 251415, 251656
क्स - 251067
इट - www.cus.ac.in

सिक्किम विश्वविद्यालय
SIKKIM UNIVERSITY

6th Mile, Samdur, Tadong-737102
Gangtok, Sikkim, India
Ph. 03592-251212, 251415, 251656
Telefax : 251067
Website : www.cus.ac.in

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DECLARATION

I declare that the thesis entitled **"Economic Evaluation of Farmer Producer Organisations in Sikkim"** submitted to Sikkim University in partial fulfilment of the requirement for the degree of **Doctor of Philosophy**, is my original work. This thesis has not been submitted for any other degree of this University or any other University.

Rajiv Gurung

Rajiv Gurung

Roll No: 18PDEC04

Reg. No: 18/Ph.D/ECO/04

We recommend that this thesis be placed before the examiners for evaluation.

Prof Manesh Choubey
Department of Economics
Sikkim University
6th Mile, Samdur, Tadong, 737102, Gangtok

Prof. Manesh Choubey

Supervisor

Department of Economics

Sikkim University

12/12/2022

अध्यक्ष
Head
अर्थशास्त्र विभाग
Department of Economics
सिक्किम विश्वविद्यालय
Sikkim University

Dr.Rajesh Raj SN

Head of the Department/In-Charge

Department of Economics

Sikkim University

सामदुर, तादोंग - 737102
सिक्किम, भारत
92-251212, 251415, 251656
- 251067
- www.cus.ac.in

6th Mile, Samdur, Tadong-737102
Gangtok, Sikkim, India
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सिक्किम विश्वविद्यालय
SIKKIM UNIVERSITY

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This is to certify that the thesis entitled **"Economic Evaluation of Farmer Producer Organisations in Sikkim"** submitted to Sikkim University in partial fulfilment of the requirement for the degree of **Doctor of Philosophy in Economics**, embodies the result of bona fide research work carried out by **Mr. Rajiv Gurung** under my guidance and supervision. He has fulfilled the requirements relating to nature period of research and presentation of seminar talk etc.

It is also being certified that the research work brings to light the results of an original investigation made by **Mr. Rajiv Gurung** and no part of the thesis has been submitted for any degree, diploma, associateship and fellowship.

All assistance and help received during the course of the investigation have been duly acknowledged by him.

Prof, Manesh Choubey
Supervisor
Professor
Department of Economics
Sikkim University.

Prof. Manesh Choubey
Department of Economics
Sikkim University
6th Mile, P.O. Tadong, 737102, Gangtok

माइल, सामदुर, तादोंग - 737102
ोक, सिक्किम, भारत
-03592-251212, 251415, 251656
फैक्स - 251067
साइट - www.cus.ac.in

6th Mile, Samdur, Tadong-737102
Gangtok, Sikkim, India
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Telefax : 251067
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"Economic Evaluation of Farmer Producer Organisations in Sikkim"

Submitted by **Rajiv Gurung** under the supervision of **Prof. Manesh Choubey**, **Professor in the Department of Economics, School of Social Sciences**, Sikkim University, Gangtok, 737102, India.

Rajiv Gurung
Signature of the Candidate

Prof. Manesh Choubey
Department of Economics
Sikkim University
6th Mile, P.O. Tadong-737102, Gangtok

Countersigned by the Supervisor

13/12/2022

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- **Rajiv Gurung.**

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

List of Acronyms

AC	Agricultural Cooperatives
APMC	Agricultural Produce Marketing Committee
ATMA	Agricultural Technology Management Agency
ATT	Average Treatment Effect on the Treated
BCC	Banker, Charnes and Cooper
BoD	Board of Directors
BPL	Below Poverty Line
CAMPCO	The Central Arecanut and Cocoa Marketing and Processing Co-operative Limited
CBBO	Cluster-Based Business Organisations
CCR	Charnes, Cooper and Rhodes
CEO	Chief Executive Officer
CF	Contract Farming
CHC	Custom Hiring Centre
CM	Caliper Matching
CMRHM	Chief Minister's Rural Housing Mission
CRS	Constant Returns to Scale
DACS	Denzong Agricultural Cooperative Society
DAY-NRLM	Deendayal Antyodaya Yojana- National Rural Livelihood Mission
DEA	Data Envelopment Analysis
DEAP	Data Envelopment Analysis Program
DMU	Decision-Making Unit
DRS	Decreasing Returns to Scale
EPWRF	Economic & Political Weekly Research Foundation
FA	Field Assistant
FAO	Food and Agriculture Organisation
FBOs	Farmer-Based Organisations
FIG	Farmer Interest Group
FPOs/FPCs	Farmer Producer Organisations/Farmer Producer Companies

FS & ADD	Food Security & Agriculture Development Department
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GoI	Government of India
GPU	Gram Panchayat Unit
GSDP	Gross State Domestic Product
HOPCOMS	Horticulture Producers Co-operative Marketing and Processing Society Limited
IA	Implementing Agency
ICA	International Co-operative Alliance
ICCOA	International Competence Centre for Organic Agriculture
ICT	Information and Communication Technologies
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IGS	Indian Grameen Service
IOFs	Investor-Owned Firms
IRS	Increasing Returns to Scale
KBM	Kernel Based Matching
LRP	Local Resource Person
MAR	Mean Annual Rainfall
MASB	Mean Absolute Standard Bias
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MMKAY	Mukhya Mantri Krishi Atmanirbhar Yojana
MNCs	Multinational Companies
MOVCD-NER	Mission Organic Value Chain Development for North East Region
NABARD	National Bank for Agriculture and Rural Development
NCDC	National Cooperative Development Corporation
NER	North-East Region
NGOs	Non-Governmental Organisations
NHB	National Horticulture Board
NIE	New Institutional Economics
NIRD/SIRD	National/State Institute of Rural Development

NNM	Nearest Neighbour Matching
NRLM	National Rural Livelihood Mission
NSDP	Net State Domestic Product
NSSO	National Sample Survey Organisation
OFOJ	One Family One Job
PODF	Producers' Organisation Development Fund
PIS	Product Incentive Scheme
PRODUCE	Producers' Organisation Development and Upliftment Corpus
PSM	Propensity Score Matching
PTE/PTIE	Pure Technical Efficiency/ Pure Technical Inefficiency
RI	Resource Institution
RoI	Return on Investment
RPOs	Rural Producer Organisations
SDGs	Sustainable Development Goals
SE/SIE	Scale Efficiency/ Scale Inefficiency
SFA	Stochastic Frontier Analysis
SFAC	Small Farmers' Agri-Business Consortium
SFPCL	Sahyadri Farmers Producer Company Limited
SHG	Self-Help Group
SIMFED	Sikkim State Cooperative Supply and Marketing Federation Limited
SOM	Sikkim Organic Mission
SRLM	State Rural Livelihood Mission
TCA	Transaction Cost Approach
TE	Technical Efficiency/ Technical Inefficiency
VLW	Village Level Worker
VRS	Variable Returns to Scale
WPR	Work Participation Rate

List of Abbreviations

et al.	and others
etc.	et cetera
Ltd.	Limited
ha	hectare
e.g.	for example
i.e.	that is
sq. km.	Square metre
Rs	Rupees
%	Percentage
vis-à-vis	in relation to or with regards to
viz.	namely
&	and
m	metre
MT	metric tonnes

ABSTRACT

Collectivisation of smallholder farmers has been considered as one of the ways to collectively overcome the challenges they face. In India, where around 86% of the farming community are smallholders, different forms of farmer collectives were formed to organise farmers. Howerver, these farmer collectives either excluded the small farmers or faced excessive bureaucratic control, political interference and inefficiency. Therefore, a new form of farmer collective, known as Farmer Producer Organisation (FPO) was introduced in 2002 on the recommendations of the YK Alagh Committee. At present, FPOs are being considered as the most effective means of aggregating small and marginal farmers and empowering them to overcome inherent constraints faced by them individually. By leveraging the collective strength and bargaining power of small farmers, FPOs enhance their access to investments, technology and inputs and markets. It retains the desirable features of a cooperative as well as the efficiency and flexibility of a private company. FPOs support farmers at all stages of production, processing and marketing to increase their income levels.

The present study has examined all 28 FPOs existing in the first fully organic state of India, Sikkim, where the majority of the population depends on agriculture for their livelihood. It attempts to identify the determinants and impact of FPO membership in Sikkim. Moreover, this study has also made an attempt to estimate the efficiency levels of the FPOs and then classify efficient and inefficient FPO in the state. The results argued that farmers in Sikkim are not joining FPOs mainly due to lack of information and awareness about potential benefits of FPOs. In particular, FPO membership is influenced by variables like education, primary occupation being farming, farming experience,

ownership of mobile phones, landholding size, extension contact, medium level of social participation, distance to the nearest market, transportation facility and expansion of scale. Furthermore, the results suggested that FPO membership has a significantly positive impact on all three outcome variables- Net Returns, Return on Investment (RoI) and profit margin. It infers that FPO membership significantly improves the economic performance of the members. However, FPOs in Sikkim suffer from significant technical, pure technical and scale inefficiencies. Only 5 FPOs were performing efficiently and thus defined the efficient frontier. The remaining 15 FPOs were technically inefficient (OTE<1) and were underperforming. These inefficient FPOs were further classified and found that 5 FPOs were found to be the marginally inefficient FPOs. On the other hand, 5 FPOs namely Rongli, Machong Parakha, Mellidara and Soreng Sunrisers FPOs were found to be the most inefficient. They should be treated as the most vulnerable or target FPOs which may face the risk of making losses if the situation does not improve. First, there are significant possibilities to increase efficiency levels in FPOs in Sikkim. Second, managerial inefficiency for the FPOs in Sikkim makes a greater contribution to overall inefficiency indicating the lack of skilled managers of FPOs. This study argues that FPOs can be considered as an appropriate rural institution to improve the economic condition of farming households in India. In that direction, it suggests information transmission and awareness campaigns about FPOs and its benefits, strengthening of extension-farmer linkage, effective usage of mobile phones to reach the farmers in the remote areas, provision of more forward and backward linkages to FPOs, regular training to Board of Directors on business management aspects and provision of adequate and timely credit to FPOs.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Globalisation has resulted in the entry of giant retail chains and supermarkets into the domestic food production and marketing domain of developing countries (Reardon et al., 2012; Reardon & Hopkins, 2006). These countries have gradually started observing a shift in consumption patterns owing to improved incomes, urbanisation, and increasing awareness among consumers about nutritional values (Tschirley et al., 2015). Along with this, sustained economic growth, rapid urbanisation and rising middle-class population around the world have also further expanded the demand for a wider variety of agricultural food products (Regmi & Gehlhar, 2005). More high-value agricultural products (especially, horticultural products) are being preferred thereby causing transformations in local-food systems in these countries which can prove beneficial for small[1]-farmers too (Lowitt et al., 2015; Reardon et al., 2012).

Broadly, two patterns are being observed in emerging and developing countries in recent times: increasing demand for high-value products in their domestic economy, and growth of exports of high-value commodities to high-income countries. Firstly, the increasing urbanisation, rise in incomes and entry of modern food retail chains or supermarkets and MNCs due to liberalised investment policies have led to growth in demand in domestic markets. Secondly, developing countries have now shifted from the export of bulky primary products to high-value products that have a higher value per unit or weight in the developed countries.

[1] In this study, a small farmer or a smallholder farmer is simply defined as a farmer who cultivates on less than two hectares of land.

Globally, there are 525 million farms out of which the majority of them are small holdings of less than 2 ha and out of this, about 87% are in Asia, 8% in Africa and the remaining 5% in Europe and America (Oksana, 2005). Within Asia, China has the largest number of smallholders followed by India, Indonesia, Bangladesh and Vietnam. Interestingly, most of the smaller land holdings are involved in high-value agriculture (Rao et al., 2006). Since most of the poor people in rural areas of developing countries depend on smallholder farming for their livelihood (Ogutu et al., 2020), this development has created opportunities for smallholder farmers in developing countries (Swinnen & Maertens, 2014).

This opportunity can be tapped by small farmers to access the rapidly expanding market for their produce and earn more income. However, they are also required to maintain stricter international food safety and quality standards (Onumah et al., 2007) while they lack the necessary resources to do so. Thus, they are placed in a disadvantaged and challenging position to compete against the capital and technology-rich international supermarkets. As a result of this development, small-scale farmers in these countries have faced unfair competition and numerous challenges.

Due to their small scale of operation, smallholder farmers face several constraints. They face high transaction costs, limited access to output and input markets, lack of access to improved technology, dependence on obsolete production methods, low yields, expensive transportation costs and inadequate profits leading to underdevelopment in rural areas (Maemken & Bellemare, 2020; Mwangi & Kariuki, 2015; Poulton et al., 2006; Barham & Chitemi, 2009). With a small scale of operation and resulting low marketable surplus, they face low bargaining power in both input and output markets too. Lack of access to post-harvest facilities too compels them to dispose of their perishable high-value products at minimal prices (Negi et al., 2018;

Hegde, 2010). Moreover, agricultural supply chains in developing countries are characterised by a long chain of middlemen who take away the major share of a farmer's produce while the farmers get only a small fraction of what the final consumers pay, thereby making agriculture an unremunerative business.

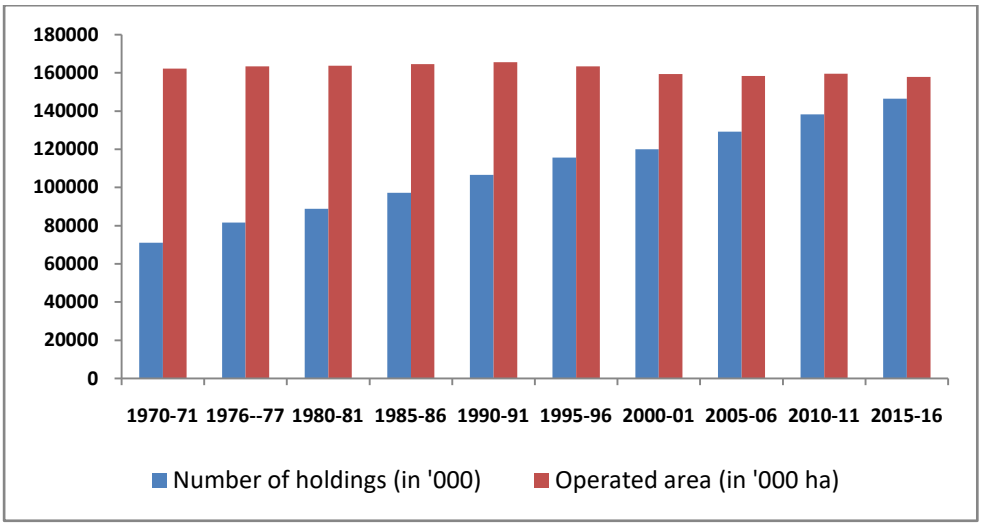
According to Mojo et al. (2017), smallholder farmers in developing countries face several complex production and marketing constraints that hinder the improvement of livelihoods. Asymmetrical power relations in agro-food value chains have been highlighted by Bolwig et al. (2010).

Selling their produce in the market requires farmers to pay high taxes to the marketing officials and also incur transportation costs. Thus, farmers are forced to sell their produce to local traders at the farm gate to avoid such high costs (Barham & Chitemi, 2009; Fafchamps & Hill, 2008). In general, small-scale producers lack access to all facilities required for supplying a product demanded by the market. They are in a disadvantaged position compared to large farmers and corporations in terms of economic, social and physical factors. Most of them lack access to updated market information, technical advisory services, agricultural inputs and financial services and post-harvest facilities for agricultural produce. Nevertheless, small farmers also can produce quality products and compete with larger farmers (Boselie et al., 2003) if they are provided with the necessary capital and technology. This can be made possible through the collectivisation of the small farmers which will give them collective and affordable access to the resources that were earlier inaccessible to them as individual farmers (Verma et al., 2019; Singh & Vatta, 2019; Cherukuri & Reddy, 2014).

1.2 Indian Agriculture and Smallholder farmers

India is an agricultural economy where around half of its workforce is employed in agriculture. However, this sector contributes only around 18.4 per cent to the country's Nominal Gross Value Added (GVA) (GoI, 2022) as a result of high growth in the manufacturing and services sector. Around 88.1 per cent of India's farmers are small and marginal landholders who cultivate small plots of land and produce low marketable surplus (NSSO, 2019). While the operated area under agriculture is declining over the years, the number of holdings has been increasing steadily (Figure 1.1).

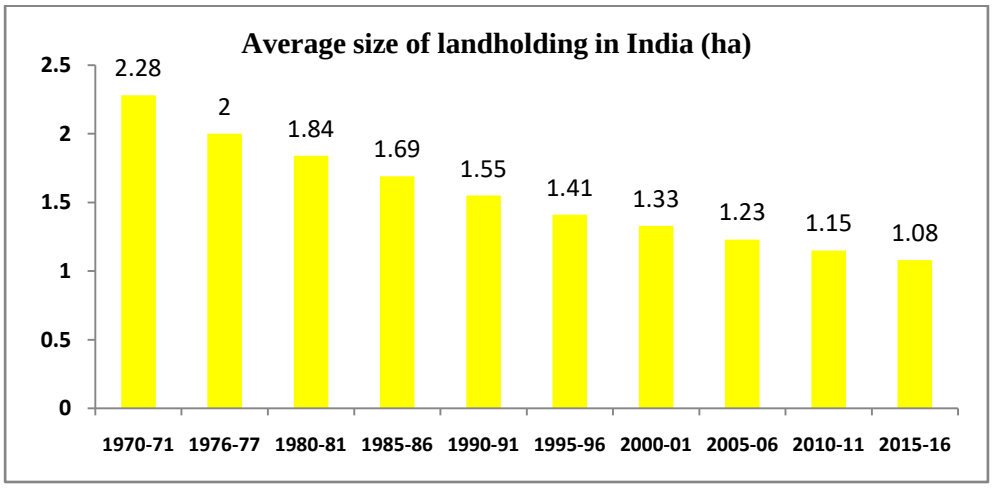
Figure 1.1: Total number of holdings and Total operated area in India



Source: Agricultural Census, 2015-16.

Allocation of land to non-agricultural purposes like industrial, commercial, residential or manufacturing uses has led to a reduction in the total operated area. On the other hand, the rise in population and inheritance of property has increased the number of holdings. As a result, the average landholding size in the country has been declining steadily over the years (Figure 1.2). With smaller land sizes, the cost of inputs increases but the marketable surplus reduces making agriculture an infeasible profession.

Figure 1.2: Decline in average landholding size in India



Source: Agriculture Census, 2015-16

The average size of holdings had shown a continuous decline over the entire Census periods from 1970-71 to 2015-16 (Figure 1.2). The average size of holding was 2.28 ha in 1970-71 which fell to 1.41 ha in 1995-96. In the recent Agriculture Census of 2015-16, it was found to be at 1.08 ha. These figures highlight the prevalence and increasing prominence of smallholder farmers in Indian agriculture more than ever before (Dev, 2012). The challenges and constraints faced by smallholder farmers across the globe are similar. In India, the major problems faced by small and marginal farmers are imperfect markets for both inputs and outputs resulting in lower incomes, inadequate and costly institutional credit, increasing indebtedness, lack of irrigation and costly access to it, lack of extension services for commercial crops, low levels of education and skills, exploitation in the marketing of their produce, lack of alternative sources of income, vulnerable to agricultural production risks, lack of economies of scale and expensive transportation costs. They lack updated market information on price fluctuations, demand and supply of products and have low bargaining power in the market resulting in low returns for their production (Bihari et al., 2019).

Numerous studies have suggested that smallholders could overcome such constraints if organised into collective action groups, such as cooperatives (Narrod et al., 2009;

Bernard & Spielman, 2009; Mojo et al., 2017). Collective action is the key to overcoming the shortcomings of unreliable and low production and enhancing producers' negotiating power in the value chain (Wymann von Dach et al., 2013). To meet the strict food quality and safety requirements, farmers need to become organised and strengthen internal and external relations with group members, service providers, and market chain actors.

By acting collectively, smallholder farmers can reduce transaction costs, access market information, obtain new technologies and improve market access (Barham & Chitemi, 2009; Kruijssen, 2009; Markelova et al., 2009; Bihari et al., 2019). Agriculture becomes even more difficult for small farmers in hilly regions. Therefore, the presence of effective farmer organisations and producer associations can be a major support to the commercialisation of agriculture even in hilly and mountain regions (Choudhary et al., 2015).

In India, efforts have been made to organise small-scale farmers into groups under formal institutions. The agricultural cooperative is the most important one among them. According to International Co-operative Alliance (ICA): "A Cooperative is a people-centred enterprise that is owned, controlled and run by and for its members to realise their common economic, social, and cultural needs and aspirations." Cooperatives have been generally considered as organisations playing significant socioeconomic roles, among others, by reducing transaction costs and improving the bargaining power of individuals in all sectors including agriculture (Bernard et al., 2008; Francesconi & Ruben, 2012). However, experience with agricultural co-operatives (ACs) has been unpleasant and more of a failure than a success across developing countries (Ebrahim, 2000). ACs are alleged to have led to exclusion of the poor, excessive government intervention and the promotion of differentiation instead

of equity in rural communities (Borda-Rodriguez et al., 2016). For instance, Ebrahim (2000) reported that agricultural cooperatives in Gujarat had increased agricultural production but at the cost of exploitation of many landless and migrant labourers. The second alternative is contract farming (introduced under the APMC Model Act, 2003). Under this arrangement, the farmers agree to grow selected crops which the contracting agri-business firm will buy after harvesting at a pre-determined price and time. The agri-business firm provides inputs and technical assistance to the farmers to produce crops that meet certain standards required by the firm. This system assures consistent buyers of their produce. Under this system, marketing risk is reduced as the price and quantity of sale are agreed upon in advance. However, contract farming has also been found to succumb to certain limitations. Contract farming arrangements, however, tend to exclude small producers (Hazell, 2011; Reardon et al., 2009; Singh, 2008) and in many instances have benefited the buyers at the expense of the producers (Hellin et al., 2009). Contract farming has a limited impact on small-farmer inclusion (Porter & Howard, 1997; Key & Runsten, 1999). Even farmers, sometimes, feel exploited as a result of several different quality requirements adopted by the contracting company (Dhillon, et al., 2006). Swain (2011) and Kumar (2006) found that contract farming excluded the small growers in Andhra Pradesh and Punjab, respectively. Crop rejection and payment delays were experienced by farmers as confirmed by Dev and Rao (2005). Also, the contracts were many times unwritten and informal which could be easily altered by the big retailers according to their interests. Many buyers of farm products prefer to work with farmer groups instead of individual farmers because the groups are better able to provide stable supplies of quality products. Since large farmers can supply large volumes and also incur lower transaction costs, contracting firms usually prefer to contract with large-scale growers,

excluding small growers from the contract (Kirsten & Sartorius, 2002). Innovations in alternative procurement technologies, such as the concept of the procurement shed[2] that emerged due to agri-food transformation have also been found to exclude small farmers with limited non-land assets (Reardon et al., 2009)

1.3 Farmer Producer Organisation (FPO)

And the third one is Farmer Producer Organisations (FPOs) which aggregate the farmers and endow them with increased bargaining power and protect them against exploitation by the corporate or the bureaucracy. The FPOs were introduced by the Government of India in 2002 by amending the Companies Act of 1956 (Government of India, 2013) to aggregate the primary producers to strengthen their bargaining power in the market by improving their economies of scale. FPOs are formed by a group of smallholder farmers who contribute individual shares to build the initial capital of the FPO. The farmers themselves are the equity holders and owners of the FPO. More and more farmers in India are being increasingly organised under these business-like entities called FPOs.

Becoming a member of an FPO provides them with the benefits of economies of scale, improved access to necessary inputs at reduced costs, higher prices for their output, better marketing facilities, access to credit, technical assistance and inclusion in value addition processes thereby enabling them to earn better prices. FPOs can protect small farmers from the ill effects of globalisation and also integrate them into modern competitive markets while benefitting from economies of scale (Pingali et al., 2005). Recent studies have shown that FPOs have been successful in minimising the costs and maximising the revenue for its members (Cherukuri & Reddy, 2014), increasing the net incomes by arranging better market access and improving bargaining power

[2] the area from which supermarket companies procure from the farmers.

(Kumari et al., 2021), reduce transaction costs for its members and awareness and utilisation of financial resources (Desai & Joshi, 2014) average monthly per capita expenditure and higher prices realisation (Roy et al., 2020). As a consequence, growing interest has been observed regarding the roles of producer organisations and collective action institutions aimed at reducing market inefficiencies and, subsequently, improving small farmers' conditions (Shiferaw et al., 2011).

Sikkim is a small mountainous state in the Northeast Region of India. Agriculture is the major source of livelihood in Sikkim as it employs around 66.3% of rural households (NSSO, 2019). According to Agricultural Census (2015-16), around 80 per cent of the farming community in Sikkim are marginal and small farmers. Marginal farmers (holding less than 1 hectare of land) comprise around 62 per cent of the total farmers while around 18 per cent of the farmers are small farmers (with less than 2 hectares of land). Agriculture, horticulture and animal husbandry constitute a major source of livelihood for the majority of Sikkim's population. Small-scale vegetable farming is profitable in hilly areas mainly because of lesser pest attacks, fewer plant diseases and a perennial water supply (Hellin et al., 2009). The fertile land, the topography and the climatic condition of the state largely support the cultivation of high-value crops like large cardamom, fruits & vegetables and exotic flowers. The cropping pattern of the State has over the years transformed from cereal-dominated subsistence agriculture to high-value, cash crop-dominated commercial agriculture. Maize, paddy, wheat, barley and buckwheat are the main cereals and potato, ginger, cardamom and mandarin are the major commercial/horticultural crops grown in the state. In the year 2016, Sikkim was declared the first fully organic state in India and also in the world after all 76 thousand hectares of agricultural land were certified organic (FAO, 2018). However, this sudden shift to organic farming and the complete

ban on chemical inputs has resulted in a drastic decline in the production and productivity of crops, pest attacks and diseases (Das & Bhattacharya, 2018). Also, the lack of marketing arrangements for organic produce has deprived farmers of earning higher prices despite their products being organic making agriculture an even more uneconomical business. Such dominance of smallholder farmers coupled with geographical constraints and a low level of agricultural development necessitates an appropriate institutional framework like the Farmer Producer Organisation (FPO) that has the most solutions for small farmers.

In 2017, 28 FPOs were registered in Sikkim to organise farmers throughout the state. These FPOs registered recently in Sikkim have shown uneven growth among themselves across four districts. To the best of our knowledge, there exists no study assessing the impact of FPO membership in the state of Sikkim and also measuring the efficiencies of these individual FPOs. This study attempts to assess the impact of FPO membership on the farmers in the state. It will also apply efficiency analysis to the individual FPOs. Thus, efficiency analysis will indicate the long-term viability of the FPO since the growth and competitiveness of each FPO depend on its efficiency. In this study, we propose to address this gap and show that organising small farmers under farmer organisations can significantly improve their position.

1.4 Statement of the Problem

Millions of small subsistence farmers in Asia and Africa produce most of the food consumed in the world on small plots of land. Small farmers face similar production and marketing problems at all levels. The low scale of operations in input and output markets weakens their bargaining position. Lack of information leaves them vulnerable to exploitation by middlemen. Limited access to markets combined with their inability to invest in advanced types of equipment, place small farmers in a

disadvantaged position. Entry of supermarkets and giant retail chains into the food production and marketing domain in developing countries has further aggravated the situation. Small farmers cannot meet the demand for high-value foods that satisfy international safety and quality standards. Despite being the actual producers of food, they receive a smaller proportion of the final value of sales than the middlemen who trade in food.

In India, the majority of the farming community is small and marginal farmers. They face numerous constraints and challenges at all levels because of their small landholdings. As a result, agriculture is becoming non-profitable. Moreover, agriculture in hilly states is even more difficult. Collectivisation has been considered an effective instrument for uplifting small and marginal farmers. While agricultural cooperative societies in India have been subject to excessive government intervention, contract farming systems deal only with large farmers. A new form of farmer organisation called Farmer Producer Organisation (FPO) was introduced in 2002 as recommended by the YK Alagh Committee. Farmer Producer Organisations or Farmer Producer Companies (FPCs) having the mixed characteristics of traditional cooperatives and private enterprises were introduced as an alternative farmer organisation in India. These have generally had a positive impact, as the aggregation of farmers benefits them with several incentives, including economies of scope and scale.

In Sikkim, almost 80 per cent of the farming community is comprised of small and marginal farmers dependent on agriculture for their livelihoods. For collectivising farmers, Farmer Producer Organisations (FPOs) have been registered in 2017. Despite the potential of FPOs in improving farmers' condition and encouragement from the

Government, not all farmers are joining these organisations. Of around 930 lakh farmers in India, only 1.5 percent of them (14.7 lakh) in 28 states and 4 Union Territories have become members of 4442 FPOs (TCI, 2022). Research in this direction will make it possible to understand the underlying reasons. There is also a need for a proper impact assessment research on FPOs in the North-East states. This would enable policymakers to estimate and understand the economic impact that FPOs have on the farmer members. The study proposes to examine the impacts that FPOs have on farming in the hilly North-Eastern state of Sikkim and to make appropriate recommendations to all concerned stakeholders. The findings of the proposed study will provide basic information to institutions interested in promoting farmer collectives.

1.5 Research Questions

1. What are the socio-economic conditions of FPO members and non-members?
2. What are the factors affecting farmers' decisions to participate in the FPOs?
3. Does FPO membership have any economic impact on members' net returns, returns on investment and profit margin?
4. Are the FPOs uniforms in their efficiency levels? Which FPOs are the most efficient and inefficient ones?

1.6 Research Objectives

1. To examine the socio-economic condition of members of FPOs and non-members in Sikkim.
2. To identify and analyse the determinants of FPO membership in Sikkim.
3. To assess the economic impact of FPO membership on member farmers.
4. To estimate the efficiency of FPOs and identify the efficient and inefficient FPOs.

1.7 Data and methodology

1.7.1 Study area

Sikkim is a small hilly state in the northeastern part of India. It extends from 27º5' to 20º9' North latitude and 87º59' to 88º56' East longitude and shares borders with Bhutan in the east, China on the North, Nepal on the west and the Darjeeling Hills in the south. Kanchenjunga, the highest peak in India and the third highest peak in the world is in Sikkim. The landscape varies from mountains to plains within a few kilometres. It has five agro-climatic zones: alpine and trans-Himalayan zones (4,000–5,500 m), temperate zone (2,500–4,000 m), subtropical to warm temperate zones (600–2,500 m) and subtropical zones (300–1,700 m) (Sharma et al., 2016a) offering a favourable condition for growing a wide range of agricultural, horticultural and floriculture products.

There are four districts in Sikkim: East, West, North and South. The total population of Sikkim is 6 lakhs out of which 74.85 per cent live in rural areas and more than 88 per cent of the rural population relies on the agriculture sector (NSSO, 2019). Cereals, vegetables, fruits, pulses/beans, oilseeds, spices and roots are grown locally. Sikkim is the largest producer of large cardamom and contributes around 88% to the national production. High-value flowers are also grown and exported. Sikkim was declared the first 'fully' organic state of India in 2016 after all of its farmland was certified organic combined with a total ban on the sale and use of chemical fertilizers and pesticides (FAO, 2018). This study selected Sikkim as the area of study because:

i. Agriculture is the major source of livelihood for majority of the population. However, only around 11% of the total area is available for agriculture in the state. Such large dependence of population on limited

land for agriculture demands significant improvement in efficiency in agriculture in Sikkim.

ii. All 28 FPOs in Sikkim deal only in organic items. Since most of the FPOs in the country deal with both organic and non-organic items, this study of organic FPOs will uniquely contribute to the literature on the role and performance of organic FPOs.

Therefore, Sikkim will provide a good example to conduct research on the impact and efficiency of FPOs and serve as good reference for development of FPOs in other Himalayan and Northeast states in particular and in other states of India in general.

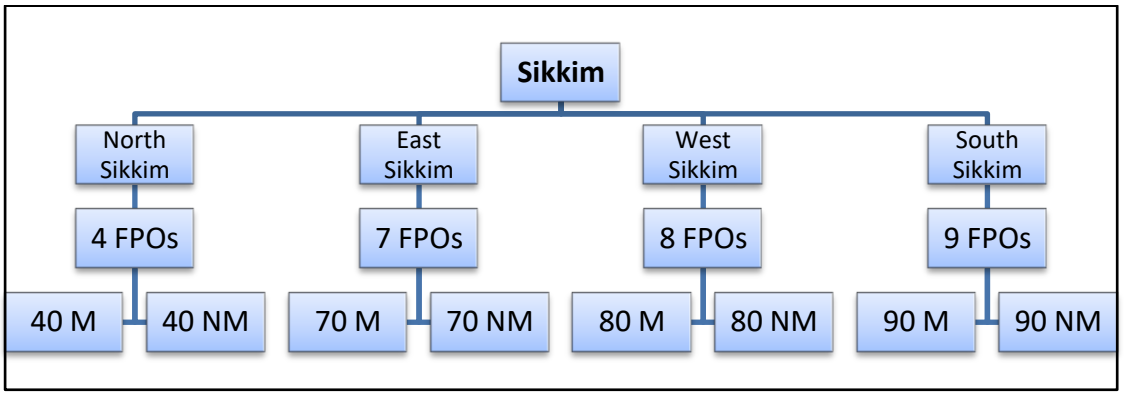
1.7.2 Data Source, sampling technique and sample Design

The study is mainly based on primary data and also makes use of secondary data. The primary data was collected in two parts:

(i) For the first three objectives i.e., to analyse the socio-economic conditions of FPO members and non-members, identify the determinants of FPO membership and to assess the economic impact of FPO membership on farmers, a household survey was conducted using a pre-structured interview schedule. According to the list of FPOs released by Small Farmers' Agricultural Consortium (SFAC), 28 FPOs currently exist in all the four districts of Sikkim. All 28 FPOs were selected for the study.

A multi-stage sampling technique was used to draw an appropriate sample for this study (Figure 1.3).

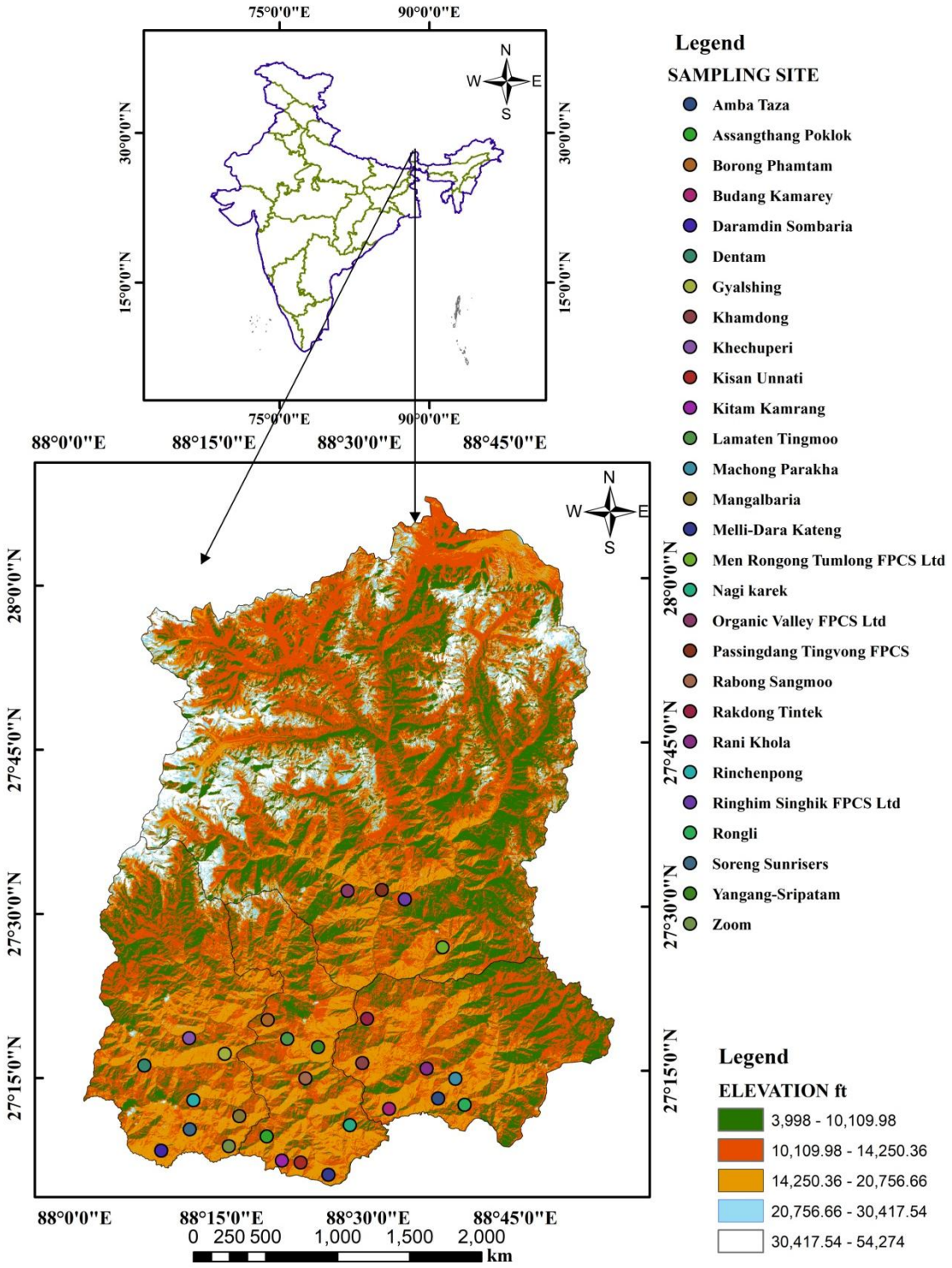
Figure 1.3: Sample Design



Note: M = FPO members; NM = non-members

In the first stage, all 28 FPOs located across four districts of Sikkim i.e. North, South, East and West were selected. In the second stage, from each FPO, 10 members were selected randomly. Also, equal number of individual farmers from the same area (who were not members of any FPO) were selected randomly and interviewed. Thus, a total of 560 farmers (280 members and 280 non-members) were selected and interviewed between November 2019 and August 2020. Interactions with Board of Directors and Chief Executive Officers of FPOs were also conducted. They were asked about the formation, functioning, performance, challenges and opportunities of the FPOs. These group discussion responses were later used to substantiate the household survey results. The secondary data was collected from journals, FPO policy documents, government reports and Ministry of Agriculture websites. Figure 1.3 shows the selection procedure of the FPOs and corresponding sample respondents. Figure 1.4 presents a map of Sikkim showing the study area and location of all 28 FPOs.

Figure 1.4: Map of the Sample Study Area



Source: Created by Authors using QGIS 3.22.10

(ii) For the fourth objective i.e. estimation of efficiency of FPOs, the secondary data was collected from the Annual Audit reports maintained by all FPOs. Regulations of Sikkim Cooperative Societies Act, 1978 requires that every society or a cooperative society or an FPO registered under this Act must conduct financial audit of its business annually by the department auditor appointed by the Registrar or by a certified auditor approved by the registrar. Since most of the FPOs had been unable to conduct audit for the financial years 2020-21 and 2021-22 due to worldwide lockdown imposed to contain the corona virus, the latest audit reports completed by all FPOs was for the financial year 2019-20. Therefore, this study used data collected from annual audit reports of each FPO for the financial year 2019-20. All FPOs registered under Sikkim Cooperative Societies Act must conduct annual audit. Sikkim has a total of 28 FPOs currently active. Out of these 28 FPOs, only 26 FPOs could provide us with their Annual Audit Reports while information from the remaining two could not be retrieved despite repeated requests. On examination of the audit reports, it was found that 6 FPOs had reported losses for the year 2019-20. Thus, these 6 loss-making FPOs were also excluded and the remaining 20 FPOs were finalised for analysis.The selected FPOs deal in many organic products like fruits and vegetables, spices and other non-food agricultural produce like brooms. They are located in all four districts of the state.

(iii) The secondary data and information was collected from secondary sources such as Annual Audit Reports of each FPO, Ministry of Agriculture and Farmers' Welfare, Government of India, literature published by various Government/Non-Government agencies, Small Farmers Agribusiness Consortium (SFAC) and National Bank for Agricultural Development (NABARD) websites, Food Security & Agriculture Development Department and Cooperation Department, Government of Sikkim,

Census of India, statistical database IndiaStat and Economic and Political Weekly Research Foundation (EPWRF).

1.7.3 Methods of Analysis

Appropriate empirical method has been chosen based on the objectives of the study. These methods are explained below briefly which are then discussed elaborately in their respective chapters.

(i) Comparison of socio-economic conditions of FPO Members and Non-members

Appropriate descriptive statistics such as t-test, chi-square test, frequency table, percentage scores, mean scores and standard deviations have been used.

(ii) Identifying determinants of FPO membership

Our second objective is to identify the determinants of FPO membership. FPOs do not select the members; rather the farmers themselves choose whether to join or not based on their socio-economic characteristics (Kumar et al., 2011). A probit model will be used to identify the factors that influence farmers' decision to join FPOs. Probit regression analysis is a multivariate technique which allows for estimating the probability that an event occurs or not, by predicting a binary dependent outcome from a set of explanatory variables. The choice of explanatory variables is guided by the previous empirical literatures which are discussed elaborately in the Section 6.5 of Chapter 6.

(iii) Analysing the economic impact of FPO membership

Our objective is to estimate impacts of FPO membership on Net returns, Return on Investment (RoI) and Profit margin. If FPO membership was assigned randomly to the agricultural households (like a randomized experiment), we could evaluate the causal effect of FPO membership on the variables of interest by differencing the mean of these variables between the members and non-members (Heckman et al., 1998). But

we cannot do that because FPO membership is not random. Since we are interested in estimating the impact of membership on FPO members, we want to estimate the average treatment effect on the treated (ATT). Also, members and non-members differ in several observable characteristics like age, gender, education and land size. Therefore, a simple comparison of these two groups will produce biased estimates (Caliendo & Kopeinig, 2008). Propensity Score Matching (PSM) is the commonly used method to overcome this selection bias (Chagwiza et al., 2016). Therefore, to analyse the impact of FPO membership on members, our study used PSM technique. Previous studies have widely used this technique for impact assessment of policies or interventions. For example, it has been used by Francesconi & Heerink (2011), Getnet and Anullo (2012), Mojo et al. (2015) and Ahmed and Mesfin (2017) for evaluating the impact of cooperative membership on various desired outcome variables.

(iv) Estimating efficiencies of individual FPOs

To measure the extent of technical, pure technical and scale efficiencies of individual FPOs we have used Data Envelopment Analysis (DEA) methodology. It is a nonparametric method used to empirically measure productive efficiency of decision making units (DMUs). DEA gives us relative efficiencies and does not give us absolute efficiencies. DMUs (here, FPOs) perform similar set of operations.

In this methodological framework, technical, pure technical, and scale efficiency scores for individual FPOs shall be obtained by employing two popular DEA models, namely, CCR[3] and BCC[4] models, involving only the conventional inputs and outputs. Thus, we can find the most efficient FPOs whose good operation practices can be

[3]CCR model is named after its developers Charnes, Cooper and Rhodes (1978), and is based on the assumption of constant returns to scale.

[4] BCC model is named after its developers Banker, Charnes and Cooper (1984), and is based on the assumption of variable returns to scale.

emulated by other inefficient FPOS and also identify inefficient FPOs that need special attention for improvement. We calculate Technical efficiency (TE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE). Efficiency scores of 20 FPOs are obtained using the computer program DEAP version 2.1 described in Coelli (1996).

1.8 Organisation of the Study

This thesis has been divided into 9 chapters.

Chapter 1: Introduction

This chapter presents an overview of recent developments in the food and agriculture sector against the background of constraints faced by small and marginal farmers. It also introduces institutional interventions to strengthen farmers and then introduces the need for Farmer Producer Organisations. It outlines the statement of the problem, research objectives and research questions along with data and methodology of the study.

Chapter 2: Conceptual Framework and Review of Literature

This chapter provides an overview of theoretical and conceptual frameworks of the research and a comprehensive review of literature. A research gap is also drawn consequent to the review of literature.

Chapter 3: Economy of Sikkim: An Overview

The first part of this chapter discusses about the general economy of Sikkim. The second part presents a detailed description of the agricultural economy of Sikkim.

Chapter 4: Status of FPOs in India and Sikkim

This chapter, using secondary information from NABARD and SFAC, makes a detailed discussion about the distribution of FPOs farmers across Indian states and

Northeast Region. Using data collected from the field, it also discusses the current progress and performance of 28 FPOs in Sikkim.

Chapter 5: Socio-economic status of FPO members and non-members in Sikkim

This chapter discusses and compares the socio-economic conditions of FPO members and non-members in Sikkim. It makes detailed description of demographic profile of the farmers, socio-economic status of the respondents and access to basic amenities.

Chapter 6: Determinants of Membership in Farmer Producer Organisation (FPOs) in Sikkim

This chapter identifies the determinants of FPO membership using a Probit model.

Chapter 7: Impact of Membership in Farmer Producer Organisations (FPOs) in Sikkim

This chapter assesses the impact of FPO membership on members' Net Returns, RoI and profit margin using PSM technique.

Chapter 8: Efficiency Evaluation of Farmer Producer Organisations (FPOs) in Sikkim

This chapter uses a non-parametric technique Data Envelopment Analysis to identify and classify the efficient and inefficient FPOs in Sikkim. It outlines the description of the methodology used followed by identification of efficient and inefficient FPOs.

Chapter 9: Conclusions and Policy Recommendations

This chapter summarises the main findings of the study. It provides implications of this study and also makes policy suggestions that need to be taken up. Limitations of the study are also listed.

CHAPTER 2

THEORETICAL FRAMEWORK & REVIEW OF LITERATURE

2.1 Theoretical Framework

This chapter discusses the existing theories that support the arguments of this thesis and show that the research is based on well-established ideas. A theoretical framework justifies and contextualises the research. In other words, it provides a lens or a perspective through which we will focus our attention on the gap and shortcomings. Since the problem we have in hand can be addressed in so many different ways, a theoretical framework is needed to place the focus of our study. In the following sections, we discuss three major theories relevant to farmer organisations and attempt to see our research through the perspective of these theories. They are the New Institutional Economics (NIE), the Transaction Cost Approach (TCA) and the Collective Action Theory. These theories have explained why small farmers must come together under some form of institution to collectively overcome the numerous challenges they face. By working together, they can lower the costs involved in conducting all transactions.

