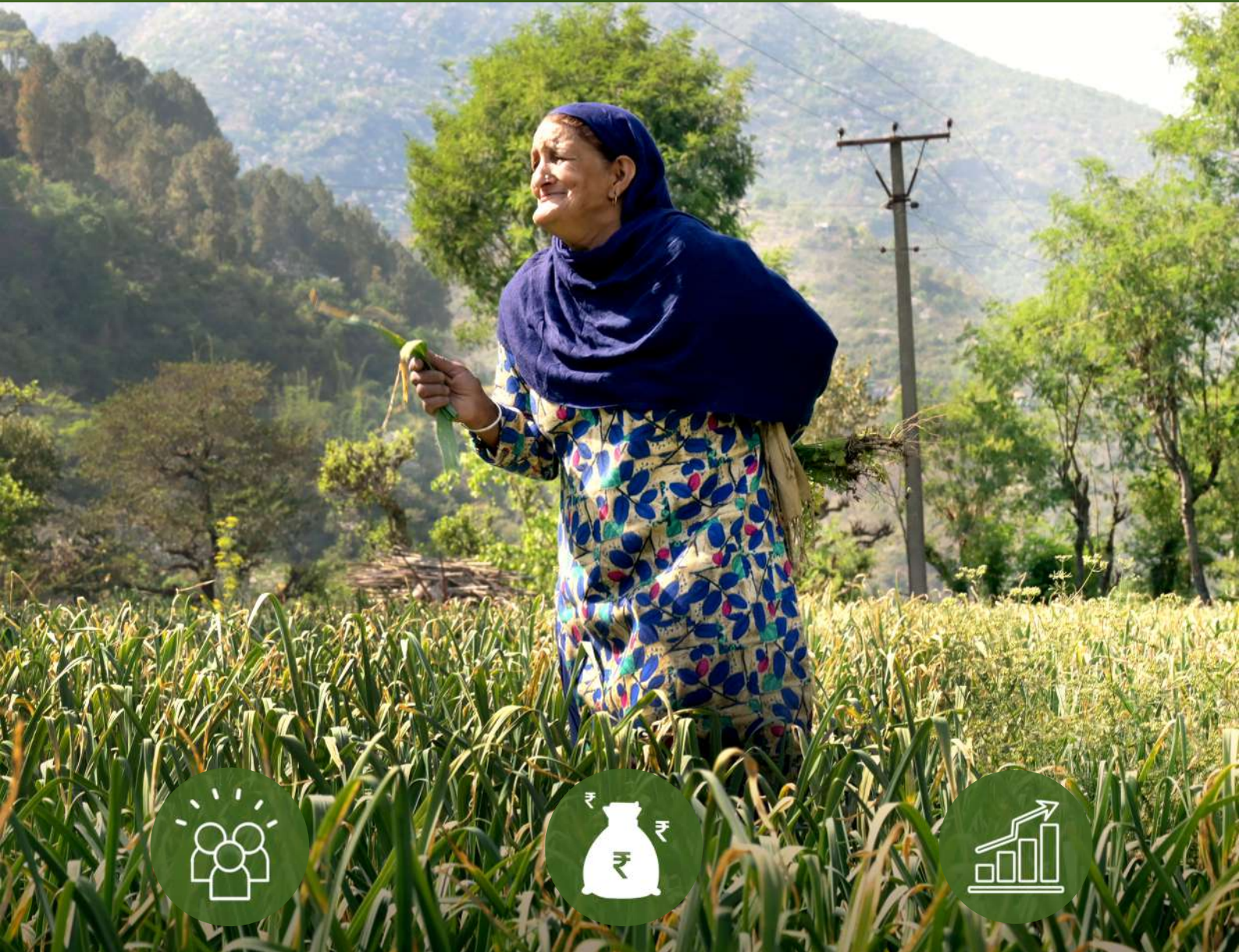




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# CLIMATE RESILIENT BUSINESS MODEL FOR GINGER AND GARLIC



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A2/18 Safdarjung Enclave  
New Delhi 110029  
Phone +91 49 49 53 53  
Fax +91 49 49 5391  
info@giz.de  
www.giz.de/india

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Environment, Climate Change and Natural Resource Management

**Responsible:**

Shailendra Dwivedi  
Shailendra.dwivedi@giz.de

**On behalf of the**

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**Prepared by**

Centre for Food and Agribusiness Management, Indian Institute of Management (IIM) Lucknow


**As at**

New Delhi, October 2022





**Developing a Bankable Business Plan for  
Farmer Producer Organizations Involved in  
Garlic and Ginger Value Chains in Sirmour  
District of Himachal Pradesh**



# LIST OF ABBREVIATIONS

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APMC:	Agricultural Produce Market Committee
CBBO:	Cluster Based Business Organisations
CCA:	Climate Change Adaptation
CSA:	Climate-Smart Agriculture
DFI:	Development Finance Institutions
FPO:	Farmer Producer Organisation
IIM-L:	Indian Institute of Management - Lucknow
MoEFCC:	Ministry of Environment, Forest and Climate Change
NABARD:	National Agricultural Bank for Rural Development
PMFBY:	Pradhan Mantri Fasal Bima Yojana
POPI:	Producer Organisation Promoting Institutions
SCB:	Scheduled Commercial Banks



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# EXECUTIVE SUMMARY

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The study undertaken in the Sirmour district of Himachal Pradesh is intended to explore the scope of climate change adaptation/mitigation measures for Farmer Producer Organizations (FPOs) to mitigate pure (climatic risks) and co-variate risks (production and postharvest risks) affecting garlic and ginger cultivation and decrease FPOs vulnerabilities. The study has identified a few Climate-Smart Agriculture (CSA) technologies adopted by resourceful farmers in the FPOs. Such interventions include installing sprinkler irrigation to enhance water use efficiency, furrow bed irrigation practices, and intercropping to improve soil fertility and farming resilience. However, technologies such as anti-hail guns and zero tillage for carbon and energy-smart farming systems are yet to be adopted on a larger scale. It may be noted that indigenous anti-hail gun efficacy is yet to be ascertained. Its impact on incremental costs and adoption benefits needs to be assessed and as such the adoption of this technology depends on the benefits and costs of adoption and implementation feasibility. The construction of a pond or water bodies near farmers' fields for rainwater harvesting is cost-effective for adoption.

First, considering the IPCC AR-5 framework, climatic risk assessments showed that FPOs are highly vulnerable to climatic risks. Inclement weather conditions and the frequency and severity of hailstorms or cold waves often prevented sowing and cause damage to crop growth. Hence, weather-based crop insurance and multi-peril yield indemnity indices are necessary to indemnify the yield and associated income loss. The state government can invite bids from eligible insurance agencies to construct a weather-based product for ginger, garlic, and high-value cash crops. Currently, garlic and ginger are not covered in yield indemnity insurance products, namely Pradhan Mantri Fasal Bima Yojana. Given the severity and frequency of climatic risks, these two crops need to be insured.

Second, crop and weather advisory services are critical to building the economic and ecological resilience of farming systems and increasing the risk aversion quotient of FPOs in production planning, value-added services, and marketing of members' produce. A digital platform architecture developer or service provider can be roped in to provide real-time weather advisory and extension services. Krishi Vigyan Kendra can offer field demonstration facilities for seed selection and adopt a package of practices for garlic and ginger cultivation based on climatic risks and farmer vulnerabilities to production and income losses.

Third, FPOs' effort to connect member farmers with the marketplace appears to be dismal. The lack of awareness and technical know-how of market structure and its conduct could be a potential reason for dismal performance. The study proposes that an electronic marketplace, namely an electronic spot market can be a profitable marketing channel for improved sales realization. Surpluses (after distributing members' shares and patronage bonus) can be invested in acquiring storage and grading facilities with the support of concessional or project loans.