2.1.1 The New Institutional Economics (NIE)

The term "New Institutional Economics" was coined by Williamson in 1975. While old institutional economics argued that economic behaviour was explained and determined by institutions, they lacked rigorous quantitative analysis and clear theoretical framework making it difficult for generalisation in policy making. Thus, to differentiate it, the term NIE was coined. Unlike Neoclassical economics, the NIE acknowledged the significant role of institutions. The NIE has relaxed some of the unrealistic assumptions of

neoclassical economics such as perfect information, absence of transaction costs and full rationality. However, it has retained the assumption that an individual attempts to maximise his self-interest or objective subject to constraints. Additionally, this framework has included institutions as an additional constraint to the existing ones. Furthermore, while neoclassical economics prefers economic theory without institutions, the NIE attempts to promote economics with both theory and institutions. Thus, the NIE aims (a) to explain the determinants of institutions and evolution over time and (b) to evaluate the impact on economic performance, efficiency and distribution (Nabli & Nugent, 1989). It is important to note that institutions and economic growth have bidirectional causality between them. For instance, institutions have a significant impact on growth while economic growth and development often lead to changes in institutions. On the other hand, expansion in international trade and globalisation makes it quite necessary for institutions to adapt to new food safety and quality requirements and certifications. However, it is to be noted that changes in institutions do not always imply economic growth. It can have negative impacts too. Therefore, we see the evolution of different types of institutions in different regions defining distinct paths of economic development.

What is an institution?

An institution is a set of formal (laws, contracts, political systems, agreements, markets, etc.) and informal rules of conduct (norms, traditions, customs, value systems, religions, sociological trends etc.) that facilitate coordination or govern relationships between individuals and groups. Institutions ensure more certainty and predictability of human behaviour and interactions (North, 1990) which becomes unpredictable in absence of

such institutions. Since institutions influence our behaviour and interactions, they also influence outcomes of interest like economic performance, efficiency and economic growth and development.

The theory of NIE operates at two levels- micro and macro. The macro level deals with the institutional environment or the rules of conduct that affect the behaviour of economic agents and also governs the form of organisation and transactions. On the other hand, the micro level of analysis which is also referred to as institutional arrangement implies the ways and methods (markets, quasi-markets and contracts) through which transactions are conducted and managed. Our concern here is specifically related to the individual transaction and organisational forms (vertical and horizontal integration) involved. An institutional arrangement means an arrangement between economic units or organisations that governs how its members can cooperate and/or compete (Kherallah & Kirsten, 2002). Therefore, this institutional arrangement could be the nearest meaning of institution.

2.1.1.1 The NIE in farmer organisations

In developing countries, the cost of transacting in all markets (capital, labour or product) is high (North, 2000). Since the cost of interacting and transacting is high in these countries, the high transaction costs result in a poor economy. Therefore, it becomes very pertinent to understand the reason behind such high transaction costs in these countries, especially in the agriculture sector. To understand this, we first need to have an institutional analysis as institutions and institutional frameworks provide the incentives for efficient production and people's engagement in economic activity. Thus, it cannot be explained by neoclassical economics and requires institutional analysis. It is to be noted

that many institutions existing in developed countries and facilitating market exchange are absent in developing countries. Therefore, the NIE can be a useful framework that will help us to determine the type of institutions to improve economic performance in developing countries. This framework can be more relevant against the background of rapid changes in the food and agricultural sector in developing countries in the post-market liberalisation period.

2.1.1.2 Why is coordination required?

After market liberalisation, developing countries have seen the emergence of a new producer and a new consumer. Broadly, changes in agriculture in these countries can be attributed to the following developments among many others:

(i) Consumers in developed countries have seen new lifestyles, demographic shifts and increasing concern for health and diet. This has led to changes in eating patterns and food purchases.

(ii) Besides more choices and variety of foods, they also are now increasingly demanding quality, consistency and value. In response to this, food production has shifted from what farmers used to produce to what consumer want. And this shift has been largely supported by improvements in biotechnology and information technology.

(iii) Much importance is being given to food safety which is more relevant in the case of perishable food products like fruits and vegetables. Around 50 per cent of agricultural exports from developing countries are perishable commodities. Therefore, it demands the need for large investments to control its perishability which small producers cannot afford.

(iv) Besides these factors, other major driving factors for changes in agriculture are increased competition from global market participants, and economies of size.

However, the failure of traditional markets to handle and adapt to these changes necessitates the need for increased coordination among the producer and different institutions. Thus, there arises the need for different forms of vertical integration and alliances.

Consumers, now, demand tailored food and to ensure they get what they want, companies involved in the food business demand specific farm products that meet certain requirements. In this way, processors or food companies avoid traditional markets and engage directly with farmers through contract farming or vertical integration channels. Consequently, only a few capital-rich and skilled will be able to participate in this marketing channel thereby excluding small producers. The food quality and safety requirements act as barriers to small producers' market participation. Nevertheless, even under this adverse environment, small producers have the scope of playing important roles. They can create a space for themselves through product differentiation. In fact, for survival, in the long run, they can exploit external economies of scale through vertical integration, clustering and coordination. This can be done either by creating linkages of the small producers with bigger enterprises that have already overcome these major barriers or by aggregation of small producers to tide over these barriers collectively. In this context, the NIE can inform agribusiness on the most appropriate organisational form or the alternative institutional form that could minimise transaction costs.

2.1.2 Transaction Cost Approach (TCA)

The Transaction cost Approach was pioneered by Ronald Coase. In his article, The Nature of Firm (1937), he argued that any market or economic exchange involves transaction costs. The costs incurred while conducting any transaction in the market (buying or selling) are referred to as transaction costs. Major examples of transaction costs include labour costs, transportation costs, broker fees, bank charges, commissions, etc. Broadly, transaction costs can be divided into three categories: information costs, negotiation & enforcement costs and monitoring costs (North, 1990). For individual primary producers, information costs will be more if they have to spend more energy and time searching for information about the right buyer who is ready to offer the best price. In other words, small farmers face high costs in searching for the best market for both inputs and outputs. Similarly, negotiation costs for individual farmers will be high if there is a delay in payment. This will result in low bargaining power requiring them to passively accept whatever price is paid. Small farmers face high negotiation costs means costs incurred to come to acceptable terms. The enforcement cost is also quite high for small farmers because individually they are incapable of ensuring that the buyers agree and comply with the agreed price, quantity and other parameters. In short, the transaction cost economics paradigm highlights different types of costs (besides production costs) involved in facilitating an economic exchange of goods acceptable and beneficial to both parties.

According to North (2000), the evolution or emergence of institutions is important for facilitating low transaction costs in exchanges which will ultimately result in higher economic growth and are thus desirable in an economy. He also mentions the importance

of the government's role in specifying property rights and enforcing contracts, both of which reduce transaction costs. In the agricultural sector of developing countries, smallholder farmers which form the majority of the farming community, face numerous transaction costs. Further, these countries see the frequent occurrence of market failures and incomplete markets necessitating the emergence of institutional arrangements that will enable these small producers to overcome the high transaction costs. FPOs are one such form of institutional arrangement that can support farmers in many ways.

Therefore, the shift from wholesale spot markets towards farmers' collectives might be a response to changes in consumers' preferences. Increasing preference of consumers for quality, fresh and safe food products motivates retailers and food companies to deal only with organised farmer groups who can provide a consistent supply of quality food products. Under such circumstances, resource-poor small producers are excluded as dealing with numerous individual farmers will mean higher transaction costs for the companies.

While selling through traditional marketing channels, economic transactions are majorly governed by price, whereas in the case of collective selling under farmer organisations, one can find long-term institutional arrangements between producers and buyers (Peterson et al., 2001). Institutional arrangement (here, FPOs) integrates the farmers vertically into the markets offering them the opportunity to produce and sell value-added products (Reardon & Berdegue, 2002). Thus, through aggregation, small producers not only earn premium prices but also enjoy the scope to capture a greater share of the total price paid by end consumers as farmers themselves participate in more activities of the supply chain than just being confined to production. Thus, the emergence of farmer

organisations in developing countries has been recognized as a potential institutional arrangement to overcome the high transaction costs they would have faced individually (Reardon et al., 2009) and would have prevented them from market participation.

2.1.3 Theory of Collective Action

Collective action has been defined as: “action taken by a group (either directly or on its behalf through an organisation) in pursuit of members’ perceived shared interest” (Marshall, 1988). It refers to a group of people taking social or political action to achieve a common goal. It occurs when many people work together to achieve some common objective. Typically, a group of disadvantaged people will come together to solve their common problem or meet a common goal. Therefore the primary objective of collective action is to promote the collective interest of individuals. Thus, recognizing that individuals have shared or common interest is the first step. Then, the homogeneity of the group is also an important factor in collective action as it promotes space for lesser conflicts.

The concept of collective action has been widely used to describe and analyze the management of certain natural resources, such as forests, fisheries, irrigation systems and also farmer organisations (Ostrom, 1990). By contrast, in theory, a group of farmers could maintain more diversity than any individual can, and at a lower cost and reduced probability of loss. Therefore, there should be clear incentives for individual farmers to cooperate and contribute to the group. Individual farmers may rely on the collective for building and maintaining networks that allow them to manage and reduce the transaction costs associated with production, value-addition and marketing of agricultural produce. The existence of collective action would depend on its providing certain advantages over

farmers working individually. These could include lower transaction costs or reduced risk. However, people participate in collective action only if they perceive that the collective action will be effective. If they perceive it to be not effective they prefer not to join.

Collective action theory was first published by Mancur Olson in 1965 in the book The Logic of Collective Action. However, collective action problem arises when individuals often fail to work together to achieve some common good. The problem arises from the fact that while each member has a shared common goal with every other member in the group, each will also have some conflicting interests not common to others. Each member will have an individual interest which is different from the interest of other members. Therefore, if an individual perceives that his/her participation in the collective action is going to have more costs then he /she will refrain from participating in it. On the other hand, if he/she perceives that they can get benefitted without any contribution they will tend to free ride. Also as the group size increases, managing and coordination become difficult. The problems of collective action were popularized by the American political economist Mancur Olson coercion or some other device is necessary for guiding a group of individuals to act collectively towards their common interest. In large groups, where managing and coordination become difficult, these problems of collective action can be solved through the use of selective incentives which include a reward for the ones who actively participate and penalties for those who do not contribute to the group. But awarding of such incentives too first requires identification of those who actively participate and who do not. This process of identification itself can be an extra burden on the organization.

Individuals will not contribute to a collective action if the extra benefits they receive are lesser than the costs they incur while contributing to the group. But this argument is context-specific. For example, richer members perceive a certain cost to be lower while for the poorer members, the same cost will be relatively more expensive.

2.2 Review of Literature

This section discusses existing studies related to farmer organisations in India and around the world. Using elaborate discussion of several studies helps us to identify research gaps, contradictions in previous studies, formulation of research questions and objectives and relevant methodologies in research. This section has discussed literature related to FPOs in India, problems faced by Small Farmers, determinants of membership in farmer organisations, impact of membership in farmer organisations and efficiency of farmer organisations.

2.2.1. Producer Organisations

Producer Organisations (POs) are formalised form of collective action. They enable farmers to access the market by providing necessary services (marketing services, financial services, technology services). These organisations contribute to poverty reduction and food security (Hellin et al., 2009). According to Singh (2008)**,** POs are aggregations of small farmers created to benefit from economies of scale. They amplify the political voice of the farmers, reduce transaction costs, engage farmers in value addition activities, enable farmers to share services (like storage, transportation, knowledge) and make collective decisions. FPCs are hybrids between traditional cooperatives societies and private companies aiming to combine good principles of cooperatives with efficient business practices of private companies. They aim to

aggregate the farmers and link them to modern supply chains by improving their bargaining position, reducing transaction costs and benefitting from economies of scale. Producer companies are owned and governed by farmers, financially supported by the government or donor agencies and administered by professionals (Trebbin & Hassler, 2012).

Farmer organizations are 'self-managed' associations of farmers formed voluntarily to fulfill their economic and cultural interests which are owned and managed by the farmers themselves. Thus, in terms of management, they differ from traditional cooperatives that are run by the government department. These organizations can take many forms namely, mutual aid parties, special interest clubs, and primary cooperative societies (Bratton, 1986).

2.2.2 Farmer Producer Organisations (FPOs) in India

A review of recent studies related to FPOs in India has been carried out. Singh (2008) has discussed the evolution of Producer Companies from traditional cooperatives. Though FPCs are growing in numbers across the country, they are facing several problems as they are a new form of cooperatives. Firstly, they lack adequate recognition and support from the state and central governments. Secondly, they are incapable of mobilizing capital directly from the market disabling them from expanding their business by undertaking their own value-addition and marketing activities. This study has made suggestions like exempting FPCs from taxes, designating organic FPCs as certifying agencies and extension of investments from state governments.

Trebbin (2014) has advocated the appropriateness of FPOs as a new form of institution that will enable farmers to participate in the competitive and globalised food market. Like

other developing countries, India also saw a rise in modern food retail companies and supermarkets in the early 2000s. Thus, the modernization of food retail resulted in tighter food quality requirements posing greater challenges for small farmers and putting them in an unfavourable bargaining position in the supply chain. Therefore, the study has found very few cases of successful linkage between FPOs and modern retail chains due to a lack of targeted support for FPOs. Similarly, Nikam et al. (2019) have studied FPOs as innovative institutions for uplifting small farmers. FPOs generally support them by clearly identifying and expressing the demand, providing all necessary services, conducting capacity-building activities and creating access to finance. Sharma (2013) states that globalization has presented both problems as well as the potential for FPOs to emerge and grow into sustainable business entities. Citing the constraints faced by small farmers, he advocates that FPOs are the new innovative institutional framework that can uplift the small farmers that are already in a disadvantaged position owing to structural problems like small operational holdings, fragmented marketing channels and exclusion from contract farming. However, FPOs too face some risks and constraints. FPOs require 3 to 5 years to become self-reliant, and face the risk of being influenced by political elites and the managers are farmers themselves who lack any formal technical training in managing an organisation.

According to Shah (2016), Farmer Producer Companies (FPCs) do not face the same constraints that traditional cooperatives had faced. Yet, they are not able to grow into viable institutions. The problem lies in the logic of founding these FPCs. The focus was made more on the formation of these FPOs and the mobilization of a maximum number of farmers. Not much attention was given to finding the markets for their products. Instead

of first identifying remunerative markets for the FPCs, FPC formation was done first. As a result, when the farmers came together as an FPC later, they could not do business and thus could not grow as viable business entities. Most of the FPCs in India today are the result of support and handholding by government agencies and NGOs. The focus has been mostly on the formation of FPCs only. Besides much other regional and structural specificity, these FPCs face the problem of a lack of design principles. Successful dairy cooperatives are quoted as examples of institutions based on design principles. In response to this argument of Shah (2016), Ganesh (2016) responds by stating that the former's comparison of dairy cooperatives and FPCs dealing with agriculture is misplaced. Describing dairy cooperatives as successful examples of design principles cannot be compared to FPCs that deal in agriculture and are more prone to risks.

Bhanot et al. (2021) have studied the role of FPCs and contract farming as institutional innovations in agricultural marketing. The majority of Indian farmers are small and marginal farmers facing several constraints owing to smaller landholdings and a low volume of inputs and outputs. The problem becomes even worse in the case of perishable crops like tomatoes. This paper attempts to understand the effect of such institutional innovations on the likelihood of distress selling by farmers. The results found that these alternate marketing channels alleviate the likelihood of distress selling. Likewise, Singh et al. (2018) have compared the FPO-led marketing system and the conventional models and investigated the efficacy and sustainability of FPO models in Gujarat and Punjab, India. They have found that linking farmers with formal value networks through FPOs seems ineffective for new entrants in the business. Also, the sustainability of an FPO depended on the institutional support that formed and later supported. In a similar study, Krishnan et

al. (2021) have analysed and explained how collaborative efforts among stakeholders in the supply chain result in different innovations and also on sustainability. FPOs provide valuable information to farmers through various media that help them to plan their cultivation. Information related to land size, expected harvest time and quantity are also collected and recorded by FPOs enabling them to find the right buyers. Secondly, FPOs procure only from registered members. Thus, the problem of over or underestimation of supply is eliminated. Also, the arrangement of training for farmers helps in improving production. Thirdly, instead of selling agricultural products in raw form, FPOs encourage farmers to undertake primary processing of the products and improve the value of the products. Fourthly, FPOs update customers about product delivery through WhatsApp groups. Fifthly, FPOs also undertake the disposal of agricultural wastes by converting them into animal feed or bio-fertilisers.

Using data from 120 households and 2 Farmer Producer Companies (FPCs) in West Bengal Das and Mandal (2021) examined the current status of FPCs in the state, investigated the factors that determine the farmers' participation in FPCs and whether the members benefitted from participation. They found that the FPC members realised better income, easy access to inputs and better linkages with markets as well as financial institutions. Members were even motivated to cultivate high-value cash crops like vegetables, flowers and fruits. The success of FPOs depends on the performance of managers, availability of working capital, value-addition and market linkages. In a similar study, Joshi and Choudhary (2018) have studied FPOs in different agro-climatic sub-regions of Chhattisgarh in India to understand the operational modalities and challenges in the functioning of the FPOs. This study also discussed the farmers' awareness and

perception of the FPOs. For examining impact, a ranking of perceived impact has been done to examine social empowerment. FPOs have the potential of creating a link between smallholders and modern input and output markets by providing several forms of assistance. Besides achieving economies of scale through bulk selling and buying of farmers' inputs and outputs, FPOs support farmers with lower transaction costs, technical guidance in production and the development of social capital.

In an empirical case study of Sahyadri Farmers Producer Company Ltd (SFPCL) in Maharashtra, Lalitha et al. (2022) discuss the role of FPOs in improving farm income and economic benefits of farmers. They have also highlighted the numerous institutional and structural constraints that affect the FPOs' performance, finally hampering the empowerment and well-being of the farmers. In an another study, Mukherjee et al. (2019) have identified different factors influencing the growth and constraints of FPCs covering different aspects viz. technical factors, organisational, economic, infrastructural, and marketing. Dynamic leadership was found to be the most important growth-promoting factor while inadequate working capital during the initial years was the major constraint faced by FPOs. Similarly, Trivedi et al. (2022) analysed the current business model of FPOs to understand the socio-economic consequences for individual members of 10 FPOs from Uttar Pradesh, India. Aggregation under FPOs enhanced the bargaining power of small farmers and also improved their access to new techniques resulting in a positive socio-economic impact on their lives. However, difficulty in accessing financial assistance from banks remained a major challenge. The study also outlines suggestions to enhance the sustainability of FPOs.

Using a mixed-method approach, Mourya and Mehta (2021) have discussed the potential of FPOs in realising some of the SDGs (no poverty, end hunger, sustainable and inclusive economic growth, etc). Some of these SDGs are directly related to agriculture where a major portion of the country's workforce depends for livelihood. Thus, the betterment of this sector will uplift the lives of millions of small and marginal farmers engaged in it. FPOs as collectives of farmers hold the potential to do this by improving agricultural productivity and incomes of farmers. It also examines the member's perception of the roles farmer producer companies (FPCs) play in their lives and livelihood. Moreover, FPOs also face constraints like the working capital problem, lack of trained staff, financial instability etc. Kakati and Roy (2021) have assessed the financial performance of 83 FPCs in India from 2013– 2014 to 2018–2019. The liquidity and solvency positions of the FPCs were found to be at satisfactory levels while the efficiency and profitability positions were not up to the mark. Almost one-third of the FPCs were incurring losses in 2018–2019. Among the selected FPCs, Howrah Agro Producer Company from West Bengal was found to be the best performing.

Recognizing the gap between the rising importance of FPOs/FPCs and the lack of a consolidated dataset on FPOs across India, Govil et al. (2020) have attempted to provide a comprehensive and authoritative dataset/document that can form a base for all future research and discussions on FPCs/FPOs. It shows the growth of FPOs over the years, their geographical spread, investments in these organisations, their activity profile, etc. This document also draws qualitative insights into how these organisations are managed, members' sense of ownership as well as the textured relationships that the members have with their organisations.

2.2.3 Problems faced by Small Farmers

Agricultural marketing can be defined as the commercial functions involved in transferring agricultural produce from the producer (farmer) to the consumer. Agricultural marketing also reflects another dimension from the supply of produce from rural to rural and rural to urban and from rural to industrial consumers.

The market for agricultural commodities suffers from various problems that act as barriers to small farmers and put them in a disadvantaged position compared to large farmers. Various studies have identified these complications.

Barham & Chitemi (2009) found that lack of market access is the major obstacle faced by small farmers. Especially in rural areas, they are often unaware of the information regarding the prices of their products in urban areas. Thus, market intermediaries and middlemen possessing such information buy small farmers' produce at farm gate prices (Svensson & Yanagizawa, 2009)**.** Also, smaller quantities of their agricultural products leave them with lower bargaining power against the traders and thus tend to accept even minimal prices for their produce (Robbins et al., 2004). In case of excess production, the perishable nature of some crops (e.g. tomatoes) forces farmers to sell at any price otherwise they might lose the ripe produce. Also, high transport and transaction costs for farmers and traders (in terms of searching, negotiating and enforcing contracts), poor information flows and weak bargaining power are the main problems that hinder small farmers in rural areas from accessing the market (Lyon, 2003)**.**

In a study about the supermarket revolution in Asia, Reardon et al. (2012) found that even supermarkets and wholesalers prefer to procure from large farmers who can supply large volumes of horticulture products regularly. In Asia and developing regions, lack of access

to credit, inputs, insurance and markets and also low levels of education, infrastructure, irrigation facilities and crop-specific knowledge are the major problems faced by small farmers. Not only in procurement of products but even for extending loans, large farmers are preferred to smaller ones. Assessing the creditworthiness of individual small farmers is a tedious and costly job for financial institutions. Thus, they prefer to extend loans to large farmers as compared to small farmers.

Interestingly, small farmers produce mostly fresh products (eggs, meat, fruits and vegetables) because they can conduct labour-intensive production on smaller areas of land and earn more per unit of land as compared to basic grains. Supporting this view, Joshi et al. (2006) found that the majority of farmers producing horticultural crops are smallholders whose marketable surpluses are usually small. Consequently, they face high transportation and transaction costs in marketing mainly because their agricultural products are perishable (Pingali et al., 2005).

Many institutional regulations tend to exclude small farmers from the market. For example, Joseph (2014) reports that an e-auction system was introduced in Kerala's cardamom market to help cardamom growers get better prices. But it required the farmers to possess a cardamom certificate and payment was made only after 14 days. These regulations put the small farmers in a disadvantageous position and excluded them from the market. According to Banerji and Meenakshi (2004)**,** buyers of wheat in wholesale markets of Northern India form collusion to put bidding right in their favour. The market committee designs the rules of the regulated market requiring the farmers to compulsorily pay commissions on the value of purchases. Similarly, Gulati (2009) reports that a commission agent can legally earn 6-10% commission for just a five-minute-long

auctioning at Delhi's Azadpur Market while in Mumbai's Vashi Market, around 8-15% commission can be earned. These kinds of provisions have supported middlemen a lot in the exploitation of primary producers in India. In India, processed foods yield more value than fresh ones. Aneja and Balachandran (2009) have observed in their study that in India, on average when tomatoes are sold at the price of Rs. 3 per kg, after processing and value addition tomato ketchup produced out of the same tomatoes are sold for around Rs. 70 per kg. Fruits and vegetable growers in India receive less than 20 per cent of the price paid by the consumers. This has led to the earning of very low income by the actual producer of the agricultural produce whereas middlemen and processing industries take the lion's share of the final value. Chand et al. (2011) observe that farmers receive only a small share of the actual value paid by the final consumers. For a long time, middlemen have been manipulating marketing policies to profit themselves by exploiting the farmers. Though the APMC Act contributed to the improvement of the agricultural market in many aspects, middlemen and traders eventually regained their dominance in the agricultural market. Agrawal (2000) reported that small farmers are excluded from the market. Weak bargaining power and lower holding capacity force small farmers to receive lower prices compared to large farmers. Major concerns for smallholders in India's modern agricultural market are price and production risks. Nevertheless, policy and market instruments necessary to address these issues have been introduced. However, their implementation and effectiveness have often been weak.

In traditional supply chains, buyers are separated from producers via the often lengthy, intermediate trading chains. Moreover, small farmers' inability to afford storage facilities and the perishable nature of agricultural commodities force them to stock lesser quantities

to avoid losses (Ruteri & Xu, 2009). Additionally, low-scale production, poor post-harvest handling as well as the inability of small farmers to aggregate and add value to their products reduce their bargaining power (Gyau et al., 2012). Not only that, market imperfections and low volume of supply combined with strict procurement requirements and lack of required capital lead to exclusion of farmers (Emongor & Kirsten, 2006; Gyau et al., 2016) from the supply chain. As a result, they are forced to sell in the traditional market where they face price fluctuation risks. Indian farmers are connected to consumers through several supply chains. The oldest among them is the Agricultural Produce Marketing Committee (APMC) where the farmers sell their produce to the traders at local mandis. And these products are again sold to other traders and later to wholesalers and retailers. But the farmers were found to be exploited by the traders and they received a very minimal percentage of the final price the consumers paid for their produce.

It is a widely accepted fact that the cost of credit is generally higher for smallholder farmers. While large farmers have access to commercial banks and other formal lending institutions, small farmers are often denied access to commercial banks because they are illiterate, lack collateral, have insecure titles to land or maybe because they are perceived to be less creditworthy for many other reasons. Therefore, difficulty in accessing credit from formal institutions forces them to depend on informal sources such as moneylenders, merchants and shopkeepers, traders and landlords where interest rates will be exorbitant. Sometimes, middlemen also lend on the condition that the harvest will be sold to them only (Griffin et al., 2003).

Even though the repayment record of small farmers around the world is quite impressive, formal lending institutions consider the overhead costs of advancing small loans and thus

prefer advancing loans mostly to larger farmers. The consequence is that lack of access to adequate, timely and cheaper credit hinders small farmers from making productive investments in agriculture that could have generated additional income (Berhanu et al., 2021) for them.

In geographically adverse regions like the hill and mountain states of India, the low density of the population is an important characteristic. As a result, the distance between the lending institutions or banks and the farmers is higher implying higher transportation costs and time. Also, poor road infrastructure and communication infrastructure further worsen the situation. Therefore, it offers few opportunities for economies of scale.

Formation of farmer organisations is one way to overcome these constraints because it reduces the number of intermediaries who enjoy a major share of the price paid by the final buyers leaving the actual producers with a smaller share. Consequently, farmers enjoy economies of scale in both input and output markets and also improved access to markets with reduced transaction costs. Also, dealing with a group of farmers rather than with several individual farmers is more convenient and entails lower transaction costs for financial institutions. In South Africa, smallholder farmers face challenges in accessing agricultural production inputs like seeds and fertilisers and also accessing markets (Alene et al., 2008).

2.2.4 Determinants of FPO Membership

Even though membership in Farmer Producer Organisations results in several benefits, not all small farmers are found joining these FPOs. What are the factors that influence their decision to join the FPOs? This section reviews existing studies that have identified some of the factors determining membership in FPOs in different contexts and periods.

Cechin et al. (2013) have shown that as farm size increases, the chances of farmers joining collective action decrease. Since large farmers are generally better off in terms of bargaining power and access to markets, membership in farmer organisations will not have a significant impact on them. On the other hand, such cooperation will benefit smaller farmers significantly. Mojo et al. (2017) report that age, education level, land size, family size, participation in social networks, land property and accessibility to cooperatives are major variables that influence farmers' participation in cooperatives. Similar results have been found by Adong et al. (2013) who emphasize that education is a very important factor in influencing a farmer's decision to join the group. Based on a survey among smallholders in Zimbabwe in 2001-2002, Masakure and Henson (2005) found four factors (i.e. market uncertainty, indirect benefits like knowledge acquisitions, better income, and intangible benefits like status) that motivated them to contract with an export company. Fischer and Qaim (2014) also reported that decision to join farmer organisations is also influenced by the number of crops grown, cultivated area and participation in other social groups. The expectation of lower transaction costs from cooperative membership is another factor influencing a farmer's decision to join the group (Leathers, 2006). Higher output prices, smaller farm sizes and lower transaction costs also motivated cashew farmers in Benin to join the cooperatives (Mensah et al. 2012). In Tamil Nadu, mango farmers considered education, economic benefits and area under mango cultivation as the major factors influencing their decision to join the producer organisation Tamil Nadu Mango Growers' Federation (Parthiban et al., 2015).

For small farmers in Ghana, age, farm size, access to credit, access to machinery services and income were the major determinants influencing their decision to join Farmer-Based

Organisations (Asante et al., 2011). They mentioned that the timely availability of credit and machinery will increase membership in FBOs. The probability of joining a Farmer-based Organisation increases with family size, educational level distance to market centres, participation in off-farm work and access to credit (Addai & Owusu, 2014). In a study about avocado farmers in Kenya, Gyau et al. (2016) found that age, education, gender and perceptions of knowledge and improved technology influence farmers' decision to participate in group activities while Kassa et al. (2017) found age, household size, extension service, income, land holding, proximity to the road and livestock ownership influencing banana farmers' decision to participate. Such problems or constraints can be overcome if farmers organise themselves into collective groups like FPOs (Narrod et al., 2009).

2.2.5 Impact of Farmer Producer Organisations

Usually, small farmers in developing countries are suggested to aggregate themselves because it is believed that aggregation of small farmers will endow them with positive benefits like increased production, more bargaining power, economies of scale, better prices, stable market and access to formal credit. However, in assessing the impact of these producer organisations on small farmers, we find both positive and negative results. It is empirically unclear whether these organisations have always delivered positive benefits or not. In many cases, even these producer organisations which were introduced to benefit the small farmers tend to exclude small farmers. Different studies offer differing views on the impact of these organisations. Some of them have found that these organisations benefit small farmers while others have found only the large farmers being benefitted.

In a study about the collective action of small farmers in rural Ghana, Lyon (2003) found that farmer groups affect poverty by increasing local incomes and money flows in the rural economy. These groups open networks and opportunities outside the community, increase rural employment and check rural-urban migration. Agricultural groups have been found to be more effective than conventional individual agricultural strategies in reducing rural poverty.

Direct buying and selling between organized retailers, food processors and farmers would free farmers from such exploitation (Gulati, 2009). When small farmers come together in groups, they gain more bargaining power against processors and retailers resulting in lesser transaction costs and better prices. With an increase in cooperative membership, transaction costs decrease for the members and increase for the non-members (Leathers, 2006). Using transaction cost theory, Bijman and Wollni (2009) argue that producer organisation (PO) can be used as appropriate governance for organizing the transactions between farmers and their customers. POs have organisational characteristics that help to reduce governance problems. Joseph et al. (2018) found that smallholder farmers in Nigeria joined cooperative societies only for access to credit and a higher standard of living as membership in co-operatives led to better access to information, higher income, output expansion, access to credit and improved market opportunities. In a study of 15 contract farming (CF) arrangements in China, Guo et al. (2015) found that farmers enter these contracts to obtain the following advantages: price stability, market access, and technical assistance to improve product quality. In Ethiopia, Abebaw and Haile (2013) found that membership in agricultural cooperatives increases the probability of adoption of agricultural technologies (improved seeds, fertilisers, pesticides, etc.) by small farmers.

In Thailand, cooperative membership benefitted potato farmers with lower input costs and improved bargaining power by linking them with the buyer companies (Ornberg, 2003). Alho (2015) found that the farmer members consider stable marketing channels and remunerative prices for their products as the main benefits of membership. The dairy cooperatives in Finland are required to collect the entire milk produced by the members. This facility reduces the transaction costs of searching for a market. Membership in the organisation was found to have a significant positive impact on income, employment, food security and social empowerment for the members in comparison to the non-members. Ahmed and Mesfin (2017) estimated the impact of agricultural cooperative membership by applying propensity score matching and endogenous switching regression methods. They found that agricultural cooperatives are effective in improving the well-being of the rural community.

In Uttarakhand and Kerala, membership in producer organisations provided the members with improved market access, increased marketable surplus and more bargaining power. As a result, members observed an increase in their net incomes as compared to non-members (Cherukuri & Reddy, 2014). Ishaq et al. (2016) found that members of milk marketing cooperatives in Punjab have realised increased farm income, more milk production, reared improved cattle breeds, got better access to veterinarian services and used more nutritious fodder as compared to non-members. Cooperative membership was found to benefit small and poor dairy farmers. Similarly, the organisation of female farmers into producer organisations in Gujarat had a modest impact on output and members' income (Desai & Joshi, 2014). Also, poor landless women with fewer schooling years were found to experience stronger effects of the programme. Interestingly, the type

of product also has some influence on the benefits of farmer organisations. For example, Hellin et al. (2009) reported that benefits of market access were higher for the vegetable sector which has higher transaction costs whereas much benefits were not observed for maize growers since transaction costs were quite low.

The lack of necessary resources, technology and skills suppresses the production quantity and quality for small farmers. However, in a study involving sesame seed farmers in eastern Chad, collective action provided training support which enhanced their production quantity, quality and profit (Orsi et al., 2017). Parthiban et al. (2015) have tried to examine whether membership in an FPO has reduced transaction costs for mango farmers of Tamil Nadu. Results show that for members mean transactional cost per hectare was found to be around two and half times less for inputs and three times less for output compared to non-members. Bernard and Spielman (2009) examined the Rural Producer Organisations in Sub-Saharan Africa to find whether they are inclusive in their membership and whether they can be used to benefit poorer households. The poorest of the poor are found to be excluded from membership in marketing cooperatives mainly because they are required to make a high financial contribution while the average return is low. Small farmers with limited income cannot afford to fulfil these financial requirements and thus get excluded. Finally, they present a trade-off model where RPOs can achieve either inclusive membership or economic performance. Pustovoitova (2011) has found that producer companies follow exclusive membership by allowing only land-owning agricultural producers as members. However, Mojo et al. (2015) did not find a unique impact of membership on members' economic performance and output. Rather it

delivered positive economic benefits to both (members and non-members), regardless of membership.

Abate et al. (2014) revealed that agricultural cooperative membership has a positive and significant impact on farmers' technical efficiency. It provides easier access to productive inputs and agricultural extension services and improves small farmers' technical efficiency. Cooperative membership reduced technical inefficiency at the mean by approximately 5 per cent.

A study by Addai et al. (2014) contradicts the general notion that farmers' collective action improves members' efficiency. Maize farmers in Ghana have observed no significant impact on the level of technical efficiency and yield of maize even after joining FBOs. Similarly, Hao et al. (2017) in their study about apple farmers in China, questioned the ability of Farmer Organisations in benefitting the farmers. Cooperative membership has a significantly positive effect on yields but has no significant effect on profits per unit area. After receiving training, members of the cooperatives tend to spend more on fertilisers and hired capital inflating their expenditure. By doing this, their yields definitely become higher than that of non-members, but the extra production is not sufficient to cover the extra input expenditure. This expansion in cost suppresses the profits of members and is not significantly higher than those of non-members. Consequently, members do not experience any significant rise in income even after membership.

Sugar cooperatives in Gujarat India have successfully increased agricultural production and delivered economic and social benefits to their members (Ebrahim, 2000). However,

in the process, local landless communities and migrant labourers have been exploited. As a result, there has been an increased differentiation of the peasantry in south Gujarat.

In Nepal, farmer members of farmer organisations had a lesser variety of crops than non-members and thus focussed on the production of fewer numbers of crops (Rana et al., 2007). This may be because farmer organisations mostly deal with a specific and pre-decided list of crops to achieve economies of scale. Through a field survey, Maharjan and Fradejas (2005) have found that cooperatives in the Philippines have improved production and marketing activities of pig-raisers. The cooperative members received higher production income than non-members. Moreover, their products were also found to be more competitive.

2.2.6 Efficiency of Farmer Organisations

To stay economically competitive in the globalized world, FPOs must continuously maintain and improve their efficiency. Efficiency indicates the long-term viability of the FPO as the growth and competitiveness of each FPO depend on its efficiency. Co-operatives that are not able to increase their efficiency will slowly be eliminated (Huang et al., 2013**).** An efficient FPO will minimize the input costs and maximize the output price for the members.

Ariyaratne et al. (1997) measured the technical, allocative, scale, and overall efficiencies of 89-grain marketing and supply cooperatives during 1988-1992 by applying a non-parametric method, and found that technical and allocative efficiency were lower than scale efficiency (SE). These cooperatives, therefore, need to improve the overall efficiency by increasing efficiencies of capital and labour, rather than scale efficiency. They find that larger cooperatives are more efficient, while small-sized cooperatives

respond to market opportunities quickly. Hailu et al. (2005) have found similar results. Applying a stochastic frontier approach, they measure the efficiency of fruit and vegetable marketing cooperatives in Canada finding that larger-sized fruits and vegetable marketing cooperatives are more cost-efficient. Using bootstrap-Data Envelopment Analysis (DEA), Huang et al. (2013) estimate technical, scale, and pure technical efficiencies (PTE) and also identify the key determinants of efficiencies for the agricultural marketing cooperatives in China. The empirical results suggest that pure technical inefficiency was the main source of technical inefficiency. Local economic development level, the entrepreneurial ability of managers and the human capital of members were found to have significant positive impacts on the efficiency of cooperatives while the size of financial leverage and the number of board members had a negative impact on pure technical efficiency.

Krasachat and Chimkul (2009) measure the efficiency of cooperatives and identify the determinants. The result is that cooperatives' asset size has a positive effect on PTE, whereas it has a negative impact on SE. Pure technical inefficiency contributes the most to the overall inefficiency of the cooperatives. Thus, training programs can be used to improve the technical inefficiencies of the members. Soboh et al. (2014) compared the functioning efficiency in cooperatives and investor-owned firms (IOFs) in the European dairy sector. Since cooperatives and IOFs differ in objectives, two different methods have been used. Using an input-oriented approach, IOFs were found to be more efficient whereas using an approach that was according to cooperatives' objectives showed that cooperatives were more efficient.

2.3 Research Gap

Research studies on a new form of farmer collective called Farmer Producer Organisations (FPOs) is emerging as a new area of study. Existing research on FPOs in India and particularly in North East India is scarce and incomplete. Having reviewed the available literature, we find very little empirical research on the economic impact of FPOs. Most of the studies have either focussed on the description of FPOs or have assessed the impact of FPOs based on the perceptions of the farmers.

Some studies were found estimating the efficiencies of agricultural cooperatives and comparing their efficiencies with private firms, but to the best of our knowledge, no study compares the relative efficiencies of two or more FPOs. The majority of the existing studies about farmer collectives focus on farmer cooperatives, contract farming and other forms. However, very few studies have shown particular interest in FPOs. Only very few studies have explored the effectiveness of this important policy intervention in North East India, although many such studies exist in other countries and other parts of India. Although many studies of FPOs are emerging lately, in general, only a few studies have focussed on empirical analysis of this problem, as most of them have concentrated on qualitative studies. Impact assessment and efficiency measurement of FPOs is a relevant and expanding area of research. There has been no study so far about the FPOs in North-East India and particularly in Sikkim, although this region grows several high-value crops like organic fruits and vegetables. The determinants and economic impact of FPO membership and the efficiency of individual FPOs in Sikkim have not been studied so far. The present study will try to fill these gaps. Hence, the study aims to identify factors that influence farmers' decisions to join FPOs, estimate the impact of FPO membership on

smallholder farmers and also estimate the efficiency of each FPO in Sikkim. Limited and very less information about the positive benefits of FPO membership may have been discouraging farmers from joining FPOs. This study will also attempt to address such gaps in understanding.

2.4 Conceptual Framework

This section attempts to summarise and illustrate the relationship between all concepts under the scope of the present study in an organised way. As a result, this particular section helps us focus on the main themes and the way they flow in the study finally bonding the whole study into a complete one. After identifying important variables and relationships among them from the theoretical and empirical literature, this section draws interrelationships between the important variables. It shows the relationship between different ideas and how they relate to each other and the research study. It outlines the process and direction of the whole study. This section provides a novel conceptual framework by identifying determinants of FPO membership, assessing its impact on farmers and finally estimating the efficiency levels of each DMU (FPO in our case) to identify the efficient and inefficient ones.

FPO is a model that aggregates primary producers to improve their bargaining power through economies of scale by aggregating farm produce and input demands. It aims to mobilise fragmented smallholder farmers of the Indian farming community into farmer groups owned by the members themselves to improve their production, productivity and profitability ultimately resulting in higher farm incomes.

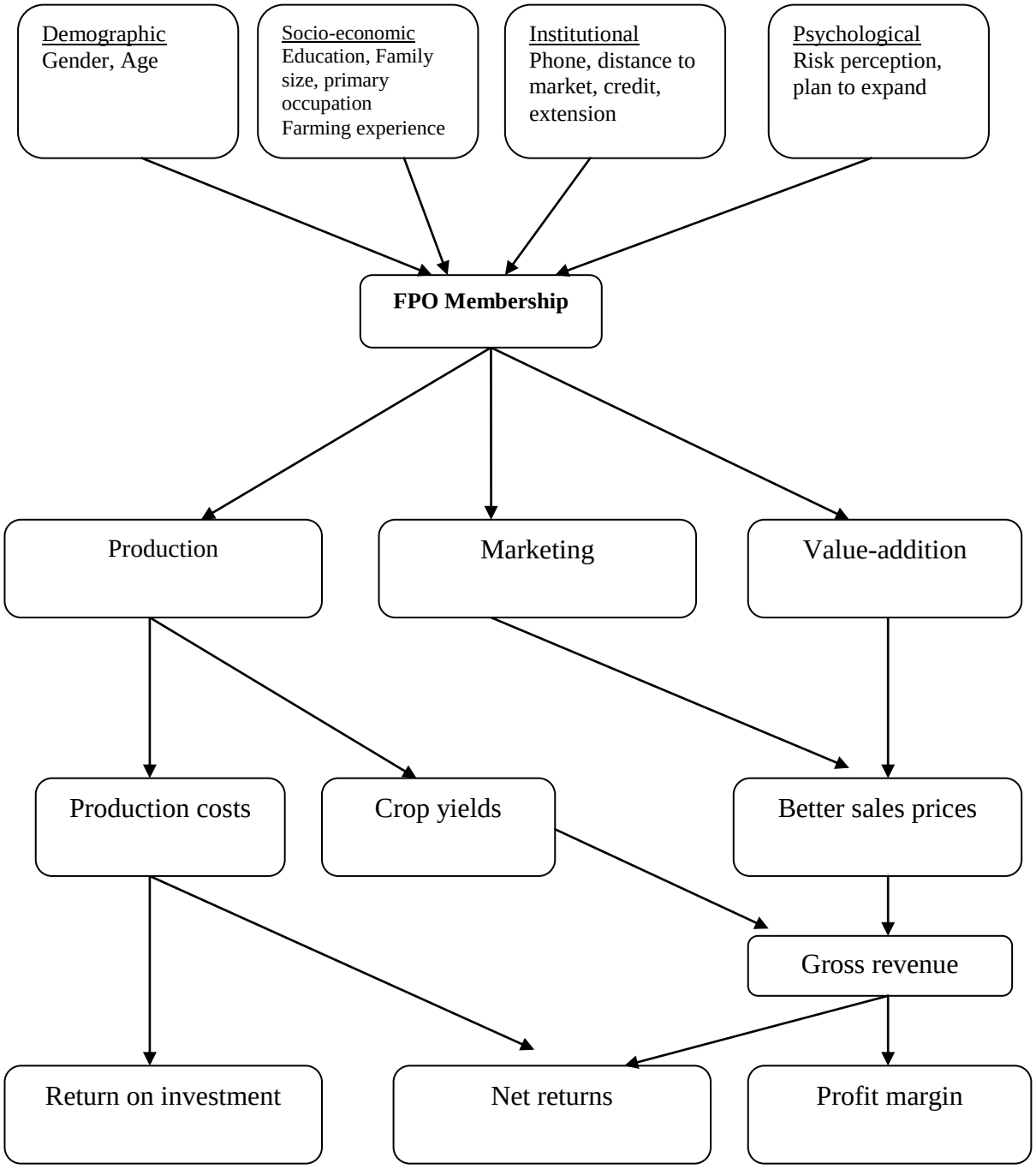
After considering theoretical arguments on the determinants of members' participation in farmer organisations or collective action, we focus on what factors motivate their

membership. FPOs practice open-membership to any primary producer who is willing to pay the initial individual share and membership fee. Since FPOs benefit from economies of scale; therefore, they do not restrict membership through any entry barrier to any willing primary producer who wishes to become a shareholder and is ready to pay the requisite share and registration fees. Therefore, FPOs practice open-membership and aim for wide membership.

Farmers consider expected benefits and costs to decide whether or not to join a collective action (here, FPOs). They are assumed to join farmer organisations only if the expected benefits exceed the expected costs after participation. But, empirical measurement of the expected costs and benefits of participation in collective action is difficult (Fischer & Qaim, 2014). Expected costs and benefits may be perceived differently by different households (Fischer & Qaim, 2012) as they depend on individual characteristics. For example, if a farmer resides very far from the market, he/she can benefit more from group marketing than the farmer residing nearer to town who has several marketing channels at lower transportation costs. Therefore, it can be inferred that perception and also the incidence of these costs and benefits depend on several household and farm-level characteristics (e.g. age, gender, land size, farming experience, phone ownership) and institutional factors (e.g. distance to the nearest town, credit access, extension services). Based on several recent empirical works of literature (Bernard et al., 2008; Bernard & Spielman, 2009; Abebaw & Haile, 2013), farmers' decision to join farmer organisations may be influenced, broadly, by demographic, socioeconomic, institutional and physical characteristics of the households.