Fourth, an evaluation and prioritization of CSA technologies is important for stakeholders, such as FPOs, technology firms, financing agencies, and local implementing agencies. A blended finance structure has

emerged as a potential solution to financing CSA technologies and practices. However, financial mainstreaming remains a key challenge since local bankers are yet to consider it a mainstream product. So, Development Finance Institutions (DFIs) like National Bank for Agriculture and Rural Development (NABARD) need to exhibit a strategic use of philanthropic/development funds to attract 'additional' private capital of impact investors in CSA interventions in a staged manner. Grant and technical assistance funds would help in the project design stage. Meanwhile, concessional loan, equity, and risk guarantee would be crucial in the implementation and scaling up of CSA interventions as means of adaptation/mitigation measures.

Fifth, based on the field survey and consultation with the stakeholders, we have noted a few key adaptation measures and proposed technical institutions and financing agencies for financing CSA interventions in Sirmour district of Himachal Pradesh.

Sixth, we mention the potential of blended finance facilities and funds in financing CSA interventions by reviewing the literature, archival information, and database or published research articles. It is learned that financing CSA interventions has received attention from Development Finance Institutions (DFIs), project sponsors and private investors embracing a Convergence platform (2021). Blended finance has emerged as a potential climatic risk financing structure that blends various financial instruments, namely grant, concessional loan, credit guarantee and enhancement, technical assistance fund, risk insurance, among others. It enables a strategic use of philanthropic/development funds for mobilizing the additional private capital or commercial finance in sustainable development interventions, CSA intervention is one of them.

Given a mixed evidence of blended finance utilization in CSA in developing and least-developed countries, we propose the NABARD as a refinance agency to initiate lending concessional loans to eligible FPOs for mitigating climatic risks and post-harvest risks in association with insurance agencies. The apex refinance agency, NABARD needs to attain financial and non-financial 'additionality' to attract private equities or impact investing in CSA interventions, especially for garlic and ginger value cultivation and marketing. GIZ can provide technical support assistance funds to FPOs for CSA interventions—project design and execution on the ground. The impact of such interventions can be evaluated by a third party in the future course, say two to three years post-implementation.

Market linkages through participation in marketplaces, namely electronic spot market, construction of pond, penetration of weather-based crop insurance and multi-peril yield indemnity insurance (PMFBY) for garlic and ginger, and real-time crop and weather advisory services to FPOs can be relevant to mitigate climatic hazards and perils and make the farming system productive, resilient, and enable the system to fetch a remunerative price through market access. The convergence of state government promoted scheme, like Krishi Kosh of Himachal Pradesh government scheme with the NABARD/central government schemes is important for addressing moral hazard and adverse selection of beneficiary farmers/collectives and local implementing agencies such as Producer Organization Promoting Institutions (POPI) or cluster based business organization (CBBO).



## Implications

This study has important implications for policymakers, climate risk experts, market agencies, NGOs, financial institutions, donor agencies, and agriculture research institutions. We present a few important policy and managerial implications for stakeholders responsible for developing a climate resilient food and agricultural ecosystem in Sirmour district of Himachal Pradesh.

1. CSA interventions take place at the farmer field. So, capacity building of farmers or their collectives is important. On the other hand, accounting the costs and benefits of CSA technologies adoption is critical for farm viability and sustainability. Implementation feasibility is often a challenge to adoption because farmers look for short-term realizations and environmental concern is a long-term undertaking which can only be managed at a systemic level. A bottom-up climate risk modeling is therefore necessary to design and prioritize CSA technologies.
2. There should be a synchronization between the activities of different stakeholders to adopt cost-effective CSA technologies in a time-bound manner. Given the short-term orientation of farmers for crop productivity and income, and the concern for environmental sustainability, the research agencies, extension service providers and implementing agencies like NGOs should try to bring a synergy between them.
3. There are many central/state government schemes through which CSA technologies could be adopted at the local level without much financial burden to the farmers, their collectives, and financial institutions. Custom Hiring Centre (CHC) is such an example that utilizes government grants for procuring agricultural implements related to CSA technologies. There is thus a need to create awareness about CHC or any government aided public-private partnership model, availability of technologies or implements embracing the existing schemes and their utilities for use in the local environment or setting. Economic/financial and technical feasibility of such technologies should be performed before the adoption.
4. Integration of farming systems by diversifying into allied activities seems important to reduce income uncertainties and farmers' vulnerabilities to climatic risks. How to utilize the space and mechanism for optimizing yield and return is a task for the implementing agencies and technical support providers. GIZ can work out such possibilities in vulnerable areas of Himachal Pradesh for promoting a risk averse and resilient farming system.
5. An evaluation and prioritization of CSA technologies interventions based on stakeholder participatory assessment can help policy makers and funding agencies to develop climate resilient pathways for crops in regions vulnerable to climatic risks and hazards.

# CHAPTER 1

## INTRODUCTION

---

### 1.1 Background of the study

This study forms an integral part of the Indo-German Development project, Climate Adaptation and Finance in Rural India (CAFRI) which is commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), in cooperation with the Ministry of Environment, Forest, and Climate Change (MoEFCC), and the National Bank for Agriculture and Rural Development (NABARD). The Indian Institute of Management Lucknow (IIM-L) was entrusted with an exploratory study in a few blocks of Sirmour district in Himachal Pradesh from December 2021–April 2022. This study assessed selected Farmer Producer Organizations (FPOs) performance and preferences for CSA technologies adoption involved in garlic and ginger value chains.

The rationale of this study is threefold. First, climatic risks and vulnerabilities have drawn the attention of policymakers in identifying climate change adaptation/mitigation measures for high value agricultural/horticultural crops and farmers and their collectives (FPOs) sustainable livelihood and welfare in Himachal Pradesh. Climate-Smart Agriculture (CSA) technologies have gained salience as means of adaptation/mitigation measures in such vulnerable regions. However, their evaluation and farmer collectives' preferences to adopt a combination of CSA technologies entail a comprehensive assessment of socio-economic, institutional, and technical parameters or determinants.

First, there is a significant increase of exports of garlic and ginger products due to Covid-19 pandemic that pushed the production of garlic and ginger in India in 2020–21. It is worth noting that the area under cultivation of garlic is reported to be 385 thousand hectares and production is pegged at 3,119 thousand metric tons in 2020–21. During the same period, the corresponding figures for ginger are 176 thousand hectares and 1,885 thousand metric tons. The average value of exports for garlic and ginger from 2016 to 2020 are reported to be USD 26.62 million and USD 29.90 million. Himachal Pradesh has a significant contribution to the production of garlic and ginger in India due to its agro-climatic conditions, farmers' interest in cultivation, and geographical terrains.

Second, financing CSA technologies interventions has gained traction in developing countries and India is no exception. Blended finance has evolved as an experimental structure in de-risking the agricultural sector through adaptation/mitigation measures although its mainstreaming is yet to be attained (Have-mann, Negra, & Werneck, 2020; Dey and Mishra, 2022).

In this backdrop, FPOs involved in garlic and ginger value chains in different parts of Sirmour district of Himachal Pradesh can be potential beneficiaries of blended finance products given there are evidence-based outcomes of adaptation measures on sustainability goals. This experimental structure follows a modality of blending financial instruments of varying risks and returns, namely, grants, technical assistance funds, group guarantees for risk insurance, concessional loans, senior/subordinated bonds, and equities or quasi-equities.





Fig 1.1: Farmers working in a field in Sirmour District, Himachal Pradesh

Blended finance utilization in the agricultural sector has been observed in developing and least-developed countries as can be seen from Table 1.1. The structure includes guarantees, payment by outcomes, equity/quasi-equity, technical assistance funds, or grants. It is observed that concessional loans and grants as facilities of a blended finance structure are used in the agricultural sector. Concerning the blended finance mainstreaming, the use cases reported in the table lend insights into the product-mix of blended finance structure that (1) guarantees and other risk-sharing instruments can make the agricultural market inclusive, (2) liquidity instruments such as concessional loans and equities and philanthropic or development funds can help attain social and environmental dimensions of sustainability, and (3) grants and technical assistance funds can attract additional commercial capital or private equities in CSA technologies and practices or such developmental interventions (Apampa et al., 2021).

With this motivation, the study is aimed at understanding the business environment of selected FPOs engaged in garlic and ginger value chains in different blocks of Sirmour district of Himachal Pradesh. The implementing agencies, namely Aravali and BJJS of selected farmer organizations are non-governmental organizations and have taken initiatives and facilitated programmatic interventions to set up in different periods. The activities of FPOs range from input supply and seed production to aggregation of produce to marketing. While these FPOs have accorded grade 'A' rating as per the NABARD criteria, they tend to differ in their stages and size/scale of businesses and adoption of CSA technologies interventions. This study uncovers the determinants of performance and viability of FPOs' business contours and gauges their preferences to CSA adoption and offers potential scope of blended finance structure in mitigating climatic risks affecting agricultural business activities and garlic and ginger value chains.

INTERVENTION'S AREA	COUNTRY	FINANCIAL AND/OR TECHNICAL ASSISTANCE AGENCIES/INSTITUTIONS	FINANCING STRUCTURE AND INSTRUMENTS USED
Sustainable Landscapes Portfolio Guarantee	India	USAID, Rabobank Foundation	Guarantees
Financing Ghanaian Agriculture Project (FinGAP)	Ghana	USAID, Palladium	Payment by Result (PBR) Guarantees, Technical Assistance
Blending Happiness, Hazelnuts and Finance in Bhutan: IFC's Blended Finance Investment in Mountain Hazelnuts	Bhutan	ADB, IFC, Private Sector Window of GAFSP	Equity, Quasi-equity
Family Farming Financing Programme (PROAF)	Mexico	Mexican Agriculture Development Bank	Guarantees, Technical Assistance
Programme For Rural Outreach Of Financial Innovations And Technologies (PROFIT)	Kenya	IFC, Agricultural Finance Corporation of Kenya	Credit Lines, Guarantees, Technical Assistance

Table 1.1: Use cases of blended finance structure in the agricultural sector  
Source: OECD (2021), Apampa et al. (2021)

## 1.2 Objectives of the Study

The primary objective of this study is as follows:

1. To develop a bankable business plan for financing five FPOs/Cooperatives' adaptation measures of different types and magnitudes.
2. To design a blended finance structure for experimenting with climate-risk financing mechanisms through adaptation/mitigation measures.

## 1.3 Deliverables

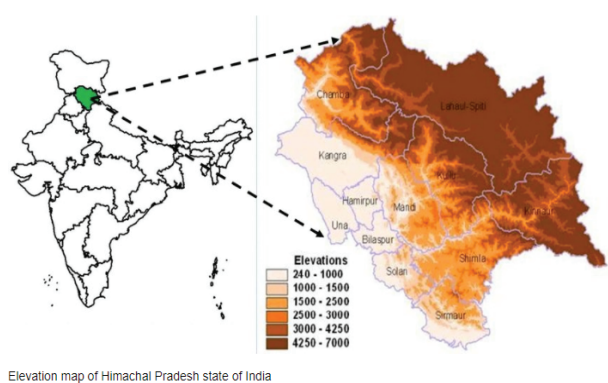
1. Develop a broad understanding about viability of the ongoing/proposed business of value-chain at the level of relevant agro-climatic zone (district-wise).
2. Assess the business environment within which the five-FPOs operate and analyze their direct or indirect competitors to help the FPOs to comprehend their mission, vision, core value, niche market, strengths, and weaknesses.
3. Assess and analyze the business opportunities for FPOs in value-creation and value-appropriation.
4. Conduct a thorough analysis of the five FPOs business model in the ginger/garlic value chain and its performance with continuous consultations with relevant stakeholders such as NABARD, State Agriculture Dept, KVKs, corporates, etc.
5. Develop a stakeholder validated private-sector type (bankable) business plan to be used for sourcing for financing.
6. In collaboration with FPOs and POPIs, develop a solid Business Plan foundation on which the FPO can build its resource acquisition strategy for the long term.
7. Identifying public and private sector sources of financing for measures developed in consultation with FPOs and NABARD.
8. Identifying potential financing instruments for adaptation-relevant measures of selected FPO

# CHAPTER 2

## RESEARCH DESIGN AND METHODOLOGY

### 2.1 Research design

The study was conducted in Sirmour district of Himachal Pradesh. Three blocks, namely Nahan, Pachhad, and Sangrah (Renukaji) were selected for field visit (refer to Figure 2.1, 2.2). We adopted a mixed-methods approach (Creswell and Clark, 2017) to attain the objectives of the study. Data collection stages are presented in Figure 2.3. We considered documents and archival information on the Climate Change Adaptation (CCA) workshop conducted by the German International Development Cooperation (GIZ India) in September 2021 (refer to Appendix 1). The short-, medium-, and long-term CCA measures have emerged from the workshop (presented in Appendix 2). Based on the CCA measures, we designed three semi-structured checklists for eliciting data/information from the representatives of five FPOs (one CEO/secretary and one BoD member) and officials of Producer Organization Promoting Institutions (POPIs) and local bankers including scheduled commercial banks (SCBs), regional rural banks and cooperatives (District Central Cooperative Bank) (refer to Appendix 3, 4). Also, a survey questionnaire was administered among the members of FPOs and non-members, who often buy inputs and packaging materials from FPOs (refer to Appendix 5).



Elevation map of Himachal Pradesh state of India

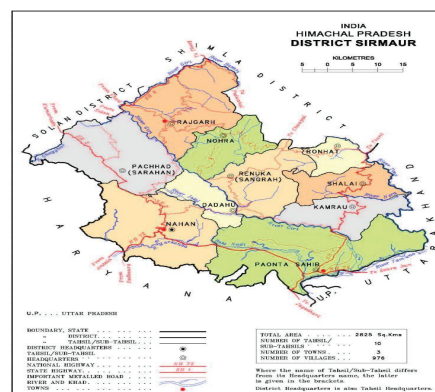


Fig. 2.2: Sirmour district map

Fig. 2.1: Himachal Pradesh highlighted in green (elevation map enlarged)

Source: Jaswal-Bhan et al (2015)

### 2.2 Methodology

We performed a boundary scanning of the local economy using a PESTLE framework to understand the scope of climate finance for CCA measures for two commercial horticultural systems, garlic and ginger.

It is worth noting that Himachal Pradesh has export potential of these crops and the price realization of garlic by farmers appears remunerative. In conjunction with Political-Economic-Social-Technological-Legal-Environmental (PESTLE) analysis performed for appreciating the local economy and business environment, we considered a SWOT framework for assessing the strengths (S), weaknesses (W) of five FPOs and opportunities (O), and threats (T) influencing their businesses. We prepared a semi-structured checklist (as mentioned in the above paragraph) for assessing the socio-economic health, especially governance and management of FPOs. This exercise helps us to understand the business model of FPOs and their capacities and capabilities to venture in CCA measures and access climate finance.