Figure 2.1 summarises the direction of the research study. It begins with the identification of determinants of FPO membership and then illustrates different potential pathways of the economic impact of FPO membership on the farmers. It takes into account theoretical and empirical literature available on the membership decisions of farmers. This section broadly discusses these determining or influencing factors or determinants of membership. Socio-economic factors like education, gender or land size can influence expected costs and benefits and ultimately participation decisions of farmers. These factors are further specified, defined and discussed in detail in later chapters of this study. They are used as explanatory variables in the probit regression model to explain the membership decisions of farmers in FPOs in Sikkim. After the farmers become members of FPOs, their farm performance can be influenced by the FPOs through production, value addition and marketing (GoI, 2013). A simple framework of potential pathways is illustrated in the lower part of Figure 2.1.

Figure 2.1: A conceptual framework for assessing determinants and the impact of FPO membership on economic performance of farmers



Source: Author's design based on Review of Literature (2020)

Membership in FPOs can influence smallholder farmers' economic performance in terms of net returns, return on investment (RoI) and profit margin. This section discusses the different potential impact pathways through which FPO membership affects these indicators or outcomes. First, it shows that membership in a farmer organisation directly affects a smallholder farmer's production performance through many channels. Farmer organisations collectively purchase agricultural inputs like quality seeds, fertiliser, pesticides and other improved inputs at wholesale rates. Thus, aggregation of their demand smallholder not only enables the farmers to access inputs at better prices but also their transportation and transaction costs (like searching costs and information costs) are reduced. Whereas individual purchases would have incurred a higher cost of searching and transportation, collective purchasing of inputs reduces the unit cost for members. In this way, farmer organisations contribute towards cost reduction for member smallholder farmers, especially those living in remote hilly and mountainous regions that face high transaction costs in terms of market information searching costs, costs of negotiating with input suppliers, and contract enforcement costs. Thus, by bulk procuring and making agricultural inputs accessible to small farmers, farmer organisations use the opportunity of economies of scale and assist farmers in cutting down production costs and maximising profits. The study by Roy et al. (2020) has shown that FPOs in Bihar have successfully reduced input costs for farmers. In this study we have identified three pathways through which FPOs generally affect farmers' economic performance:

I. First pathway: FPOs improve farm income through improved production

Besides cutting down production costs, farmer organisations have been proven worldwide to be an effective pathway to increase crop yields by facilitating enhanced access to agricultural extension, credit, investment and improved technologies such as seeds, fertilisers, pesticides and farm machines (Zhang et al., 2020). Blekking et al. (2021) reported that membership in farmer cooperatives has increased yields of maize by around 50 per cent for members as compared to non-members. Cooperatives provide access to subsidised fertilisers and seeds promoting greater use of these inputs thereby resulting in substantial improvements in maize yields. In other words, such farmer organisations bridge the gap between farmers and agricultural inputs. Members enjoy lower costs of raw materials and technical services. For example, Kumar et al. (2011) showed that farmer organisations for dairy farmers in India facilitated the adoption of food safety practices resulting in increased milk yield and net returns per litre. Abate et al. (2014) reported that farmer organisations have a major role in enhancing the efficiency and productivity of farmers. In other words, FPOs not only supply agricultural inputs but also assist the farmers in using those inputs in an efficient manner that will increase their technical efficiency. They promote efficient utilisation of resources and efficiency of production (Zheng et al., 2012). The study for Bihar, India by Verma et al. (2019) reveals that membership in FPO increases the probability of adopting more technologies and Good Agricultural Practices (GAPs) by farmers which finally improves crop yields. Many FPOs in Bihar have formed a tie-up with the Indian Farmers Fertiliser Cooperative (IFFCO) to facilitate the availability of quality fertilisers to members at better prices (Roy et al., 2020). Manda et al. (2020) and Getnet and Anullo (2012) have

provided evidence showing that farmer organisations induce the adoption of improved seeds, fertilisers and crop production technologies in African countries. In Kenya, membership in farmer organisations facilitated collective access to the improved technology of tissue culture planting materials for small farmers which are expensive but are provided at lesser prices (Fischer & Qaim, 2012). Usage of such modern input technologies contributes towards the improvement of crop yields which ultimately enhances farm income and profitability of the small farmers.

II. Second pathway: FPOs improve prices through better marketing

Another important function of FPOs is enabling small farmers' access to remunerative markets. FPO membership influences sales prices by directly affecting smallholder farmers' marketing performance. Individual smallholder farmers cannot directly access buyers. They have to depend on a long chain of intermediaries who tend to exploit them due to their weak bargaining position. Smallholder farmers usually lack information on output markets. They incur higher transaction costs and get lower prices when selling individually. Even the institutional buyers of agricultural produce exclude small farmers because (i) it is easier for them to deal with a few large farmers instead of numerous small farmers, (ii) they have strict quality requirements in terms of the quality of inputs used as well as that of outputs produced which individual small farms often cannot comply with (Swinnen & Maertens, 2014; Trebbin, 2014). All these constraints make it difficult for small farmers to take advantage of market opportunities. Small farmers are constrained by their remote location, high transportation costs, information asymmetry and lack of business acumen. However, FPOs through collectivisation, aim to skip the middlemen and directly link the farmers to wholesalers with a better bargaining position.

Farmer organisations can solve the constraint of information asymmetry by providing them with timely and accurate marketing information. They aggregate the farm produce and with a larger volume resulting in improved economies of scale, can negotiate for optimal prices (Hellin et al., 2009). With aggregated produce, they can directly access buyers and remunerative markets. Thus, they skip the intermediaries and capture a higher share of the final price paid by the consumer. For example, Krishak Veej Kalyan FPO in Tripura facilitated the transportation of the first consignment of Queen variety of pineapple to New Delhi which was earlier disposed of within the state at lower prices (Nath, 2022). In another instance, the first consignment of jackfruit from Tripura was transported to the United Kingdom and the procurement from individual farmers was facilitated by an FPO in the Melaghar village of the state (Bhattacharjee, 2021). In India, grape marketing cooperatives aggregated the produce of farmers, reduced transaction costs and improved their bargaining position in the international market (Roy & Thorat, 2008) fetching them higher prices than before. In Vietnam, small tea farmers faced numerous challenges in accessing domestic and international markets. Farmer organisations have helped them connect to these markets by providing advisory information, guidance on meeting food safety and quality requirements and information on potential markets. They show that farmers who are members of farmer organisations were able to access markets better than non-members and received higher prices and earned higher average income (Vu et al., 2020).

Farmer organisations also play price-stabilising roles (Mojo et al., 2017) offering a fair price to coffee farmers in Ethiopia. In absence of such farmer organisations, traders and middlemen offered very low prices making coffee cultivation a loss-making business for

the farmers. Wollni and Zeller (2007) found that cooperatives of coffee farmers facilitated the participation of small-scale farmers in speciality markets where they get higher prices. Similarly, when green bean farmers in Kenya, Ethiopia and Zambia were organised into farmer groups, they could reach remunerative markets in Europe (Okello et al., 2007). Members of the dairy cooperative had better access to the market for selling milk (Kumar et al., 2011). They also realised higher prices for milk than on-members. Similarly, Fischer and Qaim (2012) found that marketing through group fetches 23 per cent higher price than selling individually bananas. Liu et al. (2019) agricultural cooperatives in China helped farmers in marketing and as a result improving their farm income and household income. Better prices ensured through FPOs directly determine gross revenue which in turn affects net returns and profit margin.

III Third Pathway: FPOs improve prices through value-addition

Demand for high-value products has increased instead of bulky primary commodities necessitating the need for value-addition and processing. A higher value of the final price can be captured by involving farmers in value-addition and processing activities in the groups. Several recent studies have shown evidence of farmer organisations assisting farmers in value-addition activities to fetch better prices. Kruijssen et al. (2007) showed that the processing of tropical fruit by women farmers' group in Thailand enabled them to enter high-value markets fetching them higher prices in Thailand. In India, FPOs helped organic chilli producers in aggregation, grading and packaging which enabled them to access remunerative markets in metropolitan cities. With the assistance of FPOs, farmers could earn shares ranging from 55 to 65 per cent in the consumer's rupee (Manaswi et al., 2020). Dairy cooperatives in Ethiopia process the milk into less perishable products like

cheese, yoghurt and other milk products reducing losses and ensuring more income (Fischer & Qaim, 2012). Okello et al. (2007) have found that smallholder green bean growers in Kenya, Ethiopia and Zambia have been able to meet stringent food quality standards of high-value European markets and find buyers there. Developed country markets can offer high value for food products but have to meet stringent food quality standards. There have been several protocols to be met like pesticide residue limits, field and packinghouse hygiene and traceability. Under such requirements, retailers in developing countries tend to exclude smallholder farmers. The organisation of farmers into groups enables them to acquire training and certification against food safety and quality requirements enabling them to participate in high-value markets.

CHAPTER 3

ECONOMY OF SIKKIM: AN OVERVIEW

3.1 Introduction

This chapter provides a profile of the economy of Sikkim, a tiny Himalayan state in Northeast India. It also makes a detailed discussion of the agricultural economy of Sikkim in an attempt to justify the need for the emergence of Farmer Producer Organisations (FPOs) in the state. The first part provides a brief insight into the Gross State Domestic Product (GSDP), Per capita GSDP and the contribution of each sector to the states' economy. It also makes a comprehensive discussion on population, decadal growth in population and also the composition of the urban and rural population in the state of Sikkim. It also further discusses workforce participation as well as the participation of the state's population in both farm and off-farm activities. In the next part, a detailed note of the agricultural situation in Sikkim is made. We discuss the operational landholding in terms of ownership, area and average size. It also provides extensive information on cropping patterns and trends in various food and cash crops. Through this discussion, an attempt has been made to show that the economy of Sikkim is predominantly agricultural where the majority of the farming community is composed of small and marginal farmers. Further, the decline in average landholding size is also making agriculture less profitable.

3.2. Economy of Sikkim

3.2.1 Sectoral composition of GSDP

Consistent with the general pattern of economic development, the contribution of agriculture to the net state domestic product for Sikkim declined continuously. The share of agriculture almost halved during the period (Table 3.1). However, a rise in the share of livestock to the NSDP led to an increase in the overall share of the primary sector from 14.22 per cent in 2000-01 to around 17.80 per cent in 2019-20.

Table 3.1: Gross State Domestic Product (GSDP) at Factor Cost, Sikkim (at constant price; 2011-12)

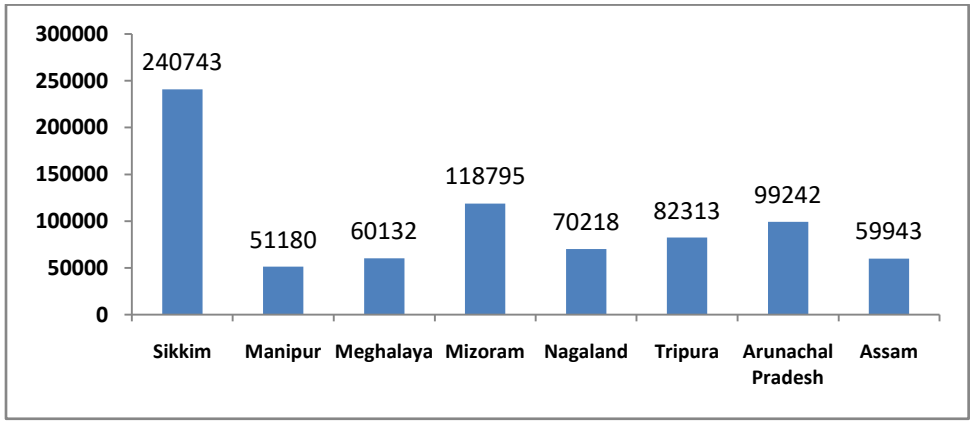
Year	2000-01	2004-05	2009-10	2014-15	2019-20
Primary sector	14.22	13.31	6.86	17.52	17.80
(i) Agriculture	12.29	11.86	6.29	6.24	6.67
(ii) Livestock	0.00	0.00	0.00	10.78	10.62
(iii) Forestry	1.81	1.34	0.50	0.40	0.41
(iv) Fishing	0.06	0.04	0.02	0.03	0.03
(v) Mining and Quarrying	0.07	0.07	0.05	0.08	0.06
Secondary sector	25.38	30.23	55.96	59.84	57.02
Tertiary sector	49.78	47.01	33.65	28.44	29.22
Net State Domestic Product (NSDP)(Rs Lakh)	239139	323630	783786	1143670	1677467
Per Capita NSDP (Rs.)	44951	57178	130197	180675	251494

Source: DESME, Government of Sikkim, Gangtok.

On the other hand, the contribution of the secondary sector witnessed a significant rise and it almost doubled during the period from around 25.38 per cent in 2000-01 to 57.02 per cent in 2019-20. From the Table 3.1, it can be observed that the share of the secondary sector saw a sharp rise between 2004-05 and 2009-10 from 30.23 per cent to 55.96 per cent respectively. According to a report by the Associated Chambers of Commerce and Industry of India, this growth was fuelled by the strong growth of the

state's industrial sector. For example, Sikkim introduced investor-friendly business policies with ease of doing business and tax incentives. Companies have also found costs for labour, power and manufacturing in the state to be lower and more attractive than other states. Moreover, the inclusion of Sikkim in the North East Industrial and Investment Policy, 2007 has presented a multitude of tax benefits. For instance, companies will be eligible for incentives for ten years or ten-year income tax holidays. The state has been offering complete exemptions on excise duties, income tax, a 30% subsidy on capital investment, an interest subsidy of 3 per cent on working capital loans and other exemptions. Therefore, it has attracted more than 15 major pharmaceutical companies to set up their operations in Sikkim. The state also has allowed independent hydro-power companies to set up around 29 hydropower plants in the state having the capacity to generate 5350 MW of electricity. However, the tertiary sector has seen a steady decline in its share during the period from around 50 per cent to 30 per cent.

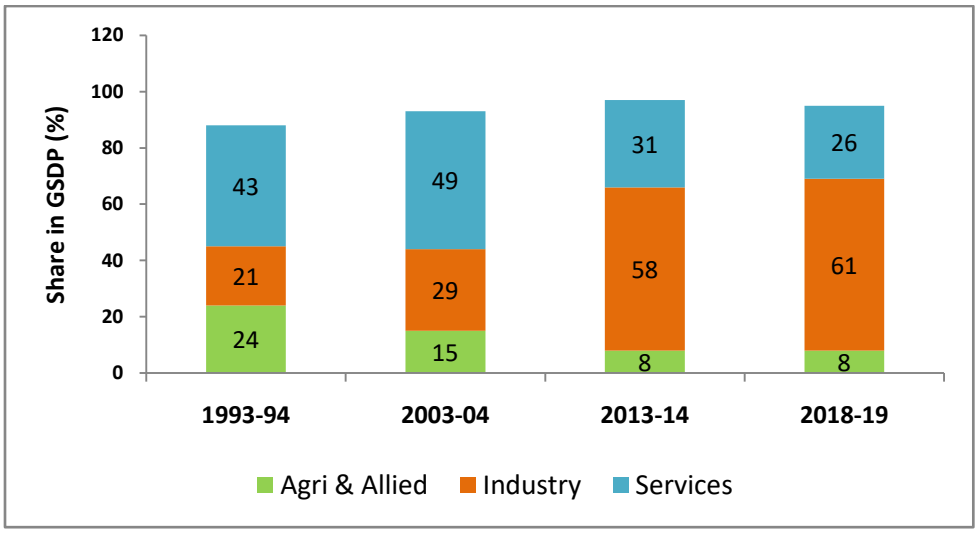
Figure 3.1: Per capita NSDP for Northeast states (Rs.) (2011-12 base year) (constant prices)



Source: National Statistical Office, Ministry of Statistics and Programme Implementation, Government of India.

Figure 3.1 illustrates that among the eight Northeastern states of India, Sikkim has the highest per capita income. This growth can be attributed to the significant growth of the industrial and tourism sector in the state coupled with a low population in recent years.

Figure 3.2: Sector-wise and year-wise distribution of GSDP, Sikkim (%)

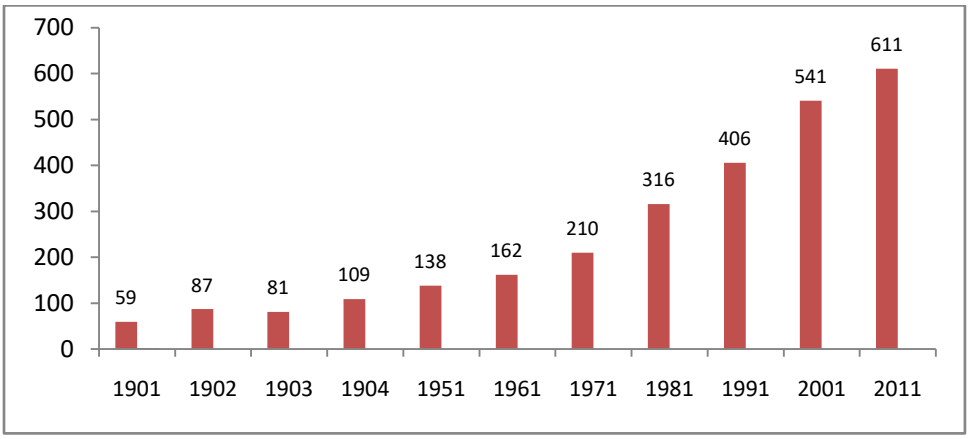


Source: EPWRF Database, 2022.

Figure 3.2 illustrates the sectoral contribution of three major sectors of an economy. The state's performance across sectors and over time shows the change in the economic structure of its economy. As an economy progresses and the GSDP increases, its economic activity shifts away from primary agricultural activities towards manufacturing and services activities. The economy of Sikkim has also followed the same distinct characteristic. It has been primarily agricultural, although in the recent years, services sector is slowly emerging as the dominant sector. During 1993-94, the share of the agriculture & allied sector was 24 per cent of the SDP while the secondary sector contributed only 21 per cent to the total SDP. The tertiary sector had the highest share in SDP. Over the years, the share of both primary and the tertiary sectors showed a

decreasing trend while that of only the secondary sector kept continuously rising. During the period 2003-04 and 2013-14, Sikkim's economy saw the strongest growth (double) of the industrial sector among the Northeast states from just 29 per cent to 58 per cent. During this period, only Sikkim and Meghalaya reported growth in industries while other Northeast states experienced a decline in industrial growth ("Sikkim sees strong", 2018). Therefore, it can be noted from Figure 3.2 that there has been a substantial shift in the sectoral contribution across sectors during the period under consideration. The share of the industrial sector has expanded over the years consequently compressing the share of primary and tertiary sectors. The share of the agriculture & allied sector has been sharply reduced by three-fold from 24 per cent in 1993-94 to a mere 8 per cent in 2018-19. However, the agriculture sector continues to support more than 75% population of the state directly or indirectly by employing more than 53% of the total workforce.

Figure 3.3: Population growth: Sikkim (1901-2011)

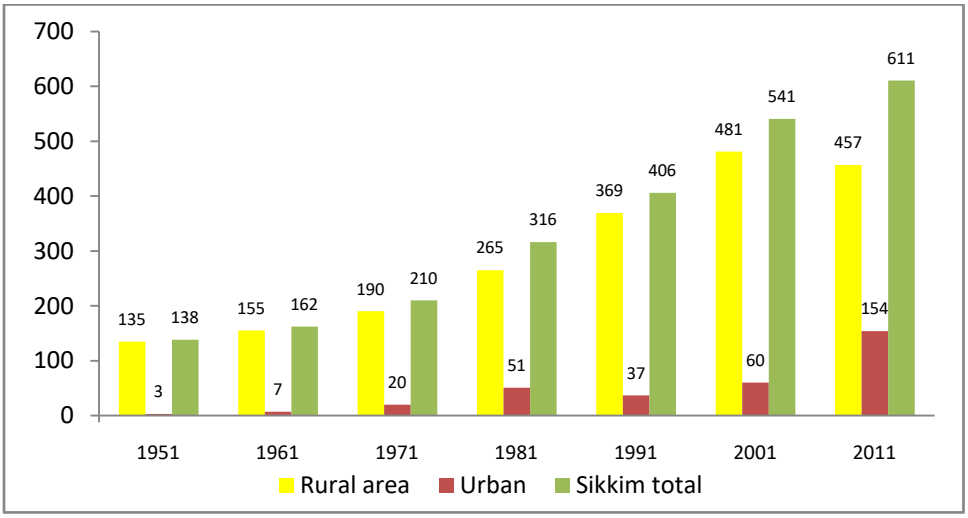


Source: Census of India, 2011.

In the first half of the century between 1901 and 1951, the growth of the population in Sikkim remained slow (Figure 3.3). But, after merging with India, Sikkim witnessed a sharp surge in development levels which attracted immigrants from other states leading to

a surge in its population. This sharply increasing trend can be observed after 1971. During the entire period, Sikkim's population rose by more than ten times.

Figure 3.4: Population in Urban and Rural areas of Sikkim ('000)

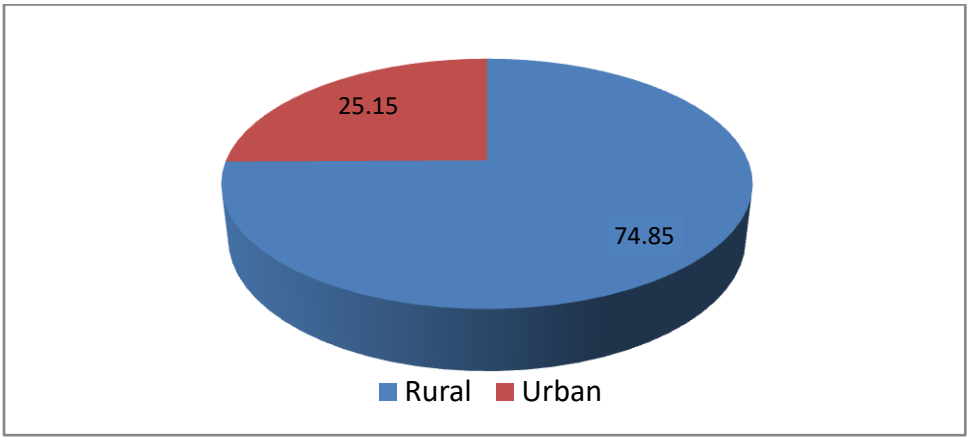


Source: Census of India, 2011.

Since 1951, the total population in the state has been always dominated by the rural population (Figure 3.4). The rural population continued to increase sharply as compared to the urban population and has always remained higher than the latter. Sikkim is the least populated state in India according to the Census of 2011. This thinly populated state had a total population of just 1.38 lakhs in 1951 which has been steadily rising and expanded to around 6.11 lakhs in 2011. Although there has been a sharp increase in urban population since the 1991 Census, this rise can be attributed to migration from rural areas and other states for better employment opportunities. The rural population has always remained higher than the urban population mainly because most of the area in the state is rural. Figure 3.5 illustrates the composition of the urban and rural populations in the total population of Sikkim in 2011. It shows that the vast majority (around 74.85 per cent) of

the total population continue to live in the rural areas of Sikkim. They are primarily dependent on agriculture and other allied activities for livelihood.

Figure 3.5: Share of Rural and Urban population in Sikkim, 2011 (%)



Source: Census of India, 2011

Table 3.2: Sikkim density of population (persons/square km)

	1951	1961	1971	1981	1991	2001	2011
Sikkim	19	23	30	45	57	76	86
All India	117	142	177	216	267	325	382

Source: Census of India (2011).

Since Sikkim is the second smallest state in India and the population has been steadily rising over the years, the population density in the state is also rising consistent with the trend at the all-India level. Higher rural population density is associated with smaller farm sizes and greater demand for inorganic fertiliser. Also, farm income per hectare decreases with the rise in rural population density.

Table 3.3: Percentage of population below the poverty line, Tendulkar methodology

	2004-05			2009-10			2011-12		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
Sikkim	31.80	25.90	30.90	15.50	5.00	13.10	9.90	3.70	8.20
All India	42.00	25.50	37.20	33.80	20.90	29.80	25.70	13.70	21.90

Source Agricultural Statistics at a Glance, 2014

Table 3.3 shows the percentage of urban and rural poor living below the poverty line (BPL) in Sikkim and India during the period 2004-05 to 2011-12. Sikkim has been ranked one of the top poverty-reducing states in India by the Planning commission. According to the Tendulkar methodology, 30.9 per cent of the total population in Sikkim was living below the poverty line in 2004-05. During the same period, around 31.8 per cent of the rural population and 25.9 per cent of the urban population were below the poverty line. The percentage of rural poor halved from 31.8 per cent in 2004-05 to around 15.5 per cent in 2009-10 while the share of urban poor had a huge reduction and thus sharply reduced by five times from 25.9 per cent in 2004-05 to just 5 per cent in 2009-10. These figures were further reduced in 2011-12 where the rural poor stood at 9.9 per cent while the proportion of urban poor came down to just 3.7 per cent. Throughout the period under consideration, the percentage of BPL households has remained significantly lower than all India figures owing to inclusive and equitable development programmes of the Central and the State government. During 2011-12, the percentage of BPL households was just 8.2 per cent of the total population in Sikkim mainly contributed by the rise in per capita income and the lowest percentage of urban poor in the country. It is evident from the Table 3.3 that rural poverty in Sikkim is still high and is around three times that in urban areas.

Table 3.4: Workforce in Sikkim, 2011

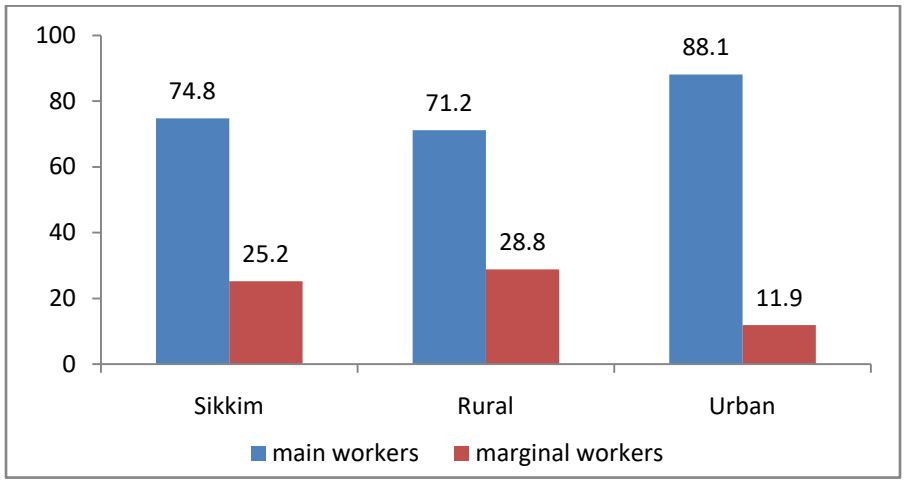
Area	Total population	Total workers	Main workers	Marginal workers	WPR	Main workers (%)	Marginal workers (%)
T	6,10,577	3,08,138	2,30,397	77,741	50.50	74.80	25.20
R	4,56,999	2,43,785	1,73,682	70,103	53.30	71.20	28.80
U	1,53,578	64,353	56,715	7,638	41.90	88.10	11.90

Source: Census of India, 2011.

T denotes Total; R denotes Rural and U denotes Urban

In 2011, Sikkim had an aggregate workforce of 3.08 lakhs amounting to approximately 50.46 per cent of the total population. In the state, around 2, 30,397 people worked around the year as main workers while around 77,741 worked part-time as marginal workers. Work participation rate of Sikkim (50.5) is the highest among the Northeast states (39.9) and also quite higher than all India WPR which is 33.2. Sikkim's workforce comprised 2, 43,785 workers in rural areas and only 64,353 workers in urban areas that accounted for 53.34 per cent and 41.9 per cent respectively.

Figure 3.6: Distribution of the Workforce into Rural and Urban Workforce in 2011



Source: Census of India, 2011.

The total workers in the state differ in terms of the amount of work they get. Figure 3.6 illustrates that the rural and urban areas differ substantially in terms of deployment of the workforce in the main and marginal workforce. At the state level, 74.8 per cent of the workforce is the main workers who work for most of the year while the remaining 25.2 per cent are marginal workers working part-time for less than 6 months in a year. It is interesting to note that around 88.1 per cent of the urban workforce gets work for most part of the year while only 71.2 per cent of the rural workforce is main workers. Consequently, the percentage of the rural workforce engaged as marginal workers is more than double their share in the urban workforce. This implies that a significant number of workers in rural areas are dependent on marginal work that provides livelihood for them for less than six months a year.

3.2.2 Distribution of workers into on-farm and off-farm workers

Following the classification of the Census, the workforce in Sikkim can also be divided into the on-farm sector and the off-farm sector. This analysis is useful given the fact that work profiles vary distinctly across the state.

Table 3.5: Distribution of workers into on-farm and off-farm workers

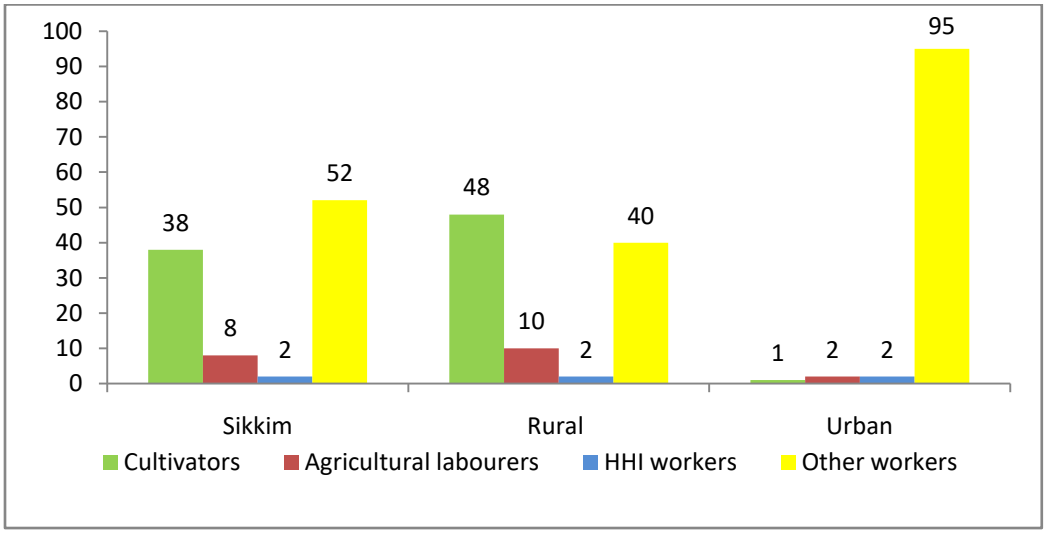
	Total workers	Cultivators	Agricultural labourers	HHI workers	Other workers
Sikkim	3,08,138	117401 (38)	25986 (8)	5,143 (2)	1,59,608 (52)
Rural	2,43,785	116532 (48)	24880 (10)	4,047 (2)	98,326 (40)
Urban	64,353	869 (1)	1106 (2)	1,096 (2)	61,282 (95)

Source: Census of India (2011).

It was found that a little less than half of the total workforce was found to be engaged in on-farm work with 117401 cultivators and 25986 agricultural labourers. On the other hand, while only 5143 workers were engaged in home-based productive work like artisanship, a huge number i.e. 159608 workers were engaged in other miscellaneous

works and services. Although for Sikkim, the number of cultivators was more than four times the number of agricultural labourers, this proportion varied widely across rural and urban areas. It indicates the presence of a low number of agricultural labourers in Sikkim owing to smaller sizes of land which are usually tilled and cultivated by the family labour with the occasional assistance of labour under the *parma*[1] system. Also, since most of the cultivators practise agriculture for subsistence rather than for market sale, the necessity and number of agricultural labourers have remained low.

Figure 3.7: Workforce distribution in farm and off-farm activities in Sikkim



Source: Census of India, 2011

Figure 3.7 indicates that at the state level, around 52 per cent of the total workers are involved in off-farm work while around 46 per cent of the workforce still depends on agriculture. In rural areas, the majority of the workers are engaged in agriculture as

[1] The parma or labour system is a type of community farming where labour is offered in exchange for labour in the villages of Sikkim during the sowing and harvesting seasons. The parma khetala operates on a rotational system, based on mutual understanding and respect between the members of a village with the absence of any exchange of cash or kind except food during the day. On the other hand, rojkari khetala system involves labour exchange for cash or kind. Such wage-labour exists only in areas with large landholdings and agricultural production. Because of prevalence of mostly smaller landholdings, parma khetala is common throughout the state.

cultivators while just 10 per cent are agricultural labourers. Interestingly, around 40 per cent of the workforce in rural areas are involved in off-farm activities such as government services, private services, pretty business, construction activities, transportation, and other self-employment activities like handicrafts, household-based manufacturing activities etc. On the other hand, a vast majority of workers in urban areas i.e. about 97 per cent are involved in off-farm activities. This analysis highlights the importance of the agriculture sector to the rural populace as well as to the total workforce of the state. It shows that a significant share of the rural workforce directly and an even larger number of the population indirectly depend on agriculture for deriving livelihood. Despite the shrinking share of the primary sector to GSDP, a considerable proportion of the rural populace still depend on agriculture for livelihood.

3.3. Agricultural Economy of Sikkim

The mountainous state of Sikkim has a total geographical area of 7096 sq. km. Majority of the state's population is highly dependent on agriculture. Rice, maize and cardamom are the main crops. The terrain of the state is characterised by steep slopes which are prone to water loss and soil erosion. Therefore, wet cultivation of rice is done on terraced fields which are again dependent on rainfall. Terrace farming is practised here and subsistence agriculture is common in the state. The geographical location and agro-climatic conditions of Sikkim provide favourable conditions for the cultivation of a diverse range of agricultural and horticultural crops and flowers. Moreover, Northeast states were not benefitted much from the Green Revolution (Sharma et al., 2000) due to which most of these states have been practising organic farming.

Table 3.6: Land use statistics, Sikkim (2017-18)

Land use type	Area ('000 hectares)
Geographical area	710
Reporting area for land utilisation	440.90
Forests	334.20
Not available for cultivation: Total	10.20
Fallow lands: Total	11.50
Net area sown	77.20
Total cropped area	152.68
Area sown more than once	75.48
Agri. Land/Cultivable land/Culturable land/Arable land	96.50
Cultivated land	84.20
Cropping Intensity (%)	197.77
Uncultivable/Unculturable land	344.40
Uncultivated land	356.70

Source: IndiaStat, 2022

Most of the state's areas are covered by mountain peaks, forests, water bodies, steep slopes, and rocky terrain leaving very less land for agriculture. Only 120 hectares (about 11%) out of the total geographical area (709600 ha) in Sikkim is available for cultivation or agricultural purposes.

Table 3.7: District-wise forests cover in Sikkim (area in sq km)

District/State	Geographical area (GA)	2005 Assessment		2013 Assessment		2021 Assessment	
		Total	% of GA	Total	% of GA	Total	% of GA
East	954	679	71.17	699	73.27	713.27	74.77
North	4226	1326	31.38	1316	31.14	1282.31	30.34
South	750	529	70.53	571	76.13	571.14	76.15
West	1166	728	62.44	772	66.21	774.31	66.41
Sikkim	7096	3262	**45.97**	3358	**47.32**	3341	**47.08**

Source: Forest and Environment Department, Governmentt of Sikkim.

Sikkim is a forest-rich state. There has been a significant change in forest cover in the 2013 assessment as compared to the 2005 assessment. Out of the total geographical area of the state, around 45.97 per cent area was under forest cover. The largest area under

forest cover was in the North district which accounted for 1326 square kilometres of land under forests while the East district owing to urbanisation and the setting up of industries had a forest cover of only 679 square kilometres. Out of the four districts, we can see that the South district has experienced a significant increase in area under forest cover from 70 per cent in the 2005 assessment to 76.15 per cent in the 2021 assessment.

Around 3357 thousand hectares i.e. 47.31 per cent of the total geographical area, was covered by forest in 2015 while only 21.34 per cent of India's total land is under forest (Forest Survey of India [FSI], 2015). Sikkim has the largest recorded forest land area as it covers around 82.31 per cent of the total geographical area of the state.

Climate and Rainfall

Climatic factors play a very important role in a predominantly agrarian state like Sikkim. The state experiences varied climatic conditions within a few kilometres owing to wide variations in altitude. As a result, rainfall and temperatures see high variation throughout the state. The climate here is the high-mountain type characterised by high rainfall on the windward side and lower rainfall on the leeward side, heavy snowfall on mountain tops and dry winters at lower elevations. The state has three dominant seasons: cold weather season (December to February), spring weather season (March to May), monsoon (June to September) and retreating monsoon (October to November). The seasonal rhythm of the monsoon influences the lives of farming households.

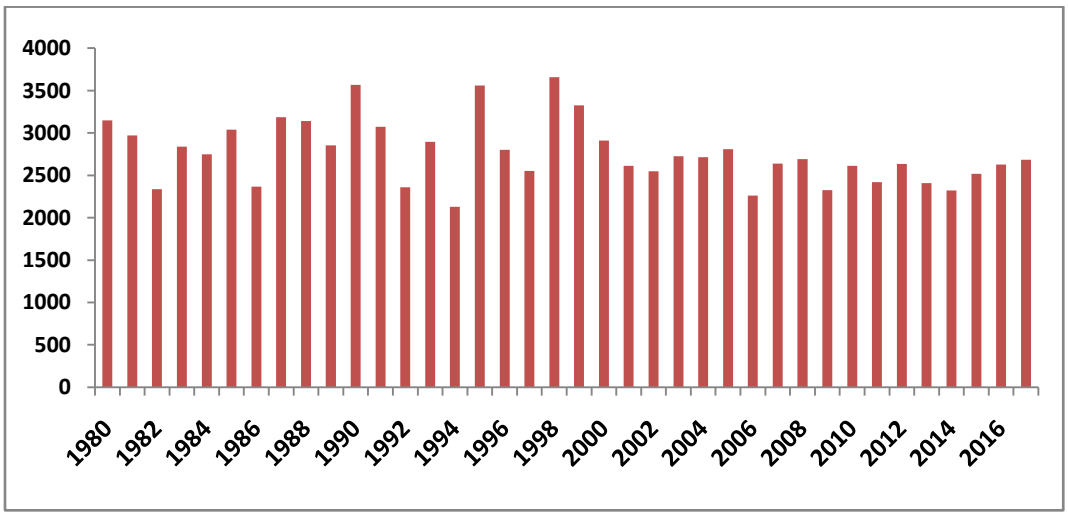
Table 3.8: Temperature in Sikkim

Station	Maximum temperature (ºC)	Minimum temperature (ºC)
Gangtok (East)	18.80	12.70
Mangan (North)	25.40	15.30
Mazitar (East)	29.40	17.30
Namthang (South)	23.10	14.00

Source: Meteorological Centre, Gangtok.

Rainfall is the main source of moisture in the soil. The Mean Annual Rainfall (MAR) in the state ranges from 2000mm-4000mm. Lower altitude regions receive drizzling showers while higher-altitude regions receive heavy showers. The state receives most of the rainfall during May to September period. Maximum rainfall is received by the South-East and South-West regions of the state while an area in the North-West region receives very little rainfall. The southern part receives more summer rains while the Northern part of the state receives more winter rains

Figure 3.8: Rainfall pattern in Darjeeling-Sikkim Himalaya (mm) (1980-2016)



Source: RBI, 2022

Figure 3.8 depicts that the rainfall pattern in Sikkim Himalaya has been declining over the years due to climate change and other factors. The state has been receiving decreased rainfall during the winter months of December and January. This phenomenon has an important impact on the agriculture of Sikkim as the agriculture in this state largely depends on rainwater for irrigation (Azhoni & Goyal, 2018) for irrigating crops on steep mountain farms. Around 98 per cent of water use is for irrigation in Sikkim (Government of Sikkim, 2012) as the state is highly dependent on agriculture. For both drinking and irrigation purposes, the local population depends mainly on rain-fed spring sources. Therefore, timely rainfall is a crucial factor influencing local lives. Large irrigation projects become infeasible owing to the geographical terrain of the state which further reinforces the dependence of the state's agriculture on rain-fed streams and springs. Decreased rainfall during the winters makes it difficult for the farmers to irrigate their fields and cultivate high-value crops.

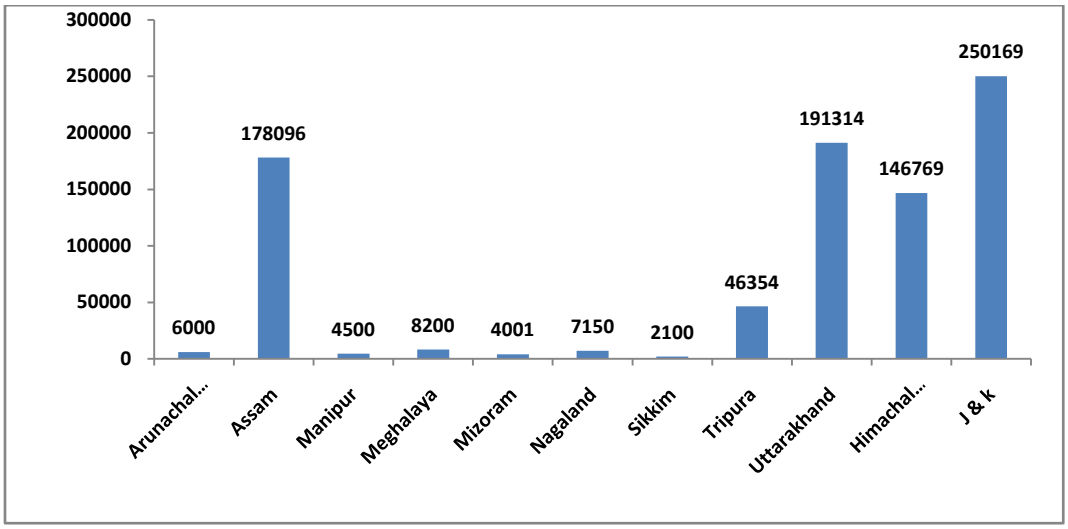
Irrigation

Even though rainfall is the only source of moisture in the soil, the only source of irrigation is the spring water which is available only during the monsoon season. However, the lack of reservoirs restricts the flow of irrigation water to the Kharif season only. In 2011-12, the total net irrigated area in Sikkim is 14000 hectares while for India it was 65263 thousand hectares (Government of India, 2019).

Cold Storage

In most of the hill states, infrastructure remains to be the main constraint to agricultural development. Hill areas lack adequate access to infrastructure. Compared to the plains, agricultural farms are located in remote and inaccessible locations.

Figure 3.9: Cold Storage capacity (Metric Tonnes) in Hill states as on 31.08.2020



Source: Agricultural Statistics at a Glance, 2018, Govt of India.

These agricultural areas are weakly connected to the main towns and markets by poor road infrastructure. Moreover, these roads are often damaged by frequently occurring natural disasters like landslides and earthquakes leaving many rural areas inaccessible during monsoon season. Quick transportation of perishable horticultural crops has remained a serious constraint in Sikkim (Biswas & Majumdar, 2013). Also, hill states are favourable for growing mostly perishable crops i.e. fruits, vegetables and other cash crops (Pokhrel & Thapa, 2007). But such crops need proper post-harvest handling infrastructure like cold storage, quicker/immediate transportation, processing, proper packaging, etc. However, it was observed during field visits that villages in Sikkim lack proper facilities for packaging and storage. Figure 3.9 depicts the status of cold storage

infrastructure in Sikkim with respect to other hill states. The absence of cold storage facilities has compelled the farmers and also some FPOs in the state to depend on local middlemen to dispose their farm produce at very low prices which inflate the transaction costs for the farmers (Rao et al., 2006) and remain a very important constraint for hill agriculture.

3.3.1. Sikkim Organic Mission

In Sikkim, agro-climatic conditions vary from sub-tropical to alpine creating a favourable region for a wide variety of crops, fruits, vegetables and commercial crops to grow. Such ecological environment supports the cultivation of a variety of crops but on a smaller scale. In Sikkim, most of the lands are steep, mountainous and rocky slopes leaving very little land for agriculture.

Green Revolution benefitted other states having developed irrigation facilities in terms of increased production and productivity whereas, hilly states like Sikkim and other North-eastern states could not be benefitted due to lack of adequate and timely fertiliser, undeveloped irrigation and fragile soils (Sharma et al., 2000). In Sikkim, the organic farming system is not new and has been traditionally practised in its rural areas for many years. However, when chemical substitutes for plant nutrients and pesticides were easily available in the later years, wide use of chemicals in the farms occurred. Still, large areas under some particular crops like large cardamom remained untouched by chemicals though. Thus, chemical fertiliser usage in the state (12 kg/ha) was quite below the national average (90 kg/ha). Also, the soil is rich in organic content. This helped later in the easy adoption of organic farming. Sikkimese farmers own an average of 1.9 hectares of farmland.

Thus, to maintain the environment quality and traditional farming of the state, a resolution was passed in the Sikkim Legislative Assembly in 2003 to transform Sikkim into a totally organic state. The use of chemical inputs and subsidies on these lands were completely prohibited and the state aimed to be made fully organic by 2015.

In the initial stage, large-scale support for chemical fertilisers, insecticides and pesticides was removed. Experts were mobilised to conduct massive public awareness and disseminate techniques of organic farming to the farmers. In the next stage, around a hundred villages were selected and termed 'Bio-villages' where farmers were trained on organic farming techniques and producing organic manure through rural composting, herbal composting and vermicomposting, by making use of locally available materials (Government of Sikkim, 2012b). Local medicinal plants were used as organic pesticides. Subsidies were provided for the improvement and construction of manure production infrastructures like vermin compost pits. Certified organic manures were made available. Organic farming was integrated with livestock for dung and animal manure. The Government of Sikkim formed a joint venture with Indian Farmers Fertiliser Cooperative Limited (IFFCO) called SIKKIM IFFCO ORGANIC LTD which provides the farmers with agri-inputs, bio-fertilisers, processing and marketing of organic produce assisting the state in its organic mission. An MoU was signed with Sikkim State Cooperative Supply and Marketing Federation Limited (SIMFED) to provide market linkage to the certified farmers. Eventually, Sikkim was proclaimed as a fully organic state of India by the Prime Minister on the 18th of January 2016.