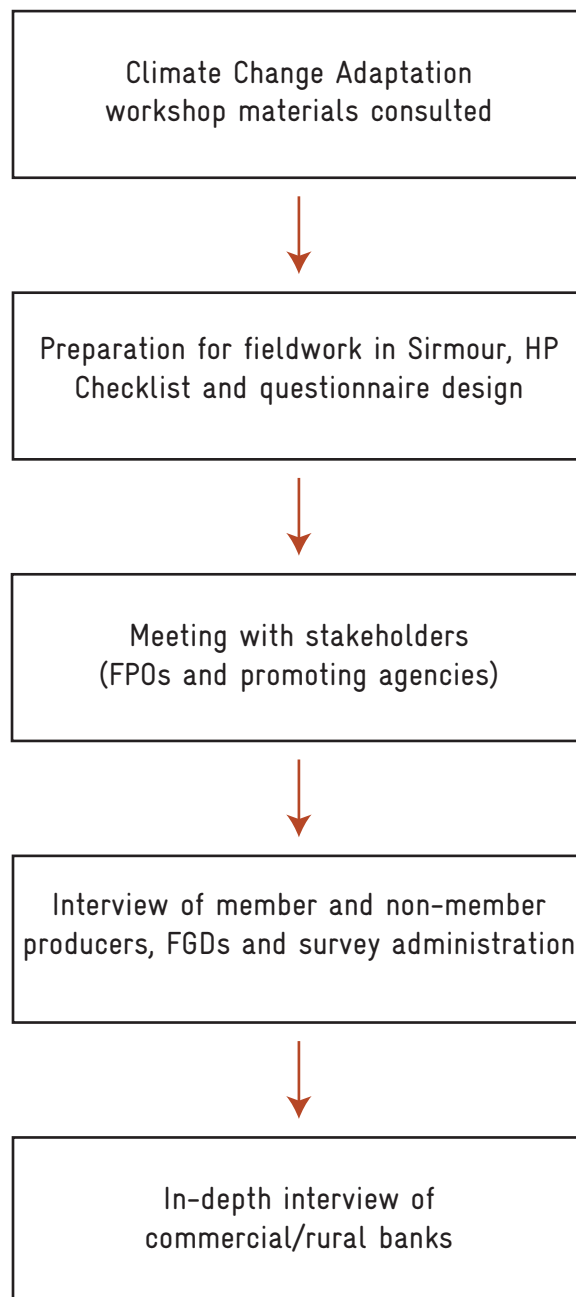


Fig. 2.3 Data collection stages



Given the importance of garlic and ginger in the business model of FPOs, value chain analysis (VCA) was performed using the Porter framework (1980). The VCA elucidates the costs and benefits appropriated by upstream (farmer) and downstream (processor) actors involved in the value chain. This helps rationalize the intervention of FPOs in aggregation, assortment/grading, and marketing of members produced for value capture and value delivery along the value chain. We then collected data from members and non-members of FPOs for establishing a relationship if any between the incomes from cultivation of these two crops, and age, gender, membership, category of farmers, landholdings, poverty status, acreage of garlic/ginger, price realizations, climate-smart agriculture (CSA) interventions for water, nutrient, weather, carbon/energy, and knowledge, credit access, irrigation system adopted, and access to regulated markets. The rationale for choosing these variables is guided by the Khatri-Chhetri et al. (2019) study. They propose an evaluation framework for stakeholders' prioritization of CSA interventions concerning CCA adoption benefits and implementation feasibility. Similar kind of prioritization experiment in CSA interventions has been observed in African countries, namely Mali (Dossou-Yovo et al., 2021).

The relationship between net earnings and CCA measures preferred by stakeholders, especially member and non-member producers engaged in garlic and ginger cultivation drives us to explore the various risks in pre-production, production, and post-production stages aligned with adaptation and mitigation measures and find out appropriate institutions for delivering technology solutions and financing agencies to finance CSA interventions (Khatri-Chhetri et al., 2019). CSA interventions framework motivates us to delve deeper into the farmers' preferences for adoption of CSA technologies that can serve as CCA measures (Khatri-Chhetri, Aggarwal, Joshi, and Vyas, 2017). We collected farmers' responses on a Likert-scale (1 being least important and 5 being most important) to categorize the CSA interventions, namely for water-smart, nutrient-smart, carbon/energy-smart, weather-smart, and knowledge-smart (see Table 2.1).

The preliminary findings of the study were presented to local bankers, state government officials from relevant departments, FPO members and POPIs in a workshop organized by the National Bank for Agriculture and Rural Development (NABARD) and GIZ India in Nahan, Himachal Pradesh. The emphasis was given to capacity development of stakeholders, namely bankers, agriculture-horticulture department, processing units, FPOs, POPIs, and farmers, among others. The outcomes of the workshop stimulate us to prioritize CSA technologies interventions in ginger and garlic cultivation, explore the adoption benefits and implementation feasibility aligned with the scope of blended finance utilization and the nature of institutional linkages in the context of Sirmour, Himachal Pradesh.

TECHNOLOGY	ADAPTATION/ MITIGATION MEASURES
1. Water-smart - Rainwater Harvesting - Drip/sprinkler irrigation - Furrow irrigated bed planting	Interventions that improve water use efficiency - Collection of rainwater not allowing to run-off and use for agricultural activities in rainfed/dry areas and other on-site purposes - Application of water directly to the root zone of crops and minimize water loss - Enhance irrigation efficiency and drainage as well as rainwater management during the monsoon and improves nutrient use efficiency
2. Weather-smart - Weather-based crop advisory - Crop insurance - Installation of technical device, e.g. anti-hail gun	Interventions that provide insurance mechanism to income security and weather advisories to farmers to strengthen decision-making in crop production - Climate information-based value added agro-advisories to the farmers - Crop-specific insurance/weather-based crop insurance to indemnify yield cum income loss of farmers - It is effective against cloud bursting and hailstorm by assessing the fuel-air ratio to maximize the intensity of the shockwaves and pressure readings
3. Nutrient-smart - Green manuring - Intercropping with legumes	Interventions that improve nutrient use efficiency - Using legumes in a crop cycle for nitrogen-fixation and improving soil quality - Cultivation of legumes with other main crops in alternative rows or mixed to improve nitrogen supply and soil quality.
4. Carbon-smart - Fodder management - Integrated pest management	Interventions that reduce greenhouse gas (GHG) emissions - Promote carbon sequestration including sustainable land use management - Reduces use of toxic chemicals or use a blend of organic/bio-chemicals
5. Knowledge-smart - Contingent crop planning - Improved crop varieties	Use of combination of science and local knowledge - Climatic risk management plan to cope with major weather-related contingencies like hailstorm, flood, heat/cold stresses during the crop sowing and development stages - Crop varieties that are tolerant to drought, heat/cold stresses and fungal/viral diseases
6. Energy-smart - Zero tillage/minimum tillage	Interventions that improve energy use efficiency - Reduces amount of energy use in land preparation due to minimal or absence of tilling, in long-run it also improves water infiltration and organic matter retention into the soil

Table 2.1: Climate change adaptation measures/CSA interventions to assess farmer preferences

Source: Adapted from Khatri-Chhetri et al. (2017) and author' inputs

# CHAPTER 3

## RESULTS AND DISCUSSION

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### 3.1 Study of FPOs profile

It is noteworthy to mention that the GIZ conducted a climatic risk assessment of five FPOs engaged in garlic and ginger value chains in three blocks, Nahan, Pachhad, and Sangrah of Sirmour district, Himachal Pradesh. A profile of five FPOs is presented in later sub-sections. The climate expert tool adapted for risk assessment of FPOs value chains was implanted in a participatory manner. The tool utilized the IPCC AR5 risk framework for identifying hazards/perils and assessing vulnerabilities to climate change impacts.

Five FPOs, namely (1) Vijeshwari Agro Marketing Cooperative Society Limited (established 2016 and 520 members); (2) Devansh Jai Kisan Marketing Cooperative Society Limited (2018 and 301 members); (3) Vardhan FPO (2020 and 285 members); (4) Renuka Agro-Marketing Cooperative Society Limited (2018 and 448 members) and (5) Shradha Agro Marketing FPO (2020 and 262 members) were included in the study. These FPOs engage in input and gunny bags/packaging material supply, aggregation of ginger and garlic, and marketing of produce through traders. The profile of five FPOs is presented in Table 3.1.

PARTICULARS	Vijeshwari Agro Marketing	Devansh Jai Kisan Marketing	Vardaan FPO	Shradha Agro Marketing	Renuka Agro Marketing
LOCATION (SIRMOUR DISTRICT OF HIMACHAL PRADESH)	Kamlar, Nahan	Falang, Nahan	Chanyana, Pachhad	Chamoura, Pachhad	Kamlar, Nahan
POPI (PROMOTING AGENCY)	Aravali	Aravali	BJJS	BJJS	Aravali
YEAR OF ESTABLISHMENT	2016	2018	2020	2020	2018
BUSINESS ACTIVITIES	Aggregation, Marketing, Input Sales, Processing	Aggregation, Marketing	Aggregation, Marketing	Aggregation, Marketing	Aggregation, Marketing, Seed, Input Sales
MAIN PRODUCE	Spices, Garlic	Garlic, Ginger	Garlic, Tomato	Horticulture, Garlic	Garlic, Ginger, Tomato
NUMBER OF MEMBERS	520	301	285	262	448
MEMBERSHIP	Marginal	Marginal	Marginal	Marginal	Marginal

COMPOSITION	farmers(<1 ha): 25%, small(1-2 ha): 60%, medium(2-10 ha): 15%	farmers(<1 ha): 85%, small(1-2 ha): 10%, medium(2-10 ha): 5%	farmers(<1 ha): 85%, small(1-2 ha): 10%, medium(2-10 ha): 5%	farmers(<1 ha): 25%, small(1-2 ha): 60%, medium(2-10 ha): 15%	farmers(<1 ha): 25%, small(1-2 ha): 60%, medium(2-10 ha): 15%
ANNUAL TURNOVER ( CRORE)	1.10	0.62	0.048	0.05	0.47
DESTINATION	Himachal Pradesh, Gujarat, Tamil Nadu, Rajasthan	Himachal Pradesh	NA	NA	Himachal Pradesh

Table 3.1: Profile of FPOs selected for the study  
Source: Documents provided by NABARD field office, 2021

## 3.2 Business environment affecting FPOs' performance

### 1. AGRO-CLIMATIC CONDITIONS

The district is divided into zone 1, 2 and 3. Due to wide range in altitude, the climate of the state varies from sub-humid tropical (elevation 350-1,000 m) in the southern low tracts, warm and temperate (elevation 1,001-1,500 m), cool and temperate (elevation 1,501-2,500 m), and cold alpine and glacial (elevation 2,501-6,975 m) in the northern and eastern mountain ranges.

The average annual rainfall of 55 meteorological stations ranges from 332 to 2,606 mm with an average of 1,050 mm. The district, offering a wide range in altitude and climatic situations, is endowed with some important plant species- flora and fauna and a variety of wild animals and birds.

### 2. POLITICAL

- Political influence and 'elite capture' have often caused delay in the collectivization process.
- Performance assessment, shareholding, and member economic participation in FPOs often guided by the whims of political leaders.

### 3. ECONOMIC

- A higher thrust on various economic activities of FPOs determine their performance and members' welfare.
- Collective (FPOs) social capital induces trust and fosters intercommunity trade.

### 4. SOCIAL

Low awareness of institutional credit access and insurance on crop and livestock indemnity or weather-based crop insurance schemes.

## 5. TECHNOLOGICAL

- Reduces transaction cost and helps in connecting the members of FPOs with the 'missing' market.
- Reduces an array of risk from production to distribution through adoption of ICTs and access to online marketplaces.

## 6. LEGAL

- The entire process of FPO (e.g., Producer companies) registration takes two to six months or even more, depending upon the heterogeneity of group and risk preferences of member producers for collective investment.
- Taxation depends on the constitution of a legal entity. For a society registered, the tax burden on the entity is least.

## 7. ENVIRONMENTAL

- Estimation of greenhouse gas emission attributed to livestock farming is challenging.
- In the absence of an appropriate policy environment, the benefits of CSA to the environment are not yet realized.

With this backdrop, it is important to present a brief overview of garlic and ginger crop cultivation practices and market outlook in the district. As can be seen from Table 3.2, the Compound Annual Growth Rate (CAGR) of area and production for garlic is 40% while the CAGR of area for ginger is only 2%, and the production for ginger is -4%. It is also evident from the table that farmers have evinced interest in garlic cultivation due to higher price realization in recent years.

YEAR	GARLIC			GINGER		
	AREA(HA)	PRODUCTION(MT)	FARMERS INVOLVED	AREA(HA)	PRODUCTION(MT)	FARMERS INVOLVED
2018-19	2,020	30,939	About 12,500	1,450	17,995	About 6,000
2019-20	3,734	57,205		1,450	17,995	
2020-21	3,958	60,637		1,500	16,650	

Table 3.2 : Garlic and Ginger Area and Production in Sirmour  
Source: Deputy Director of Agriculture, Sirmour, H.P. (Feb 2022)

Correlations of garlic/ginger area, production and price are reported in Table 3.3. It may be noted that garlic and ginger are not competing crops, but the production cycle of ginger (7-9 months) is higher than that of garlic (6 months). As farmers over a period are realizing a remunerative price of garlic, garlic acreage has increased relative to ginger acreage. Price and production of garlic has high significant positive correlation implying that given demand in intra-state and inter-state and export potential of garlic could induce its price at a higher production level. Also, the lag effect between price of garlic/ginger and area of ginger/garlic is not considered in estimating the correlation confidence. Therefore, we obtain a negative correlation between area and price of garlic.



VARIABLE	AREA OF GARLIC	PRODUCTION OF GARLIC	PRICE OF GARLIC	AREA OF GINGER	PRODUCTION OF GINGER	PRICE OF GINGER
Area of garlic	1	.951**	- .468**	.998**	.966**	-0.078
Production of garlic		1	.966**	-0.078	.952**	-0.052
Price of garlic			1	-.486**	-.486**	.279*
Area of garlic				1	-.966**	-0.061
Production of garlic					1	-0.10
Price of garlic						1

Table 3.3: Correlations of Area-Production-Price of Garlic & Ginger crops (as of 2020-21)

Note: \*\* & \* indicates the significance at 1% & 5% level.

Source: Analyzed from the survey data

Garlic and ginger price fluctuations are reported in Table 3.4 in terms of Coefficient of Variation (CV). Although the CV of ginger wholesale price is relatively higher than that of garlic wholesale prices, the increased CV for garlic indicates a higher price fluctuation in recent periods. The higher CV of ginger and garlic prices implies that price fluctuations are subject to climatic risks impacting production and market arrival. Hence, climate change adaptation/mitigation measures are critical to realize a remunerative price for farmers.

CROP	PERIOD	CV(%)
Ginger	Apr-Dec 2017	15.38
	Apr-Dec 2020	16.80
Garlic	Apr-Dec 2017	6.78
	Apr-Dec 2020	14.89

Table 3.4 : Coefficient of Variation (CV) of Garlic and Ginger Wholesale Prices in Himachal Pradesh

Source: Economic Survey, 2020-21 Himachal Pradesh

The study selected three blocks, namely Nahan, Pachhad, and Sangrah (Renukaji) in Sirmour district of HP. Five FPOs are based in these three blocks. The member producers of FPOs and non-members are interviewed following a convenience/purposive sampling. The sample comprises 35 members and 15 non-members. The sample distribution in three blocks is 48% (Sangrah), 28% (Pachhad), and 24% (Nahan). Fieldwork was conducted during January-February 2022.

### 3.3 Value chain analysis of garlic and ginger

The value chain analysis of garlic and ginger is presented in Table 3.5. Although the crop duration of garlic is much less (about 4.5-5 months) compared to ginger (about 6-7 months), the cost of production of garlic is almost double that of ginger. However, both the farmers and FPOs are well compensated for the higher cost because the revenues generated for garlic is about 3.3 times higher than that of ginger.