Table 3.9: Area under organic cultivation in the Himalayan states of India (2017)

State	Share of organic land in total cultivated area (%)
Sikkim	80.08
J & K	3.12
Himachal Pradesh	2.57
Uttarakhand	5.37
Arunachal Pradesh	3.72
Manipur	3.86
Meghalaya	16.81
Mizoram	1.10
Nagaland	3.39
Tripura	0.81
Assam	1.04
West Bengal	0.11

Source: IFOAM

Supported by favourable climatic conditions and the prevalence of chemical-free traditional farming systems, the Himalayan states are increasingly contributing to the development of the organic sector in India. Among them, Sikkim has been successful in converting the largest share (80.08%) of total land to organic farming. Along with Sikkim, other Himalayan states also have adopted organic farming, however, with varying levels of intensity. States like Sikkim, Himachal Pradesh and Uttarakhand have developed their organic policy frameworks while states like Nagaland and Manipur are yet to develop organic policies but have been supporting organic farming.

The Mission has a positive impact on the cost of production which is lower than in non-organic farming. The benefits of organic farming on human health and the environment have been experienced by farmers. However, the simultaneous development of marketing has not been properly attended. As a result, the farmers are not able to enjoy the financial gains that they deserve.

3.3.2 Distribution of Land Holdings

In the strategy or planning for agricultural development, knowledge of the detailed structure and characteristics of agriculture holdings becomes essential for efficient planning and implementation of programmes. Apart from ownership holdings, information on operational holdings specifically is also necessary. Ownership holding gives an idea of wealth distribution but operation holdings are important for the implementation of agriculture development programmes because it is the operational holder who makes decisions and operational holding is all land which is wholly or partly used for agriculture production operated as one person alone and is taken as statistical unit for data collection in agriculture census.

Table 3.10: Number of operational holdings by size groups in Sikkim

Year/ Size group	Marginal (below 1 ha)	Small (1-2 ha)	Semi-medium (2-4 ha)	Medium (4-10 ha)	Large (10 & above)	Total
2000-01	36318 (54.5)	15358 (23.04)	9840 (14.77)	4358 (6.54)	734 (1.10)	66635 (100)
2005-06	39832 (54.25)	16546 (22.53)	10791 (14.70)	5405 (7.36)	852 (1.16)	73426 (100)
2010-11	40476 (53.98)	16941 (22.59)	10809 (14.42)	5922 (7.90)	780 (1.04)	74982 9 (100)
2015-16	44294 (61.92)	12767 (17.85)	10591 (14.81)	3513 (4.91)	367 (0.51)	71532 (100)

Source: Agricultural Census, 2005-06, 2010-11 and 2015-16.

In Sikkim, the number of total operational holdings increased during 2000-01 to 2015-16. First, it rose till 2010-11 and then fell in 2015-16. During the same period, many changes have been noted in the share of different size groups.The number of total operational holdings has increased during 2000-01 to 2015-16 from 66,635 to 71,532 by 7.35 per cent. Fragmentation of landholdings is increasing in India mainly due to rising population, rural indebtedness and inheritance laws as the land owned by the parent is inherited by the children and divided into small holdings or fragments.

From Table 3.10, it can be observed that the share of different size groups has changed during the period. Over the entire period under consideration or intercensal across four agricultural censuses, the number of marginal farmers increased by a magnitude of around 7.42 per cent. During the 2000-01 Agricultural Census, marginal farmers comprised a little more than half of the entire farming community which remained stable till 2010-11 but increased sharply after that period and thus marginal farmers comprised a little more than 60 per cent in 2015-16. On the other hand, the number of small farmers has come down by 5.19 per cent. Therefore, the combined share of marginal & small farmers in total operational holding which was 77.54 per cent in 2000-01 marginally increased to 79.77 per cent in 2015-16. The share of semi-medium farmers has remained almost the same with minor variations whereas their actual number increased from 9840 in 2000-01 to 10591 in 2015-16. On the other hand, the share of the medium farmers has reduced by around 1.63 per cent and their number decreased from 4358 to 3513. So, the combined share of semi-medium and medium farmers in the total operational holdings has seen a decline by a magnitude of 1.59 per cent. Lastly, large farmers comprised only 1.10 per cent of the total holdings which further declined to just 0.51 per cent of the entire operational holdings in Sikkim (Table 3.10). Thus, we can infer that the agriculture sector in Sikkim is dominated largely by small & marginal farmers which is consistent with the country as a whole. Overall more than 75 per cent of the landholdings in the Northeast region of India are small and marginal holdings (Birthal et al., 2006).

Table 3.11: Average size of holdings by size group in NER (2015-16)

State	Marginal	Small	Semi-medium	Medium	Large	All
Arunachal Pradesh	0.53	1.27	2.67	5.82	15.59	3.35
Assam	0.42	1.41	2.73	5.17	72.80	1.09
Manipur	0.53	1.29	2.48	4.89	11.09	1.14
Meghalaya	0.46	1.32	2.73	5.55	16.17	1.29
Mizoram	0.60	1.28	2.29	4.65	12.82	1.25
Nagaland	0.56	1.24	2.68	5.84	14.67	4.87
Sikkim	0.41	1.39	2.72	5.68	17.21	1.27
Tripura	0.30	1.46	2.65	5.07	14.82	0.49
All India	0.38	1.40	2.69	5.72	17.07	1.08

Source: Agricultural Census, 2015-16.

In 2015-16 the average size of holding in the North-East Region (NER) is 0.5 ha while it was 1.08 ha for all of India. The average size of land holding has marginally declined in all NE states from 1.3 ha in 2011-12 to 0.5 ha in 2015-16. In India, we find increased fragmentation of the most important input of agriculture i.e. land. On careful observation, we find that number of landholdings has more than doubled from 71 million in 1970-71 to 145 million in 2015-16 but the average holding size has reduced by more than half from 2.28 ha in 1976-77 to 1.08 in 2015-16. With the rise in population, it can be expected to decline further. The rising rural population and division of land among the family members have caused a rise in the number of holdings and thus resulted in the fragmentation of landholdings into numerous small farms (Singh, 2019). In India, the increase in the number of holdings was in tandem with the increase in rise in population. While the landholding number increased by 194 %, the rural population increased by 189%. Since 1970-71, both the number of landholdings and rural population increased exactly at the same rate (1.76%) further strengthening the notion that the rise in rural population was the major factor for the increase in landholdings.

Such a decline in average landholding size has prevented from achieving economies of scale in agriculture operations. Such smaller size of landholdings and predominance of marginal holdings in agriculture hinder poverty alleviation, attainment of higher productivity, improving farmers' income and agricultural growth (Chand et al., 2011). It becomes difficult for marginal farmers to generate enough income from such tiny plots of land to earn for the family.

Table 3.12: Area of operational holdings by size group in NER (2015-16)

State	Marginal	Small	Semi-medium	Medium	Large	All
Arunachal Pradesh	14.36	30.64	77.43	153.22	104.29	379.94
Assam	784.97	696.11	806.25	410.09	278.84	2976.25
Manipur	40.30	62.77	55.32	13.36	0.43	172.18
Meghalaya	55.93	79.60	108.90	51.41	4.24	300.08
Mizoram	27.17	35.06	31.67	14.91	3.65	112.46
Nagaland	4.61	36.80	169.45	431.17	314.41	956.44
Sikkim	18.07	17.76	28.76	19.96	6.32	90.87
Tripura	148.78	70.10	49.20	12.63	1.08	281.79
NE Region	37923.35	36150.71	37619.31	31810.43	14313.54	157817.34
All India	14.36	30.64	77.43	153.22	104.29	379.94

Source: Agricultural Census, 2015-16

The total area of operational land in the NE states is around 1578.17 lakh ha comprising around 3.22 per cent of total operational holdings in the country. Among the NE states, Assam has the highest area of operational land (29.76 lakh ha) while Sikkim (0.90 lakh ha) has the lowest area of operational holdings. Most notably, marginal landholders account for around 67% of total landholdings in 2015-16. The share of small and marginal holders which was 85 % in 2011-12 went up to 87 % in 2015-16.

3.3.3 Cropping Pattern

Most of the farming households throughout the state practice mixed cropping. Rice, maize, finger millet and buckwheat are cultivated as traditional or non-commercial crops. Rice is primarily grown for domestic consumption as a staple crop while maize is mostly used as cattle feed. Buckwheat is now identified as a crop among four crops identified for FPOs in the state. Millet and buckwheat flour are also sold in the local markets at better prices. Wheat cultivation had increased during the 1980s, however, has decreased in recent times replaced by horticultural crops. Important cash crops or commercial crops include large cardamom, orange, cherry pepper, ginger, turmeric, kiwi-fruit, potato and off-season vegetables.

To have a better understanding of the climate with respect to land use pattern, the following climatic types are the main ones. Agricultural practices vary according to time and varying altitude and agro-climatic zones. The state of Sikkim has diverse agro-climatic zones presenting favourable conditions for the cultivation of various types of crops

Advantageously, the diverse ecological condition of Sikkim makes it suitable to grow various kinds of fruits, vegetables and commercial crops at different altitudes. Despite being small in terms of geographical area, Sikkim has unusually diverse agro-climatic conditions. The agro-climatic conditions and suitable cropping patterns of the state are shown in Table 3.13.

Table 3.13: Crop Pattern at different altitudes in Sikkim

Altitude	Crops
Tropical & Subtropical (300-1800 m)	Pulses, oilseeds, Banana, mango, mosambi, guava, sapota, rice, maize, millet wheat, mustard, potato, lemon, ginger, mandarin orange, vegetables etc.
Temperate (1800-2700m)	Peach, plum, kiwi fruit, passion fruit, apple, rajma, pulses, vegetables, mandarin orange, large cardamom, pear, ginger, soybean, mustard barley, rice, maize, peas, rice, maize, millet etc
Sub-alpine & alpine (2700-4000 m)	Maize, barley, vegetables, potato, apple, walnut, almond, plum, peach, peas, etc.
Alpine (>5000m)	Mainly herbs and medicinal plants, pasturage, vegetables.

Source: Government of Sikkim, 2011

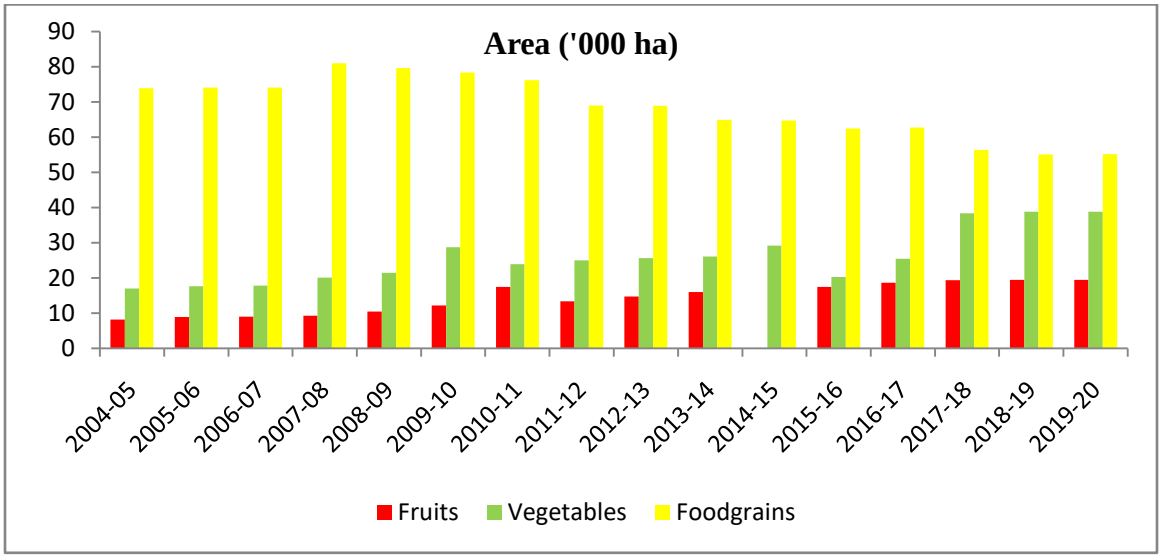
Except for maize and buckwheat, the area under all other crops has reduced over the years. This implies that farmers in the state have brought less and less land under cereal crops and oilseeds.

Horticulture in the state promotes the production of fruits like Sikkim mandarin, kiwi, papaya, banana, beans, radish, carrots, green peas, capsicum, cabbages, cauliflowers, chayote, potato and spices like large cardamom, ginger, turmeric, cherry pepper, flowers like orchids, rose, anthirium, lilium, gerbera, etc.

Horticulture is a very important sector of Sikkim's agricultural economy. This sector has the potential to improve land use, generate employment, diversify agriculture, and improve nutritional security and farm incomes. Thus, horticulture has been identified as a key sector overall development of Sikkim. Owing to its diverse agro-climatic zones, cultivation of a wide variety of horticultural crops becomes favorable around the year. According to Joshi et al. (2006), diversification of agriculture towards horticultural crops can play a significant role in improving the incomes of the rural population. Also,

increased production of horticultural crops motivates the promotion of agro-industrial enterprises in the state. For example, Government Preservation Factory in Singtam uses local horticultural crops as raw material and prepares processed products under the brand name 'Sikkim Supreme'. The products are squash of oranges, lemons, passion fruit and pine-apple. It also produces red cherry pepper paste and pickles, fruit jams, marmalade, bamboo shoot pickle etc. All the products are produced using locally procured horticultural crops from farmers.

Figure 3.10: Area under Food grains, Fruits and Vegetables ('000 Ha)



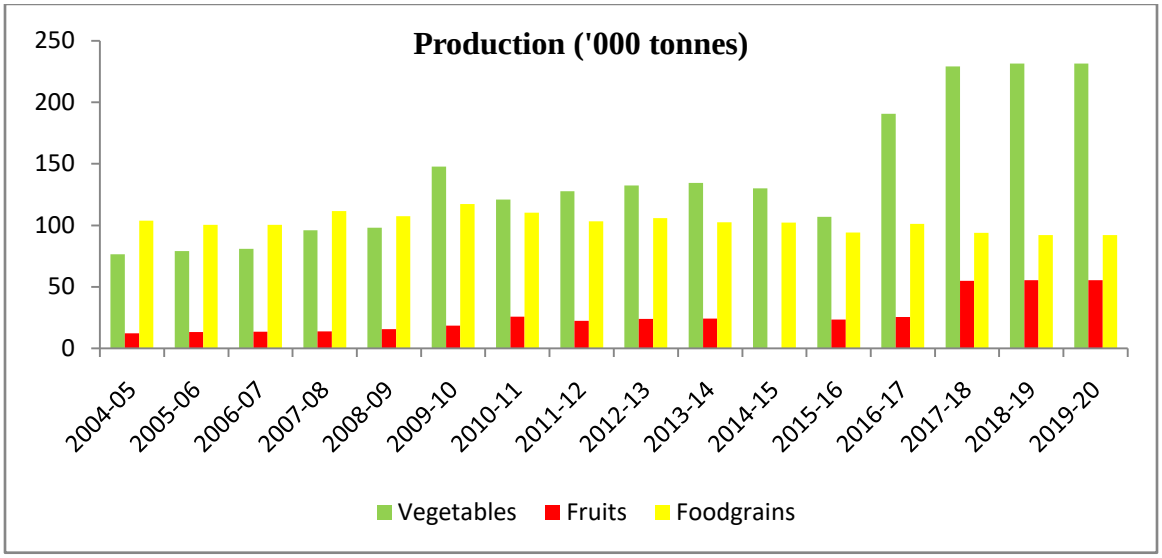
Source: RBI Handbook of Statistics, 2022.

Sikkim also follows the national cropping pattern where a significant amount of area has been devoted to the cultivation of food grains (Figure 3.10). However, in recent years, a shift from low-value food grains towards high-value horticultural crops like fruits and vegetables can be seen in terms of area and production. Figure 3.10 illustrates that area under food grains has been showing an overall declining trend from 2004-05 to 2019-20 with minor ups and downs in between. During the same period, a greater amount of

geographical area has been allotted to vegetables and fruits. Between fruits and vegetables, more area is covered under the cultivation of vegetables. Such particular preference or tendency to allot more land to vegetables than fruits may be because while vegetables can be majorly consumed domestically saving food expenditure, fruits cannot be consumed domestically as much as vegetables can be. The lack of proper marketing channels for fruits could be another reason because domestic demand for fruits is not as high as it is for vegetables. Vegetables can be consumed domestically as well as can be sold within the state. However, fruits don't have much consumption within the household and also don't have market demand within the state as much as vegetables have. Therefore, less area is allotted to fruits than vegetables. However, strengthening proper marketing channels can induce farmers to cultivate more fruits in the future. Another interesting point to note is that the fall in food grains output is sharp but the population that has been growing over time largely depends on food grains. Also, Sikkim welcomes lakhs of tourists every year. Therefore, considering this situation, attaining self-sufficiency in food grain production has to be given attention to feed its expanding population and lakhs of tourists visiting every year.

Similar trends can be observed in terms of their production too. However, in terms of production, vegetables have been found to surpass the total food grains output in the state. Fruit production has also been increasing during the same period.

Figure 3.11: Production trends of major crops in Sikkim (‘000 Tonnes)



Source: RBI Handbook of Statistics, 2022.

The state’s vegetable production surpassed the total food grain production for the first time in 2009-10 and the gap has been widening since then mainly due to the allotment of increasing area to vegetables. A sharp hike in the production of vegetables can be observed from Figure 3.11 when Sikkim produced around 80,000 metric tonnes of organic vegetables in the year 2016-17 after it was declared a fully organic state of India (“Sikkim produces”, 2017).

3.3.4 High-Value Crops in Sikkim: Traditional & New

The geographical feature of a hilly state like Sikkim has both advantages and disadvantages in agriculture. The mountainous terrain of the state poses a challenge for regional development. Only 11 per cent of the total land is available for agriculture. In recent times, the net cropped area has been reducing further mainly due to non-agricultural activities like infrastructure development. Transportation in mountainous terrain is difficult and dangerous and inflates the cost of production. Advantageously, the

diverse ecological condition of Sikkim makes it suitable to grow various kinds of high-value horticultural crops to augment income and employment. It has capitalised on the advantages of its location and has made significant effort and progress in the cultivation of high-value crops. In 2003, it decided to adopt organic farming and in 2016 it was declared to be the country's first fully organic state. In recent times, it has been growing both traditional and new high-value crops.

Table 3.14: Traditional High-Value Crops

Crops/Year		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Fruits	A	16.02	0.02	17.53	18.55	19.40	-
	P	24.05	0.03	23.48	25.56	54.90	-
Vegetables	A	26.11	29.15	20.25	25.54	38.42	-
	P	134.53	130.06	106.94	190.72	229.10	-
Large Cardamom	A	0.24	0.24	0.24	0.29	32.30	-
	P	17.88	18.42	16.59	16.53	66.60	-
Buckwheat	A	3.63	3.27	3.57	3.57	3.43	-
	P	3.49	3.16	3.47	3.48	3.35	-
Turmeric	A	-	-	1.95	1.96	5.17	5.17
	P	-	-	5.68	5.73	15.89	15.99
Ginger	A	-	-	10.11	10.13	15.79	15.63
	P	-	-	55.448	55.747	86.955	85.116

Source: Horticultural Statistics at a Glance, 2018; Department of Horticulture, Govt of Sikkim, 2020

Note: *A denotes Area ('000 Ha) and P denotes Production ('000 MT)*

The area under fruits in Sikkim during 2013-14 was about 16.02 thousand hectares which increased to above 19.4 thousand hectares in 2017-18. During this period, production increased from 24.05 thousand metric tonnes to 54.9 thousand metric tonnes. Production of fruit increased mainly due to technological intervention that improved the production of Sikkim mandarin. In recent years, the availability of quality planting materials grown in high-tech facilities and nurseries in private and public sectors has increased. Also, the

plantation of guava and litchi in the lower valleys with banana and papaya as filler crops for crop diversification has contributed to more production of fruits.

Among fruit crops, Mandarin orange, banana, guava, peach, plum, apple, kiwi, and litchi are major fruits of the state. These fruit crops which are grown organically have a high potential to fetch higher prices and generate better economic opportunities. Fruit and food-processing small industries have immense potential that can add value and increase the shelf-life of the state's high-value crops.

During 2009-10, Sikkim saw a production of around 70.85 metric tonnes (MT) of vegetables covering an area of 13680 Ha while in 2017-18, it increased almost three times to 229.10 thousand MT. The area under cultivation also increased from 26.11 hectares in 2013-14 to 38.42 hectares in 2017-18. Hill states have the advantage of growing off-season vegetables besides during the Kharif and Rabi seasons. Cultivation and supply of vegetables in the off-season gives an advantage to hill farmers when plains do not grow. Thus, in Sikkim, major emphasis is given to the cultivation of off-vegetables as they help farmers in getting maximum returns. Tomato, cabbage and cauliflower are the major off-season vegetables. Among them also, the tomato has emerged as the most important one. Tomato cultivation is practised by clusters[2] of farmers in the West and South districts of Sikkim.

The Department of Agriculture has successfully promoted the cultivation of other off-season vegetables like cabbage, cauliflower, radish, broccoli, carrot, peas and beans. In Lower Bega and Simkharka villages in West Sikkim, off-season vegetables like peas, carrots and radishes are grown abundantly and are supplied to nearby Geyzing bazaar

[2] each cluster comprises more than ten villages

when supplies from lower areas like Jorethang fall during the off-season. Hill farmers in Sikkim also produce beans widely.

India ranks first in the production and export of spices in the world. USA, Germany, and Netherlands are the major buyers of Indian organic spices. Agro-climatic conditions of Sikkim favour the cultivation of major spices like large cardamom, ginger, turmeric and pepper chillies. Recently, large cardamom, turmeric and ginger have been recognised by Mission Organic Value Chain Development (MOVCD) as the major crops to be dealt with by FPOs and also for export sales (Gupta et al., 2019).

Large cardamom is the most important high-value cash crop in the Sikkim Himalayas. It is used as a spice or condiment, flavouring agent, and preventive and curative agent for sore throats, lung congestion, digestive disorders, and pulmonary tuberculosis in Unani and Ayurvedic medicine (Sharma et al., 2016b) and thus, fetches a good price in the international market. Its cultivation acts as a source of livelihood for many Sikkimese farmers and has helped them to pay for their basic needs as well as farm management (Sharma et al., 2016a). Almost 90 per cent of the total cardamom farmers are marginal and small farmers and 30 per cent of them depend on this crop for their livelihood (Khawas, 2015). The cash income earned from this crop in Sikkim increased from US$ 1.9 million in 1975 to US$ 13.8 million in 2005 and as high as US$ 50 million in 2010 (Sharma et al., 2016a). Around 88 per cent of India's total large cardamom production is contributed by Sikkim alone which is the second largest exporter of the crop in the world after Nepal (Vijayan et al., 2019).

Cultivation and harvesting are done mainly using human labour and after harvesting, the crop is sold to either middlemen or Northeast Regional Agricultural Marketing

Corporation (NERAMAC). Through both channels, cardamom is transported to the markets at Siliguri. From there it is transported to exporters at Guwahati, Kolkata, Mumbai and Cochin from where it is further exported to countries like Pakistan, the Middle East and the USA. However, large cardamom production and income from it has been declining in recent times mainly due to the old age of bushes, viral infections, extreme temperatures, erratic rainfall, long dry spells lasting until flowering, drying springs, lack of irrigation facilities, lack of appropriate policy support, lack of extension services, lack of training and poor disease management.

Cultivation of buckwheat has been showing declining trends in the Himalayan region (Rana et al., 2012). Sikkim can make use of this opportunity and become a major producer and supplier of buckwheat. Area, production and yield under buckwheat have not changed much over the years. However, in recent times, the govt has been distributing buckwheat seeds to farmers through FPOs under the MOVCDNER scheme. MOVCD has recognised buckwheat as one of the four major crops to be dealt with by FPOs in Sikkim. Thus, area, as well as production, is expected to increase in the near future.

Organically produced turmeric (powder and fingers) in Sikkim has great potential in both national and international markets. It can be cultivated in different types of soil and is best suited for dry land in marginal areas of the Himalayas (Gudade et al., 2015). It is mainly used as a spice, cosmetic and drug.

Ginger is an important cash crop providing livelihood and economic support to many farmers in the northeast region of India. Indigenous cultivars of ginger in Sikkim are Bhaise, Gorubathanay, Jorethangay, Nangray and Majhauley. They are grown

commercially due to their high yield and big size of rhizomes (Yadav et al, 2004). Small and marginal farmers mostly sell ginger without processing it. Lately, FPOs in the state have been receiving orders for dried ginger flakes amounting upto 3 metric tonnes. However, to meet these orders, higher production and processing plants are needed.

Just like turmeric, ginger also has seen significant expansion in area and production in Sikkim after 2017-18. This increase was a result of increased area and production in all four districts. Despite improved production, farmers face problems in storage. In in-situ storage (harvest is delayed according to the demand) or soil pits or dry shaded places, ginger rhizomes are prone to rhizome rot or sprout, insect and pests and also rhizome drying. It has huge export potential to developed countries where it can be used as ginger oil, ginger oleoresin, manufacturing of ginger brandy, wine and beer as a flavouring agent in confectionery and also for several medicinal purposes fetching a good price (Yadav et al, 2004). The ginger grown in Sikkim is also of good quality and has export prospects.

Sikkim is home to high-value flowers like Gladioli, anthuriums, lilliums, primulas, rhododendrons and orchids. Sikkim produced around 16.5 metric tonnes of loose flowers and 0.1 metric tonnes of cut flowers in 2017-18 (Table 3.15).

Table 3.15: Area, Production and Productivity of floriculture in Sikkim

Year	Area ('000 Ha)	Production ('000 MT) Loose
2011-12	0.21	25.95
2012-13	0.22	26.50
2013-14	0.24	17.88
2014-15	0.24	18.42
2015-16	0.24	16.59
2016-17	0.29	16.50
2017-18	0.20	16.50

Source: Department of Horticulture, Govt of Sikkim, 2020

In recent years, the area under floriculture has been consistently increasing. However, production increased marginally and has even reduced significantly during some years, e.g. production fell from 26.50 metric tonnes to only 16.50 metric tonnes in 2017-18. Consequently, the productivity of floriculture has been falling significantly over the years. Despite this, Sikkim continues to be in the category of states with high productivity in floriculture. The state has immense potential for developing floriculture on a commercial basis.

CHAPTER 4

OVERVIEW OF FARMER PRODUCER ORGANISATIONS IN INDIA AND SIKKIM

4.1. Introduction

The share of agriculture in India's GDP has declined significantly since independence but the number of people dependent on it has experienced only a marginal decline. The agriculture sector contributed around 20 per cent only to India's GDP in 2020-21 (PIB, 2021a) while it employs around 55 per cent of total employment. Among the total farming community in the country, around 86.2 per cent of them are small and marginal farmers (Agriculture Census, 2015-16) with an operational holding size of less than 2 hectares.

The size of operational holdings in India is declining continuously. On the other hand, the rapid increase in population has led to further fragmentation of landholdings. Since small and marginal farmers constitute the majority of the farming community, what happens to them has a major implication for the whole agricultural community. Owing to the smaller size of holdings and lower marketable surplus, the smallholder farmers face several inherent constraints such as lack of economies of scale, exploitation by middlemen and traders, lack of access to information, lack of credit, low bargaining power and other several problems. Their participation in the market is further constrained by poor vertical and horizontal linkages, limited access to the market, low marketable surplus, and lack of access to training and finance.

Therefore, the major challenge lies in organising and collectivising these farmers through some form of aggregation model. Collective action would fetch them economies of scale, improve their bargaining power and fetch them access to many other resources which they would not have accessed individually. Integrating them with the agricultural markets is required to help them earn higher incomes. The constraints tend to persist as long as they are unorganised and are cultivating on fragmented pieces of land. The aggregation of small farmers would bring in economies of scale. Once the farmers are organised under a single collective organisation, they can be linked to the remunerative market through this aggregation. In the past, various institutional interventions have been tried to link the farmers to the markets (both input and output). These interventions were in the form of agricultural cooperatives, Self-help groups, commodity interest groups, contract farming, FPOs, etc.

Several attempts have been made in the past to aggregate the farmers. One such pioneering attempt was the promotion of agriculture cooperatives. However, the experiences of the performance of agricultural cooperatives have been poor with an exception of the sugar cooperatives of Maharashtra and the dairy cooperatives of Gujarat. There are also a few other successful cooperatives like MAHAGRAPES in Maharashtra, Gambhira in Gujarat, HOPCOMS and CAMPCO in Karnataka and Milkanoor women cooperative groups in Andhra Pradesh. However, these successful models could not be emulated in other parts of the country. Agricultural cooperatives in India had been started with the cooperative revolution to collectivise small farmers to overcome hindrances faced by them. However, these cooperatives were soon found to be plagued by excessive bureaucratic control, corruption and inefficiency. Cooperatives saw the misuse of funds

and concentration of power in the hands of a few. Bigger landholding farmers started aiming for this leadership and cooperatives became a gateway to the political system

The National Policy for the promotion of FPOs notes that the collectivisation of small and marginal producers into producer organisations has proved to be one of the most effective methods to address the many challenges inherent in agriculture. Producer organisations improve access to investments, modern technology, quality inputs and remunerative markets. Thus, in 2003, a provision for the formation of FPOs was added through amendment in Part IX of the Constitution on the recommendations of the YK Alagh Committee. Department of Agriculture and Cooperation under the Ministry of Agriculture, Government of India has identified FPOs registered under the special provisions of the Companies Act, 1956 as the most appropriate institutional form. Presently, FPOs are emerging as the most effective means of aggregating small and marginal farmers and empowering them to overcome inherent constraints faced by them individually. By leveraging the collective strength and bargaining power of small farmers, FPOs enhance their access to investments, technology and inputs and markets. It retains the desirable features of a cooperative as well as the efficiency and flexibility of a private company (Trebbin, 2014). FPOs support farmers at all stages of production, processing and marketing to increase farmers' income levels. Govt. of India has identified FPOs as the most suitable institutional form to organise farmers and help them collectively enhance their production and marketing strength. The Union Budget 2019-20 also announced its plan to set up 10,000 new FPOs over a span of five years. These FPOs aim to improve the bargaining power of the small and marginal farmers in both the input and output markets. Successful FPOs will not only help farmers realise better output

prices but also incur lesser input costs. This law makes provision for strengthening the rural economy by supporting the establishment of FPOs that aim to strengthen small farmers by collectivising them. Such FPOs aim to link small farmers to traders, processors, and retailers downstream in the value chain, including modern value chains catering to high-quality markets. Through this collective action, farmers can bargain with the buyers in the value chain.

Table 4.1: Difference between a Cooperative and an FPO

Feature	Co-operative	FPO
Registered under	Co-operative Societies Act	
Membership	Open to any individual or co-operative	only to producer members and their agencies
Professionals on Board	Not provided	Can be co-opted
Area of operation	Restricted	Throughout India
relation with other entities	Only transaction based	Can form joint ventures and alliances
Shares	Not tradable	Tradable within membership only
Member stakes	No linkage with number of shares held	Article of association can provide for linking shares and delivery rights
Voting rights	One person one vote but RoC and government have veto power	Only one member one vote and non-producer can't vote
Reserves	can be created if made profit	Mandatory to create reserves
Profit sharing	Limited dividend on capital	Based on patronage but reserves must and limit on dividend
Role of government	Significant	Minimal
Disclosure and audit requirements	Annual report to regulator	Very strict as per Companies Act
Administrative control	Excessive	None
External equity	No provision	No provision
Borrowing power	Restricted	Many options
Dispute settlement	Through co-op system	Through arbitration

Source: Singh et al. (2018); Singh (2008); Nikam et al. (2019)

4.2. Farmer Producer Organisations (FPOs)

4.2.1. Definition

According to Operational Guidelines of FPOs, 2020, Farmer Producer Organisation (FPO) is a generic name which means and includes farmer- producer's organisation incorporated or registered either under Part IXA of the Companies Act, 1956 or under the Co-operative Societies Act of the concerned states. They are formed to leverage collectives through economies of scale in the production and marketing of agricultural and allied sectors. However, FPOs registered under the Co-operative Societies Act of the state have to be insulated from all kinds of interference including in the election process and day-to-day management through suitable provisioning in their Memorandum of Association and Bye-laws to encourage healthy growth and development of FPO. It is a legal entity formed by primary producers, viz. farmers, milk producers, fishermen, weavers, rural artisans, craftsmen, etc. FPOs have been considered to be one of the effective means of linking small producers with the agricultural value chain to enhance the net income of producers. NABARD provides financial and development support to FPOs through the following programmes.

4.2.2. Broad services and activities undertaken by FPOs

FPOs undertake responsibilities of one or more activities involving procurement of inputs to marketing of products. In general, FPOs undertake the following activities:

- FPOs engage in procurement bulk purchase and supply of quality agricultural inputs such as seed, fertiliser, pesticides etc. at reasonably lower wholesale prices.

- Dissemination of technology and innovation: FPOs facilitate the availability of required machinery and implements for production and post-production activities custom hiring basis for members to minimise the cost of production per unit.
- Also provide value addition activities like cleaning, grading, sorting, packing and other processing facilities at reasonably lower rates. Farmers are also provided with storage and transportation facilities.
- Facilitate participation of farmers in income-generating activities like seed production, bee-keeping, mushroom cultivation, etc.
- Aggregate smaller marketable surpluses of several smallholder farmers and add value to fetch better prices.
- Marketing of the aggregated produce to institutional buyers with better negotiation strength to the buyers.

4.2.3. Advantages of FPOs:

Numerous reports and studies have captured and established the positive role of FPOs. Some of the important benefits ascribed to FPOs are as under:

(i) FPOs facilitate the procurement of all necessary inputs in bulk at wholesale rates. Also, facilities of custom hiring centres (CHCs) enable farmers' access to modern farm equipments. Thus, the cost of production or cultivation is reduced.

(ii) Net value received by the farmers may be enhanced as aggregation and bulk transport of produce reduce marketing costs.

(iii) Aggregation of commodities enables small farmers to enjoy economies of scale and attracts traders, processors, and retailers to the farm gate. It also improves their bargaining power helping them negotiate for better prices. Major buyers prefer to buy in large volumes. Therefore, FPOs act as an aggregator.

(iv) Improved access to modern technology, extension services and joint training on Good Agricultural Practices (GAP) and ensuring traceability of agricultural produce.

(v) Risks of wastage or post-harvest losses can be minimised through value-addition activities or the arrangement of collective storage.

(vi) Adverse price fluctuations and the distressed sale can be managed or avoided; if good practices are imbibed. These include contract farming agreements, stocking in own common facilities or leased storage facilities with credit support, etc.

(vii) Access to information is improved as communication becomes easier for dissemination of information regarding prices, volumes, points of collection and remunerative markets or buyers. Thus, information asymmetry is removed to a great extent.

(viii) FPOs also facilitate improved access to collateral-free institutional credit against stock backed by the group's joint liability.

(ix) As minimum-scale economies are achieved, farmers can collectively climb along the value chain to primary and secondary processing activities.

(x) Greater bargaining power to farmers and greater quality orientation in production and processing activities.

4.2.4 Board of Directors (BoDs)

FPOs are headed by BoDs elected among the farmers. A Chief Executive Officer (CEO) is a qualified candidate hired by the FPO to look after the operations of the organisation. The salary of the CEO is supported initially for 3 years by the SFAC. Considering the difficult topography and terrain of the state FPO offices are located at the centre of all GPUs and closest to the road and are decided by all.

4.2.5. FIGs

First, informal groups of farmers called Farmer Interest Groups (FIGs) are formed. Each FIG consists of around 15-20 members. FIGs are small neighbourhood groups of farmers which are supported to form organisations relevant to their context. These FIGs are then ultimately federated into FPOs. Thus, the farmers share a common goal and use a participatory approach to further strengthen their group.

The binding factor among these producers remains the common commodity of interest for which they desire to improve production, add value and access better markets. FIGs are open to membership from both male and female-headed households and are formed with the spirit of the SHG model. The need for FIGs arises as the FPO model is a big business model for primary producers. Therefore aggregation is done at two levels-FIG and FPO.

1. Primary producers dealing with the same crop or commodity irrespective of land size and gender can join as members of a FIG

2. They should be located in a contagious neighbourhood.
3. They should agree to supply committed commodities to FIGs and FPOs for value addition and marketing
4. They should also participate in the training and workshops organised by the FPO
5. From a family only one person should be the member

4.3. An Overview of FPOs in India

This section discusses the trends and patterns of FPOs in all states/UTs of India. Presently more than 7300 FPOs are in existence in India, which were formed under various initiatives of the Government of India (SFAC), State governments, NABARD and other organisations in the last decade since 2011. SFAC has been designated by the Department of Agriculture, Cooperation & Farmers' Welfare, and the Ministry of Agriculture & Farmers' Welfare as the nodal agency for promoting FPOs across the country. The discussion in this section is based on the data provided by SFAC and NABARD on their respective websites. NABARD and SFAC under various programmes support FPOs and have separate portals created especially for FPOs where they maintain a database on FPOs' names, addresses, main products, organisation type and business activities. Apart from them, the Ministry of Rural Development also has been promoting FPOs under the Deendayal Antyodaya Yojana- National Rural Livelihood Mission (DAY-NRLM). As on 17 March 2021, 177 FPOs had been promoted under DAY-NRLM in the country (PIB, 2021b). In this section, we discuss the trends and patterns in FPOs across states and UTs in the country.

FPOs have received immense support from the Government of India. SFAC, a society under Department of Agriculture and Cooperation, Ministry of Agriculture and Farmers

Welfare, Government of India, has been registered as a nodal agency to provide support to governments and FPOs for promotion and growth of FPOs and also create sustainable linkages between FPOs and other service providers of inputs, technology, extension and research, marketing and processing. Recently, Government of India has launched a Central Sector Scheme titled "Formation and Promotion of 10,000 Farmer Produce Organisations (FPOs)" to form and promote 10,000 new FPOs in the country with budgetary provision of Rs 6865 crores. These new FPOs will be formed and promoted by Implementing Agencies (IA) which will engage Cluster-Based Business Organisations for handholding for a period of 5 years (PIB, 2021b).

4.3.1. FPOs promoted by SFAC

The current details on the number of FPOs and farmers mobilised under SFAC are presented in Table 4.2.

Table 4.2: State-wise Progress of FPO Promotion as on 31.05.2022

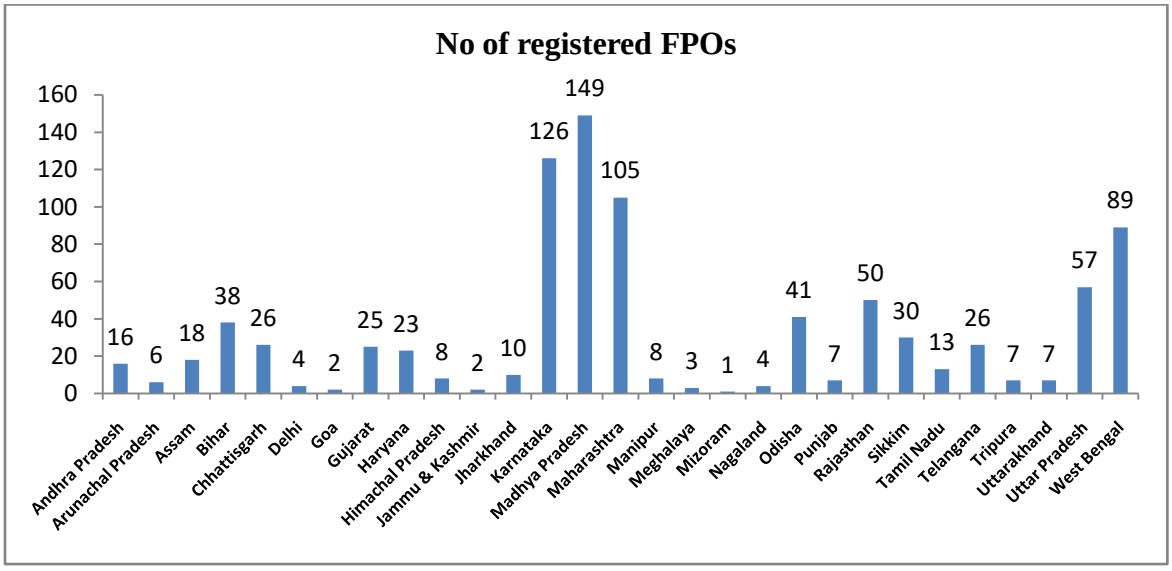
State/UTs	No of farmers			No of FPOs		
	Mobilised	Under mobilisation	Total Targeted Farmers	Registered	Under the process of registration	Total
Andhra Pradesh	15499	0	15300	16	0	16
Arunachal Pradesh	4750	0	4750	6	0	6
Assam	12331	0	10500	18	0	18
Bihar	36958	0	35600	38	0	38
Chhattisgarh	29436	0	29000	26	2	28
Delhi	3535	0	3500	4	0	4
Goa	1810	0	1750	2	0	2
Gujarat	25462	0	24000	25	0	25
Haryana	14081	0	12750	23	0	23
Himachal Pradesh	7213	0	7150	8	0	8
Jammu (Division)	5854	0	5481	1	0	1
Srinagar (Division)	4090	0	4080	1	0	1
Jharkhand	12009	0	12000	10	0	10
Karnataka	128827	0	128500	126	0	126
Madhya Pradesh	139252	10748	150000	149	0	149
Maharashtra	106012	0	104500	105	0	105
Manipur	6450	500	6950	8	0	8
Meghalaya	2990	760	3750	3	1	4
Mizoram	1700	1000	2700	1	1	2
Nagaland	3450	300	3750	4	0	4
Odisha	38605	295	38900	41	0	41
Punjab	6288	0	6000	7	0	7
Rajasthan	60303	197	60500	50	0	50
Sikkim	18537	0	15750	30	0	30
Tamil Nadu	15168	1832	17000	13	4	17
Telangana	30048	0	29998	26	0	26
Tripura	4705	1045	5750	7	0	7
Uttarakhand	6004	0	6000	7	0	7
Uttar Pradesh	57370	0	56000	57	1	58
West Bengal	93784	0	90500	89	0	89
Total	892521	16677	892409	901	9	910

Source: SFAC 2022.

As on March 2019, there were only 551 FPOs supported by SFAC in India. This number has jumped to 910 FPOs in 2022. As compared to NABARD, FPOs supported by SFAC

have grown at a lower rate. The growth is not as much as that of those FPOs supported by NABARD. The FPOs supported by SFACs are skewed towards a few states(Figure 4.1). States like Kerala (108), Karnataka (113), and West Bengal had the most number of FPOs. As on May 2022, Madhya Pradesh (149) has the highest number of FPOs followed by Karnataka (126), Maharashtra (105) and West Bengal (89). It can be observed that states like Madhya Pradesh and West Bengal have a larger number of both SFAC and NABARD-supported FPOs.

Figure 4.1: Number of FPOs promoted by SFAC



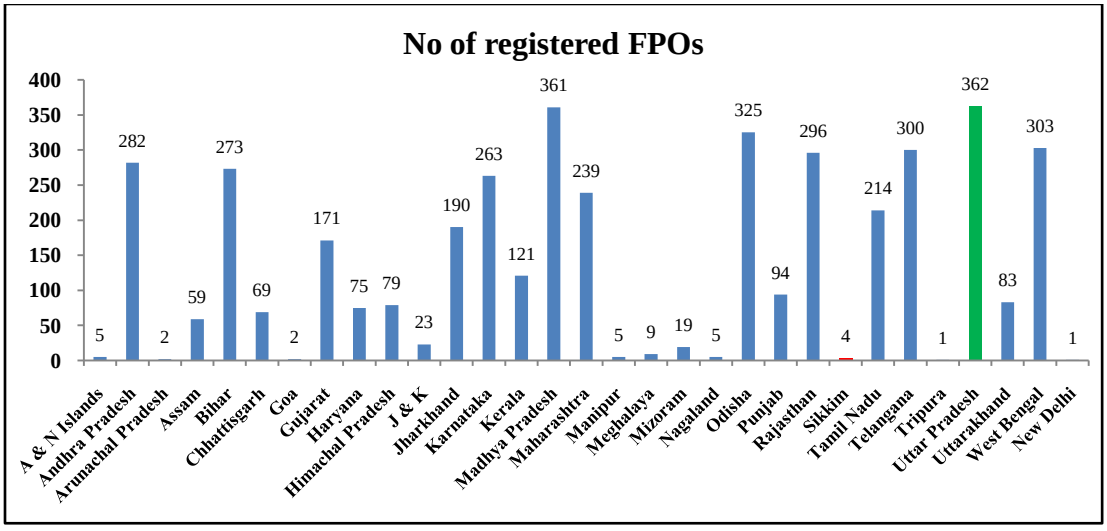
Source: SFAC, 2022.

Among the Northeast states, Sikkim has the highest number of FPOs supported by SFAC followed by Assam (18) and Manipur (8). Mizoram has only 2 FPOs supported by SFAC.

4.3.2. FPOs promoted by NABARD

Compared to SFAC, NABARD has supported more number of FPOs in all states in the country. As on March 2019, there were 2083 FPOs supported by NABARD in India (Padmaja et al., 2019) which later doubled and increased to 4235 as on 15 August 2019 (Figure 4.2). Till date, NABARD has promoted 4276 FPOs and 1833786 farmers across 603 districts of 32 states/UTs (NABARD, 2022). It shows a rapid expansion of FPOs across the country by NABARD. NABARD promoted FPOs through the PRODUCE Fund of Rs 200 crores since 2008-09. The FPOs supported by NABARD are distributed across most states (Figure 4.2).

Figure 4.2: Number of FPOs promoted by NABARD as on 15/08/2019



Source: www.nabfpo.in

Initially, states like Karnataka, Tamil Nadu, Madhya Pradesh and West Bengal had the largest number of FPOs (i.e. more than 150 FPOs) and were leading in terms of the number of FPOs. However, it can be seen from Table 4.2 that these states have been replaced by other states now. Presently, five states have more than 300 FPOs. Uttar

Pradesh (362), Madhya Pradesh (361), Odisha (325), West Bengal (303) and Telangana (300) are the leading states in terms of the number of FPOs in the country. On the other hand, New Delhi (1), Tripura (1), Goa (2), Arunachal Pradesh (2) and Sikkim (4) have the lowest number of NABARD-supported FPOs in India. All the Himalayan states of the country had FPOs lesser than 100. Uttarakhand (83) has the highest number of FPOs among them followed by Himachal Pradesh (79) and Jammu & Kashmir (23).