The net earnings from the sales of garlic and ginger crops by FPOs are 2.09 and 0.74 times the cost of production respectively. The percentage contribution of revenues to farmers is much higher for garlic (65%) compared to ginger (56%). The percentage contribution of revenues to FPOs is also higher for garlic (25%) compared to ginger (19%).

PARAMETERS	UNIT	CROP	
		GARLIC	GINGER
Cost of production per acre	₹	1,60,000	86,000
Revenue	₹	4,95,000	1,50,000
Profit/net earnings by FPO from sales of crop	₹	3,35,000	64,000
Contribution to FPOs	₹	83,750	12,000
	%	25	19
Contribution to farmer members	₹	2,17,750	36,000
	%	65	56
Contribution to traders/wholesalers/packers	₹	33,500	16,000
	%	10	25

Table 3.5: Value chain analysis of garlic and ginger

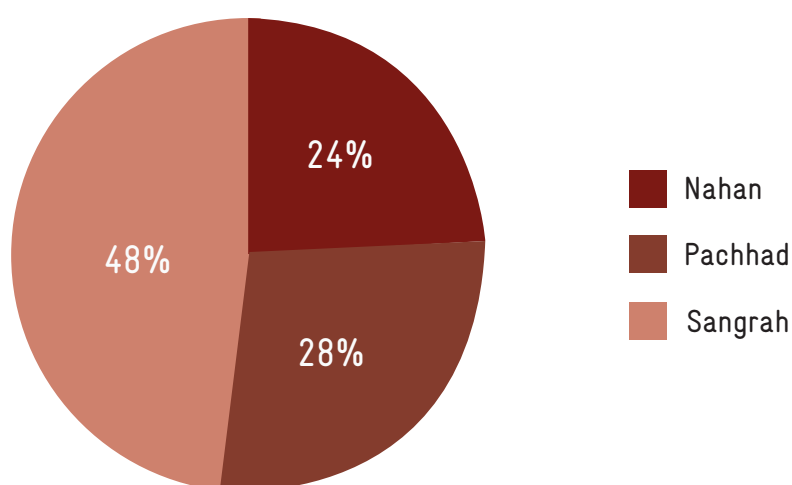


Fig. 3.1: Block-wise distribution of farmers (members and non-members)

Utilizing the survey data, we have identified a few variables to explore the influence of these variables on farmers' incomes. The consideration of Climate Change Adaptation (CCA) measures deserves a mention since its impact on additional or incremental incomes is worth exploring. The variables include, namely (1) gender, (2) poverty status (APL/BPL), (3) membership status, (4) type of irrigation system installed, (5) social category (caste), (6) type of market access, (7) CCA measures (scope or implementation feasibilities). The respondents' socio-economic profile is presented in Table 3.6.

CHARACTERISTICS	DETAILS	PERCENT
Gender	Female	22.0
	Male	78.0
Poverty status	APL	52.0
	BPL	48.0
Membership status	Non-member	30.0
	Member	70.0
Installed irrigation system	Sprinkler	56.0
	Other	44.0
Social category	ST	20.0
	OBC	38.0
	General	42.0
Type of market access	APMC Mandi	20.0
	Others	80.0
Scope for adaptation measures	Unviable	48.0
	Viable	52.0

Table 3.6: Frequency Distribution of Respondents (N=50)

### 3.4 Evaluation of CSA technologies

We explored the scope of climate change adaptation measures through CSA interventions and farmer preferences to adopt these CSA interventions using a Likert-scale (1-5 scale where 1 being the lowest preference and 5 being the highest). Table 3.7 presents the farmer preferences on CSA interventions. Farmer preferences for adoption of CSA technologies follow as water-smart > nutrient-smart > knowledge-smart > carbon/energy-smart > weather-smart. Among the six technologies mentioned in Table 2.1 (in the descending order of preferences for CSA technologies adoption), farmers prefer to adopt the sprinkler irrigation as water-smart technology followed by fertigation or integrated nutrient management and knowledge-smart using improved seed varieties and contingent crop planning. While weather-smart technology assumes an important intervention in adaptation/mitigation measures, farmers especially small and marginal ones are not aware of sophisticated technology such as installation of anti-hail guns for cloud bursting and prevention of hailstorm. Also, insurance penetration for garlic and ginger has yet to be observed and is also skewed to a few blocks which are in proximity of urban regions or townships. Table 3.8 reports that gross premium to sum insured is 12% for Nahan and Pachhad, claimed to pay-out ratio could not be determined in absence of indemnity ratio, gender inclusivity remains low in subscribing yield-indemnity product, and small and marginal farmers are included in PMFBY for only kharif and rabi crops. Commercial crops such as spices and horticultural crops are yet to be covered under the PMFBY. Weather-based crop insurance penetration is almost negligible that can otherwise help farmers realize indemnity based on the deficit in precipitation or temperature variation from the indices constructed for triggering the pay-out.

VARIABLES	MIN	MAX	MEAN	STD. DEV.
Water-smart (Sprinkler)	3.00	5.00	4.200	0.857
Nutrient-smart (Fertigation, integrated nutrient management)	2.00	5.00	4.080	0.634
Carbon/ Energy-smart (Zero tillage)	2.00	4.00	3.120	0.558
Weather Smart (Anti-hail gun installation)	2.00	5.00	3.060	0.793
Knowledge Smart (Improved seed varieties and contingent cropping)	1.00	5.00	3.740	1.69

Table 3.7: Descriptive statistics of sampled farmers' responses on evaluation of CSA technologies

TEHSIL/SUB-TEHSIL	DETAILS	NAHAN	PACHHAD
Farmers (total)		288	12
Application received	Loanee	288	1
	Non-loanee	0	11
Hectares (Ha)	Area insured	126.91	2.17
Gross Premium (₹)	Farmers premium	57,108	978
	State premium	1,99,877	3,424
	Central premium	1,99,877	3,424
	Total amount	4,56,863	7,827
Sum Insured (₹)		38,07,188	65,222
Gender	Man	266	10
	Woman	22	2
Type of Farmer	Marginal	66	0
	Small	220	12
	Others	2	0

Table 3.8: PMFBY subscription for rabi 2021 in intervention blocks of Sirmour, H.P.

Source: PMFBY Dashboard, <https://pmfby.gov.in/adminStatistics/dashboard>

Only 56% of the respondents subscribed for PMFBY (for Rabi 2021). Only 60% of the respondents used regulated markets to sell their produce and most of them (more than 70%) found it less remunerative. According to about 38% respondents, the transportation costs vary from ₹3,000 – 4,500 per truckload one-way. According to about 26% of the respondents, it is more than ₹6,000. About 96% of the respondents felt that the scope for adaptation measures is essential for climate proofing and enhancing crop yield. About 66% of member-respondents expressed that their organization invested in capacity building for evaluation and prioritization of CSA technologies.

In addition to farmers' socio-economic categorical variables, we also included some additional scale (parametric) variables, namely (1) age (years), (2) farmers' involvement in production of crops (days), (3) annual income (₹), (4) landholdings (acres), (5) cultivated area (acres), (6) garlic and ginger production (quintal), (7) market prices realized by FPOs/farmers (₹), (8) costs of production (₹), (9) transportation costs (₹), (10) net earnings (₹). The descriptive statistics of these variables are reported in Table 3.9.

Regression results aim to establish the relationship between farmers' net earnings and the categorical and scale variables as mentioned in the above section. The equation is mentioned below, and Table 3.10 reports the results.

$$\text{Net earnings} = \alpha + \beta_1\text{age} + \beta_2\text{gender} + \beta_3\text{Scheduled Tribe} + \beta_4\text{OBC} + \beta_5\text{poverty\_status} + \beta_6\text{membership\_status} + \beta_7\text{membership} + \beta_8\text{credit\_access} + \beta_9\text{garlic\_price} + \beta_{10}\text{ginger\_price} + \beta_{11}\text{landholding} + \beta_{12}\text{type-of\_irrigation\_system} + \beta_{13}\text{market\_access} + \beta_{14}\text{adaptation\_measures} + \epsilon_i$$

(Equation 1)

VARIABLES (SCALE)	MINIMUM	MAXIMUM	MEAN	STD. DEV.
Age (years)	24.00	78.30	48.47	14.36
Farmer's involvement in production of crops (days)	120	210	172.6	27.61
Annual income (₹)	1,23,188	3,84,250	2,53,157	61,391
Landholdings (acres)	0.44	1.8	1.14	0.34
Area under cultivation (acres)	0.3	1.1	0.70	0.17
Area under garlic cultivation (acres)	0.23	0.83	0.527	0.13
Garlic production (qtls)	9	37.13	20.83	6.14
Price of Garlic (₹ perqtl)	6,500	15,000	10,560	2,062
Area under ginger cultivation (acres)	0.08	0.28	0.176	0.044
Gingerproduction (qtl)	6	23.28	14.612	3.892
Price of Ginger (₹ perqtl)	2000	3500	2695	423.9
Cost of production (₹for number of acres of land cultivated)	75,438	2,76,606	1,76,324	43,535
	3,000	8,000	5,346	1,266
	-1,127	1,62,484	71,487	40,031
	1.02	2.03	1.46	0.25

Table 3.9: Descriptive statistics of scale variables used in the study

It is evident from Table 3.10 that the member of FPO can realize higher net earnings (0.286 times more) than that of a non-member. Price of garlic and landholdings are found highly significant in enhancing the farmers' income because relatively a higher price of garlic motivates farmers to shift the acreage from ginger to garlic. The average area under garlic cultivation is 3 times the average area under ginger. The average revenues from garlic and ginger production per acre are ₹4,17,391 and ₹2,23,746 respectively. Adaptation measures are found significant in enhancing the net earnings of members given the adoption benefits are higher than implementation costs. Member farmers of FPOs and non-members inter-

viewed lack credit and market access. Access to institutional credit is essential to climate change adaptation measures, e.g., installation of sprinkler/drip, anti-hail gun through custom hiring center and integrated nutrient management. Access to regulated markets (APMC), electronic marketplaces, namely electronic National Agriculture Market is crucial to fetch a remunerative price in different time periods.

VARIABLES	STANDARDISED BETA (STD. ERROR)
Age	0.110 (292.18)
Gender (Male-1, Female-0)	0.096 (9031)
ST (ST-1, else-0)	0.024 (10396.11)
OBC (OBC-1, else-0)	-0.016 (8386.09)
Poverty Status (BPL-1, APL-0)	0.201* (8020.51)
Membership (Member-1, else-0)	0.286** (9252.04)
Credit access (If yes-1, else 0)	0.028 (8534.4)
Price of garlic (₹/quintal)	0.800*** (2.03)
Price of ginger (₹/quintal)	0.136 (9.67)
Landholding (acre)	0.317*** (11943.93)
Type of irrigation system (if sprinkler-1, else 0)	0.036 (7219.02)
Market access (If APMC-1, else-0)	-0.159 (10795)
Adaptation measures (if viable-1, else-0)	0.268** (8614.56)

Table 3.10: Regression results (OLS Model 1)

Note: Dependent variable-Net earnings,  $R^2$  0.75, D-W stat, 1.841 \*, \*\* and \*\*\* denote the level of significance at 10%, 5% and 1% respectively

### 3.5 FPOs preferences for adoption of CSA technologies

It is worth noting that if adaptation measures are viable, these measures significantly stabilize farmers' net earnings. It means that adoption benefits and implementation feasibilities are critical to farming resilience and sustainability. However, climate finance or financing adaptation measures remain a key concern due to economies of scale and covariate risks including climatic and production risks involved in the processes. Financing production and market risks entail a due diligence of farmer collectives whom they are associated with. This exercise helps bankers or financing agencies assess farmer collectives' risk attitudes, heterogeneity in risk preferences, and credit worthiness (Francesconi and Wouterse, 2015). Since individual farmers often experience problems in accessing the institutional credit due to lack of land title, cumbersome documentation, and lack of adequate collateral for mitigating credit risk (Dey and Mishra, 2022), collectivizing them into an institution, such as Farmer Producer Organization or FPOs can help them access credit and effectuate the collective investment of members. In other words, health assessment of FPOs is important for financing. Oliver et al. (1985) and Olson (1965) emphasize the importance of smaller and heterogeneous groups with a few resource-rich members to drive collective action and cooperation. In such a situation, small farmers remain underrepresented in decision-making processes (Hu et al., 2014) and the poor find it difficult to access resources (Muñoz et al., 2007,



Hellin et al., 2009). In other words, 'elite capture' and 'social exclusion' are often outcomes of inclusion or over-representation of resourceful members in collective institutions like FPOs or cooperatives. So, a well-represented group and member economic participation in FPOs' business is critical to succeed in collective action (Ruttan, 2008).

There are several approaches to measure the performance and viability of FPOs in the literature. One dominant approach is centrality measures that include patronage, member, and domain (Shah, 1996). However, this measure does not capture the determinants of the business environment related to opportunities and threats to organization. Dey (2018) proposes a comprehensive performance analytic framework combining non-economic and economic/financial determinants for assessing the viability and sustainability of Producer Companies, a legal form of FPOs. Adopting a few important determinants of Shah (1996) and Dey (2018) frameworks, we assess the health of FPOs involved in garlic and ginger value chains. The SWOT analysis of FPOs (more than 20 promoted by the NABARD) working in garlic and ginger value chains in Sirmour district of Himachal Pradesh is presented in Table 3.11.

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>- Direct marketing of produce</li> <li>- Better coordination with CBBO or Technical Support Agencies</li> <li>- Inclusive and reliable staff</li> <li>- Sustaining Business Models</li> <li>- Proven power of backward and forward linkages</li> <li>- Support from promoting institution</li> <li>- Experience in working with FIGs</li> </ul>	<ul style="list-style-type: none"> <li>- Poor infrastructure</li> <li>- Lack of professional expertise</li> <li>- Lack of financial support</li> <li>- Absence of policy support</li> <li>- Association with Farmer Bodies brings awareness but not participation</li> <li>- Lack of awareness about modus-operandi of trading</li> <li>- Creation of significant barriers from middlemen</li> <li>- Preference for paper-based transactions</li> </ul>	<ul style="list-style-type: none"> <li>- Institutional support</li> <li>- More unexplored opportunities</li> <li>- Vertical integration of marketing channel</li> <li>- Better market linkage</li> <li>- Capacity building for FPOs</li> <li>- Diversification of the crops cultivated</li> <li>- Prevalence of farmers willing to join FPOs</li> <li>- Benefits received from Government schemes</li> <li>- Minimal government</li> </ul>	<ul style="list-style-type: none"> <li>- Competition from private firms</li> <li>- Long term sustainability</li> <li>- Inadequate funding for CCA measures and adoption of CSA technologies</li> <li>- Climatic hazards and vulnerabilities</li> <li>- Administrative control</li> <li>- Ineffective implementation of PGS system</li> <li>- Absence of any kind of blended finance product in garlic-ginger value chain</li> </ul>

Table 3.11: SWOT Analysis of FPOs

Source: Extracted from narrative of in-depth interviews held with five FPOs in Jan-Feb 2022

### 3.6 Determinants of performance and viability of FPOs

It is important to mention that performance assessment of FPOs includes governance and operating effectiveness (Shah, 2016). To assess governance and management of FPOs, we have interviewed five FPOs, especially secretaries and members of BoD and examine the financial statements of these FPOs. For collective action, governance and operating effectiveness is crucial. Ostrom (1990) prescribes eight design principles for promoting efficiency, transparency, and democracy in collective institutions and one such principle is appointment of monitor to oversee the functioning of collectives in a democratic manner.