Among the Northeast states, Assam (59) has the highest number of FPOs followed by Mizoram (19) and Meghalaya (9) (Figure 4.2). A large number of FPOs concentrated in Assam can be attributed to the area of the state and also the population of the farming community. Here too, Tripura (1), Arunachal Pradesh (2) and Sikkim (4) have the least number of FPOs. Nagaland and Manipur have equal number (5) of FPOs. Despite being the largest state in terms of area in the Northeast, Arunachal has the lowest number of FPOs. This may be attributed to the fact that the majority (i.e. around 61.55 per cent) of the area is under forests and the population density is also the lowest (17 persons/sq. km) in the country resulting in less area under agriculture and few people under farming community. It is to be noted that except for Mizoram and Nagaland, all FPOs in the northeast states were supported by the PRODUCE Fund under NABARD.

The wide disparity in the number of FPOs among states and across regions might be attributed to geographical specificities, enabling environment, and enterprising farmers who actively participated and nurtured the organisations through collective action (Shah, 2016). There are other factors too such as the type of crops grown in the region, marketing opportunities, etc (Padmaja et al., 2019).

NABARD has been supporting the formation and promotion of FPOs in India under two different funds, namely, the PRODUCE Fund and the NABARD Promotional Fund. Observing the potential and relevance of producer organisations, NABARD, in 2011, allocated a separate fund titled Producers' Organisation Development Fund (PODF) with an initial corpus of Rs. 50 crores to support the formation and promotion of FPOs. This fund aimed to assist FPOs at three levels, namely, facilitation of credit support, capacity-building programmes and creating market linkages. Apart from these broad objectives, grant support has been made for other aspects too, namely, business development services, skill and capacity upgradation.

Similarly, it also took a special initiative to create new FPOs. Among many other funds, NABARD manages Producers Organisation Development and Upliftment Corpus (PRODUCE) Fund. This fund was created by the Government of India in NABARD in 2014-15 for building 2000 FPOs across the country. It aims to promote new FPOs by assisting them in meeting their initial financial requirements, making them credit-worthy and sustainable business enterprises of farmers.

NABARD has developed a portal named 'NABFPO.IN' and digitised the FPO data including members' profiles for use by the stakeholders. Broad details of FPOs are available on the NABARD website. Performance Measurement Tool has been developed for the assessment and monitoring of overall performance and facilitating designing of need-based interventions and credit linkages for building robust organisation. To increase the credit flow and to make the banks aware of the type of credit needs of FPOs, NABARD has also developed guidance notes on financing FPOs by Banks.

4.3.3. Central Sector Scheme - 'Formation and Promotion of 10,000 new FPOs'

Recognising the significance and strength of FPOs, the Government of India has approved a Central Sector Scheme -"Formation and Promotion of Farmer Producer Organisations (FPOs)" for the formation of 10000 new FPOs by 2023-24. Each FPO will be provided adequate handholding for five years from the formation. SFAC, NCDC and NABARD will serve as Implementing Agencies (IAs). However, states can also have their own IAs. These IAs will then engage professionally managed Cluster-Based Business Organisations (CBBOs) who will provide adequate support to FPOs to develop them into economically sustainable business entities. This scheme aims to provide a supportive ecosystem for FPOs to grow into vibrant and sustainable income-oriented enterprises for farmers for the socio-economic development of farming communities.

SFAC will set up a National Project Management Agency (NPMA) that will provide overall project guidance and data maintenance. Initially, three Implementing Agencies (IAs) namely, SFAC, NCDC and NABARD shall be responsible for forming and promoting FPOs. SFAC, NCDC and NABARD will form and promote FPOs registered under the Companies Act, any Cooperative Societies Act of the states and a mix of both respectively. Apart from these three IAs, states can have their own implementing agency if they want. In the next step, these IAs will set up Cluster-Based Business Organisations (CBBOs) at the state or cluster level. CBBOs are formed based on geography, produce clusters, cropping patterns etc. They are responsible for providing professional experience and exposure to FPOs and will be initially engaged for a period of three years for the formation of new FPOs. Progress in FPO formation under the Central Scheme is presented in Table 4.3.

Table 4.3: State-wise details of FPOs under Central Sector Scheme for Formation and Promotion of 10000 FPOs as on 31-03-2022

		2020-21		2021-22		Grand Total	
	State/UTs	Registered	Under process of registration	Registered	Under process of registration	Registered	Under process of registration
1	Andhra Pradesh	22	1	7	3	29	4
2	Arunachal Pradesh	1	0	0	0	1	0
3	Assam	17	3	0	31	17	34
4	Bihar	24	0	14	17	38	17
5	Chhattisgarh	14	4	0	31	14	35
6	Goa	0	0	0	5	0	5
7	Gujarat	20	0	0	31	20	31
8	Haryana	19	3	6	22	25	25
9	Himachal Pradesh	22	2	8	13	30	15
10	J & K	15	0	4	22	19	22
11	Jharkhand	22	0	1	34	23	34
12	Karnataka	21	5	2	8	23	13
13	Kerala	9	0	0	18	9	18
14	Madhya Pradesh	41	0	15	51	56	51
15	Maharashtra	56	0	14	39	70	39
16	Manipur	0	3	0	0	0	3
17	Mizoram	5	0	0	0	5	0
18	Meghalaya	1	0	0	0	1	0
19	Nagaland	1	0	0	10	1	10
20	Odisha	28	0	25	19	53	19
21	Pu:njab	18	3	0	5	18	8
22	Rajasthan	39	1	21	38	60	39
23	Tamil Nadu	20	4	1	22	21	26
24	Telangana	25	1	2	28	27	29
25	Tripura	8	0	2	1	10	1
26	Uttar Pradesh	46	0	8	75	54	75
27	Uttarakhand	18	0	3	19	21	19
28	West Bengal	5	19	0	0	5	19
	Total	517	49	133	542	650	591

Source: SFAC, 2022.

4.4. Status of Farmer Producer Organisations in Sikkim

4.4.1. Emergence and growth of FPOs

The state of Sikkim has the highest number of FPOs in Northeast India followed by Assam. FPOs were introduced in Sikkim in the year 2017. A total of 30 FPOs were registered under SFAC in Sikkim in 2017 but only 28 of them are actively operating at present (Table 4.4). The 2 FPOs were started under the Vegetable Initiative for Urban Cluster (VIUC) both in the South district while the remaining 28 FPOs were started under the Mission Organic Value Chain Development for North East Region (MOVCD-NER). These 28 FPOs are distributed across all four districts of Sikkim, namely- North, East, West and South. All these four FPOs are concentrated only in the South district. Thus, there are a total of 32 FPOs in Sikkim at present.

Table 4.4. Progress of FPO formation in the Northeast states and India as on 31-05-2022

State/Country	Mobilised	Under Mobilisation	Total Targeted Farmer	Registered	Under the process of registration	Total
Assam	12331	0	10500	18	0	18
Arunachal Pradesh	4750	0	4750	6	0	6
Manipur	6450	500	6950	8	0	8
Meghalaya	2990	760	3750	3	1	4
Mizoram	1700	1000	2700	1	1	2
Nagaland	3450	300	3750	4	0	4
Tripura	4705	1045	5750	7	0	7
Sikkim	18537	0	15750	30	0	30
India	892521	16677	892409	901	9	910

Source: SFAC, 2022

Our study has considered only SFAC-supported FPOs in the state. All 28 FPOs deal with four major crops identified by MOVCD-NER. These four main crops for FPOs are large cardamom, turmeric, ginger and buckwheat. Besides these four crops, FPOs also deal in a variety of food and non-food crops like cabbages, cauliflower, peas, potatoes, tomatoes, cherry pepper, broom-sticks, oranges, kiwis, drumsticks, carrots, etc. All FPOs in Sikkim have been registered under the Sikkim Co-operative Societies Act of 1978. Under Section 64(1) of the Act, auditors from the Department of Cooperation, Government of Sikkim conducts an audit of all financial statements of FPOs every year. It was found that all FPOs had regularly conducted audit of their accounts.

4.4.2. Resource Institutions (RIs)

To form and promote FPOs in Sikkim in a uniform and effective manner and to develop FPOs into economically sustainable entities, three Resource Institutions (RIs) namely, International Competence Centre for Organic Agriculture (ICCOA), Indian Grameen Service (IGS) and M-CRIL have been assigned. These RIs are responsible for the handholding of FPOs and providing professional experience and exposure to FPOs for the initial three years. They are responsible for assisting in the mobilisation of farmers, formation of groups and federating into FPOs and guiding them during their regular meetings. They also assist FPOs in preparing business plans, meeting other key stakeholders, capacity building, proper utilisation of finance and providing access to all relevant information. Formation of FPOs in Sikkim was supported for the initial 3 years by three Resource Institutions (RIs) ICCOA has supported FPOs in the East and the North district, MCRIL in the South district while IGS has supported FPOs in the South district. The number of FPOs and their respective RIs are presented in Table 4.5.

Resource Institutions mobilise small and marginal farmers, who produce buckwheat, ginger, large cardamom and turmeric crops under MOVCD-NER scheme from GPUs covering several villages. The scheme intends to do cluster cropping in the state. In other words, RIs intend to identify clusters of these four crops and increase their marketable surplus in the state to meet the national and international demand for organic produce. However, most of the FPOs deal with vegetables.

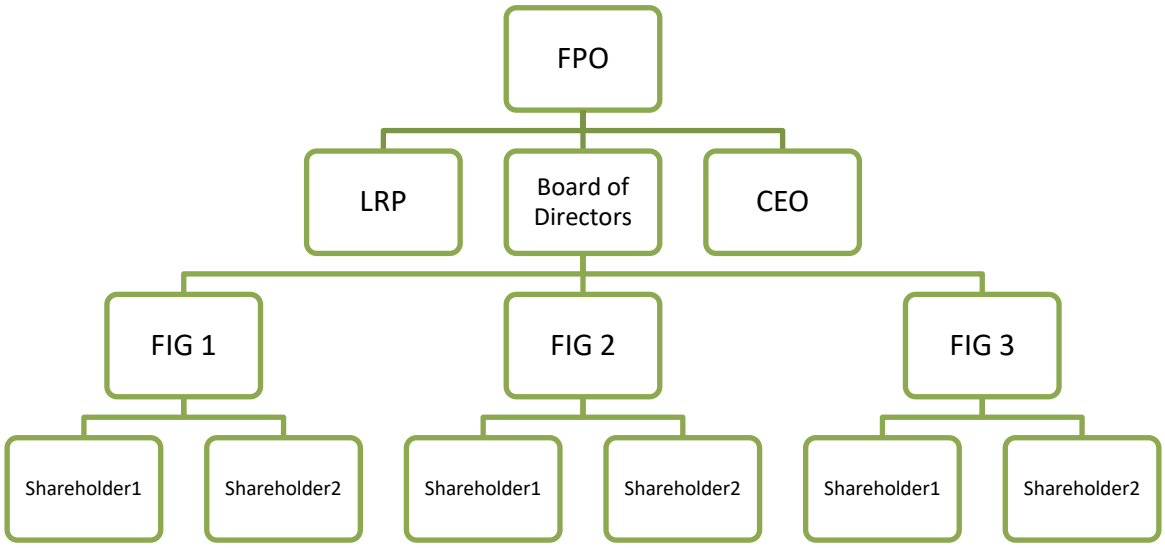
4.4.3 Process of FPO Formation

The task of formation and promotion of FPOs and mobilisation of farmers in Sikkim was entrusted with the above-mentioned three RIs. These RIs conducted meetings and orientation programmes across several villages and wards. The FPOs first approached Gram Panchayat Pradhans or heads and convinced them about the new concept of FPOs and requested them to reach out to farmers in all respective wards. The Panchayat head himself/herself or through their sub-ordinates reached farmers in all wards and informed them about the meeting going to be held for educating farmers about FPOs. They visited the wards and persuaded farmers to attend the orientation and awareness meetings citing the numerous benefits of FPOs. Moreover, the Department of Agriculture and Horticulture, Government of Sikkim in collaboration with the respective RIs has been organising workshops for sensitizing farmers about the importance of FIGs and FPOs.

During the meetings, farmers were explained about the new form of collectivisation called FPOs, the need for such collective action (especially for small and marginal farmers) and the resulting benefits of FPOs. Farmers in contagious neighbourhoods, growing similar crops and sharing similar socio-economic backgrounds would form a small group of 15-20 farmers. During such meetings, registration for some members was

also conducted. These informal groups were called as Farmer Interest Groups (FIGs) which were later federated into FPOs. Figure 4.3 illustrates the organisational structure of an FPO in Sikkim.

Figure 4.3: Organisational Structure of FPOs in Sikkim



Source: Field Survey, 2019-20.

4.4.4 Board of Directors (BoD)

BoDs were guided by Resource Institutions but the performance of FPOs and the resulting benefits after the establishment depends entirely on the level of commitment and entrepreneurial ability of the group leaders. Therefore, running an FPO requires expertise in the operation of this organisation as well as financial expertise. Running these institutions successfully requires the ability to analyse the business, identify potential profitable products, create forward and backward linkages, understand the

organisation's financial performance and also create new profitable business plans for further growth of the organisation.

For this purpose, a CEO for each FPO was appointed for performing all executive functions. Their salaries for the initial years were paid out of the grant from SFAC. After the handholding period, FPOs are expected to generate profitable business and be able to pay salry to the CEO themselves. The survey revealed that although all FPOs had appointed CEOs initially, CEOs from two FPOs (Amba Taza and Budang Kamarey) had left the FPO citing personal reasons. These 2 FPOs were operating without a CEO and the President was conducting the executive functions during the period of the survey.

For conducting proper business, an FPO needs to have accurate information about the member farmers, their land size, crops grown, expected harvest quantities and timings of the harvests. All these information have to be collected from the farmers at the village level by visiting their households. For this purpose of reaching the individual farmers, Local Resource Persons (LRPs) were appointed by the RIs by paying a monthly salary of Rs 7000 only. However, when the RIs stopped paying their salaries for around 6 months, LRPs had resigned from the FPO.

4.4.5 District-wise distribution of FPOs in Sikkim

The district-wise analysis shows that the maximum number of FPOs were established in the South district followed by the West districts, East and North districts (Table 4.5). FPOs in Sikkim are supported and promoted by three Resource Institutions (RIs), namely, International Competence Centre for Organic Agriculture (ICCOA), Indian Grameen Service (IGS) and M-CRIL. These RIs are responsible for the handholding of FPOs and

providing professional experience and exposure to FPOs for the initial three years. RIs are organisations appointed by SFAC to set up and help FPOs in capacity building. They facilitate the mobilisation of farmers into smaller groups called as Farmer Interest Groups (FIGs) which are later federated as FPOs. They also assist farmers in registration, making business plans and performing handholding of FPOs in various other activities. Table 4.5 shows the district-wise number of FPOs located in the state of Sikkim.

Table 4.5: District-wise number of FPOs in Sikkim

District	No of FPOs	Resource Institutions
East Sikkim	7	International Competence Centre for Organic Agriculture (ICCOA)
West Sikkim	8	Indian Grameen Service (IGS)
North Sikkim	4	International Competence Centre for Organic Agriculture (ICCOA)
South Sikkim	9	Micro Credit Rating International Ltd (MCRIL)

Source: SFAC.

n Sikkim, a total of 30 FPOs were promoted and registered by SFAC in 2017 but only 28 of them are operating actively at present. While 15750 farmers were targeted, around 18537 have been mobilised till date (SFAC, 2022). Formation of FPOs in Sikkim was supported for the initial 3 years by four Resource Institutions (RIs) namely; Indian Grameen Service (IGS), International Competence Centre for Organic Agriculture (ICCOA) and Micro Credit Rating International Ltd (M-CRIL). ICCOA has supported FPOs in the East and the North district, MCRIL in the South district while IGS has supported FPOs in the South district. The highest number of FPOs is in the South district (9), followed by West district (8), East district (7) and North district (4). Each FPO in the state deals with a mix of crops including vegetables, fruits, large cardamom, ginger, turmeric etc.

4.4.6 Membership size

However, membership in many FPOs remains low because (a) many farmers are leaving agriculture as they can earn more in other jobs than agriculture (b) in agriculture they have to wait for many months to harvest and earn income. Sikkim is a rapidly developing state where other sectors like tourism and pharmaceutical industries are growing rapidly. They offer several economic opportunities to earn more income and thus attract rural people away from agriculture which requires them to wait for many months. When several other economic opportunities fetch them stable and higher income, the rural population prefer to leave agriculture. In 2019, Govt of Sikkim introduced the One Family, One Job (OFOJ) scheme that aims to provide a government job to a member of every household that has no government job in the state. Rural people believe that a low-paying easy government job is better than agriculture which requires them to put in a lot of hard work and whose income depends largely on many factors like rain, pest attacks, diseases, market prices, exploitative middlemen, etc. (c) majority of the agricultural households have smaller farm sizes. They cultivate for subsistence and self-consumption and thus cannot generate a marketable surplus. For example, almost all households that cultivated maize used it as cattle feed and are rarely sold. Therefore, they find no motivation to join FPOs which are actually formed to help farmers earn more income by marketing. (d) Farmers still lack awareness as many of them are located in remote areas of hills and it becomes quite a difficult task to reach them all in far-off places. On top of that, illiteracy is widespread in rural areas. It further makes it difficult to convince farmers about a new concept that too which demands Rs 1000 at the very outset from poor rural farmers.

4.4.7 Farmer Interest Groups

FIG is an informal institutional intermediary between the primary producers and the FPO of which the farmer is a shareholder. It is an informal group of rules and regulations set by themselves. Around 25-30 such FIGs with more than 500 farmers can federate into an FPO. FIGs regularly conduct monthly meetings on a certain date where social issues are discussed. To become a member, each farmer must pay Rs 1000 as a share capital contribution. FPOs and FIGs also regularly conduct training on organic cultivation techniques, and preparation of organic fertilisers to increase organic production.

The member farmers are supported to identify crops relevant or suitable to their context and then are provided with access to modern technology through community-based processes. Consequently, they are empowered to access forward linkages through value-addition and marketing activities.

Table 4.6: Basic Profile of FPOs in Sikkim

Sl No	District	Name of the FPO	Members	FIGs	Share Capital (Rs.)	BoD	Monthly meeting	AGM
1	North	Organic Valley FPCS Ltd	256	21	281600	9	27th of every month	1
2		Passingdang Tingvong FPCS Ltd.	170	15	170000	9	1st week of every month	1
3		Ringhim Singhik FPCS Ltd	306	20	286000	7	1st week of every month	0
4		Men Rongong Tumlong FPCS Ltd	230	12	230000	9	1st week of every month	0
5	East	Rongli FPCS Ltd.	261	28	261000	9	Every 7th of month	3
6		Amba Taza FPCS Ltd.	89	8	334768	7	Every 7th of month	3
7		Machong Parakha FPCS Ltd.	291	20	291000	9	Every 7th of month	3
8		Rani Khola FPCS Ltd.	198	15	198000	17	Every 7th of month	4
9		Budang Kamarey OFPCS Ltd.	132	11	132000	8	7th of every month	3
10		Rakdong Tintek OFPCS Ltd.	374	23	374000	7	7th of every month	3
11		Khamdong FPCS Ltd.	250	19	250000	8	8th and 21st of every month	3
12	West	Soreng Sunrisers FPCS Ltd.	481	30	653000	13	8th and 21st of every month	4
13		Zoom FPCS Ltd.	274	25	274000	10	7th of every month	2
14		Mangalbaria FPCS Ltd.	338	28	345000	11	16^{th} and 25^{th} of every month	1
15		Rinchenpong FPCS Ltd.	503	32	503000	15	Last saturday of every month	2
16		Gyalshing FPCS Ltd.	380	35	380000	11	16^{th} and 25^{th} of every month	2
17		Khechuperi FPCS Ltd.	309	30	541250	11	Last saturday of every month	2
18		Daramdin Sombaria FPCS Ltd.	225	20	225000	10	Last saturday of every month	2
19		Dentam FPCS Ltd.	481	40	481000	13	16^{th} and 25^{th} of every month	3
20	South	Assangthang Poklok FPCS Ltd.	250	15	250000	11	Last saturday of every month	1
21		Kisan Unnati FPCS Ltd.	57	5	61000	9	Last saturday of every month	3
22		Melli-Dara Kateng FPCS Ltd.	48	4	48000	19	Last saturday of every month	3
23		Yangang-Sripatam FPCS Ltd.	37	9	36000	8	18^{th} of every month	2
24		Rabong Sangmoo FPCS Ltd.	154	14	154000	5	16^{th} and 25^{th} of every month	4
25		Borong Phamtam FPCS Ltd.	234	7	219500	12	Last saturday of every month	2
26		Kitam Kamrang FPCS Ltd.	68	7	68000	6	Last saturday of every month	0
27		Lamaten Tingmoo FPCS Ltd.	486	28	486000	7	8th and 21st of every month	3
28		Nagi karek FPCS Ltd.	59	20	56500	7	Last saturday of every month	3

Source: Compiled from FPO Office Records.

Note: BoD denotes Number of members in the Board of Directors; AGM denotes Annual General Meeting

Table 4.7: Main products and marketing linkages of FPOs in Sikkim

Sl No	Name of the FPO	Main Products	Market Linkage
1	Organic Valley	Large Cardamom, Ginger, Buckwheat, oranges,vegetable	Local markets (Sikkim) , Assam and Siliguri
2	Passingdang Tingvong	Large cardamom, Ginger, Turmeric, Vegetables.	Local markets (Sikkim) and Siliguri
3	Ringhim Singhik	Large Cardamom, Ginger	Local markets(Sikkim), Siliguri, Flavourit Spices Trading Ltd (Kerala), NERAMAC
4	Men Rongong Tumlong	Large Cardamom, Ginger	Local markets (Sikkim), 2 outlet in Gangtok for vegetables,
5	Rongli	Turmeric, Buckwheat, Ginger, Large cardamom, green Vegetables	Department of Horticulture and Agriculture, Nature's Gift Pvt Ltd. and 1 outlet in Rongli bazaar. Siliguri Tamil Nadu
6	Amba Taza	Ginger, Large cardamom, Vermicompost	FPOs in other districts
7	Machong Parakha	Ginger, Large cardamom , vegetables	Local markets(Sikkim)
8	Rani Khola	Large cardamom, Buckwheat, Ginger	Local markets(Sikkim); Regular vegetable supply to gangtok
9	Budang Kamarey	Green vegetables, Ginger, Turmeric, Buckwheat, Large cardamom	Regular Vegetable supply to Local distributors
10	Rakdong Tintek	Large cardamom, Buckwheat, and Ginger	Nature Gifts Pvt. Ltd., Local markets(Sikkim)
11	Khamdong	Ginger, Buckwheat, Large cardamom, Turmeric, Orange	Parvata Foods Pvt Ltd.
12	Soreng Sunrisers	Ginger, Buckwheat, Turmeric, Cardamom, Broomsticks	Parvata Food pvt ltd,Nature's Gift Pvt Ltd, Local markets(Sikkim)
13	Zoom	Turmeric, Drumsticks, Vegetables,	Nature's Gift Pvt Ltd, Siliguri
14	Mangalbaria	Ginger, Turmeric, Pulses, Broomstick, Buckwheat	Local markets(Sikkim)
15	Rinchenpon	Buckwheat, Turmeric, Cardamom, Ginger, Orange, Broom	Local markets(Sikkim)

Table 4.7: Main products and marketing linkages of FPOs in Sikkim (continued…)

Sl No	Name of the FPO	Main Products	Market Linkage
16	Gyalshing	Buckwheat, Turmeric, Vegetables, Cherry pepper, Ginger, large cardamom	Siliguri, Local market, Gyalshing local market, Mukesh Food pvt ltd, (geyzing)
17	Khechuperi	Large cardamom, Buckwheat, Oranges, Vegetables	Geyzing, Soreng, local markets
18	Daramdin Sombaria	Buckwheat, Ginger, Turmeric, Vegetables	Soreng
19	Dentam	Large cardamom, potato, buckwheat, vegetables	Geyzing, Dentam local markets
20	Assangthang Poklok	Ginger Cluster , Vegetable	Private agents (Jorethang)
21	Kisan Unnati	Turmeric, Ginger, Vegetables, Broomsticks, Cherry pepper,	Sikkim IFFCO Organic Ltd, SIMFED, Mahadev Bhander (Siliguri), Melli local market,
22	Melli-Dara Kateng	Turmeric, Ginger, Buckwheat, Pulses, Vegetables	Local markets in Sikkim
23	Yangang-Sripatam	Cherry Pepper, Vegetables, Ginger, large cardamom, Turmeric Orange	Govt. Fruit Preservation Factory (Singtam), IFFCO, Singtam wholesaler, Siliguri, Green Grocers, Organic retailers in Gangtok
24	Rabong Sangmoo	Cardamom and Ginger	Singtam (Sikkim)
25	Borong Phamtam	Large cardamom, Oranges, vegetables	Ravangla (Sikkim)
26	Kitam Kamrang	Turmeric, Ginger, Cherry pepper, Buckwheat	Namchi (Sikkim)
27	Lamaten Tingmoo	Cherry Pepper, Ginger, Turmeric, Seasonal Vegetables	Govt Fruit Preservation Factory, Anil Enterprise (Siliguri),
28	Nagi karek	Turmeric, Ginger, Vegetables	Nature's Gift (Rangpo)

Source: Compiled by the Authors from FPO Office Records.

Table 4.8: Primary & Secondary Processing activities of the FPOs

Sl No	Name of the FPO	Primary Processing	Secondary Processing
1	Organic Valley	Packaging	Ginger powder, Ginger paste.
2	Passingdang Tingvong	Packaging	Packaging and proper drying through electric machine
3	Ringhim Singhik	No	No
4	Men Rongong Tumlong	No	Grinder, ginger grinder, washer, slicer, cold storage
5	Rongli	Packaging, labelling, sorting	Ginger flakes, Buckwheat flour,, Grinding,
6	Amba Taza	No	Buckwheat powder
7	Machong Parakha	No	No
8	Rani Khola	Cleaning, sorting, packaging	No
9	Budang Kamarey	Packaging	Turmeric powder (more than 300 kg) being made from a small pulverizer, buckwheat flour, ginger flakes, ginger powder, 'Jaivik Swad' brand
10	Rakdong Tintek	Packaging, labelling, sorting	Buckwheat flour
11	Khamdong	Packaging	No
12	Soreng Sunrisers	Cleaning, sorting, grading, packaging	Ginger flakes, powder, Buckwheat flour,
13	Zoom	Packaging	No
14	Mangalbaria	No	No

Table 4.8: Primary & Secondary Processing activities of the FPOs (continued…)

Sl No	Name of the FPO	Primary Processing	Secondary Processing
15	Rinchenpong	Packaging	No
16	Gyalshing	No	No
17	Khechuperi	No	No
18	Daramdin Sombaria	No	No
19	Dentam	No	No
20	Assangthang Poklok	Only grading and sorting	No
21	Kisan Unnati	Sorting and packaging	No
22	Melli-Dara Kateng	Sorting and packaging	No
23	Yangang-Sripatam	No	Dryer, Slicer, Grinder, Sealing for pack, Labelling tools available but not started
24	Rabong Sangmoo	Yes	No
25	Borong Phamtam	Cleaning, sorting, packaging	No
26	Kitam Kamrang	Cleaning, sorting, packaging	No
27	Lamaten Tingmoo	Yes	No, processing unit is under construction.
28	Nagi karek	Cleaning, sorting, packaging	No

Source: Compiled by the Authors from FPO Office Records.

4.4.8 Procured Product

Only four crops (namely ginger, turmeric, buckwheat and large cardamom) have been identified as principal crops under MOVCD-NER scheme for value-addition and marketing by the FPOs. However, all 28 FPOs in Sikkim currently deal with a variety of agricultural, horticultural and other products. These include large cardamom, green vegetables, hill brooms, cherry pepper, drumsticks, carrot, green peas, oranges, etc.

Table 4.9: Rates under Product Incentive Scheme (PIS)

Sl. No.	Crops	Incentive (Rs/kg)
1	Large Cardamom	100
2	Ginger	20
3	turmeric	10
4	Orange	20
5	buckwheat	10
6	Cabbage	5
7	Cauliflower	7
8	Green Peas	8
9	Cherry Pepper	20
10	Carrot	7
11	Radish	7
12	Kiwi	25
13	Pahelo dal (Green Gram)	25
14	Rajmash (Kidney Bean)	25
15	Kalo Dal (Black Gram)	25
16	Masem(Ricebean)	25
17	Montulal (Matured Dry seeds)	25
18	Singtamey (Matured dry seeds)	25
19	Ghew simi (Matured dry seeds of butter beans)	25

Source: Department of Agriculture, Govt of Sikkim

With the view to enhance the production and productivity of various agricultural and horticultural crops and also to streamline/channelize marketing of those crops by involving institutional bodies, the Department of Agriculture of the Government of

Sikkim has introduced the Production Incentive Scheme (PIS). This scheme also intends to encourage youth to take up farming. Initially, it was introduced for 5 crops only which was later increased to 12 crops and finally to 20 crops at present (Table 4.9). It aims to motivate farmers to increase production. Particular details of the scheme are mentioned:

1. The scheme will be known as Mukhya Mantri Krishi Atmanirbhar Yojana (MMKAY)
2. The scheme intends to benefit all farmers irrespective of their landholding size.
3. Incentives will be given based on quantities marketed/sold. Marketing shall be done through registered institutions namely: Farmer Producer Organisations (FPOs) and Cooperatives including SIMFED and DACS and SHGs registered under NRLM/SRLM. The purchase by Government Department and agencies is also eligible for incentives.
4. Each district will form a Committee headed by the senior most officer of the Agriculture or Horticulture Department as a member. The committee will meet regularly to review and verify/cross-check the records furnished by the FPOs, SHGs, Cooperatives and Department/agencies before the release of incentives.
5. An amount of 2 per cent of incentive value will be granted as a handling charge to all agencies (except Government) engaged in aggregating and marketing farmers' produce.
6. Each beneficiary can avail up to Rs 30,000 only per individual crop while an individual can draw a maximum incentive amount of Rs 100000 only. This is done to prevent hoarding and profiteering.

7. The incentives shall be granted to only those farmers who have actually cultivated the crops in their own fields. Therefore, all claims for incentives should be supported by a verification certificate from District/Sub-division/Field level officials of respective departments.
8. The incentives will be provided twice a year as per crop season.

Each FPO procures farmers' produce and maintains a record of the name of the farmers, the name and quantity of the products procured. Later, FPOs apply for these incentives in a format prescribed by the Department of Agriculture. When the incentives are credited to the FPO's account, it distributes further to the farmers based on the records maintained at the time of procurement. In this way, FPOs have been successfully serving as an effective and efficient means of implementing the PIS.

4.4.9 Functions and Activities

The key function of all FPOs in Sikkim is to enable farmers in production, processing and marketing. Before marketing the produce, FPOs conduct primary and secondary processing activities to make the produce more marketable and fetch a higher value. Earlier farmers were disposing their produce to middlemen in the raw form directly from the farms that fetched them very low prices. Now, the FPO members first undertake primary processing activities like cleaning, grading, sorting and proper packaging. In cases of crops like cherry pepper, FPOs provide crates to farmers for safer storage and transportation. Many FPOs have also tried secondary processing like producing ginger flakes, turmeric powder and buckwheat powder.

4.4.10 Market Linkages

FPOs in Sikkim have been mostly selling to local markets or buyers only. They have reached a limited market due to their low volume and poor quality. Despite being India's first fully organic state, Sikkim's FPOs that deal only in organic products are currently disconnected from those premium markets outside the state. With better quality and larger volume, they can reach remunerative markets where they can negotiate for better prices. Higher prices cannot be commanded within the state, even if it is organic. Sikkim's local markets sell both local organic and non-organic products from West Bengal (WB). Both products are sold at almost similar prices. The general public prefers to consume cheaper and non-organic products. Thus, organic products continue to be sold for lower prices as long as it is sold domestically without any value-addition. If FPOs work towards improving volume and quantity along with some value-addition, then these products can reach premium markets in urban centres fetching higher returns.

Till date, almost all FPOs have performed the role of aggregating and marketing of farmers' produce though to different degrees. Highly successful ones like Lamaten-Tingmoo FPO have been able to create a strong market linkage between cherry pepper farmers and Sikkim Supreme (agro-firm making pickles). Soreng Sunrisers sells farmers' produce in Siliguri (WB) regulated market. Others have been procuring from farmers and selling to local markets. There have been instances where taking the advantage of Covid-19 lockdown, middlemen procured produce at throwaway prices and FPOs in that area later procured the same produce at higher prices thus saving the farmers. These FPOs procured from the farmers and then after primary processing sold to local markets at relatively better prices.

Sikkim IFFCO Organics Ltd, (an agro-processor with its factory in Rangpo, Sikkim) signed an agreement with Sumbuk FPO in 2019 to procure raw material ginger, turmeric, buckwheat and large cardamom. Its requirement is only certified agricultural and horticultural commodities from the FPO at the prevailing market price or the minimum guaranteed price agreed by both parties. The agreed quantity will be collected from the collection centre of the FPOs or will be delivered by the FPO for which transportation costs will be paid by the buyer. And the payment will be made within two weeks.

4.4.11 Financial Linkage

One very important constraint faced by all FPOs is the credit requirement. Byelaws of the FPOs in the state also mention that credit may be arranged by the FPOs at two levels. First, the FIGs may arrange credit for carrying out agricultural production activities such as procuring inputs and seeds. Secondly, the FPOs also can seek credit for carrying out other different activities like value-addition at the village level, marketing, transportation, and setting up processing facilities. Financial institutions are still unaware of the concept of FPOs and have limited knowledge. Before advancing loans, banks ask for viable business plans and FPOs are still new and naïve at creating such business plans. Moreover, agriculture is a risky business and financial institutions hesitate in advancing loans to them.

For the FPOs to be financially viable and sustainable in the long run, FPOs need to be run by the farmers themselves. Presently, they have received capital support and matching equity grants. However, they need to reduce their dependence on external financial grants and function like business entities that mobilise their own financial resources. For

purchasing a transportation vehicle, FPOs are provided around 50 per cent subsidy by MOVCDNER scheme.

4.4.12 Training

Regular trainings are organised by different institutions at regular intervals focusing on both management of FPOs and the farmers. For example, ATMA under FS&ADD, Govt of Sikkim organised training on preparing vermicompost and other organic fertilizers and pesticides attended by farmers. On the other several training and workshops are organised for the FPO representatives also. IFFCO, Cooperation Department, NIRD, SIRD, SOM & MOVCD, and MANAGE provide training to CEOs, managers and BODs of FPOs. SOM and MOVCD organise training for CEOs on preparing business plans, book-keeping and knowledge about societies.

4.4.13 Technology & Custom Hiring Centre (CHC)

In Sikkim, mechanisation becomes difficult due to hilly terrain. Bullocks also have become expensive. Therefore, CHC under an FPO will have modern farming equipments suitable to the state's geographicall terrain. These machines or tools are provided at a minimal rent to the farmers. Since FPO offices are located near the motorable road, farmer members borrow from FPO and transport them using vehicles to their fields. For each day, they pay some rent to the FPO. One very important point to remember here is that farmers are not trained to use the machines. As a solution to this, FPOs have assigned this task to one trained farmer to handle the machine so that the machine lasts longer. There is also the provision of imposing fines for returning late.

CHAPTER 5

SOCIO-ECONOMIC STATUS OF FPO MEMBERS AND NON-MEMBERS IN SIKKIM

5.1 Introduction

Sikkim is a tiny mountainous state in India's northeast. It has no commercial airports or railway stations. It can be accessed only by road from West Bengal. Transportation of agricultural produce via the mountainous roads is costly. Therefore, small farmers generally face higher transportation costs if they try to transport and sell small volumes of agricultural produce. A study by Thakur et al. (1997) reported that high transportation cost was the most serious problem faced by around 82 per cent of the hill farmers in two districts of India's hilly state, Himachal Pradesh. Faced with such huge transportation costs and small quantities of products to sell, small farmers prefer to opt-out of the remunerative market. As a result, they are poorly connected to both input and output markets and thus lack market information about prevailing market prices and quantity demanded. Taking advantage of such a fragmented supply chain, middlemen and local traders step in and procure agricultural produce at throwaway prices from the farmers. The lack of storage facilities and the perishable nature of produce further force them to accept the minimal prices offered by the traders. In Nepal, taking advantage of weak bargaining power and poor economic condition of smallholder hill farmers, middlemen even cheat them (Pokhrel & Thapa, 2007) on weights and prices. Pokhrel and Thapa (2007) suggest that the inherent problems of exploitative middlemen or marketing intermediaries can be solved by strengthening group marketing systems.

FPOs are one form of such farmer group or collective where farmers come together and organise themselves into a group. Organising as a group strengthens their bargaining power and helps them attain economies of scale in both input and output markets. Together, they can skip the long chain of marketing intermediaries and directly access the markets. Through the FPOs, small farmers as a group can directly sell to wholesale traders or institutional buyers and get a larger share of the final value of the farm products. Bulk selling of farm products and purchasing of inputs can accrue more benefits to farmers (Bingen et al., 2003).

In Sikkim, majority of the total population depends on agriculture for their livelihood while only 11 per cent of the total land is available for agriculture. A large variety of crops are cultivated including high-value crops like large cardamom, spices, flowers etc. most of the farmers are subsistence farmers with small agricultural holdings. Most of the farmers are small and marginal farmers. Such low scale of operation and resulting low marketable surplus makes agriculture a non-profitable economic activity. Moreover, climate-induced losses and pest attacks are also quite common. FPOs as farmer collectives can solve many of these constraints faced by small farmers in this hilly state.

Understanding the socio-economic profile of both FPO members and non-members becomes very essential before examining the determinants and impact of FPO membership. Agricultural households are the key stakeholder of any policy intervention that aims to benefit them. Collective action like FPOs, demands active participation from the farmers. Therefore, a clear understanding of their socio-economic characteristics enables us to draw precise conclusions about the functioning and effectiveness of any such policy intervention. This section describes the socio-economic status of 560

agricultural households comprising 280 FPO members and 280 non-members in Sikkim. Analysis of the socio-economic conditions of the FPO member and non-members have been categorised into: the demographic profile, socio-economic conditions and access to basic amenities.

5.2 Comparative socio-economic status of FPO members and non-members

5.2.1 Levels of membership

Table 5.1 depicts the number and percentage of FPO members and non-members in all 28 FPOs across all four districts of Sikkim and the state as a whole. The sample contained 560 farmers comprising 280 members and 280 non-members from all four districts of Sikkim namely; East, West, North and South. Since we have taken an equal number of members and non-members of FPOs, the percentage share of each is the same for both. The West (9) and South (8) districts have the most number of FPOs; therefore, their share of FPO members, non-members and total agricultural households in the total sample is the highest among all districts. The East district comprises 25 per cent of members and non-members while the West district comprises 32.14 per cent of agricultural households. Similarly, the North district and the South district comprise 14.28 and 28.37 per cent of agricultural households in the sample.

Table 5.1: Membership in FPOs in Sikkim

Districts	No of FPOS	Members (n=280)		Non-members (n=280)		Pooled (n=560)	
		Frequency	Per cent	Frequency	Per cent	Frequency	Per cent
East	7	70	25.00	70	25.00	140	25.00
West	9	90	32.14	90	32.14	180	32.14
North	4	40	14.28	40	14.28	80	14.28
South	8	80	28.57	80	28.57	160	28.57
Total	28	280	100.00	280	100.00	560	100.00

Source: Authors' computation based on field survey

5.2.2 Demographic Profile of the respondents

This section discussed the demographic profile of the FPO members and non-members in Sikkim. The parameters like gender, age, social category, religion, caste and family size have been discussed.

Table 5.2: Demographic Profile of FPO members and Non-members in Sikkim

Particulars	**Members**		**Non-members**		**ALL**	
	No.	Percent	No.	Percent	No.	Percent
Gender						
Female	60	21.43	68	24.29	128	22.86
Male	220	78.57	212	75.71	432	77.14
Age						
Upto 25	0	0.00	2	0.71	2	0.36
26 to 45	131	46.79	134	47.86	265	47.32
46 to 65	141	50.36	141	50.36	282	50.36
above 65	8	2.86	3	1.07	11	1.96
Social Category						
ST	87	31.07	72	25.71	159	28.39
SC	30	10.71	32	11.43	62	11.07
OBC	103	36.79	112	40.00	215	38.39
GENERAL	60	21.43	64	22.86	124	22.14
Religion						
Hindu	171	61.07	187	66.79	358	63.93
Buddhist	85	30.36	70	25.00	155	27.68
Christian	24	8.57	23	8.21	47	8.39

Particulars	Members		Non-members		ALL	
	No.	Percent	No.	Percent	No.	Percent
Family size						
1 to 3	23	8.21	14	5.00	37	6.61
4 to 6	207	73.93	223	79.64	430	76.79
7 to 9	46	16.43	42	15.00	88	15.71
Above 9	4	1.43	1	0.36	5	0.89

Source: Authors' computation based on field survey. Note: ST denotes Scheduled Tribe, SC denotes Scheduled Caste, OBC denotes Other Backward Class and GEN denotes General.

Gender

The results presented in Table 5.2 revealed that there is a dominance of males in FPO membership in all districts of Sikkim. The majority of members were males (75.7 per cent) while only 24.3 per cent of members were female. Such dominance of males is due to two reasons: (i) typically, the ownership of land is with the male member of the household. And despite land ownership not being a criterion of membership in FPO, agricultural households consider it safe and convenient to select a male member of the family as a member of the FPO. Second, women are usually confined to labour-intensive farm works like transplanting, weeding, sowing, etc while the decisions are taken by the male members. Thus, women tend to participate only in the absence of male members at home. Consequently, low participation of women will result in their less access to many government schemes that are channelised through FPOs. If more participation of women is not encouraged, women farmers will be left out of the value chain and will be confined to low-value labour-intensive agricultural activities in the fields. This result is backed by the study of Verma et al. (2019) that FPOs are dominated by male members.

Age

Age structure is considered to be an important factor while assessing the socioeconomic condition of farmers. It reflects the level of their physical well-being and productivity in economic activities. Most importantly, it ascertains the working potentiality or productivity of the farmers. It can also be an indicator for better-experienced farmers. Majority of farmer members of FPOs fall in the age group of 46 to 65 followed by 26 to 45 years indicating active participation of the productive age groups in FPOs. These age groups are considered to be productive and economically active age. In Sikkim, around half (i.e. 50.36 per cent) of the members belong to the age group 46 to 65 years indicating the absence of young farmers and prevalence of aged farmers in agriculture. This is followed by the presence of around 47.2 per cent of farmers between the ages of 26 and 45 years in FPOs. Subsequently, farmers of age lesser than 25 years are not members of FPOs while just 2.9 per cent of the members are of age more than 65 years.

Social Category

Broadly, the population of Sikkim can be categorised into four social categories namely ST, SC, OBC and General. The caste-wise distribution of the agricultural households is presented in Table 5.2. The figures depict that out of 580 agricultural households, around 37 per cent belonged to the ST category, 34.5 per cent belonged to the OBC category and 19.4 per cent belonged to the General category and just 9.1 per cent were from the SC category. Further, it can be seen that around 36 per cent of the members were from the OBC community while 31 per cent were from the ST community. Similarly, the General and SC categories comprised 21.4 and 10.7 per cent respectively. Similarly, non-members also comprised 40 per cent, 25.7 per cent, 22.9 per cent and 11.4 per cent of

OBC, ST, General and SC communities respectively. Overall, it can be concluded that major participation in FPOs was higher among ST and OBC households.

Religion

Religious views, values and practices have a direct or indirect impact on the socioeconomic development of any region. Religion plays a vital role in the social and economic interaction of people in a region. It acts as a social group that brings people together and encourages collective action. In Sikkim, the rural population practises three religions majorly: Hinduism, Buddhism and Christianity. Therefore, this study also considers only these three major religions. As per the census of 2011, there were 57.76 per cent Hindus, Buddhists 27.4 and 9.9 per cent Christians. The religion-wise distribution of the respondents (members and non-members) is depicted in Table 5.2. It shows that majority of the respondents are Hindus (63.9 per cent) followed by Buddhists (27.7 per cent) and Christians (8.4 per cent). The results further revealed that around 66.8 per cent, 25 per cent and 8.2 per cent of FPO members belonged to Hindu, Buddhist and Christian communities, respectively. Following a similar pattern, the non-members also comprised 66.8 per cent Hindus, 25 per cent Buddhists and only 8.2 per cent of Christians.

Family size

Family size indicates the socio-economic condition of a family in terms of income, consumption, savings and liabilities (Kaur & Singh, 2020), and social well-being and also reflects the availability of labour force in the household. It also has an impact on the number of labour it can supply for agriculture and other activities (Reardon, 1997). The

results show that majority of the FPO members have a household size of between 4 to 6 members. Fewer member farmers reported 7 to 9 members, while 5 per cent and only 0.4 per cent of member households reported having 1 to 3 and more than 9 members in the family.

On the other hand, of the total 280 non-member households, the majority of them (73.9 per cent) reported having around 4 to 6 family members followed by 16.4 per cent having a larger family size of 7 to 9 members. Only a few households i.e. 8.2 and 1.4 per cent of non-member households had the smallest and largest family sizes of 1 to 3 members and more than 9 members.

5.2.3. Socio-economic status of the respondents

Table 5.3 Socio-economic status of the FPO members and non-members in Sikkim

Particulars	Members		Non-members		ALL	
	No	Percent	No	Percent	No	Percent
Marital Status						
Single	11	3.93	14	5.00	25	4.46
Married	250	89.29	250	89.29	500	89.29
Widowed/separated/divorced	19	6.79	16	5.71	35	6.25
Education Level						
No formal education	15	5.36	28	10.00	43	7.68
Primary	97	34.64	96	34.29	193	34.46
High school	151	53.93	145	51.79	296	52.86
Graduate and above	17	6.07	11	3.93	28	5.00
Primary Occupation						
Cultivator	204	72.86	203	72.50	407	72.68
Livestock	11	3.93	14	5.00	25	4.46
Casual labour	9	3.21	6	2.14	15	2.68
Private job	2	0.71	2	0.71	4	0.71
Government job	37	13.21	39	13.93	76	13.57
Petty business	17	6.07	16	5.71	33	5.89
Landholding size (acres)						
0 to 0.33	46	16.40	56	20.00	102	18.20

Particulars	Members		Non-members		ALL	
	No	Percent	No	Percent	No	Percent
0.33 to 0.66	79	28.20	68	24.30	147	26.30
above 0.66	155	55.40	156	55.70	311	55.50
Training						
no	89	31.79	95	33.93	184	32.86
yes	191	68.21	185	66.07	376	67.14
Farming experience						
1 to 5	29	10.36	39	13.93	68	12.14
6 to 10	70	25.00	75	26.79	145	25.89
11 to 15	48	17.14	57	20.36	105	18.75
16 to 20	52	18.57	49	17.50	101	18.04
above 20	81	28.93	60	21.43	141	25.18
MGNREGA						
No	95	33.93	96	34.29	191	34.11
Yes	185	66.07	184	65.71	369	65.89
Cattle						
0	205	73.21	204	72.86	409	73.04
1	32	11.43	30	10.71	62	11.07
2	6	2.14	12	4.29	18	3.21

Source: Authors' computation based on field survey.

Note: MGNREGA= Mahatma Gandhi National Rural Employment Guarantee Act.

Marital status

Married individuals tend to be more responsible and committed towards their families, responsibilities and duties (Oladoja et al., 2008). Table 5.3 depicts the marital status of the respondents. Most of the member farmers at the state level are married (89.3 per cent) while only 6.8 per cent are either widowed or separated or divorced and very few farmers are in the unmarried category. On the other hand, non-members also majorly comprised of married individuals but the proportion of unmarried and either widowed/separated/divorced categories was almost equal. The majority of the farmers, both members and non-members were married individuals.

Education

Education plays an important role in any type of activity. Higher educational levels enable farmers to acquire better knowledge and take better decisions resulting in the efficient management of all farming activities. It also enables them to understand the benefits of collective action and the adoption of innovations. The results in Table 5.3 depict that more than 50 per cent of the total sample respondents had completed education level up to higher secondary while over 34 per cent had completed primary education. While only 5 per cent of them had attained graduation and above, around 7.7 per cent had no formal education at all.

Further, it was found that more than half of the FPO members (i.e. 53.9 per cent) in Sikkim have attained education up to the higher secondary level, followed by primary education (34.6 per cent). Members with an educational level of graduation and above and no formal education comprised 6.1 per cent and 5.4 per cent respectively.

On the other hand, most non-members also had attained an education level up to high school but the proportion of farmers with no formal education was considerably higher (10 per cent) than that of farmers with an education level of graduation and above (3.9 per cent).

Table 5.3 shows that 53.9 per cent of FPO members have attained education up to higher secondary, followed by primary education (34.6 per cent) and graduate and above 6.1 per cent. Other remaining 5.4 per cent of members have attained no formal education. On the other hand, 51.8 per cent of non-members have attained education up to higher secondary but it can be seen that farmers with no formal education are in more proportion (10 per

cent) than those with graduation and above (3.9 per cent). Overall, it was found that most of the members were educated while a higher proportion of non-members had no formal education.

Occupation

The occupational structure indicates the standard of living and earnings in society (Goswami et al., 2012). According to our primary investigation of the sample agricultural households, the primary occupation of the majority of the total respondents was found to be farming (72.7 per cent) followed by government services (13.6 per cent), small local businesses (5.9 per cent), livestock and dairy (4.5 per cent) and casual labour (2.7 per cent).

This may be due to the presence of diverse occupation opportunities in other fields. The results indicate that farming was the primary occupation for both members and non-members. A farmer whose primary occupation is farming and who derive his/her livelihood majorly farming find it beneficial to join farmer groups or collectives like FPOs.

Landholding pattern

The landholding pattern of a region also reflects the socio-economic condition of agricultural households. Larger farm sizes yield higher agricultural production earning higher agricultural income resulting in more disposable income. On the other hand, small farm sizes make agriculture uneconomical. Owing to geographical terrain, agriculture in Sikkim is dominated by small-scale farms. Such small-scale size of landholdings results in the low economic strength of the households. In the FPO member households, 16.4 per

cent had a farm size of less than 0.33 acres, while the corresponding figure for non-members was 20 per cent (Table 5.3). However, the proportion of households with greater than 0.33 acres was more in FPO members than in non-members; 28.2 per cent of the member households had farm-size of 0.33 acres to 0.66 acres while only 24.3 per cent of non-member households had farm sizes greater than 0.33 acres but lesser than 0.66 acres. Finally, around 55 per cent of both member and non-member households owned farms of an area of more than 0.66 acres.

Training

Training enables the capacity building of farmers and enhances their skills in agricultural work. It can be more effective than the provision of financial support as it enhances farmers' ability to improve their production and income. It was observed from the results that the majority of the respondent farmers had acquired training while the remaining 32.9 per cent of the farmers had still not received any form of training in agricultural activities. Farmers in the North district mostly cultivate large cardamom. Also, the Spices Board of India organises regular training solely focussed on the cultivation and processing of large cardamom covering the maximum number of farmers in this district. In all districts, the majority of farmers are covered under training regularly provided by the state government free of cost. FPOs also organise regular training. The training was provided by the state agriculture department on the transfer of improved technologies of organic farming for enhancing production and productivity of crops, improving soil health, sustainable mountain farming under changing climatic conditions, techniques for resource conservation, technologies for enhancing production by efficient use of water and nutrients, cultivation of high-value crops, preparation and use of bio-fertilisers, bio-

compost and bio-pesticides in the fields, use of organic nutrients, Azolla cultivation, farm demonstration of various inputs etc are imparted to farmers regularly.

Farming Experience

Farming experience is also an important factor that enables a farmer to efficiently utilise resources and achieve optimum output in the primary sector of an economy. A perusal of Table 5.3 shows that majority of the farmers had a farming experience of 6 to 10 years followed by farmers having experience of more than 20 years. Among the members, at the state level, the majority of the members had a farming experience of more than 20 years followed by 6 to 10 years while the majority (26.8 per cent) of non-members had an experience of 6 to 10 years followed by farmers with experience of more than 20 years (21.4 per cent), 11 to 15 years (20.4 per cent) and 16 to 20 years (17.5 per cent).

MGNREGA

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is a social welfare program aimed to improve livelihood security and fight rural poverty. It promises at least 100 days of work to an adult member of each family who is willing to work per year. During the financial year 2021-22, around 63,000 households and 75,000 individuals benefitted from this scheme in Sikkim. From Table 5.3, it is observed that around 66 per cent of the respondents had participated in MGNREGA work while around 34 per cent of them had not participated in it. Among the FPO members, around 66 per cent had participated and derived income from the program while around 34 per cent of them had not participated in this employment program. A similar pattern was observed in the case of non-members also as 65.7 per cent of them participated while 34.3 per cent

did not participate in the MGNREGA works. Since this scheme guarantees employment for a number of days in a year and pays farmers in cash; it has pulled out labour from agriculture creating a shortage of labour for agricultural works (Harish et al., 2011).

Livestock

In Sikkim, livestock mainly comprises bovines (cows, oxen, buffaloes, and yaks), ovines (goats and sheep), pigs and poultry. Earlier, livestock was kept at subsistence levels only by households but in recent times, they keep it at the commercial level owing to the development of dairy, piggery and poultry sectors. Livestock is now kept and used as economic assets and contributes significantly to household income.

Table 5.4. Livestock ownership of FPO members and non-members

Livestock type	Member			Non-member			Total	
	No.	Per cent	Average holding	No.	Per cent	Average holding	No.	Per cent
Bovine	215	76.8	1.98	223	79.6	2.01	438	78.2
Ovine	170	60.7	2.33	171	61.1	2.33	341	60.9
Pigs	110	39.3	0.80	106	37.9	0.78	216	38.6
Poultry	160	57.1	4.22	169	60.4	4.29	329	38.8

Source: Authors' computation based on field survey

About 78 per cent of the agricultural households keep bovines in the state, while around 61 per cent keep ovines and an equal percentage (about 39 per cent) of the households keep pigs and poultry. About 77 per cent of FPO members rear bovines, while around 61 per cent, 40 per cent and 57 per cent of them keep ovines, pigs and poultry respectively. In the case of non-members, about 80 per cent, 61 per cent 38 per cent and 60 per cent of them keep bovines, ovines, pigs and poultry respectively.

5.2.4 Access to Basic Amenities

The living conditions of the sampled agricultural households were ascertained broadly from their descriptions of house construction quality, drinking water, sanitation and fuel source.

Table 5.5. Access to Basic Amenities

Particulars	Members		Non-members		ALL	
	No	Percent	No	Percent	No	Percent
Condition of dwelling house						
Kutcha	77	27.50	74	26.43	151	26.96
Semi pucca	134	47.86	123	43.93	257	45.89
Pucca	69	24.64	83	29.64	152	27.14
House constructed by						
Self	245	87.50	257	91.79	502	89.64
Government	35	12.50	23	8.21	58	10.36
Drinking water source						
Government	129	46.07	143	51.07	272	48.57
Private	151	53.93	137	48.93	288	51.43
Sanitation						
Kutcha	58	20.71	59	21.07	117	20.89
Pucca	222	79.29	221	78.93	443	79.11
Fuel sources						
Firewood	43	15.36	46	16.43	89	15.89
Only LPG	41	14.64	37	13.21	78	13.93
Both	196	70.00	197	70.36	393	70.18
Distance to the nearest market						
Upto 10 km	46	16.43	44	15.71	90	16.07
11 to 20 km	92	32.86	89	31.79	181	32.32
21 to 30 km	85	30.36	91	32.50	176	31.43
above 30 km	57	20.36	56	20.00	113	20.18
Ownership of phone						
No	10	3.57	46	16.43	56	10.00
Yes	270	96.43	234	83.57	504	90.00
Agricultural credit						
No	227	81.07	239	85.36	466	83.21
Yes	53	18.93	41	14.64	94	16.79
Extension contact						

Particulars	Members		Non-members		ALL	
	No	Percent	No	Percent	No	Percent
No	115	41.07	175	62.50	290	51.79
Yes	165	58.93	105	37.50	270	48.21

Source: Authors' computation based on field survey. Note LPG= Liquefied Petroleum Gas

Housing condition

Table 5.5 provides information on the type and status of dwelling houses of farmers to assess the living condition of the agricultural households in the state. Basic amenities like type and ownership of dwelling house, drinking water facility and availability of electricity indicate the living condition, quality of life, and standard of living of the farmers. National Family Health Survey (NFHS) 2005-06 has categorised dwelling houses into three types namely, pucca[1], semi-pucca[2] and kutcha[3] houses. At the aggregate level, the results indicate that majority (around 46 per cent) of the farmers lived in semi-pucca houses while around 27.14 per cent of them lived in well-constructed pucca houses indicating good economic conditions. Only the remaining 27 per cent of them lived in much lower quality kutcha houses. It can be observed that the overall housing condition of the agricultural households in the state is moderate. About 47.9 per cent of FPO members lived in semi-pucca housing structures while 27.5 per cent lived in low-quality kutcha houses and the remaining 24.6 per cent lived in high-quality pucca houses. From

[1]Pucca House: A pucca house is one, which has walls and roof made of the following material. Wall material: Burnt bricks, stones (packed with lime or cement), cement concrete, timber, ekra etc

[2] Semi -Pucca house: A house that has fixed walls made up of pucca material but roof is made up of the material other than those used for pucca house.

[3] Kutcha House: The walls and/or roof of which are made of material other than those mentioned above, such as un burnt bricks, bamboos, mud, grass, reeds, thatch, loosely packed stones, etc. are treated as kutcha house.

Table 5.5, it can be seen that the non-members also live in similar housing conditions. Around 26.4 per cent of the houses among the surveyed households were kutcha in nature. The Majority i.e. 44 per cent of the houses were semi-pucca and the remaining 29.6 per cent were pucca houses. Overall, the results indicate that majority of agricultural households in Sikkim live under moderate housing conditions.

Houses can either be constructed by themselves or with assistance from the government. From the survey, it was found that the majority of the farmers (89.6 per cent) dwelt in self-owned houses. For around 10.4 per cent of agricultural households, dwellings were provided by the government under different schemes like the Chief Minister's Rural Housing Mission (CMRHM)[4], 2010. Most of the households were constructed by the farmers themselves.

Drinking Water and Sanitation

The availability of quality drinking water is also another basic and important aspect of living conditions. The rural population in Sikkim derives their drinking water from two major sources: either own private arrangements from nearby sources like rain-fed natural micro springs and streams using pipelines or channels or from water sources provided by the Public Health Engineering Department (PHED). In the rural parts of hilly states, natural spring water is brought to the dwelling houses through private pipelines. From the survey of the sample agricultural households, it was found that most of them were

4 The Chief Minister's Rural Housing Mission was launched in the year 2010 in Sikkim and was later merged with Indira Awas Yojana (AAY) of Ministry of Rural Development, Government of India in 2011-12 in order to bring a qualitative improvement in the housing status of the poor. It aimed to convert the existing 6000 dwelling units to a single storey, earthquake resistant pucca houses of area 605 square feet each and and thus make Sikkim, the first 'Kutcha House Free State' in India.

dependent on their own source of water for drinking and domestic purposes. Most of these sources of drinking water are located in the private lands of the inhabitants. It was found that around 51.43 per cent of the respondents had made their own arrangements for drinking water sources while around 48.57 per cent of them had access to drinking water from government-provided sources. At the state level, most of the FPO members had their own sources of drinking water while among the non-members; the majority (51.1 per cent) of them relied on government sources of drinking water. About 54 per cent of the sampled FPO members directly relied on their own sources of drinking water while only 46 per cent of them depended on government-provided water sources. While in the case of non-members, only 49 per cent depend on private sources and over 51 per cent rely on government-provided sources of water for drinking and domestic purposes.

It has achieved 100 per cent sanitation either in pucca or kutcha form. From the survey, around 79.2 respondents had access to pucca toilets while only 20.8 per cent of them had kutcha toilet facilities (Table 5.5).

Fuel sources

Access to clean, sustainable and affordable cooking fuel is an important aspect of socio-economic development. Agricultural households in Sikkim mostly use three types of cooking fuel namely, firewood, LPG and a mix of both. Table 5.5 distributes the members and non-members according to the type of fuel used by the households. On average, about 70 per cent of households use a mix of both firewood and LPG. There were about 16 per cent of the total households that used only firewood as the only source of fuel while the remaining 14 per cent used only LPG.

The situation concerning the sources of fuel is similar for both FPO members and non-members. In case of both members and non-members, the majority of them use a mix of both sources followed by only firewood and only LPG. Such dependence on more than one source of fuel is mainly due to their usage of firewood to cook feed for livestock. Even if a household has LPG for cooking food, it uses firewood to cook feed for livestock. Households that have received LPG from the government scheme keep both. However, all the houses in the state were found to be electrified.

Ownership of mobile phones

Information and communication technologies (ICTs) are one of the important media that has a significant role to play in the acceleration of the development process in developing countries and mobile phone, in particular, is the most important among them. It enables the poor farmers to connect with fellow farmers, markets, service and information providers and extension officials. Mobile phones expand contacts and opportunities for farmers, improve their market access, save their travel costs, energy and time and ultimately help them augment their income. Above all, in a mountainous state like Sikkim where the geographical terrain is difficult, mobile phones can play a significant role in the transmission of information and reaching out to the remotest farmers in the hills of the state. Table 5.5 elucidates the distribution of the sample agricultural households according to the ownership of mobile phones. On average, around 90 per cent of the respondents owned a mobile phone while 10 per cent of them did not. Ownership was generally high with around 96.4 per cent of members owning mobile phones while only 83.6 per cent of non-members possessed mobile phones.

Distance to the nearest market or town

Distance to the nearest market or town indicates the level of access to markets for farmers. It has a significant impact on different choices made by farmers, particularly those residing in hilly or mountainous regions. Farmers residing nearer to the markets have easier and better access to markets and for marketing their agricultural produce as they have more than one channel. On the other hand, farmers located farther from the markets face higher transaction costs and lack of access to markets forcing them to depend on local traders and middlemen. Therefore, distance to the nearest market affects the marketing of produce and also the income from agriculture finally determining the economic condition of the agricultural households. From Table 5.5, it is observed that the majority of the respondents (32.3 per cent and 31.4 per cent) are located around 11 to 20 km and 21 to 30 km away from the nearest town or market respectively. About 20.18 per cent of the total respondents stay more than 30 km away from the nearest market while the remaining 16 per cent of farmers live within 10 km distance from the market. It is found that the majority (32.9 per cent) of the FPO members are located around 11 to 20 km away from the nearest market while only 16.4 per cent of them are located within a radius of 10 km from the nearest market. On the other hand, the majority (32.5 per cent) of the non-members stay 21 to 30 km away from the nearest market.

Loan for agricultural purposes

Agricultural loans can play an important role in improving productivity and efficiency of farming households. In developing countries, lack of adequate and timely credit is one of the major constraints faced by small farmers. Agriculture credit can bridge the gap between their incomes and production costs. Agricultural loans can be used as a tool to

transform subsistence agriculture into commercial and modern agriculture. However, in Sikkim, the majority of the farmers preferred not to borrow for agriculture as they are afraid of failure to repay their loans. They consider agriculture a risky business and prefer not to invest in it through loans and borrowings. Since agriculture in this state is vulnerable to climate and pest attacks, most of the farmers are worried that they might be indebted in case of crop failure. From the survey, it was found that most of them (83.2 per cent) had not availed of loans while only 16.7 per cent had availed of loans for agricultural purposes. In case of members, 81.1 per cent had relied on their own capital and not borrowed for agriculture while around 19 per cent had borrowed loans. In terms of non-members, an even lesser proportion of farmers (i.e. 14.6 per cent only) had borrowed for agriculture. Hence, it is observed that even though borrowing for agriculture is generally low in the state, yet more members of FPOs have borrowed for agriculture than non-members.

Extension

Extension services can play a vital role in improving the efficiency of farming, augmenting production, improving farm income and ultimately improving the economic and social conditions of farming communities. Extension services provide farmers with extra knowledge and information and improved technologies that aim to improve their farm performance. From Table 5.5, it is observed that around 48 per cent of the total respondents have access to extension services or are visited by extension officials. Therefore, there are around 52 per cent of the respondents who have not accessed the extension services. In case of members, the majority (58.9 per cent) had access to extension services whereas the remaining 41 per cent had either no access or had not

availed of extension services. On the contrary, the majority (62.5 per cent) of the non-members had no access to extension services and only 37.5 per cent of non-member farmers had access to extension services.

5.3 Conclusion

In Sikkim, agriculture in general is dominated by male farmers. Membership in FPOs is dominated by male farmers only as the ownership of land lies with them and also takes the major decisions related to agriculture. Majority of the sampled farmers in Sikkim fall in the age group of 46 to 65 years which indicates that they are experienced farmers of the productive age group. The maximum number of farmers belongs to the ST category followed by OBC. In terms of religion, the majority of the farmers are Hindus followed by Buddhists and Christians. Most of the farmers (i.e. around 90 per cent) of the farmers are married implying a greater level of social responsibility in the community. In terms of educational level, the majority of the farmers have attained primary and high school levels of education followed by illiterate and graduate farmers. The primary occupation for the majority of households is agriculture. The primary occupation for around 73 per cent of FPO members is farming while for only 56 per cent of non-members it is the primary occupation. The results also indicate that majority of the farmers have received training.

With respect to basic amenities, the majority of the agricultural households lived in moderate-quality semi-pucca while an equal proportion (around 27 per cent) of them lived in pucca and kutcha houses. More than half of the households have reported having own private source of drinking water. The majority of the farmers keep both LPG and firewood for cooking purposes.

CHAPTER 6

DETERMINANTS OF MEMBERSHIP IN FARMER PRODUCER ORGANISATIONS (FPOs) IN SIKKIM

6.1 Introduction

Agriculture and allied activities are one of the largest sources of labour employment in the Indian economy, providing livelihood for 54.60 percent of the country's total workforce (Government of India, 2018). Small and marginal farmers who cultivate on small plots and produce low marketable surplus account for 86.08% of the total operational holdings and 46.94% of the total operated area in the country (Government of India, 2019a; NSSO, 2019). Such small marketable surplus, inadequate local markets and expensive transport costs force them to sell to local traders and middlemen at unremunerative prices (Negi et al., 2018; Hegde, 2010). Modern retail chains, supermarkets and agribusiness firms also prefer to deal with large farmers who can meet their quantity and quality standards (Reardon et al., 2012) consequently excluding small farmers from the supply chain. Majority of the small farmers are involved in labour-intensive high-value crops production (Birthal et al., 2007) but constraints like low scale of production, lack of capital, storage, quality inputs and improved technology act as barrier to market access. Even if they can access markets, their inability to aggregate and add value to the products reduce their bargaining power (Gyau et al., 2012) forcing them to accept lower prices (Agrawal, 2000). Despite being the actual producers of food, small farmers receive only a small share of the actual value paid by the final consumers (Chand et al., 2011). On the other hand, expenditure on inputs has substantially risen

while the returns have reduced due to fall in crop prices further depressing the levels of income.

Sikkim is a small mountainous state in North-east India. Agriculture is the backbone of the state's economy employing around 66.3 percent of the total population and has contributed around 10.33 percent to the GSDP at current prices during 2017-18 (Government of Sikkim, 2019). In 2016, it was declared as India's first fully organic state after successfully converting around 75000 hectares of land into certified organic farms. Land under cultivation is only 13.66 percent of the total geographical area of 7096 square kilometres (Government of Sikkim, 2014-15). Around 95.9 percent of landholdings and 83.9 percent of the area is operated by small and marginal farmers in the state (NSSO, 2019). Due to hilly and difficult terrain, expansion of area under cultivation is limited and per-capita availability of land is low. Dependence of majority of the population and small holdings has kept agriculture at subsistence levels. Traditional production technology, lack of reliable marketing channels, presence of large number of intermediaries, poor infrastructure support and vulnerability to natural calamities are the major constraints faced by smallholder farmers in the state.

Multiple constraints faced by small farmers can be overcome by organising and collectivising them through cooperatives, farmer associations, unions and self help groups (Verma et al., 2019; Singh & Vatta, 2019; Cherukuri & Reddy, 2014). Studies suggest that collectivisation has enhanced smallholder farmers' collective bargaining power, reduced transaction costs, improved access to credit and other resources they could not afford individually (Rondot & Collin, 2001; Birthal et al, 2007; Hellin et al., 2009; Fischer and Qaim, 2014; Karatepe & Scherrer, 2019). It also enables small farmers

to achieve economies of scale in input and output markets and also reduces the role of intermediaries (Fafchamps & Hill, 2008). It also facilitates access to improved technologies and other farm advisory services (Cherukuri & Reddy, 2014) enabling them to produce quality products at a larger scale and earn more income (Kruijssen, 2009).

FPOs are being encouraged by developing countries to overcome challenges faced by small farmers. In India, following the recommendations of YK Alagh Committee in 1999, a new concept of Farmer Producer Companies (FPCs) was introduced under the Part-IX Chapter I of The Companies Act in 2002. The main objective of FPOs is to provide improved access to investments, technology and inputs and markets. It retains the desirable features of a cooperative as well as efficiency and flexibility of a private company (Trebbin, 2014). These organisations support farmers at all stages of production, processing and marketing in order to increase farmers' income levels. Govt. of India has identified FPO as the most suitable institutional form to organize farmers and help them to collectively enhance their production and marketing strength.

Despite the potential of FPOs in improving farmers' condition and encouragement from the Government, there are many farmers who do not join the FPOs. No study has been conducted in the Northeast region, particularly in Sikkim, to answer why many farmers do not join the FPOs. The only existing study on FPOs in India's Northeast region is by Kakati and Roy (2019) but deals with financial sustainability. Therefore, using household survey data and binary choice model, this chapter aims to identify the major factors that influence farmers' decisions to join FPOs.

6.2 Existing Studies on FPOs

Producer Organisations are formalised form of collective action. They enable farmers to access market by providing necessary services (marketing, financial, technology) and contribute to poverty reduction and food security (Hellin et al., 2009). According to Singh (2008), producer organizations are aggregations of small farmers created to benefit them with economies of scale. They amplify the political voice of the farmers, reduce transaction costs, engage farmers in value addition activities, enable farmers to share services (like storage, transportation, knowledge) and make collective decisions. FPOs are formal, member-owned organisations mainly comprising of small and marginal farmers (Verma et al., 2019).

A study was made in Bihar in India about the impact of FPO on adoption of technology in agriculture. It has identified major determinants of membership in FPOs. The study used data collected from 550 farmers through a random survey. The finding of the study indicates that gender, education level, farming as primary occupation, loans and extension services are the main explanatory variables that have a statistically significant influence on rural farmers to participate in FPOs. The probability to join FPOs is higher for female-headed households whose primary occupation is farming and have attained high school education. Farmers availing loans and receiving information from various government agricultural agencies are more likely to join FPOs. The study concluded that members can be selected based on cropping pattern or region in small numbers so that managing and working of the group becomes easier and efficient. It has also suggested product differentiation through sorting, grading, packaging, labeling in order to fetch

higher prices for the farmers. Finally, it has also suggested incentives for farmers' active participation (Verma et al., 2019).

Another study was conducted in Gujarat about the determinants and impact of membership in FPOs using data from household survey of 300 farmers in 2018. The result shows that age, education, use of ICT for progressive farming, land size, membership of a cooperative, market risk, and provision of markets, inputs and extension services are explanatory variables that have statistically significant effect on farmers' decision to participate in FPOs. It shows that younger and better educated farmers with smaller landholdings are more likely to participate. Farmers participate in FPOs to avoid market risk, to avail extension services and technical information, to access quality inputs, and also to access credit and storage and processing facilities. The study concluded that further work is necessary to understand region-specific and crop-specific factors for the success of FPOs (Singh & Vatta, 2019). Another study by Roy et al. (2020) has compared the FPOs in Bihar and Maharashtra. They have found that more educated farmers and those who have availed loans and linked to formal extension services are more likely to become FPO members.

6.3 Econometric Formulation of Probit model

The study has applied a probit model to identify the factors affecting farmers' decision to join an FPO. Therefore the dependent variable is participation in an FPO (1= member and 0= non-member). The study uses participation model to identify the major factors affecting farmers' decision to participate in FPOs which is specified as:

$$Y_i = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon_i \quad \text{where } \varepsilon_i \approx N(0, \delta) \quad I = 1, 2, \ldots, n \qquad (1)$$

Since the dependent variable is dichotomous, the study assigned 1 for members of an FPO while 0 is assigned for non-members.

While modelling a dichotomous dependent variable (like FPO membership), OLS model does not yield good result as it suffers from non-normality and heteroscedasticity (Victoria-Feser, 2007). But, the binary choice models (like probit and logit) overcome these problems by fitting a non-linear function to the data (Greene, 2002). This study uses probit model and not logistic model since probit model assumes normal distribution. Equation (1) is revised as follows:

$$E\left(Y_i = \frac{1}{X_i}\right) = \beta_0 + \sum_{i=1}^{n} \beta_i X_i = \int_{-\infty}^{X_i} \varphi\,(X) dX = \frac{1}{\sqrt{2\Pi}} \int_{-\infty}^{\infty} e^{-(\frac{1}{2})X^2} dX \qquad (2)$$

Where, $\varphi(*)$ denotes the cumulative distribution function (cdf) of the standard normal distribution. But the coefficients of equation (2) are used to interpret the direction only. For instance, it can be said that the probability of the farmer's membership in FPO increases when β_i is greater than zero. The coefficient of the probit model does not help in analysis and interpretation purposes. Therefore, the marginal probit model is used to capture the magnitude of the coefficient.

$$\frac{\partial P\,(Y_i=1/X_i)}{\partial X_i} = \frac{\partial\,(Y_i/X_i\beta_i)}{\partial X_i} = \frac{\partial\,(\beta_0+\sum_{i=1}^{n}\beta_i X_i}{\partial X_i} \qquad (3)$$

Equation (3) is the partial (elasticity) response of the model. It shows, by how many units the response variable increases or decreases with a unit change, from the baseline, in one explanatory variable, keeping other independent variables constant.

6.4 Definitions of explanatory variables

Studies indicate that farmers' decision to join farmer organisations may be motivated by several demographic, socio-economic and physical characteristics of the household. Based on previous empirical literature, discussion with the stakeholders and primary survey, a set of explanatory variables are selected and are defined in Table 6.1.

Table 6.1: Description of Variables

Variables	Description
FPO membership	Farmer is a member of an FPO (1 = yes, 0 = no)
Gender	Gender of the household (HH) head (1 = male, 0 = female)
Age	Age of the HH head (years)
Education	Education level of the HH head (years of schooling)
Household size	Number of family members in the household
Farming experience	Experience of HH head in crop farming (years)
Primary occupation	Primary occupation of the HH head is farming (1 = yes, 0 = no)
Landholding size	Total land size owned by the household (acres)
Phone	Mobile phone ownership (1= yes, 0 = no)
Cattle	Number of cattle owned by the household
Distance to market	Distance to the nearest town or market (km)
Social participation	Level of social participation of the HH (1= low, 2= moderate and 3=high)
Extension	Access to extension service (1 = yes, 0 = no)
Agriculture loan	Access to agricultural credit (1 = yes, 0 = no)
Transportation	Availability of daily service taxi to the nearest town (1=yes, 0 = No)
Risk	Perceived level of risk in agriculture (1= low, 2= moderate and 3= high)
Expansion of scale	Plan to expand farm operations (0 = constant, 1= expand and 2= reduce)

A farmer's choice to join an FPO might be affected by gender also. Women may have different opportunities, motivation and capabilities than men to participate in collective action (Pandolfelli et al., 2007). For example, women have limited access to external support and productive resources as the documented land rights are mostly with the men (Velde et al., 2020). Further, women are usually confined to labour-intensive farm works

like transplanting, weeding, sowing, etc while the decisions are taken by the male members. Thus, men are more likely to join farmer organisations than women (Ma et al., 2021; Abebaw & Haile, 2013). Therefore, women tend to participate only in the absence of male members at home. Previous studies (Asante et al., 2011; Fischer & Qaim, 2012, Chagwiza et al., 2016; Ahmed & Mesfin, 2017; Priscilla & Chauhan, 2019) found that a farmer's decision to join a group is positively and significantly determined by his/her age. On the other hand, studies by Ma et al. (2021), Kassa et al. (2017), and Bernard et al. (2013) reported that age has a negative relationship with the membership decision as younger farmers are more likely to receptive to new ideas and less risk averse as compared to older farmers (Barret, 2008).

Similarly, educational level of the household head also significantly influences a farmer's decision to join a farmer group (Adong et al., 2013; Bernard & Spielman, 2009; Zheng et al., 2012; Verhofstadt & Maertens, 2014; Mojo et al., 2015). Formal education enhances the human capital and endows the farmer with the ability to make informed decisions (Ahmed & Anang, 2019). Educated farmers know and understand more about the farmer groups than their uneducated counterparts and are thus willing to join. Thus, previous studies by Parthiban et al. (2015), Addai & Owusu, 2014; Abate et al. (2014), Chagwiza et al. (2016) and Wang et al. (2019) have also confirmed that educational level has a positive and a significant impact on the likelihood of FPO membership.

Family size indicates availability of labour in a household (Fischer & Qaim, 2012). As confirmed by Abebaw and Haile (2013), family size can also influence a farmer's decision to join farmer organisations. Previous studies by Olagunju et al. (2021), Ma et al. (2021), Manda et al. (2020), Chagwiza et al. (2016) and Addai and Owusu (2014)

found that family size has a positive and significant influence on membership decision of a household. On the contrary, studies by Tarekegn et al. (2021) confirmed that farm size has a negative impact on the likelihood of FPO membership.

Like education, farming experience also enhances human capital and enables farmers to take informed decisions. Mojo et al. (2017) confirmed that membership in FPOs increases with increase in farming experience. Farmers with more experience are more likely to join FPOs. With more experience in farm work, a farmer gains more knowledge about agricultural operations. Also, he tries to secure market for his increasing output as he gains experience in farm work.

Farming as a primary occupation also has a significant effect on a farmer's decision to join an FPO. For instance, Verma et al. (2019) confirmed that households with farming as the primary occupation are more likely to join farmer organisations as these organisations provide all kinds of services that are highly beneficial to farmers. Households whose primary occupation is not farming expect to benefit less from such farmer groups.

Previous studies by Asante et al. (2011), Fischer and Qaim (2012), Ma and Abdulai (2016) and Adong et al. (2013) indicated that landholding size has a positive and significant effect on a farmer's decision to join a farmer group. Larger farmers are usually more capable of expanding cultivation and production. Contrary to their results, Mensah et al. (2012), Cechin et al. (2013) and Chagwiza et al. (2016) have reported a negative relationship between landholding size and the probability of joining a farmer organisation. As large farmers are generally better-off in terms of bargaining power and access to markets, they might not expect to benefit much from membership in farmer

organisations. On the other hand, such cooperation will benefit smaller farmers significantly (Chagwiza et al., 2016).

We have also included a dummy variable for mobile phone ownership that can reduce the cost of information exchange. This is especially true in the context of a hilly state Sikkim, where agricultural households are located in the remote corners of steep hills. Farmers possessing mobile phones are easily contacted and notified about the new technologies and policies (Fischer & Qaim, 2012; Ma & Abdulai, 2016) while the ones without phones are less informed about farmer group formation and tend to get excluded. Therefore, we have considered mobile phone as an indicator for ownership of ICT.

Previous studies (Francesconi & Heerink, 2011; Mojo et al., 2015; Kassa et al., 2017) have indicated that ownership of cattle also has positive and significant effect on farmer's membership decision. However, another study by Ahmed and Anang (2019) has found that ownership of cattle has negative impact on a farmer's participation in farmer organisations.

The nearest towns serve as alternative marketing channels where the farm produce can be sold to different types of buyers. It also indicates the market access for all inputs. Therefore, distance to the nearest town is also included as an explanatory variable. Farmers located nearer to the towns have better market access; therefore, they are less dependent on group activities. On the other hand, farmers located at greater distance from the towns expect higher returns or more benefits from the group membership and are more likely to become a member (Addai & Owusu, 2014; Nugusse et al., 2013; Fischer & Qaim, 2012). On the contrary, Ahmed and Mesfin (2017) confirmed that distance to the nearest town has a positive and significant relationship with a farmer's decision to join a farmer organisation.

Participation in various social groups and events promotes efficient flow of information about farmer groups and their benefits which may influence the decision to join a farmer group (Mojo et al., 2017; Tarekegn et al., 2021). Empirical studies have shown that participation in social groups have positive influence on a farmer's decision to join adopt new technologies or join farmer organisations (Conley & Udry, 2010; Fischer & Qaim, 2014; Ahmed & Mesfin, 2017;).

Access to extension services also plays an important role in encouraging farmers to join the FPOs (Ahmed & Anang, 2019; Kassa et al., 2017). Farmers having access to extension workers are more informed about agricultural policies and are more likely to join groups (Adong et al., 2019; Tolno et al., 2015; Etwire et al., 2013). Extension officials explain farmers about importance and benefits of farmer groups and encourage them to join. With encouragement from government officials, rural farmers perceive these organisations to be trust-worthy and intended for the benefits of farmers only. More contact and interactions with extension officials tend to encourage more farmers to join FPOs.

Access to credit shows a positive influence on a farmer's decision to join farmer groups (Asante et al., 2011; Addai & Owusu, 2014). Practicing agriculture at commercial level requires sufficient financial capital in order to overcome their financial constraints and adopt new technologies. However, financial institutions prefer to lend to farmer groups rather than individual farmers due to risky nature of farming. Therefore, access to credit has positive effect on membership in farmer groups.

Furthermore, we have also used daily service taxi availability as an indicator for transportation costs. Easy availability of vehicles running daily to the nearest towns

offers transportation of farm produce at lower costs and even in smaller volumes. However, in absence of such facility, farmers face high transportation costs and are thus, more likely to find FPOs beneficial which offer collection, procurement and transportation of their produce at lower costs and thus, are more likely to join FPOs (Fischer & Qaim, 2012; Verhofstadt & Maertens, 2014; Ahmed & Mesfin, 2017).

Farmers planning to expand future operations are more likely to participate in FPOs than those who have no plans of expanding it because they believe FPOs will provide them support required to manage larger operations in terms of raw materials, investment, transportation, marketing etc (Zheng et al., 2012). On the other hand, farmers planning to reduce scale of operation in future are less likely to participate in FPOs probably because they do not expect to benefit much from FPOs.

Perception of farmers about risks involved in agriculture is also an important determinant of a farmer's decision to join a farmer organisation. Farmers who perceive agriculture to be risky in the region are more likely to participate (Zheng et al., 2012). They believe that FPOs could reduce the risks faced by them in agriculture by negotiating collectively on their behalf better prices of outputs, lower prices of inputs, more stable marketing channels and facilitation of market information.

6.5 Descriptive Results

Table 6.2 presents the descriptive statistics for the variables used in the study. The surveyed household heads have an average education level of 7 years and about 77% of them are male household-heads. For around 65% of the households, farming is the primary occupation. The average age of the household head is 46 years and ranges from

24 to 75 years. On average, the sample households have been farming for 16 years and the average land ownership is 1 acre. An average household consists of about five members. The sample respondents are, on average, 22.87 kilometres far from the nearest town or market, while the average livestock per household is 4.

Table 6.2: Descriptive Statistics by FPO membership

Variables	Members	Non-members	All	Pearson χ^2	t-value
Gender	0.76	0.79	0.77	-	0.648
Age	46.24	45.60	45.92	-	0.816
Education	7.11	6.46	6.78	-	1.950**
Household size	5.26	5.25	5.26	-	1.470
Farming experience	17.21	15.30	16.26	-	2.320***
Primary occupation	0.73	0.57	0.65	15.858***	-
Landholding size	1.11	0.96	1.04	-	1.760*
Phone	0.96	0.94	0.90	25.714***	-
Cattle	4.28	4.34	4.31	-	0.199
Distance to market	23.08	22.66	22.87	-	0.410
Social participation	1.41	1.31	1.39	4.192	-
Extension	0.59	0.37	0.48	25.747***	-
Agriculture loan	0.19	0.15	0.17	1.841	-
Transportation	0.45	0.61	0.53	13.874***	-
Risk	2.06	2.06	2.06	0.462	-
Expansion of scale	1.29	1.57	1.43	34.899***	-

Source: Field survey, 2019-20. *<0.10; **<0.05 and ***<0.01.

The two-sample t-test demonstrates that there is a significant difference in farming experience, education and landholding size while there is no statistically significant difference among between members and non-members in household head's age, number of cattle and distance to market. Also, farming as primary occupation, phone ownership, extension contact, transportation facility and expansion of scale are significantly different for the two groups. Compared to non-members, FPO members are more likely to be better educated, possess more farming experience, possess a smart phone, own a larger

landholding and reside farther from the town. On average, FPO members are older than the non-members. However, it is evident that they do not differ much in terms of household size.

6.6 Factors Affecting Farmers' Participation in FPOs

The results of the probit model are reported in Table 6.3. The finding shows that the variables education, primary occupation being farming, farming experience, phone ownership, landholding size, extension contact, medium level of social participation, distance to the nearest market, transportation facility and expansion of scale are the statistically significant variables that positively or negatively affect the households' decision to participate in FPOs. On the other hand, variables like age, gender, household size, agriculture credit, number of cattle and farmers' perception of risk have no statistically significant influence on farmers' decision to become a member of an FPO.

Table 6.3: Probit model coefficient and marginal estimations for FPO membership

Variable	Coefficient (β)	Marginal effects (dy/dx)	P>|z|
Gender	0.064	0.024	0.646
Age	-0.004	-0.002	0.651
Education	0.056	0.018	0.002***
Household size	-0.027	-0.009	0.546
Farming experience	0.022	0.007	0.013**
Primary occupation	0.282	0.092	0.025*
Landholding size	0.206	0.067	0.002***
Phone	0.984	0.308	0.000***
Cattle	-0.007	-0.002	0.671
Distance to market	0.013	0.004	0.021**
Social participation level (base: low)			
Medium	0.491	0.159	0.055*
High	0.276	0.087	0.306
Extension	0.543	0.182	0.000***
Agriculture loan	0.251	0.081	0.113
Transportation	-0.252	-0.082	0.036**
Risk (base: low)			
Medium	-0.106	-0.034	0.492
High	0.017	0.006	0.923
Expansion of scale (base: constant)			
Expand	0.385	0.132	0.002***
Reduce	-1.932	-0.504	0.000***
Constant	-2.430	-	0.000***
Number of obs. = 560; LR $\chi 2$ (19) = 138.75; Prob > $\chi 2$ = 0.000; Pseudo R2 = 0.179; Log likelihood= -318.785			

Source: Field Survey, 2019-20. Notes: *p < 0.10; ** p <0.05 and *** p < 0.01

Results show that the probability of being a member in an FPO increases with the education level. This is consistent with the findings of Wang et al. (2019) and Abate et al. (2014) who have found a positive relation between the two variables. A farmer with higher educational level is 1.8% more likely to join an FPO because educated farmers are relatively more aware about the functions and potential benefits of rural institutions like FPOs than their uneducated counterparts and might be willing to accept new production

and marketing systems (Zheng et al., 2012). Consistent with the findings of Mojo et al. (2017), membership in FPOs increases with increase in farming experience. Farmers with more experience are more likely to join FPOs. As the farming experience increases by one unit, the probability of a farmer becoming a member of an FPO increases by 0.7%. This is probably because with more experience in farm work, the farmer accumulates more knowledge about cultivation and marketing of his produce. Equipped with experience of years, he compares potential costs and benefits through different channels and selects the most profitable one. Also, he tries to secure market for his increasing output as he gains experience in farm work.

Furthermore, the results show a positive relation between farm size and FPO membership similar to the works of Ahmed and Mesfin (2017) and Abate et al. (2014). This is contradictory to that of Singh and Vatta (2019) who have found a negative relation between landholding size and FPO membership in Gujarat. This may be because small farms in Sikkim mostly produce a mix of crops for domestic consumption while bigger farmers produce for selling. Also, large farms require inputs in greater quantities producing larger marketable surplus. Through membership in FPOs, larger farmers expect to benefit more from bulk selling of outputs and buying of inputs at better prices. The marginal effect of land size suggests that farmers with larger lands are 6.7% more likely to become FPO members.

In line with the findings of Verma et al. (2019), households with farming as the primary occupation are 9.2% more likely to join FPOs because these organisations are focussed on providing all kinds of services (marketing, value-addition, training, cheaper inputs) beneficial to farmers. On the other hand, households whose primary occupation is not

farming are less likely to join FPOs as they do not expect to benefit much from membership in such organisations.

Ownership of a mobile phone also has important impact on membership decision. The Agriculture Department under the Government of Sikkim and the FPOs, through their respective Facebook pages, frequently post news regarding announcement of incentives on joining FPOs, conduct of training to FPO members, bulk procurement of agricultural produce by FPOs, distribution of seeds and other inputs etc. spreading awareness and also instilling confidence about FPOs among the farmers. Communication through mobile phones has become an effective medium of information transmission in this hilly state. Farmers possessing a phone are 30.8% more likely to join FPOs relative to those without a smart phone.

Furthermore, households located away from the market are more likely to be a member of an FPO. This result is in line with that found by Bardhan et al. (2012) who found the relation to be positive while contradicts the findings of Priscilla et al. (2017). The results demonstrate that households living far from the markets are 0.4% more likely to join FPOs than those living near the markets. Distance to the market indicates transportation time and cost. In hilly states like Sikkim, greater distance to the nearest town or market implies more difficulty and higher costs for the farmers. Middlemen collect directly from villages but at very low prices also accounting for their profits and the transportation costs. In such situation, FPOs have emerged as an alternate channel which procures from farmers keeping only a minimal profit for themselves. For example, FPOs in this hilly state use their trucks to collect from the villages where the farmers just need to bring their

produce to the nearest motorable road. In doing so, farmers save transportation costs as well as earn better prices.

There are different formal (SHGs, FIGs, organic producer groups, vegetable growers' association, etc) and informal associations (village committee, religious, communal) in the state. Participation in these organisations and events eases access to information about farmer groups and their benefits (Ahmed & Mesfin, 2017; Abebaw & Haile, 2013) and has a positive contribution in developing farmers' perspective towards FPOs. Therefore, level of social participation also affects farmers' decision of FPO membership. Farmers with medium level of social participation are almost 16% more likely than those with low level of social participation to be an FPO member. However, higher level of social participation has no significant impact on membership. This may be explained by the fact that farmers highly active in social groups are engaged by various other social responsibilities leaving them with little time for farming and FPO membership.

Interactions with extension officials also play an important role in encouraging farmers to join the FPOs. During trainings, workshops or field visits, extension officials from the Agriculture Department and other institutions (ICAR, ATMA etc) encourage farmers to join farmer collectives like FPOs. Extension officials increase awareness regarding importance of farmer groups. With encouragement from government officials, rural farmers perceive these organisations to be trust-worthy and intended for the benefits of farmers only. More contact and interactions with extension officials tend to encourage more farmers to join FPOs. The results of the probit model show that extension contact has a positive and significant effect on farmers' decision to participate. The farmers who

have more interaction with extension officials have 18.2% more probability to become a member of an FPO.

Agriculture credit is another main determinant of FPO membership. Households that have taken loan for agriculture in the last three years are 8.1% more likely to join FPOs, consistent with the findings of Roy et al. (2020) but contradicting with that of Nugusse et al. (2013). From survey, it was found that in Sikkim, farmers generally prefer to avoid credit for agriculture considering it a risky business. Those who have borrowed for agriculture invest considerable amount of capital and labour in farming and thus must earn higher returns for their produce. Therefore, they need trust-worthy marketing channel to sell their produce at remunerative prices. Generally, the village traders and middlemen try to offer the lowest prices. On the other hand, FPOs provide better inputs at lower prices and procure farmers' produce at higher prices helping them earn higher profits thereby enabling them to pay back the loans.

Daily service taxi travelling to and fro the nearest town used as a proxy for easy availability of transportation facility in the area has a negative impact on FPO membership. From the survey, it was learnt that these vehicles not only provided transportation of agricultural produce but also facilitated transmission of information between whole sellers in the town and the farmers in the villages. With a view to earn commission from traders in the town, drivers persuade individual farmers to sell their produce for instant cash payment. It acts as an alternative marketing channel to farmers. Therefore, farmers having access to easy availability of transportation facility are 8.2% less likely to become members of FPO.

The results also show that farmers planning to expand future operations are 13.2% more likely to participate in FPOs than those who have no plans of expanding it. On the other hand, farmers planning to reduce scale of operation in future are almost 50.4 % less likely to participate in FPOs probably because they do not expect to benefit much from FPOs.

Findings show that farmers in Sikkim are not joining FPOs mainly due to lack of information and awareness about potential benefits of FPOs. The state government along with respective RIs should put in extra effort to spread awareness about the activities and benefits of FPOs to improve the understanding and perception of the farmers so that more farmers join FPOs in the state. Awareness and information transmission should be done through various channels like SHGs, producers' groups etc. News and reports of FPO activities also should be regularly posted through internet in order to improve farmers' awareness regarding active performance of FPOs in the state. Provision of credit to the farmers planning to expand in future can be facilitated.

6.7 Conclusion

This chapter aims to identify the major determinants of membership in FPOs using household survey and binary choice model estimates. The findings indicate that the most important variables that significantly influence the likelihood of the farmers to join the FPOs are education, farming experience, farming as the primary occupation, size of landholding, mobile phone ownership, distance to the nearest market, medium level of social participation, extension contact, transportation facility and plan to expand the scale of operation in future.

For example, years of formal schooling and farming experience has helped farmers become more aware and understand more about the FPOs and hence improved membership. Households with access to internet and other information through mobile phones have 32% higher probability than those who do not have them. Households with medium level of participation in various groups are 16% more likely to join FPOs compared to the counterfactual households. Distance to the nearest market also has statistically significant and positive impact on households' decision to join FPOs. However, easy availability of transportation facility in the local area negatively affects the farmers' decision to join FPOs. This study echoes recent works which advocate the need for educating farmers and raising awareness about the benefits of FPOs. A proper concept and understanding of FPOs is still lacking among the majority of the farmers in this hilly state.

Besides already existing FPOs in India, the government has launched a central sector scheme for promotion of 10,000 more FPOs for the time period between 2019-20 and 2023-24 that aims to assist farmers in production technology, value-addition and marketing. To achieve sufficient membership, the government and concerned agencies should put more emphasis on awareness campaigns, education and demonstration. More farmers should be reached by extension agents. Effective usage of mobile phones and internet should be made to reach the distant farmers in this hilly state. The promoters of FPOs should identify the region-specific factors that affect farmers' decision to join FPOs and work more to increase membership as low membership will hinder an FPO from benefitting from economies of scale.

CHAPTER 7

IMPACT OF MEMBERSHIP IN FARMER PRODUCER ORGANISATIONS (FPOs) IN SIKKIM

7.1 Introduction

Majority of the agricultural households in developing countries are smallholder farmers cultivating on less than 2 hectares of land (Rapsomanikis, 2015). These smallholder farmers are often faced with constraints like high transaction costs, limited access to output and input markets, lack of access to improved technology, dependence on obsolete production methods, low yields, expensive transportation costs and inadequate profits leading to underdevelopment in the rural areas (Maemken & Bellemare, 2020; Mwangi & Kariuki, 2015; Poulton et al., 2006; Barham & Chitemi, 2009). With a small scale of operation and resulting low marketable surplus, they face low bargaining power in both input and output markets. Lack of access to post-harvest facilities too compels them to dispose off their perishable high-value products at minimal prices (Negi et al., 2018; Hegde, 2010). Moreover, agricultural supply chains in developing countries are characterised by a long chain of middlemen who take away the major share while the farmers get only a small fraction of what the final consumers pay, thereby making agriculture an unremunerative business.

To overcome the constraints of smallholder agriculture, farmer organisations can be an appropriate institutional intervention in developing countries like India where around 88% of the agricultural households are small and marginal farmers (NSSO, 2019). Organising farmers into farmer organisations or groups can help smallholder farmers overcome such constraints collectively (Mojo et al., 2017; Priscilla & Chauhan, 2019; Sebhatu et al., 2021; Ma & Abdulai, 2017; Ma et al., 2018). One such

institutional innovation in India aimed to help smallholders overcome all constraints and improve access to resources and services to uplift them is FPO (Bhanot et al., 2021; Nikam et al., 2019).

In recent years, several studies have examined the important role of FPOs in enabling smallholder farmers to benefit from agriculture by assisting them in all stages of production, value-addition and marketing. The existing literature on FPOs has shown that FPOs can be beneficial for smallholder farmers in several ways. Using data from 120 farmers, Kumar et al. (2019) examined the impact of FPOs on the gross income and technical efficiency of organic chilli farmers in the Telangana state of India. Members of FPOs have experienced higher gross incomes and higher technical efficiency compared to non-members. In a comparative study of FPOs in Bihar and Maharashtra, Roy et al. (2020) found that membership in FPOs positively affects average monthly per capita expenditure by boosting farmers' incomes through the discovery of new markets in Bihar and higher prices realisation in Maharashtra. Desai and Joshi (2014) have found that producer organisations tend to reduce transaction costs for their members and thus improve their non-farm income, access to output markets and awareness and utilisation of financial resources. Through a comparative study of three successful FPOs in Maharashtra, Kumari et al. (2021) have reported that these FPOs were successful in minimising the costs and also increasing the revenue for their members. In their study about producer organisations in Kerala and Uttarakhand, Cherukuri and Reddy (2014) observe that relative to non-members, members of these organisations experienced increased net incomes as a result of better market access and improved bargaining power provided by these organisations.

In light of increasing support towards the promotion and formation of more FPOs in India, it becomes quite important to assess whether existing FPOs have benefitted the

farming community or not. This chapter utilizes a recent farm household survey data of 560 farmers from East, West, North and South districts of Sikkim, India to identify the determinants and economic impacts of FPO membership. The chapter proceeds as follows. The following section presents the methodology we have employed. Data and descriptive statistics are presented in the next section followed by the empirical results while findings and policy implications are discussed in the last section.

7.2 Analytical Framework: Propensity Score Matching (PSM)

Our objective is to estimate the impacts of FPO membership on net returns, ROI and profit margin. If FPO membership was assigned randomly to the agricultural households (like a randomized experiment), we could evaluate the causal effect of FPO membership on the variables of interest by differencing the mean of these variables between the members and non-members (Heckman et al., 1998). But we cannot do that because FPO membership is not random. Since we are interested in estimating the impact of membership on FPO members, we want to estimate the average treatment effect on the treated (ATT). The challenge that remains is our inability to observe the outcomes for members if they were not members. This challenge is our need for a counterfactual group which means a control group of farmers who are not members of FPOs. In other words, we have to estimate the impact of FPO membership that FPO members would have experienced, on average, if they had not participated as members in the FPOs. It is impossible to assess the impact of a treatment on an individual both with the treatment and without the treatment simultaneously. To analyse the impact of FPO membership, the differences between the same subject or farmer have to be looked at in two different situations (being a member and a non-member simultaneously). At any one time, a farmer either is a member or a non-member of an FPO. This means we cannot observe the

counterfactual outcomes. However, the research goal can be achieved by finding and identifying an appropriate comparison or control group or non-members whose characteristics are very similar to the FPO members. We face the problem of missing data because only one of the potential outcomes is observed for each individual (Holland, 1986). Therefore we need statistical approaches for identifying appropriate comparison or control groups (Chagwiza et al., 2016). For the comparison group, we can select non-members of FPOs whose characteristics are very similar to members. However, in doing so we face selection bias because FPO membership is a non-experimental intervention meaning membership is not assigned randomly and membership decision to join or not is not random. Also, members and non-members differ in several observable characteristics like age, gender, education and landholding size. Therefore, a simple comparison of these two groups will produce biased estimates (Caliendo & Kopeinig, 2008). Propensity Score Matching (PSM) is the commonly used method to overcome this selection bias (Chagwiza et al., 2016). PSM method helps us to identify non-members of FPOs who are similar to FPO members in their observable characteristics.

Since the two groups differ in terms of several observable characteristics, matching becomes a difficult task. Therefore, Rosenbaum and Rubin (1983) suggest the use of PSM where the observations are matched based on a single parameter i.e. propensity scores.

To estimate the impact of FPO membership on selected outcome variables, we employ the PSM method proposed by Rosenbaum and Rubin (1983) to control for biases that may exist between the two groups (FPO members and non-members). This technique has been commonly used to estimate the impact of agricultural collectives on member farmers (Ma et al., 2018; Mojo et al., 2017; Ahmed & Mesfin, 2017;

Priscilla & Chauhan, 2019). However, this method is also not free from limitations. Some of the important limitations are:

- PSM can only account for observed (and observable) covariates.
- The overarching assumption when estimating propensity scores is unconfoundedness. The researcher assumes that all variables that influence and affect treatment assignment have been accounted for in the statistical model
- Unconfoundedness cannot be empirically tested; instead, researchers must attempt to provide theoretical and empirical evidence that all relevant covariates have been included in the model
- If researchers fail to include an important confounder, the propensity scores will lead to biased results
- Another limitation of propensity score matching is that it often produces smaller sample sizes than initially obtained in the data collection process.

The first step in PSM involves estimating the propensity score to predict the probability of a farmers's decision to join FPOs. For this, we used the probit model as indicated in the following equation:

$$pr(X_i) = P(Z = 1 \mid X_i)$$

Where pr (X_i) is the propensity score of the i^{th} individual; $P(Z = 1 \mid X_i)$ is the probability of treatment given the observable covariates (X) of i^{th} individual. The propensity scores are then used to construct a control group by matching FPO members to non-members.

Second, we applied three types of matching, namely, nearest neighbour matching (NNM), kernel-based matching (KBM) and Caliper matching (CM) for robustness.

Thirdly, we check common support conditions to verify the presence of enough overlap in the propensity score distribution of the treatment and comparison groups. We also perform the balancing test to verify that the differences in covariates of two groups in the matched sample have been eliminated or ensure the existence of similarity between the covariates of the two groups.

Finally, after matching the FPO members with similar non-members, ATTs are computed. The matches should be restricted to households with propensity scores that fall in the area of common support. Propensity scores that fall out of this region are dropped from the sample on which matching is executed. FPO members, for whom an appropriate match cannot be found as well as non-members not used as matches are dropped from the further analysis. The average impact of FPO membership on the performance of the members, referred to as ATT is estimated as follows:

$$ATT = E(Y_i^1 - Y_i^0)$$

Where ATT is the average treatment effects on the treated; $E(Y_i)$ **i**s the expected value of the impact indicator; 1 represents the treated, 0 otherwise.

7.3 Description of Variables and Descriptive Statistics

The treatment variable is a binary FPO membership, and it has a value of 1 if a farmer has membership in an FPO and 0 otherwise. The three focused explanatory variables include net returns, ROI and profit margin which are used to capture the economic impact of FPO membership on farmers. In particular, net returns refer to the difference between the gross revenue of agriculture and investment costs measured in Rupees/acre. The investment costs include all actual expenses in cash and kind incurred in production by owners like expenditure on seeds, organic manure, pesticides, irrigation, machinery, and hired and family labour. ROI refers to the ratio of net returns to investment costs and is calculated as follows:

$$ROI = \frac{Return - Investment}{Investment}$$

ROI from crop production and marketing measures the profitability of the investment made by the farmer in agriculture Profit margin refers to the ratio of net returns to gross revenue.

$$Profit\ margin = \frac{Net\ returns}{Gross\ revenue}$$

Guided by previous empirical literature on farmer organizations (Jitmun et al., 2020; Manda et al., 2020; Mojo et al., 2017; Wossen et al., 2017; Ma & Abdulai, 2017) and FPOs in India (Singh & Vatta, 2019; Verma et al., 2019), we have included a set of explanatory variables. These variables include age, gender, education, household size, farming experience, landholding size, farming as a primary occupation, ownership of phone and cattle, distance to market, agricultural credit and extension services.

Table 7.1 illustrates the definition and summary statistics of the variables used in the study. The survey showed that around 77% of the sample households were headed by males. On average, the household heads were 46 years old and had attained 7 years of formal schooling. The average household size is 5.26 members while the average landholding is just above one acre. On average, the sample respondents have been engaged in farming for 16.26 years. Around 65% of the sample respondents identified farming as their primary occupation in the study area and 90% of them owned a mobile phone. On average, each household owns 4.31 cattle. The mean distance from the respondents' residence to the nearest market is 22.87 km. Only 17 per cent of the respondents had availed of agricultural credit while about 48% of them had interacted with the extension officials in the last one year.

Table 7.1: Variable definitions and descriptive statistics

Variables	Definition	Mean (SD)
Explanatory variables		
Net returns	Gross income from farming minus investment costs ('000 Rs/acre/annum)	37.98 (28.35)
ROI	Return on Investment (%)	1.60 (0.56)
Profit margin	Ratio of net returns to gross revenue	0.59 (0.11)
Treatment variable		
FPO membership	Farmer is a member of an FPO (1 = yes, 0 = no)	0.50 (0.50)
Control variables		
Age	Age of household-head (years)	45.92 (9.37)
Gender	Gender of the household (HH) head (1 = male, 0 = female)	0.77 (0.42)
Education	Formal schooling of HH head (years)	6.78 (3.93)
Household size	Number of family members in the household	5.26 (1.44)
Farming experience	Experience of farming of the HH head (years)	16.26 (9.78)
Landholding size	Size of landholding of the HH (acres)	1.04 (0.96)
Primary occupation	1 if farmer's primary occupation is farming, 0 otherwise	0.65 (0.48)
Phone	Mobile phone ownership (1= yes, 0 = no)	0.90 (0.30)
Cattle	Number of cattle owned by the household	4.31 (3.60)
Distance to market	Distance to the nearest market (kms)	22.87 (12.27)
Agricultural credit	Access to agricultural credit (1 = yes, 0 = no)	0.17 (0.37)
Extension	Access to extension service (1 = yes, 0 = no)	0.48 (0.50)

SD = standard deviation in parentheses

Source: Authors' estimates

Table 7.2 presents the mean differences in the selected variables between FPO members and non-members. It shows that FPO members tend to earn 30% higher net returns per acre per annum than non-members. Both ROI and profit margin for FPO members are also significantly higher than those for non-members. However, these observations cannot be used to conclude that FPO members are economically performing better than non-members as these comparisons are only descriptive and do not control for other confounding factors.

Table 7.2: Mean differences in the selected outcome and explanatory variables between FPO members and non-members

Variable	FPO member (N=280)	Non-member (N=280)	Mean Difference
Dependent Variables			
Net returns	42.88 (28.98)	33.09 (26.88)	9.78***
ROI	1.84 (0.48)	1.36 (0.52)	0.48***
Profit margin	0.64 (0.08)	0.55 (0.11)	0.08***
Independent variables			
Age	46.24 (9.48)	45.60 (9.28)	0.65
Gender	0.79 (0.41)	0.76 (0.43)	0.03
Education	7.11 (3.86)	6.46 (3.99)	0.65*
Household size	5.26 (1.51)	5.25 (1.37)	0.02
Farming experience	17.21 (10.09)	15.30 (9.38)	1.91**
Landholding size	1.11 (1.05)	0.96 (0.86)	0.14*
Primary occupation	0.73 (0.45)	0.57 (0.50)	0.16***
Phone	0.96 (0.19)	0.84 (0.37)	0.13***
Cattle	4.31 (3.48)	4.30 (3.73)	0.02
Distance	23.08 (13.01)	22.66 (11.51)	0.43
Agriculture credit	0.19 (0.39)	0.15 (0.35)	0.04
Extension	0.59 (0.49)	0.38 (0.48)	0.21***

Source: Estimates based on field survey.

Note: Standard Deviation in parentheses. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.10$

Further, Table 7.2 shows that FPO members and non-members are systematically different in terms of several observed characteristics. For example, education was higher for FPO members than for non-members. Also, FPO members tend to possess more experience in farming. Members also tend to own larger landholding sizes and mobile phones. Compared with non-members, FPO members are also more likely to have farming as their primary occupation. These findings suggest that FPO members and non-members differ significantly in terms of several covariates, justifying the usage of a matching method like PSM to estimate the true impact of FPO membership on the economic performance of the farmers.

7.4 Determinants of participation in FPOs

A probit model was fitted to estimate the propensity scores for matching the FPO members with non-members (Table 7.3). The dependent variable assumed a value of

1 if the respondent was a member of an FPO and 0, if not. Marginal effects along with the coefficients are included to aid us in interpretation.

The mean value of the estimated propensity score for the whole sample was 0.5027, with minimum and maximum values of 0.0392 and 0.9222 respectively. The propensity scores derived from the covariates under consideration ranged from 0.6146 to 0.9046 with a mean score of 0.5700 for the treated group and from 0.0392 to 0.9222 with a mean score of 0.4288 for the control group. Hence, the region of common support for the distribution of the estimated propensity scores of the control (non-member) and treated (member) groups ranged between 0.0614 and 0.9046; this accounts for 272 members and 280 non-members with only 8 members outside this range and the final sample size becomes 552. The propensity scores in the common support region were used to estimate the ATT.

Table 7.3: Determinants of FPO membership: Probit estimation

Variables	Coefficients	Marginal effects
Age	-0.008 (0.009)	-0.003 (0.003)
Gender	0.008 (0.135)	0.003 (0.048)
Education	0.053 (0.016)***	0.019 (0.006)***
Household size	-0.017 (0.042)	-0.006 (0.015)
Experience	0.022 (0.009)***	0.008 (0.003)***
Landholding size	0.077 (0.061)	0.027 (0.021)
Primary occupation	0.339 (0.120)***	0.119 (0.041)***
Phone	0.923 (0.218)***	0.325 (0.074)***
Cattle	0.007 (0.016)	0.002 (0.005)
Market distance	0.014 (0.005)***	0.005 (0.002)***
Agricultural credit	0.275 (0.152)*	0.097 (0.053)*
Extension	0.521 (0.112)***	0.184 (0.037)***
Constant	-2.174 (0.486)***	
Pseudo R^2	0.1093	
LR $\chi 2(13)$	84.82	
Prob>$\chi 2$	0.0000	
No of observations	560	

Source: Estimates based on field survey

Note: Standard Deviation in parentheses. ***$p < 0.01$, **$p < 0.05$ and *$p < 0.10$

Table 7.3 reports the results of the probit model, which are estimated using Equation (1). The estimated probit regression was significant at a 1% level as indicated by the probability of LR- $\chi 2$ statistic.

The results show that the marginal effect of education is positive and statistically significant, suggesting that better-educated farmers are 1.9 % more likely to join FPOs compared to their uneducated counterparts. Educated farmers are more likely to be aware of the potential benefits of farmer organisations and thus, are more likely to become members of farmer organisations, consistent with Wang et al. (2019) and Abate et al. (2014).

The probability of being a member of an FPO is higher for those who have more years of farming experience. This finding primarily reflects the fact that older farmers are more likely to produce and sell bananas based on their farming experience rather than seeking help from agricultural cooperatives. Our results show that distance to the nearest market positively and significantly influences the probability of FPO membership. This finding suggests that farmers closer to the market have better access to markets, have several marketing options and are thus less dependent on farmer groups. On the other hand, farmers residing far from the market face higher transaction costs in accessing the markets as transportation costs increase with distance. FPOs help them in reducing these costs through collective action and thus farmers are more likely to join FPOs. This finding is in line with Fischer and Qaim (2012) and Ahmed and Mesfin (2017).

Mobile phone ownership also affects farmers' decisions to join FPOs. Our results suggest that it positively and significantly affects a farmer's FPO membership decision. This finding can be justified by the fact that mobile phones make it easy to contact and inform farmers about various group activities and its benefits. It acts as an

effective means of communication, especially in a hilly state like Sikkim, where farmers are located in highly remote villages.

The positive and statistically significant marginal effect of agricultural credit suggests that farmers who have availed credit for agricultural purposes are 9.7% more likely to join FPOs. This finding may be explained by the fact that higher credit for agriculture means higher investment also. Farmers must earn higher returns from agriculture so that they can at least pay back their loans and save themselves from getting into debt. Through FPOs, members can get inputs at lower prices and sell their produce at higher prices, thereby earning higher profits. Thus, farmers with agriculture credit prefer to join FPOs.

The marginal effect of farming as a primary occupation is also positive and statistically significant indicating that farmers for whom farming is the primary occupation are 11.9% more likely to join FPOs. A possible explanation for this finding is that FPOs are rural institutions that aim to provide all kinds of services useful for farmers. Thus, they expect to benefit more from FPOs and are more likely to join than those for whom farming is not the primary occupation. This finding provides further support for that of Verma et al. (2019).

It is to be noted that some of the covariates may potentially be endogenous. For example, ownership of mobile phones among group members could be higher due to higher incomes as a result of group membership, which would lead to reverse causality. However, since all the FPOs were started only three years before we implemented the survey, so the monetary benefits may not yet have resulted in significant investments. Therefore, we conclude that issues of endogeneity are negligible in our context (Fischer & Qaim, 2012).

7.5 Robustness and validity of matching estimates

First, the propensity scores for the FPO members and non-members, estimated through the probit model, were used to find the region of common support by plotting histograms of the propensity scores (Figure 7.1 & 7.2). In case of NNM and KBM, 279 members find a match, meaning that 1 member is treated off-support and dropped during the analysis (Figure 7.1). On the other hand, in the case of Caliper matching, only 272 members find a match and 8 members are dropped from the analysis. As the figures indicate that the propensity score distributions of the two groups largely overlap in all matching techniques, the common support assumption is satisfied and ATT is estimated using only those observations that are under the common support region.

Figure 7.1: Propensity scores distribution and common support (Nearest neighbour and Kernel matching)

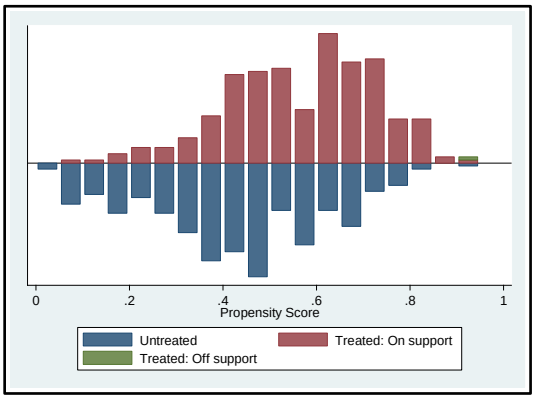
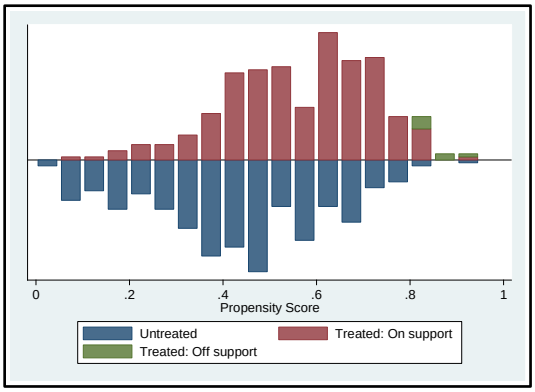


Figure 7.2: Propensity scores distribution and common support (Caliper matching)



Second, the test for balancing property (Table 7.4) verifies that all covariates are similar for both treated and untreated groups after matching. The test shows that bias for all covariates is less than 20% after matching, implying a successful matching (Rosenbaum & Rubin, 1985).

Table 7.4: Balancing test of individual covariates

Variable	Unmatched (UM) Matched (M)	%bias		
		NN (3)	Kernel (0.06)	Radius (0.01)
Age	U	6.9	6.9	6.9
	M	-7.3	-0.1	-7.3
Gender	U	6.8	6.8	6.8
	M	0.3	1.7	-0.4
Education	U	16.5	16.5	16.5
	M	12.2	1.7	9.8
HH size	U	1.2	1.2	1.2
	M	-8	-1.8	-5.3
Farming experience	U	19.6	19.6	19.6
	M	-14.4	-2	-10.7
Landholding size	U	14.9	14.9	14.9
	M	-3	1.6	0.8
Primary occupation	U	34.1	34.1	34.1
	M	0	-1.2	-1.5
Phone	U	43.8	43.8	43.8
	M	-1.2	-2.5	-3.9
Cattle	U	0.5	0.5	0.5
	M	-3.4	0.9	-0.2
Distance to market	U	3.5	3.5	3.5
	M	1.4	4.1	3.2
Agriculture loan	U	11.5	11.5	11.5
	M	6.1	7	6.6
Extension	U	43.8	43.8	43.8
	M	-1.5	-0.9	-0.7

Table 7.5: Balancing Test of the model

Test	Before matching	After matching		
		NN (3)	Kernel (0.06)	Radius (0.01)
Pseudo R^2	0.109	0.007	0.003	0.004
LR $\chi 2$	84.82	5.26	2.1	3.22
Prob>$\chi 2$	0.000	0.969	1	0.997
Mean standardized bias	16.7	4.8	2.3	4

Further, Table 7.5 shows that the Pseudo-R^2 drops significantly from 10.9% before matching to 0.7%, 0.3% and 0.4% for NNM, KBM and CM respectively verifying the appropriateness of the model as a whole. The p-value is also not significant after matching implying that the covariate means of the two groups are not significantly different after matching. The MASB also reduces to 4.8, 2.3 and 4% respectively for NNM, KBM and CM. The low Pseudo-R^2, insignificant p-values of the likelihood ratio test, low standardized biases and high reduction in the total bias after matching indicate that the specification of PSM is appropriate in terms of balancing the distribution of covariates between FPO members and non-members.

7.6 Impact of FPO membership on farmers' economic performance

The effect of FPO membership on farmers' economic performance was estimated using ATT. To check the robustness of the PSM estimates, ATT from three different alternative matching methods (NNM, KBM and CM) were computed, compared and tested. The results of all three techniques are presented in Table 7.6.

Table 7.6: Average impact of FPO membership on the economic performance of farmers

Outcome	ATT		
	NN	Kernel	Radius
Net Returns	7.521 (3.043)***	8.133 (2.676)***	7.254 (2.945)***
ROI	0.463 (0.056)***	0.480 (0.049)***	0.460 (0.053)***
Profit margin	0.080 (0.114)***	0.084 (0.009)***	0.081 (0.011)***

Figures in parentheses indicate standard error.

Using NNM, KBM and CM techniques, the ATT was computed to assess the impact of FPO membership on the selected performance indicators: gross income, net returns, ROI and profit margin.

It is observed that the FPO membership has a significant impact on all three outcome variables. The ATT value for net returns was large and quite similar across different matching techniques implying that FPO membership had a significant positive impact on the net returns of the farmers. This finding is well in line with Verma et al. (2019) and Roy et al. (2020) who found a positive impact of FPO membership on net returns. This increased income in farmers' income in Sikkim can be attributed to better prices offered by FPOs as compared to traditional marketing channels, provision of inputs at discounted rates, training on cultivation of economically remunerative crops, lower transportation costs as FPOs reach farmers with their vehicles for procurement and other value addition activities.

Participation in FPO had a significant impact on members' return on investment also. The results are significant and similar across three matching algorithms. These findings suggest that relative to non-members, being a member in an FPO increases ROI by 46.3%, 48% and 46% in NNM, KBM and CM techniques respectively. We can infer that compared to a non-member, an FPO member earns at least 46 per cent higher return on investment made in agriculture. This result is consistent with that reported by Ma et al. (2021) and Ma and Abdulai (2017) who reported that

membership in farmer organisations had a positive impact on farmers' return on investment. The impact estimates also indicate that the impact of FPO membership on profit margin is positive and statistically significant for the members.

Profit margin is the ratio of net returns to gross revenue. It assesses the profitability of business activity with respect to the total revenue generated. Here, by applying three matching algorithms, we find that FPO members earn 8%, 8.4% and 8.1% higher profit for each Rupee of sales generated as compared to non-members. On average for each rupee earned as sales revenue, an FPO member would earn around 8 paise more than a non-member. This result indicates that FPO membership makes agriculture a profitable business for farmers.

Overall, these results suggest that membership in an FPO leads to a significant improvement in the economic performance of the members. The finding that farmer organisations improve the economic performance of farmers is consistent with the findings of previous studies (Ma et al., 2021; Roy et al., 2020; Kumar et al., 2020; Verma et al., 2019; Ahmed & Mesfin, 2017). This significant impact of FPOs comes from the services that FPOs provide in maximising earnings through higher prices and minimising costs by securing inputs in bulk at lower prices (Bikkina et al., 2018; Gurung, 2020).

7.7 Conclusion

This study examined the economic impact of FPO membership on net returns, ROI and profit margin of farmers, using cross-sectional household survey data collected from all four districts of Sikkim in northeast India where the majority of the agricultural households are smallholders. It employed the PSM technique in which FPO members and non-members were matched on several covariates to estimate the

average impact of FPO membership on the economic performance of farmers. First, a probit regression model was employed to determine the covariates that affect a farmer's decision to join an FPO. Secondly, the propensity scores generated in the probit model were used to match the member and non-member farmers using three different matching algorithms.

The empirical results from the probit model showed that farmers' decision to join FPOs is mainly determined by their education, farming experience, farming as a primary occupation, phone ownership, distance to the nearest market, agriculture credit and extension services.

The results from the PSM methodology suggest that FPO membership has a positive and significant impact on net returns, return on investment and profit margin. The results confirm that non-members have lower net returns and ROI than a member. The causal impact of FPO membership on net returns per acre per annum varies from Rs 7254 to Rs. 8133 for the members while ROI and profit margin varies between 0.46 and 0.48 and 0.08 and 0.084 respectively.

CHAPTER 8

EFFICIENCY EVALUATION OF FARMER PRODUCER ORGANISATIONS (FPOs) IN SIKKIM

8.1 Introduction

In developing countries, FPOs are an important form of collective action that helps in the aggregation of farmers' produce and links them to high-value markets (Prasad & Prateek, 2019). FPOs have an important role to play as an important socio-economic phenomenon in terms of employment, business, value-addition, and income. When resource-poor small farmers organise themselves and work together, their access to farm inputs becomes easier and larger markets can be reached with the aggregated produce. Such collective action enables them to minimise costs and improve bargaining power. FPOs also focus and assist farmers on value-addition which further enhances their earnings from the produce. The primary purpose of FPOs is to collectivise the farmers to utilise the available resources productively and to become more efficient over time to enable farmers to earn more rupees per unit cost of production.

Considering the important role of FPOs in the upliftment of smallholder farmers, they must grow and develop into sustainable and competitive organisations that actually enable farmers to earn more returns per rupee investment of the farmers. For such growth and development of FPOs, improvement in their efficiency levels is required because only an efficient economic organisation can contribute significantly to economic growth (Acemoglu et al., 2005). Efficient FPOs will survive in the competitive market and continue to make farming a profitable economic activity even for smallholder farmers

while on the other hand, inefficient FPOs will be eliminated (Hailu et al., 2005) as India's agriculture and food sectors see a strong presence of both private and foreign MNCs. For overcoming this challenge too, FPOs in India must stay competitive and improving efficiency is one such way to make FPOs sustainable and competitive organisations. Therefore, the important role of FPOs in socio-economic development in India, particularly uplifting the smallholder farmers and broadly their significance in attaining the government's goal of doubling farmers' income (Singh, 2020; Singh, 2019; Swaminathan et al., 2018; Gurung & Choubey, 2019) justifies the need to study their performance by measuring their efficiency levels.

In recent times, studies on the performance and impact of FPOs have been gaining much interest (Verma et al., 2019; Singh & Vatta, 2019; Roy et al., 2020; Mukherjee et al., 2019) owing to the aforementioned significance of FPOs in India in economic terms as well as rural development. However, an evaluation of the performance of FPOs in terms of measurement of efficiency has not been conducted so far. An economic evaluation of any economic unit can be made by analysing its efficiency. In this chapter, we attempt to evaluate the performance of 20 FPOs across four districts of Sikkim by measuring their efficiency levels to assess (i) whether FPOs in Sikkim are efficient or not, (ii) identify the efficient and inefficient FPOs and (iii) further classify the inefficient FPOs into different levels of inefficiency. In this chapter, Data Envelopment Analysis (DEA) has been applied to measure the efficiency levels of the FPOs.

The empirical results will be useful for policymakers and stakeholders of FPOs in enabling them to identify the best and worst performing FPOs and to choose the appropriate areas and direction to work on to improve the performance of FPOs in

Sikkim, in particular and in India, in general. Identification of inefficient FPOs will enable the concerned stakeholders to either strengthen or divert resources from them to other relatively efficient FPOs. On the other hand, the identification of efficient FPOs will gain us insights into the best practices performed by them.

8.2. Efficiency of Farmer Organisations: Some Existing Studies

Analysis of the efficiency of farmer organisations has long been a topic of interest in many studies (Porter & Scully, 1987). DEA has been widely used to measure the efficiency of both individual farmers and farmer organisations where they are regarded as DMUs. DEA has been used to measure the efficiency of various institutions like banks, MFIs, industries, insurance companies, agricultural cooperatives, and farmer organisations. For example, Xaba et al. (2019), using DEA, evaluated the efficiency of 19 agricultural cooperatives in South Africa and found the average technical efficiency of the cooperatives to be 72 per cent. Only 26 per cent of the total sample cooperatives were found to be fully efficient. More than half of the agricultural cooperatives were found to be operating at DRS suggesting the diversion of resources from already large agricultural cooperatives towards smaller cooperatives resulting in the formation of secondary cooperatives. This will reduce the scale of cooperatives operating at DRS and enlarge the scale of smaller cooperatives operating at IRS and ultimately lead to improvement in efficiency levels of all agricultural cooperatives. Estimating the efficiency levels of 247 agricultural cooperatives in the fresh fruit and vegetable sector in Spain over three financial years, Guzman and Arcas (2008), have found that on average, the cooperatives in Spain are operating at high levels of efficiency and are operating at levels nearer to the optimum scale of operations. It also concludes that analysis of efficiency using DEA is

complementary to the conventional economic and financial ratio analysis. Soboh et al. (2014) used DEA to measure and compare the performance of dairy cooperatives and investor-owned firms (IOFs) in Europe. Their results show that cooperatives have lower performance than investor-owned firms on average in terms of efficiency scores like technical, allocative and scale efficiencies. They concluded that different measuring approaches should be considered as these two entities differ in terms of their objectives. For example, raw materials have different meanings for the two organisations. Different approaches yield different results for these two entities. While comparing the performance of dairy cooperatives to private dairy plants in India, Singh et al. (2001) used panel data for 13 cooperative plants for the period between 1992-93 and 1996-97 and DEA to measure economic efficiency. Their results indicate that allocative and cost efficiencies saw improvements while technical efficiencies across plants declined during the sample period. They conclude that the Indian dairy industry has great scope for improvement in efficiency. Besides privatisation, efforts should be made by policymakers and plant managers to enhance both the demand and supply side of the dairy industry to improve efficiency levels. Othman et al. (2014) assessed the performance of 56 cooperatives in Malaysia using the DEA technique. The results of the study revealed the unsatisfactory performance of the cooperatives despite support from the government and positive growth in the number of cooperatives, memberships share capital assets and turnover. The study found that only 19.6 per cent of the cooperatives had achieved the highest efficiency scores implying that majority of the cooperatives were not operating at their most productive scale or optimal scale. They conclude that group size is important to influence the efficiency of the cooperative. Arcas et al. (2014) examined the

relationship between the size and performance or efficiency of 108 fruit and vegetable cooperatives in Spain. It has applied DEA to measure efficiency and has found that the size of the cooperative has a positive impact on its performance due to economies of scale and greater negotiating power and ease of access to different resources (financial, marketing and technological). They conclude that the findings might be beneficial for smaller cooperatives. Guzman et al. (2009) make a comparative study of the technical efficiency of 81 Italian and 106 Spanish fruit and vegetable cooperatives using DEA. Their results show that the general level of technical efficiency has declined over the period considered but the sources of inefficiency are different. For Spanish cooperatives, the decline in inefficiency is due to deterioration in their inability to optimise the inputs or managerial inefficiency whereas efficiency for Italian cooperatives is declining due to their inability to operate at constant returns to scale or optimal scale of operation. Krasachat and Chimkul (2009) measure the inefficiency of agricultural cooperatives in Thailand in 2004 and also investigate the cooperative-specific factors that affect inefficiency using a Tobit model. The results indicate that there are significant possibilities to increase efficiency levels in Thai agricultural cooperatives. The average overall technical inefficiency could be reduced by 28 per cent and the overall technical inefficiency is caused majorly by pure technical inefficiency. A similar study by Huang et al. (2013) was using DEA to estimate efficiency scores (TE, PTE and SE) for 896 marketing cooperatives in China. The results indicate that the overall technical efficiencies of these cooperatives can be improved significantly by improving scale and pure technical efficiencies. PTE is the root cause of overall technical inefficiency. Most of the cooperatives are operating at increasing returns to scale below the optimal level.

Therefore, scale efficiency can be improved by increasing the size of cooperatives. The paper concluded that increasing the size of these cooperatives would be better than creating new ones.

8.3 Theoretical background

Generally, efficiency refers to the level of performance an economic unit can reach within its production possibilities. The idea of estimating efficiency dates back to the original work of Farrell (1957). According to Farrell (1957), efficiency can be evaluated in two ways: first, technical efficiency which means achieving the maximum level of output with a given level of inputs and second, price efficiency meaning achieving maximum output at minimum costs. Then, total efficiency can be obtained using the values of technical efficiency and price efficiency. However, it is not always possible to measure price efficiency due to a lack of knowledge of the costs of factors on which price efficiency depends making calculation of the technical efficiency difficult (Thanassoulis, 2001).

Technical efficiency (TE) refers to the capacity to produce maximum output under fixed input or realize minimum input under fixed output. Therefore, we find that measures of efficiency focus more on technical efficiency which measures a firm's ability to choose an optimal set of inputs. TE is defined in relation to a given set of firms in terms of a given set of factors that is measured in a particular way such that any change in these specifications will change the measure (Farrell, 1957). TE can be measured either from an input-oriented perspective or an output-oriented perspective. From an output-oriented perspective, TE means the ratio of actual outputs to the outputs on the production frontier given the level of inputs, whereas, from an input-oriented perspective, it refers to the ratio

of input on the production frontier to the actual inputs given the level of output. Further, the TE measured relative to the constant returns to scale (CRS) indicates that each decision-making unit has an optimal scale of production. But some factors such as imperfect competition and constraints on finance may cause the decision-making unit not to be operating at an optimal scale in practice (Coelli et al., 2005). The production units located on the production frontier are technically efficient, whereas those located under the frontier are technically inefficient. Allowing for variable returns to scale (VRS), the PTE and SE can be distinguished. PTE is based on VRS, whereas SE measures the ratio of the production frontier under CRS to the production frontier under VRS. Calculating TE is simple and straightforward when dealing with production processes that involve the production of a single output by utilising a single input. However, the computation becomes difficult when we consider multiple outputs and multiple inputs.

8.3.1 Parametric v/s Non-parametric Approaches

After Charnes et al. (1978) first estimated a regression to explain variation in the distribution of efficiency of a unit; two different approaches (parametric and non-parametric) to the measurement of efficiency in the agricultural cooperative have evolved. These two methods are commonly used to empirically estimate the performance of firms in terms of efficiency. Much later, Parkan (2002) further added that the performance of DMUs can be evaluated using three approaches: index numbers, parametric or econometric models and non-parametric approaches such as DEA. The literature on efficiency analysis presents a large body of both parametric and non-parametric techniques (Coelli et al., 1998). However, each approach has its own set of merits and demerits.

The parametric approach involves analysis of the performance of DMUs based on the knowledge of cost function and production function and the relation between them through the use of stochastic frontier analysis (SFA). These approaches require a huge quantity of data and restrictive assumptions regarding the model specification. They take into consideration the random errors and test the hypotheses, but they have to be established on the assumption of a stochastic frontier and they are applied to the production with a single product rather than multi-products (Galdeano & Cespedes, 2008). For parametric methods, the population is approximately normal or we can approximate using a normal distribution after invoking the Central Limit Theorem. SFA is a parametric model developed and introduced simultaneously by Aigner et al. (1977) and Meeusen and Broeck (1977). Using it, we can measure farm-level technical, allocative and economic efficiency using maximum likelihood estimate. SFA is used when the relationship between the outputs produced and the inputs used (i.e. production function) is known. The parametric approach incorporates distributional assumptions which cause an important problem since the results obtained are sensitive to the functional form selected. For this reason, the utilisation of this approach is not so simple.

On the other hand, a non-parametric approach is applied when apriori information about the causality relationship between the outputs and the inputs is unavailable. We need not make any assumption of normality for the population we are studying. Therefore, these methods are also called distribution methods. Moreover, using the non-parametric approach, it is not necessary to assume any functional form of the production function or to specify any distribution function for inefficiencies. A non-parametric approach is free from the disadvantages of a parametric approach but is not able to distinguish the

influences of random error from those of measurement error (Simar & Wilson, 1998). Data Envelopment Analysis (DEA) is an example of a non-parametric method. Situating the literature on efficiency measurement of farmer collectives or agricultural cooperatives, Guzman and Arcas (2008) illustrate that there exist more studies based on non-parametric techniques as compared to parametric techniques.

8.3.2 Data Envelopment Analysis (DEA)

In our empirical study, we have selected the non-parametric technique called Data Envelopment Analysis (DEA) which was first proposed by Charnes et al. (1978) as a tool to measure the efficiency and productivity of DMUs. It is a benchmarking tool that evaluates a population of DMUs in terms of their performance in converting inputs to outputs. It identifies the DMUs that are located on the efficient frontier and are relatively more efficient than others in producing outputs from given inputs while the DMUs that lie below the frontier are considered inefficient DMUs. The efficiency of a DMU is compared to the estimated production frontier and the relative efficiency of DMUs is calculated.

The DEA model introduced by Charnes et al. (1978) can be either input or output oriented. The input-oriented efficiency scores indicate the largest possible reduction in inputs for given outputs, while output-oriented efficiency scores indicate the largest possible proportional increase in outputs for fixed inputs. For DEA, we collect observations for a finite number of entities called DMUs like private firms, hospitals, agricultural cooperatives, banks, MFIs or FPOs (in our case). The following steps are involved in the development of a typical DEA model:

i. Selection of the input and output variables
ii. Choosing the orientation of optimization- it can be either input-oriented meaning minimisation of inputs or output-oriented implying maximisation of output
iii. Restriction of possible weights
iv. Use of cross-sectional or longitudinal data

DEA will provide answers to the following questions:

i. Who are the best-in-class decision-makers managing to perform better under the same conditions?
ii. How well is a decision maker doing relative to the others- not relative to a theoretical maximum but in real life?
iii. Whom could a decision-maker learn from?
iv. What would be its target levels of observed parameter values?
v. Where and how much could it improve?

Since the seminal work of Charnes et al. (1978), the usage of the DEA technique has seen exponential growth in performance evaluation research studies (Emrouznejad & Yang, 2018) as a modern tool for measuring the performance of DMUs. This technique has been popularly applied in studies related to agriculture, banking, supply chain, transportation and many others.

Many studies (Coelli, 1995; Cooper et al., 2004; Chen & Zhu, 2003; Guzman & Arcas, 2008) have indicated that the DEA approach has two main advantages in estimating efficiency scores. First, it does not require the assumption of a functional form of the

production or cost function to specify the relationship between inputs and outputs. This implies that one can avoid unnecessary restrictions on the functional form that can affect the analysis and distort efficiency measures. Second, it does not require the distributional assumption of the inefficiency term. It generates a set of peers or the best performance with each unit is compared. It can also easily model multiple input and multiple output production processes.

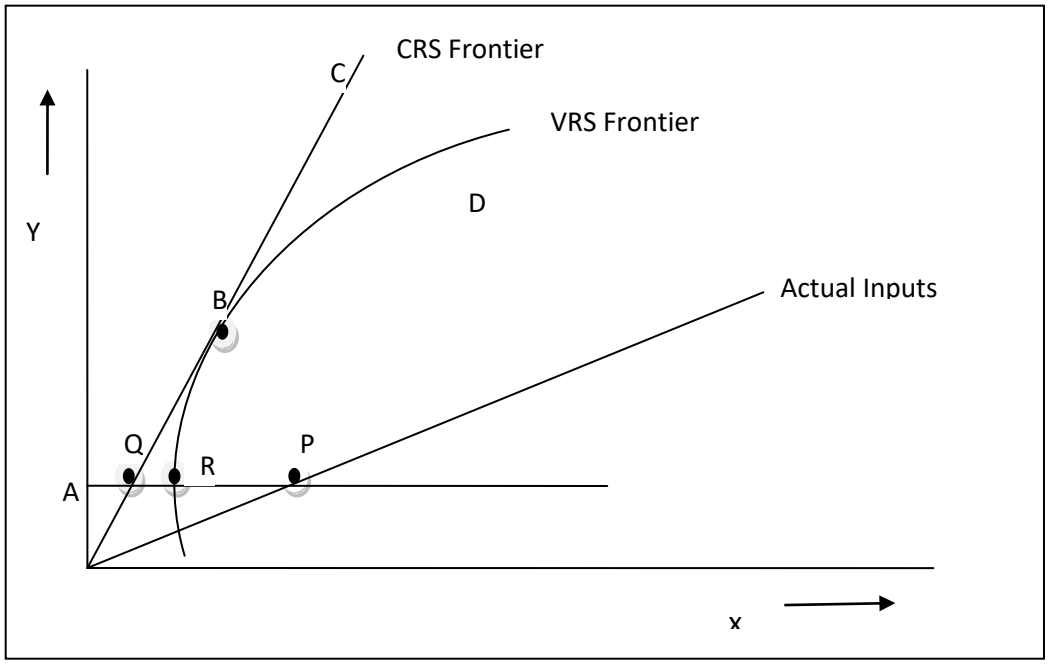
Stochastic Frontier (SF) models outperform DEA when the assumed functional form is closer to the underlying technology. But as the misspecification of the functional form becomes serious, DEA estimates become more accurate than the SF models. For example, while comparing DEA and stochastic Frontier methods, Read (1998) found that stochastic frontiers (SF) regression estimates of efficiency were worse than DEA in these regions of poor specification.

According to Coelli et al. (2005), the constant returns to scale DEA model is only appropriate when the firm is operating at an optimal scale. Some factors such as imperfect competition, constraints on finance, etc may cause the firm not to be operating at an optimal level in practice. To allow for this possibility, Banker et al. (1984) extended the CRS DEA model of Charnes et al. (1978) and introduced the variable returns to scale VRS DEA model. The estimated technical efficiency from the output-oriented VRS DEA of each DMU is always higher than or equal to that from input-oriented CRS DEA as the VRS DEA is more flexible than the CRS DEA.

FPOs are a hybrid between an agricultural cooperative and a private company. It has some elements of a private company and some of a cooperative. It is important to note here that FPOs in Sikkim are registered as cooperative societies under Sikkim State

Cooperative Societies Act in the Department of Cooperation under the Government of Sikkim. As a result, they face significant intervention from the state government on matters relating to both promotion and regulation. The financial accounts of these FPOs are regularly audited by the auditors from the State Cooperation Department. FPOs decision to use their own share capital for business purposes also requires approval from the Cooperation Department. Due to the consequence of the heavy intervention of the state government in both agriculture and FPOs in Sikkim, the FPOs may have been prevented from operating at the optimal level of firm operations. Therefore, technical efficiency in this study is calculated using the input-oriented variable returns to scale (VRS) DEA model. Under variable returns to scale, the PTE and SE can be distinguished. PTE is based on VRS while SE measures the ratio of the production frontier under CRS to the production frontier under VRS. Figure 8.1 illustrates the TE, PTE and SE from an input-oriented perspective in case of a single input and single output.

Figure 8.1: Technical, Pure technical and scale efficiencies (Coelli et al., 2005)



Following Coelli et al. (2005) the VRS model is discussed below. Let us assume that there is data available on K inputs and M outputs in each of the N decision units (i.e. FPOs). Input and output vectors are represented by the vectors x_i and y_i, respectively for the ith FPO. The data for all firms may be denoted by the K*N input matrix (X) and M*N output matrix (Y). The envelopment form of the input-oriented VRS DEA model is specified as:

$$min_{\theta,\lambda}\theta,$$

$$s_t - y_t + Y\lambda. \geq 0$$

$$\theta x_i - X\lambda \geq 0$$

$$N1'\lambda = 1$$

$$\lambda \geq 0,$$

Where θ is the input technical efficiency (TE) score that has a value $0 \leq \theta \leq 1$. If the θ value is equal to one, indicating the firm is on the frontier, the vector λ is an N*1 vector of weights which defines the linear combination of the peers of the i-th firm. Thus, the linear programming problem needs to be solved N times and a value of θ is provided for each firm in the sample.

Because the VRS DEA is more flexible and envelops the data more tightly than the CRS DEA, the VRS TE score is equal to or greater than the CRS or 'overall' TE score. The relationship can be used to measure the scale efficiency (SE) of the i-th firm as:

$$SE_i = \frac{TE_{i,CRS}}{TE_{I,VRS}}$$

Where SE=1 implies scale efficiency or CRS and SE<1 indicates scale inefficiency. However, scale inefficiency can be due to the existence of either increasing or decreasing returns to scale. This may be determined by calculating an additional DEA problem with non-increasing returns to scale (NIRS) imposed. This can be conducted by changing the DEA model in eq (1) by replacing the N1'λ=1 restriction with N1'λ≤1. The NIRS DEA model is specified as:

$$min_{\theta,\lambda}\theta,$$

$$s_t - y_t + Y\lambda. \geq 0,$$

$$\theta x_i - X\lambda \geq 0,$$

$$N1'\lambda \leq 1,$$

$$\lambda \geq 0,$$

If the NIRS TE score is unequal to the VRS TE score, it indicates that increasing returns to scale exist for that firm. If they are equal then decreasing returns to scale apply.

DEA method was chosen for its ability to overcome problems of evaluating firms with multiple inputs and outputs and complex performance (Cooper et al., 2004; Chen & Zhu, 2003). DEA could be performed even when conventional cost and profit functions (that depend on optimizing reactions to prices) could not be justified. Furthermore, DEA was developed by Charnes et al. (1978) for applications in the public sector and not-for-profit organizations where typical economic behavioural objectives, such as cost minimization and profit maximization, may not be relevant. This non-parametric technique is very useful in addressing the problems of performance measurement in agricultural cooperatives by not limiting it to a simple analysis of measures based on traditional economic ratios (Guzmán & Arcas, 2008).

8.3.3 Inputs and Outputs Selection

One important aspect of TE measurement is defining the input and output variables. Just as in other industries, capital and labour are the main inputs in FPOs. The current study has employed 3 input and 2 output variables. This study takes capital, labour and other expenses as input variables. Capital is measured by the value of total assets (Indian Rupees). Following the accounting principle that says assets can generate revenues for a firm (Klein, 1971), it can be derived that assets are inputs that can be used to generate income. Labour is measured by the number of members in an FPO. Total expenditure is used as input since the management of expenditure also affects the profitability of a firm (Petria et al., 2015). Here total expenditure comprises of procurement cost of agricultural produce and other inputs and the management fee of the FPOs. The total receipts and

profits are adopted as the outputs (in Indian Rupees). It has to be noted that though profit is a subset of the total receipts, yet a firm can have high revenue and very low profits whereas another firm can have low revenue while having high profits. Generally, management's ability or efficiency to optimise costs will be reflected in the profit and loss accounts (Demerjian et al., 2013).

Cooper et al. (2007) have suggested that a sample size is considered to be adequate if it satisfies the following two rules jointly: $n \geq \max \{m*s; 3(m+s)\}$ where n = number of DMUs, m = number of inputs and s = number of outputs. Firstly, the sample size should be greater than or equal to the product of inputs and outputs and secondly, the sample size should be greater than or equal to thrice the sum of the number of inputs and output variables. In our case, m=3 and s= 2 and our sample size (n=20) is greater than the above-mentioned desirable size. Therefore, the two rules are satisfied and the sample size is adequate for carrying out the analysis.

FPOs in Sikkim conduct procurement, value-addition and marketing of farmers' agricultural produce. They also help farmers in accessing inputs at lower prices. Many FPOs have also acted as a channel of distribution of subsidised seeds, fertilisers and other inputs from the agriculture department. This implies that FPOs perform business activities that will try to maximise the profits of farmers by reducing the costs of inputs and fetching higher prices for outputs.

8.4 Data Sources

Regulation of Sikkim Cooperative Societies Act, 1978 requires that every cooperative society or an FPO registered under this Act must conduct a financial audit of its business annually by the department auditor appointed by the Registrar or by a certified auditor approved by the registrar. Since most of the FPOs had been unable to conduct the audit for the financial years 2020-21 and 2021-22 due to the worldwide lockdown imposed to contain the coronavirus, the latest audit reports completed by all FPOs were for the financial year 2019-20. Therefore, this study used data collected from the annual audit reports of each FPO for the financial year 2019-20. There are 28 FPOs currently active in Sikkim. Out of these 28 FPOs, only 26 FPOs could provide us with their Annual Audit Reports while information from the remaining two could not be retrieved despite repeated requests. On examination of the audit reports, it was found that 6 FPOs namely had reported losses for the year 2019-20. Thus, these 6 loss-making FPOs were also excluded and the remaining 20 FPOs were finalised for analysis. The selected FPOs deal in many organic products like fruits and vegetables, spices and other non-food agricultural produce like brooms. They are located in all four districts of the state. We calculated the TE, PTE and SE of these 20 FPOs using the computer program DEAP version 2.1 described in Coelli (1996).

8.5 Results and Discussion

The descriptive statistics of the inputs and outputs of the DMUs (here FPOs) in the sample are presented and discussed in Table 8.1. This is followed by the results obtained after conducting DEA.

Table 8.1: Descriptive statistics of input and output variables of FPOs, 2019-20

Variable	Mean	SD	Minimum	Maximum
Total Receipts (Rs.)	1225398.31	2021133.99	57700	7989930
Profit (Rs.)	33933.92	60538.62	58302	171379
Members	211.69	140.78	37	623
Total assets (Rs.)	463642.27	271555.13	101654	1319000
Total expenditure (Rs.)	453273.46	515997.00	38010	2269103

Source: Compiled from Annual Audit Reports of FPOs, 2019-20

From Table 8.1, we see large values of standard deviation (SD) indicating great differences in both outputs and inputs of each FPO. Such large variations can be attributed to the wide differences in size among FPOs in the study sample. In other words, it indicates an unbalanced development and size of FPOs in the state. The minimum values indicate the presence of very small FPOs in the sample while the maximum values indicate large FPOs in terms of size and business. Overall, the standard deviation indicates huge variations in inputs (total assets and total expenditure) and outputs (total receipts and profit).

Table 8.2 presents the OTE, PTE and SE scores of 20 FPOs and also the corresponding level of overall technical inefficiency (OTIE), Pure Technical Inefficiency (PTIE) and Scale Inefficiency (SIE). Inefficiency measures are obtained by subtracting the level of efficiency calculated from 1.

Table 8.2: OTE, PTE and SE scores for 20 FPOs in Sikkim

Sl. No.	FPO name	OTE	OTIE[1]	PTE	PTIE	SE	SIE	RTS
1	Passingdong	0.441	55.9	0.769	23.1	0.573	42.7	IRS
2	Men Rongong	0.529	47.1	0.701	29.9	0.754	24.6	IRS
3	Rani khola	1	0	1	0	1	0	CRS
4	Budang Kamarey	0.386	61.4	0.68	32	0.568	43.2	IRS
5	Rakdong Tintek	0.982	1.8	1	0	0.982	1.8	DRS
6	Khamdong	1	0	1	0	1	0	CRS
7	Rongli	0.105	89.5	0.447	55.3	0.234	76.6	IRS
8	Machong Parakha	0.203	79.7	0.384	61.6	0.528	47.2	IRS
9	Lamaten Tingmoo	0.876	12.4	1	0	0.876	12.4	DRS
10	Kishan Unnati	0.487	51.3	0.898	10.2	0.543	45.7	IRS
11	Denchung	0.997	0.3	1	0	0.997	0.3	DRS
12	Melli Dara	0.253	74.7	1	0	0.253	74.7	IRS
13	Yangang	1	0	1	0	1	0	CRS
14	Nagi Karek	1	0	1	0	1	0	CRS
15	Kitam	0.775	22.5	1	0	0.775	22.5	IRS
16	Soreng Sunrisers	0.265	73.5	0.304	69.6	0.873	12.7	IRS
17	Zoom	0.916	8.4	1	0	0.916	8.4	IRS
18	Mangalbaria	0.467	53.3	0.535	46.5	0.873	12.7	IRS
19	Rinchenpong	0.443	55.7	0.677	32.3	0.654	34.6	IRS
20	Khechuperi	1	0	1	0	1	0	CRS

Source: Authors' computations using DEAP 2.1

The results indicate that FPOs differ widely in terms of their OTE (in percentage) which ranges between 10.5 per cent and 100 per cent. Rakdong-Tintek and Denchung FPOs with OTE 0.982 and 0.997 respectively were closest to 1 just short of 0.018 and 0.003 percentage points of being 100 per cent efficient. The mean value of OTE is 0.656 for 20 FPOs (Table 8.3). It indicates that if an average FPO produces its outputs on the efficient frontier, then it will require only 65.6 per cent of the inputs that are currently being used

[1] Note: OTIE (%)= Overall technical inefficiency=(1-OTE)*100, PTIE(%)= Pure technical inefficiency=(1-PTE)*100, SIE(%)= Scale inefficiency= (1-SE)*100, RTS= Returns to Scale

to produce the same level of output. This finding implies that the FPOs in Sikkim face an overall technical inefficiency of 34.37 per cent. The FPOs were 65.6 per cent efficient, meaning around 35 per cent inefficiency or wastage. This suggests that, by adopting the best practice technology, FPOs can minimize their inputs (here, in terms of total assets, total expenditure and membership) by at least 34.37 per cent, on average, and still produce the same level of outputs. Nevertheless, the potential reduction in inputs as a result of the adoption of best practices varies across individual FPOs owing to different levels of OTE. Since FPOs benefit farmers more when their membership base and business size increase, an alternative interpretation would be that FPOs in Sikkim have the potential of producing almost one and half times (i.e. 1/0.656=1.524) the outputs from the same level of inputs. However, some caution needs to be exercised while interpreting these average values as these average values may not be the true representative value because of the wide dispersion in the values across FPOs. Out of the total of 20 FPOs, only 5 FPOs were relatively technically efficient as their OTE was equal to 1. The remaining 15 FPOs were found to be technically inefficient (OTE<1) relative to others. During 2019-20, the mean values of TE, PTE and SE of FPOs were 0.656, 0.819 and 0.769 respectively. These results suggest that there is ample scope to increase the efficiency levels of the FPOs (Table 8.3).

Now, we wish to compare individual FPOs for identifying the relatively most efficient and the least efficient FPOs. Therefore, we also attempt to analyze the implications of efficiency values at the disaggregated level of FPOs. It has been discussed already that the FPO with OTE score equal to 1 is considered to be the most efficient among the sampled FPOs. Having efficiency scores that are closer or equal to 1 is the most

favourable situation. In our sample of 20 FPOs, 5 FPOs were found to be relatively technically efficient as they had an OTE score of 1 and no wastage. These 5 FPOs together represent the FPOs with the best practices or efficient frontier. They form the reference set for inefficient FPOs. These FPOs can be rightly designated as the 'efficient FPOs' in Sikkim. It can be inferred that these FPOs are making proper utilization of resources as compared to other relatively inefficient FPOs. It also means that these FPOs yield no wastage of inputs in their production processes. In the terminology of DEA, they are called the 'peers' and are a suitable example with exemplary operating practices for other inefficient FPOs to emulate. Other relatively inefficient FPOs in the state can emulate the best operating practices adopted by these efficient FPOs to improve themselves. The efficient FPOs in Sikkim are Rani Khola FPO, Khamdong FPO, Yangang FPO, Nagi Karek FPO and Khechuperi FPO (see Table 8.2).

8.5.1 Identification of inefficient FPOs

The FPO with OTE scores less than 1 is considered to be relatively inefficient. The remaining 15 FPOs (namely, Passingdong, Men Rongong, Budang Kamarey, Rakdong Tintek, Rongli, Machong Parakha, Lamaten Tingmoo, Kishan Unnati, Denchung, Soreng Sunrisers, Melli Dara, Kitam, Zoom, Mangalbaria and Rinchenpog) have OTE scores less than 1 (see Table 8.2) which means that they are technically inefficient. The results indicate a presence of significant deviations of these FPOs from the best practice frontier. These inefficient FPOs can improve their efficiency by using lesser inputs to produce the same level of output. The mean OTE of inefficient FPOs is 0.542 (Table 8.3). It suggests that if an inefficient FPO would be producing its outputs on the efficient frontier instead of the current (virtual) location, then it would require only 54.2 per cent of the inputs

currently being used to produce the same output. Among these inefficient FPOs, OTE scores range from a minimum of 0.105 for Rongli FPO to a maximum of 0.997 for Denchung FPO. This finding suggests that Rongli FPO and Denchung FPO can potentially reduce their current input levels by 89.5 per cent and 0.3 per cent respectively and still produce the same level of output as they are producing now. Similarly, other FPOs also can reduce their current level of inputs by the magnitude of their respective OTIE scores (given in the fourth column of Table 8.2) to enhance their efficiency levels. Overall, we observed that OTIE levels ranged from 0.3 per cent for Denchung FPO to 89.5 per cent for Rongli FPO among the inefficient FPOs. While the average inefficiency level of 20 FPOs was around 35 per cent, it is around 45.8 per cent for the 15 inefficient FPOs.

Table 8.3: Descriptive statistics of OTE scores for FPOs in Sikkim

Statistics	All FPOs	Efficient FPOs	Inefficient FPOs
Mean OTE	0.656	1	0.542
Standard Deviation	0.326	0	0.296
Minimum	0.105	1	0.105
Q1	0.427	1	0.326
Median	0.652	1	0.467
Q3	0.998	1	0.826
Maximum	1.000	1	0.997
Average OTIE (%)	34.375	0	45.833

Source: Authors' computations

8.5.2 Classification of Inefficient FPOs

Further, we attempt to classify 15 inefficient FPOs. We have classified the inefficient FPOs into four categories based on the quartile values of OTE scores which were used as

cut-off points (Table 8.4). Out of these four categories, the FPOs belonging to the 'most inefficient FPOs' and 'marginally inefficient FPOs' categories are of great interest to us.

Table 8.4: Classification of inefficient FPOs in Sikkim

Category I (Most Inefficient)	Category II (Below Average)	Category III (Above Average)	Category IV(Marginally Inefficient)
Rongli	Budang Kamarey	Kishan Unnati	Lamaten Tingmoo
Machong Parakha	Passingdong	Men Rongong	Zoom
Melli Dara	Rinchenpong	Kitam	Rakdong Tintek
Soreng Sunrisers	Mangalbaria		Denchung

Source: Computed by authors.

The first category i.e. the 'most inefficient FPOs' includes those FPOs that have obtained OTE scores lesser than the value of the first quartile (Q1). These are Rongli, Machong Parakha, Melli Dara and Soreng Sunrisers FPOs. It is to be noted that the FPOs included in this group are the worst performers among the 20 FPOs and may be rightly considered as 'target FPOs' that require special attention from the Resource Institutions (RIs), the state government, the Board of Directors and other stakeholders. These FPOs should be on the priority list of any future policy intervention of the supporting organisations. These FPOs seem to lack optimal utilization of resources at their disposal. They can produce quite less levels of output with available resources than what they can with the inputs owned. These FPOs were producing lesser outputs than efficient FPOs. These FPOs need to make the best use of the available inputs and try to minimize the wastage of inputs. The fourth category of 'marginally inefficient FPOs' includes those inefficient FPOs that have attained an OTE score greater than the value of the third quartile (Q3) but lesser than 1 (i.e. Q3< OTE <1). These FPOs are Lamaten Tingmoo, Zoom, Rakdong Tintek and Denchung FPOs. It is interesting to note that these FPOs were functioning at a high

level of operating efficiency even though they were not fully efficient. These FPOs are only marginally inefficient and operate quite close to the efficient frontier. It is worth noting that with a few improvements in the resource utilization process; these FPOs can easily become efficient FPOs. Therefore, we can rightly term them as the 'potential leaders' as they can attain the status of efficient FPOs with minimal improvements. The concerned stakeholders must pay special attention to these prospective efficient FPOs to improve their efficiency. The second category of 'below average FPOs' includes those inefficient FPOs that have attained an OTE score greater than the value of the first quartile (Q1) but lesser than the median (i.e. Q1< OTE <MEDIAN). Similarly, the third category of 'above average FPOs' includes those inefficient FPOs that have attained an OTE score greater than the median but lesser than the value of the third quartile (i.e. MEDIAN < OTE < Q3).

8.5.3 Decomposition of OTE: PTE and SE

After analyzing the selected FPOs on the basis of OTE, we further decompose OTE into SE and PTE (see Table 8.5). OTE measure helps to measure inefficiency due to both pure technical inefficiency (PTIE) and inefficiency due to inappropriate size of the DMU i.e. scale inefficiency (SIE). But, the PTE measure derived from the BCC model under the assumption of VRS is free from scale effects. Therefore, the PTE scores indicate all those inefficiencies that originate from managerial underperformance in organizing the FPO's inputs. In DEA literature, the FPOs that have attained OTE and PTE scores equal to 1 are known as 'globally efficient' and 'locally efficient' FPOs, respectively.

PTE and SE scores for each FPO are also reported in Table 8.2. The table shows that 11 FPOs (namely, Rani Khola, Rakdong-Tintek, Khamdong, Lamaten Tingmoo, Denchung,

Melli Dara, Yangang, Nagi Karek, Kitam, Zoom and Khechupeori) have attained PTE scores equal to 1. Therefore, they can be considered as locally efficient FPOs. They have attained the PTE score equal to 1 and thus lie on the efficient frontier under VRS assumption. But, they are inefficient under CRS assumption. Therefore, it can be inferred that the OTIE in these FPOs is not due to managerial inefficiency but rather caused by their inappropriate scale sizes.

On the other hand, for the remaining 9 FPOs (with PTE<1), inefficiency is due to managerial underperformance also, albeit of different magnitudes. These are Passingdong, Men Rongong, Budang Kamarey Rongli, Machong Parakha, Kishan Unnati, Soreng Sunrisers, Mangalbaria and Rinchenpong. For these FPOs, both PTE and SE are below 1 implying that their OTIE is caused by both PTIE and SE. Again, among these 9 FPOs also, 4 FPOs namely: Men Rongong, Machong, Soreng and Mangalbaria have PTE scores lesser than SE scores. This finding indicates that the OTIE in them is mainly due to the underperformance of the managers of the FPOs rather than due to the size of the FPOs.

Table 8.5: Descriptive statistics of OTE, PTE and SE scores

Statistics	OTE	PTE	SE
N	20	20	20
Mean	0.65625	0.81975	0.76995
Standard Deviation	0.325528	0.240175	0.248445
Minimum	0.105	0.304	0.234
Q1	0.42725	0.67925	0.57175
Median	0.652	1	0.873
Q3	0.99775	1	0.99775
Maximum	1	1	1
Average Inefficiency (%)	34.3	18.1	23.1

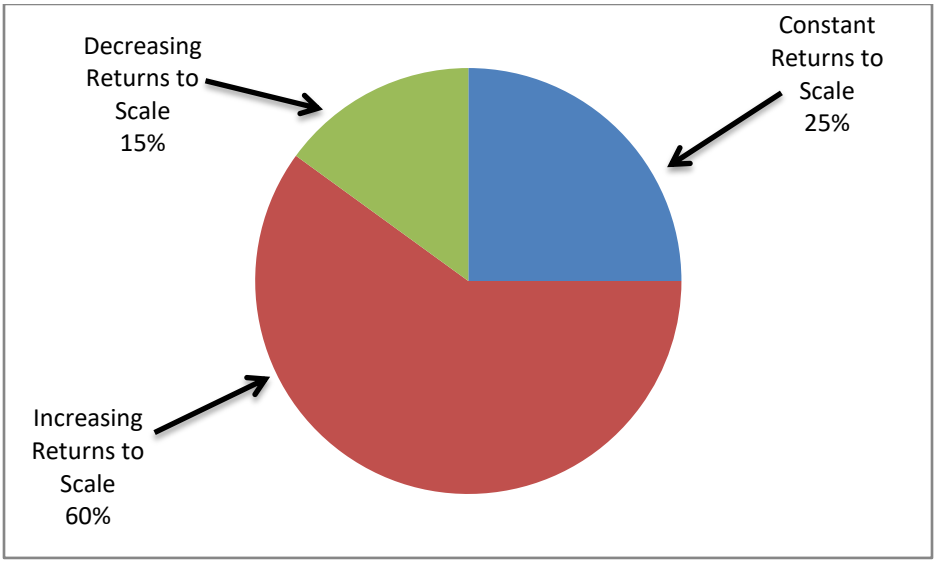
Source: Computed by authors

After identifying sources of inefficiency for individual FPOs, it is equally important to analyse the sources of inefficiency for all FPOs at an aggregate level. It is found that OTIE in FPOs generally stems from both poor utilization of inputs (i.e. PTIE) and inability to operate at the most productive scale size (i.e. due to SIE). The mean PTE score for all 20 FPOs is 0.819 (see Table 8.5). This result implies that around 18.1 per cent of about 34.3 per cent of OTIE is due to the underperformance of the FPO managers or the BoD who are unable to adopt appropriate management practices and thus select incorrect input combinations. The remaining OTIE is due to the inappropriate scale of FPO operations. Average SIEs are greater than PTIEs indicating that scale inefficiency is the major cause of overall low-efficiency scores. Thus, FPOs in Sikkim are suffering more due to the inappropriate scale size of the FPOs. Similarly, on average around 18.1 per cent of the inefficiency is due to the managerial inefficiencies of the Board of Directors of FPOs. This can be attributed to the fact that FPOs in Sikkim are still in the early stages of development and the quality of entrepreneurship, as well as management, is low. This finding highlights the lack of training among the FPO managers and BoD.

8.5.4 Scale efficiency

Figure 8.2 summarises the nature of returns to scale or scale efficiency results for individual FPOs. The DEA results indicate that, of the 20 FPOs, only 5 efficient FPOs are operating at the most productive scale size and experiencing CRS. They were operating at 100 per cent TE as well as at 100 per cent SE (or CRS), indicating a correlation between efficiency levels and the size of the FPO. This implies that only 25 per cent of the FPOs were operating at optimum scale.

Figure 8.2: Scale efficiency of 20 FPOs in Sikkim



Source: Computed by authors

Further, 12 FPOs (i.e. 60 per cent) are operating below their optimal scale size and thus, are experiencing IRS. These FPOs are Passingdong, Men Rongong, Budang Kamarey Rongli, Machong Parakha, Kishan Unnati, Melli Dara, Kitam, Soreng Sunrisers, Zoom, Mangalbaria and Rinchenpong. The policy implication of this finding is that these FPOs can improve their OTE by increasing their size. In other words, a significant improvement in overall technical efficiency could be achieved by eliminating the problem of increasing returns to scale. They must focus on improving their membership base. Doing so will increase the volume of share capital, the quantity of output produced and the quantity of inputs demanded. From an agricultural policy viewpoint, efforts towards increasing the firm size rather than decreasing the firm size would improve the operational efficiency of FPOs in the state. FPOs of bigger size are generally more capable of processing, brand extension, differentiated marketing and so on. No doubt, small farmer organisations are capable of responding to market opportunities promptly

but larger farmer organisations tend to be more efficient (Ariyaratne et al., 1997). Also, larger-sized farmer organisations dealing in fruit and vegetable marketing in Canada were found to be more cost-efficient (Hailu et al., 2005). Overall, increasing returns to scale is observed to be the predominant form of scale inefficiency in FPOs in Sikkim. This implies that most of the FPOs are of small sizes and are operating below their optimal scale size. These FPOs need to expand their operating scale to enhance their efficiency.

The remaining 3 FPOs (i.e. 15 per cent) are operating above their optimal scale size and experiencing DRS. These are Rakdong Tintek, Lamaten Tingmoo and Denchung FPOs. These FPOs are too big for their operations and should reduce their operations to avoid further economic loss. For them, decreasing firm size seems to be the appropriate strategic option.

In terms of SE, the FPOs are operating at a 62.2 per cent efficiency level implying that the FPOs are 37.8 per cent inefficient in terms of scale. The FPOs should reconsider their operations to avoid further loss and may have to reconsider their size to be 100 per cent efficient in terms of SE. These results indicate that the size or scale of the operation of the FPOs matter as the size of the FPOs affect efficiency levels. Smaller FPOs are more inefficient as they suffer with no economies of scale resulting in higher costs and lower efficiency levels (Sergaki & Semos, 2006).

8.6 Conclusion

The results of this chapter revealed that FPOs in Sikkim suffer from significant technical, pure technical and scale inefficiencies. First, the overall technical efficiencies of FPOs in Sikkim are relatively low. The level of overall technical efficiency of FPOs in Sikkim was around 65.6 per cent implying that the magnitude of technical inefficiency was around 34.37 per cent. The results indicate that there are significant possibilities to increase efficiency levels by reducing scale and pure technical inefficiencies in FPOs in Sikkim.

Among the 20 FPOs, only 5 FPOs were relatively efficient and defined the efficient frontier, while 15 FPOs were inefficient and underperforming. Among these inefficient FPOs, Lamaten Tingmoo, Zoom, Rakdong Tintek and Denchung FPOs were found to be the marginally inefficient FPOs. They may still be able to survive as they are making profits that will sustain their operations. Even with little improvements, these FPOs can improve their performance and become efficient FPOs. On the other hand, 4 FPOs namely Rongli, Machong Parakha, Melli Dara and Soreng Sunrisers FPOs were found to be the most inefficient. They should be treated as the most vulnerable FPOs or target FPOs which may face the risk of making losses if the situation does not improve.

Also, the FPOs are further classified according to their returns to scale. It was found that only 5 FPOs (25%) were operating under constant returns to scale, while the majority (60%) of FPOs (12) were operating under increasing returns to scale (IRS) and just 15% of them (3 FPOs) were operating under decreasing returns to scale (DRS). Despite the immense financial and management support from both the Central and the State governments along with Resource Institutions (RIs), the majority of the FPOs in Sikkim

have been found to be of comparatively small size. The prevalence of small-sized FPOs is also the main reason behind their low levels of scale efficiency.

Regarding sources of overall technical inefficiency (OTIE), it has been observed that the overall technical inefficiency in FPOs in Sikkim is due to both poor input utilisation (managerial inefficiency) and failure to operate at the most productive scale size (scale inefficiency). For many FPOs, focusing primarily on the procurement of produce from farmers while ignoring the buyers and regulators has resulted in unsold stocks and losses thus harming their performance.

Third, low SEs also exist in FPOs in Sikkim. Since 60 per cent of the FPOs operate below their optimal scale, the SE of the FPOs can be improved by increasing the sizes of the FPOs rather than decreasing the size. Scale efficiency will improve as the size becomes larger due to the presence of economies of scale.

CHAPTER 9

CONCLUSIONS AND POLICY RECOMMENDATIONS

9.1 Conclusion

The present study of the economic evaluation of Farmer Producer Organisations (FPOs) in Sikkim, India has yielded several valuable insights. This chapter summarises all the previous chapters and their findings. In addition, it also suggests appropriate policy recommendations that will be highly relevant in the context of farmer organisations of small farmers, particularly in hill states like Sikkim, and also generally, across the country.

Chapter 3 of this study discusses the economy of Sikkim. The discussion reveals that industries and services are the major contributors to GSDP while agriculture has the least contribution. During the last two decades, the contribution of agriculture to GSDP has almost halved. Nevertheless, the majority of the population still depends on agriculture. A steadily rising population in a small state like Sikkim implies increasing population density. Higher rural population density implies smaller farm sizes, thereby, making agriculture less profitable. In 2011, around half of the state's population contributed to the workforce. Of the total workforce, around 46 per cent are engaged in agriculture. Thus, a significant share of the rural workforce directly (and even larger number of the population indirectly) depends on agriculture for deriving livelihood. Despite the shrinking share of the primary sector to GSDP, a considerable proportion of the rural populace still depends on agriculture for livelihood.

Further, this chapter comprehensively discusses the agricultural economy of Sikkim. The geographical location and agro-climatic conditions of Sikkim provide favourable conditions for the cultivation of a diverse range of agricultural, and horticultural crops and flowers. Very less land is available for agriculture as most of the state's areas are covered by mountain peaks, forests, rivers, springs, lakes, steep slopes and rocky terrain. The state has been receiving decreased rainfall during the winter months. This has an important impact on the agriculture of Sikkim which largely depends on rainwater for irrigating the crops on steep mountain farms. Marginal and small farmers constitute around 79.77 per cent in 2015-16 illustrating that the agriculture sector in Sikkim is dominated largely by small and marginal farmers.. In terms of cropping pattern, a shift from low-value food grains towards high-value horticultural crops like fruits and vegetables can be seen in terms of area and production.

Chapter 4 discusses the current status of FPOs in India and Sikkim. It presents a state-wise description of the FPOs promoted by SFAC and NABARD in India. A total of 30 FPOs were registered under SFAC in Sikkim in 2017, however, only 28 of them are actively operating at present. These 28 FPOs are distributed across all four districts of Sikkim, namely- North, East, West and South. Three Resource Institutions (RIs) namely, International Competence Centre for Organic Agriculture (ICCOA), Indian Grameen Service (IGS) and M-CRIL are responsible for providing professional experience and exposure to FPOs for the initial three years.

Chapter 5 compares and analyses the socio-economic conditions of FPO members and non-members in Sikkim. Mostly, male farmers are the members as the ownership of land lies with them and also takes the major decisions related to agriculture. Women members

have less access to resources and thus, take the leading charge of agriculture only in the absence of male members at home. The majority of agricultural households in the state belong to the age group of 46 to 65 years. In terms of religion, the majority are Hindus. Majority of the farmers are married and have attained primary and high school levels of education. Farming is the primary occupation for around 73 per cent of FPO members and only 56 per cent of non-members. The results also indicate that majority of the farmers have received training, possess a mobile phone and live in moderate housing conditions.

Using a household survey data and probit model estimates, Chapter 6 identifies the major determinants of FPO membership in Sikkim. The most important variables significantly influencing the likelihood of FPO membership are education, farming experience, farming as the primary occupation, size of landholding, mobile phone ownership, distance to the nearest market, medium level of social participation, extension contact, daily service taxi availability, transportation facility, extension contact and plan to expand the scale of operation in future. Better- educated households with smaller landholdings, possessing a mobile phone, medium level of social participation and located away from the nearest towns are more likely to join FPOs. However, easy availability of transportation facilities in the local area negatively affects the farmers' decision to join FPOs.

Chapter 7 examined the economic impact of FPO membership on net returns, Return on Investment (RoI) and profit margin of farmers in Sikkim. It employed the Propensity Score Matching (PSM) technique. First, a probit regression model was employed to determine the covariates that affect a farmer's decision to join an FPO. Secondly, the

propensity scores generated in the probit model were used to match the member and non-member farmers using three different matching algorithms. The results suggested that FPO membership has a significantly positive impact on all three outcome variables. It concludes that FPO membership significantly improves the economic performance of the members.

Chapter 8 is devoted to estimation of efficiencies of 20 FPOs in Sikkim. FPOs in Sikkim suffer from significant technical, pure technical and scale inefficiencies. Only 5 FPOs, namely-Ranikhola, Khamdong, Yangang, Nagi Karek and Khechuperi FPOs were performing efficiently and thus defined the efficient frontier. The remaining 15 FPOs were technically inefficient (OTE<1) and were underperforming. Among them, 5 FPOs namely, Lamaten-Tingmoo, Zoom, Rakdong Tintek and Denchung FPOs were found to be the marginally inefficient FPOs. These FPOs are making relatively better utilization of resources as compared to other inefficient FPOs. Even with little improvements, they can improve their performance and become efficient FPOs. On the other hand, 5 FPOs namely Rongli, Machong Parakha, Mellidara and Soreng Sunrisers FPOs were found to be the most inefficient. This suggests that they should be treated as the most vulnerable or target FPOs which may face the risk of making losses if the situation does not improve.

The empirical results of this chapter suggest two important findings. Firstly, there are significant possibilities to increase efficiency levels in FPOs in Sikkim. Secondly, PTIE for the FPOs in Sikkim makes a greater contribution to overall inefficiency. This may be because FPOs in Sikkim are in the early stage of development, therefore the quality of management and entrepreneurship is low. It indicates the lack of skilled managers of FPOs. Also, only 5 efficient FPOs are operating at the most productive scale size and

experiencing CRS. Further, 12 FPOs are operating below their optimal scale size and thus, are experiencing IRS.

9.2 Policy Recommendations

Besides already existing FPOs in India, the Government of India has launched a central sector scheme for the promotion of 10,000 new FPOs for the period between 2019-20 and 2023-24 that aims to assist farmers in production technology, value-addition and marketing. The following are some of the policy recommendations relevant for both already existing and new FPOs:

(i) Since FPO membership improves farm economic performance, farmers in Northeast India, who are majorly smallholders, should be encouraged to join FPOs to reap the benefits of collective action.

(ii) The government and concerned agencies should emphasise on information transmission and awareness campaigns about FPOs and its benefits to achieve sufficient membership in the FPOs.

(iii) The extension-farmer linkage should be strengthened because extension agents have a significant role to play in gaining farmers' confidence in grassroots-level farmer organisations and mobilising membership.

(iv) Effective usage of mobile phones should be made to reach the distant farmers in this hilly state. Communication is very difficult in hilly and mountainous states where farmers are located across corners of the mountain slopes. Without effective communication, the mobilisation of farmers and later operation of FPOs become difficult. Therefore, usage of mobile phones can be helpful in efficient communication and information transmission.

(v) The promoters of FPOs should identify the region-specific factors that affect farmers' decision to join FPOs and work towards increasing the membership.

(vi) Existing FPOs should be supported by providing forward and backward linkages that will further enhance members' earnings from agriculture production and marketing. Conducting more value-addition activities would help farmers realise higher incomes for their produce.

(vii) Policymakers and FPO-promoting Resource Institutions may make additional efforts to enhance the formation and development of FPOs in Northeast India. It can be used as a channel for improving the economic condition of farming households. Thus, further promoting and supporting FPOs as appropriate rural institutions is recommended.

(viii) Pure technical inefficiency can be reduced through the application of best practices of efficient FPOs. Given the fact that the Board of Directors (BoDs) is elected from among the farmer members themselves, it is evident that these farmers are naïve and untrained in the business management procedures of an organisation. Imparting training to them for efficient utilisation of resources might help in this direction.

(ix) Generally, BoDs are also ignorant about the marketing of agricultural produce. Thus, it is quite common to find them struggling to find a remunerative market for their produce within and outside the state. Therefore, regular training for them on the business aspects of the FPOs is also necessary.

(x) Major source of inefficiency for the FPOs is the inappropriate scale of FPO operations. To improve their Scale Efficiencies, expansion in size of the existing FPOs is highly recommended. Size expansion will improve the scale efficiency of FPOs due to economies of scale.

(xi) Besides proper marketing channels, the reduction of production costs also enhances the profitability of agriculture for small farmers. Towards this direction, FPOs can undertake large-scale production of organic manure and other inputs on a commercial scale which can be sold to farmers at lower prices in the region.

(xii) The study shows that most of the FPOs have not developed any business linkage with the corporate or the government except for a few ones. It can be inferred that there is ample scope for the development of such tie-ups among the FPOs and institutions to make the FPOs active as well as connect them to the mainstream agricultural markets and institutions where all stakeholders can acknowledge their presence and significance. Such linkages are essential, especially in states like Sikkim where the potential of organic agriculture is high yet economically unexploited.

(xiii) Channelising all benefits and services through the FPOs by the state agriculture and horticulture departments would not only efficiently reach the masses but also educate the farmers and other stakeholders about the significance of these grassroots organisations. Without proper handholding and complete support from the government during the initial years, it will be difficult for the FPOs to grow into sustainable business institutions.

(xiv) Infrastructure, marketing linkages and irrigation are more critical than the farm size for small and marginal hill farmers. Therefore, despite small land holdings and difficult hilly terrain, agriculture in Sikkim can be made remunerative by FPOs with proper infrastructure, storage facilities and governmental support.

(xv) Provision of organic outlets for FPOs in the main centres of the major towns of the state can be made.

(xvi) Demand for large quantities of produce to FPOs from buyers outside the state are not usually met because of the smallness of land sizes, low membership in FPOs and mixed cropping. Encouragement and guidance by FPOs to farmers to produce more of the marketable crops on a larger scale might be profitable.

(xvii) Majority of the farmers have been cultivating a mixed variety of certain crops. Due to this, the harvest is usually the unsorted and ungraded produce that fetches lower prices in the market. Therefore, farmers should be persuaded and taught about the economic benefits of cultivating a particular variety of a crop.

(xviii) All FPOs have already received machines for secondary processing but the power supply infrastructure has not been provided to any FPO. This has delayed the installation of these machines and the FPOs have not been able to conduct secondary processing activities. The provision of adequate and uninterrupted power supply at a subsidised rate to the FPOs for the initial years would soon transform these FPOs from mere procuring agency to proper

institutions that also perform value-addition to the agricultural produce of the farmers.

(xix) Provision of adequate and timely credit to FPOs for their operation by the commercial banks would enable the FPOs to operate their business activities smoothly and also help the farmers attain better prices.

9.3 Limitations of the Study

(i) The study could take only 560 respondents due to sparsely located farmers across the state. It has considered only SFAC-supported FPOs in the state and has not considered the four FPOs supported by NABARD in Sikkim due to time and financial constraints.

(ii) Assessment of economic impact of FPOs on members has been done using Propensity Score Matching (PSM) technique wherein it does not take into account the effect of unobservable factors on membership. Therefore, future research can employ advanced econometric techniques that take into account both observable and unobservable factors during impact assessment.

(iii) Furthermore, estimation of efficiency of each FPO is based entirely on the Audit Reports of the respective FPOs. Therefore, accuracy of our findings will be completely subject to the accuracy of financial records maintained by the FPOs.

(iv) Homogenous effect of FPO membership on variables of interest is assumed.

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APPENDIX A: Photographs from the Field

I. Field Survey, 2019-20

II. Training provided by the FPOs to farmers

III. Agricultural tools and equipments in Custom-Hiring Centres (CHCs) of FPOs

A & B: *Tools and equipments in the Custom-Hiring-Centre of the FPO offices.*

C & D: *Farmers borrow these tools on rent and use on their farms.*

IV. Procurement and Collection by FPOs

Farmers carry their agricultural produce on their backs till the nearest motorable road and FPOs collect from these points on their pick-up trucks.

*(**A**: Farmers aggregate their produce at the collection point. **B & C**: the produce is weighed and loaded on the truck. **D:** In many cases, FPOs pay the farmers on the spot).*

V. Marketing Activities undertaken by FPOs

Different marketing strategies adopted by FPOs in Sikkim.

*(**A & B:** Labelled packets with the logo of the FPO, name and weight of the product. **C:** FPOs advertising their products in Exhibitions. **D & E:** FPOs making door-to-door delivery of fresh vegetables during Covid- 19 lockdown.)*

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APPENDIX B: QUESTIONNAIRE

Economic Evaluation of Farmer Producer Organisations in Sikkim

Household Survey Questionnaire, 2019-20

This survey is conducted as part of the research work undertaken for my PhD. The information collected through this questionnaire would be used solely for academic purpose. The identity and other information of the households participating in the survey will be kept confidential.

Date: __/__/___ Sample HH No: _____

District: _____ Block:_____ GPU:_____ Village:_____

Contact Number: _____

A. GENERAL INFORMATION

A.1. Personal Details of the Household Head

1. Name of the Farmer:_____
2. Age (in completed years):_____
3. Gender: □ Male □ Female
4. Category: □ ST □ SC □ OBC □ GENERAL
5. Religion: □ Hindu □ Buddhist □ Christian □ Others
6. Marital Status: □ Single □ Married □Widow/Separated
7. Farming experience (in years):_____

A.2. Details of Household members

Sl. No	Name of the family member	Relationship with the Head	Age (yrs)	Gender (M / F)	Years of schooling	Occupation	Annual Income
1							
2							
3							
4							
5							

8. Type of family: □ Joint Family □ Nuclear Family
9. Primary Occupation: □ Cultivator □ Livestock farmer □ Casual labourer □ Private Job □ Government Job □ Petty Business □ Others_____
10. Do you perform any off-farm work? □ Yes □ No
11. Does any member from your family participate in employment provided under MGNREGA? □ Yes □ No
12. Number of Migrated members for employment_____
13. Total household expenditure (Rs./month)_____
14. Type of house: □Kutcha □ Semi-pucca □ Pucca
15. House ownership/constructed by: □ Self □ Government
16. Drinking water source: □ Private □ Govt
17. Type of sanitation: □Kutcha □ Pucca
18. Fuel source: □ Firewood □ Kerosene □LPG
19. Whether the house is electrified or not: □ Yes □ No
20. Do you possess a mobile phone? □ Yes □ No
21. Source of capital: □ Own capital □ SHG □ Banks □ Money lenders □ Relatives
22. Have you taken loan for agriculture in the past one year? □ Yes □ No
23. Distance to the nearest paved road (in kms or minutes)_____
24. Distance to the nearest town or market (in kms or minutes)_____
25. Do you have access to a daily service taxi plying to the nearest town? □ Yes □ No
26. Have you attended any agricultural training programme? □ Yes □ No

27. Do you personally know any extension workers e.g.VLW? □ Yes □ No

28. Level of participation in social groups or associations: □ Low □ Medium □ High

B. HOUSEHOLD ASSET PORTFOLIO

B.1. Area of agricultural holdings as on date of survey (in acres)

(a)Total land	(b) Total cultivated land	(c)Irrigated (Y/N)	(d) Irrigation source	(e) Land prepared by	(f) Land ownership

B.2. Livestock assets (number)

(a) Cow	(b) Oxen	(c) Goats/sheep	(d) Pigs and others	(e) Poultry

29. Major crops grown?_____

C. COST OF FACTOR INPUTS IN AGRICULTURE

C.1. Labour cost:

Land preparation		Cost of bullocks (if used)		Sowing		Weeding		Harvesting	
No of lab-days	Wage rate (Rs)	Days	Wage rate	No of lab-days	Wage rate	No of lab-days	Wage rate	No of lab-days	Wage rate

C.2 Cost of factor inputs:

Factor inputs		Crop 1			Crop 2			Crop 3			Crop 4		
		qty	Rs/unit	TC	qty	Rs/unit	TC	qty	Rs/unit	TC	qty	Rs/unit	TC
Power-tiller(hours)													
Seeds													
Farmyard Manure													
Organic Fertilizer													
Pesticides/herbicide													
Irrigation cost													
Family labour	M												
	F												
	Child												
Hired labour	M												
	F												
Tools repairing cost													

30. From which source do you usually get marketing information (such as sales price etc.)? □ Government □ Internet □ Neighbor or friends □ Dealers □ Media such as TV and magazines □ Others_____
31. Do you experience post harvest losses? □ Yes □ No.

    If yes, approximately, what percentage of total production is lost post-harvest with every harvest? _____
32. What do you think can be the probable reasons for post-harvest losses? □ Crop diseases □ pest attacks □ lack of storage and processing facilities □ long distance to markets □ others_____

D. SALES INFORMATION OF CROPS:

Crops	Marketing channel	Quantity sold	Selling price	Total value of the produce

33. Are you planning to expand the area of crop planting and production in future? □ Yes □ No
34. How risky do you think agriculture is in your region? □ Low □ Medium □ High
35. Are you a member of any FPO? □ Yes □ No

If yes,

1. Name of the FPO joined_____
2. Member since ___years
3. Membership fee_____ rupees / year
4. Does the FPO have a brand name to promote the products? □ Yes □ No
   If yes what is the brand name?_____
5. Does the FPO provide specific variety of seed, fertilizer, and pesticide? □ Yes □ No
6. Does the FPO provide you with other production inputs? Please specify_____
7. Distance to the collection point of the FPO _____ kms or ____minutes.
8. Do you get the desired price when you dispose your product to an FPO? □Yes □ No
9. Whom did you sell your crops to before FPOs were introduced?_____

Thank You for your time and responses!