For example, five salaried secretaries are appointed in five FPOs who are accountable to the member farmers, monitor the business operations of FPOs, and oversee member participation and sanction infractions. Another principle prescribes the formation of member centric rules what is called collective-choice arrangement that monitors, or secretaries would follow.

For assessing governance and management of five FPOs, the study underpinned a few important indicators drawn from Shah (1996) and Dey (2018), namely membership type, training frequency of Board members, business expansion plan, market linkage, and record keeping activities for MIS and membership manual, release of patronage bonus, etc. (refer to Table 3.12). The membership is open as even non-member farmers can buy inputs of course at a differentiated rate. There is training activity for FPOs on either quarterly or half-yearly basis. But these FPOs are yet to develop a proper market linkage.

PARTICULARS	VIJESHWARI AGRO MARKETING	DEVANSH JAI KISAN MARKETING	VARDAAN FPO	SHRADHA AGRO MARKETING	RENUKA AGRO MARKETING
Membership type	Open	Open	Open	Open	Open
Training of Board Members	Done on half-yearly basis	Done on half-yearly basis	Done on quarterly basis	Done on quarterly basis	Done on half-yearly basis
Business expansion Plan	Not yet formulated	Not yet formulated	Plan in existence (for diversification)	Plan in existence (for vegetable production)	Plan in place (for transportation)
Market Linkage/access and participation	Lack of market access—retail and terminal	Lack of market access – marketplace (eNAM)	Yet to graduate for market access	Yet to graduate for market access	Lack of market access – marketplace (eNAM)
MIS/ Compliance/ Record Keeping	Yes	Yes	Yes	Yes	Yes

Table 3.12: Governance and management of five FPOs

Source: Extracted from checklists of FPOs and narrative of in-depth interviews

Financial performance of five FPOs is reported in Table 3.13. Sales turnover of Vijeswari and Devansh FPOs are significantly higher than other FPOs and their net profit margins indicate higher profitability. Vijeswari, Devansh, and Renuka have reported a much higher share capital compared to Vardaan and Shradha. The life cycle of these three FPOs indicates a maturity stage while Vardaan and Shradha are at nascent stage of their business that has impacted shareholding and membership. So, climate change adoption benefits and implementation feasibility of CSA technologies can influence the older FPOs chart their business plan and access the institutional credit or private equities at a market or concessional rate. Vardaan and Shradha need some time to graduate and strengthen their business model and profitability. Five FPOs have received grants from the NABARD for capacity building of members and awareness programs on various climate-smart agricultural interventions.

PARTICULARS	VIJESHWARI AGRO MARKETING	DEVANSH JAI KISAN MARKETING	VARDAAN FPO	SHRADHA AGRO MARKETING	RENUKA AGRO MARKETING
Turnover (₹)	95,36,710 (2020-21)	81,43,380 (2020-21)	4,80,000 (2020-21)	5,00,000 (2020-21)	51,56,230 (2020-21)
	92,24,500 (2019-20)	16,71,329 (2019-20)			14,02,840 (2019-20)
Share capital/net worth (in ₹Lakh as on March 31, 2021)	12,73,885	12,80,600	81,500	5,52,000	12,94,850
Net profit margin (₹)	4.612 (2020-21) 1.774 (2019-20)	2.593 (2020-21) 2.482 (2019-20)	NA	NA	1.057 (2020-21) 1.760 (2019-20)
Grants received from NABARD (₹)	2,80,000 (2020-21) 32,675 (2019-20) 1,20,000 (2016-17)	1,80,000 (2020-21) 1,10,000 (2019-20)	2,40,000 (2019-20)	1,80,000 (2019-20)	1,80,000 (2020-21) 1,10,000 (2019-20)

Table 3.13: Financial performance of five FPOs  
Source: Analyzed by authors from financial statements of FPOs

Five FPOs assessed for their governance and management and financial health indicated that three older FPOs can venture into market linkages for enhancing farmer realizations and strengthening the viability of the FPO's businesses. Two new FPOs have yet to demonstrate their business models backward and forward integration – selling inputs to member farmers and aggregating their produce for marketing. So, it can be inferred from the above analysis that older or mature FPOs can explore business opportunities and influence member farmers to adopt CSA technologies for improved productivity and incomes.

<sup>1</sup> Contribution of members to FPO's business, paid-up capital, and exercise of voting rights.

<sup>2</sup> Earnings of members given their contribution, social security, dividends or patronage bonus earned

<sup>3</sup> FPO's market share in the economy

# CHAPTER 4

## CONCLUSIONS AND IMPLICATIONS

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### 4.1 Conclusions

The study undertaken in a few blocks of Sirmour district of Himachal Pradesh is intended to explore the scope of climate change adaptation/mitigation measures for Farmer Producer Organizations (FPOs) to mitigate pure (climatic risks) and co-variate risks (production and postharvest risks) affecting garlic and ginger cultivation and decrease FPOs vulnerabilities. The study has identified a few Climate-Smart Agriculture technologies (CSA) interventions adopted by a few resourceful farmers of FPOs. Such interventions include installing sprinkler irrigation to enhance water use efficiency, furrow bed irrigation practices, and intercropping for improving soil fertility and farming resilience. However, technologies such as anti-hail guns and zero tillage for carbon and energy-smart farming systems are yet to be adopted on a larger scale. It may be noted that indigenous anti-hail gun efficacy is yet to be ascertained. Its impact on incremental costs and adoption benefits needs to be assessed as such technology adoption depends on the benefits and costs of adoption and implementation feasibility. The construction of a pond or water bodies near farmers' fields for rainwater harvesting is cost-effective for adoption.

First, considering the IPCC AR-5 framework, climatic risk assessment showed that FPOs are highly vulnerable to climatic risks. Inclement weather conditions and frequency and severity of hailstorms or cold waves often cause prevented sowing and damage to crop growth. Hence, weather-based crop insurance and multi-peril yield indemnity indices are necessary to indemnify the yield and associated income loss. The state government can invite bid from eligible insurance agencies to construct weather-based product for ginger, garlic, and high-value cash crops. Currently, garlic and ginger are not covered in yield indemnity insurance products, namely Pradhan Mantri Fasal Bima Yojana. Given the severity and frequency of climatic risks, two crops need to be insured.

Second, crop and weather advisory services are critical to building the economic and ecological resilience of farming systems and increasing the risk aversion quotient of FPOs in production planning, value-added services, and marketing of members' produce. A digital platform architecture developer or service provider can be roped in to provide real-time weather advisory and extension services. Krishi Vigyan Kendra can offer field demonstration facilities for seed selection and adopt a package of practices for garlic and ginger cultivation based on climatic risks and farmer vulnerabilities to production and income losses.

Third, FPOs' effort to connect member farmers with the marketplace appears to be dismal. The lack of awareness and technical know-how of market structure and its conduct could be a potential reason for dismal performance. The study proposes that an electronic marketplace, namely electronic spot market can be a profitable market channel for improved sales realization. Surpluses (after distributing members' shares and patronage bonus) can be invested in acquiring storage and grading facilities with the support of concessional or project loans.

Fourth, an evaluation and prioritization of CSA technologies is important for stakeholders, such as FPOs, technology firms, financing agencies, and local implementing agencies. A blended finance structure has emerged as a potential solution to financing CSA technologies and practices. However, financial mainstreaming remains a key challenge since local bankers are yet to consider it a mainstream product. So, Development Finance Institutions (DFIs) like the NABARD need to exhibit a strategic use of philanthropic/development funds to attract 'additional' private capital of impact investors in CSA interventions in a staged manner. Grant and technical assistance funds would help in the project design stage. Meanwhile, concessional loan, equity, and risk guarantee would be crucial in the implementation and scaling up of CSA interventions as means of adaptation/mitigation measures.

Fifth, based on the field survey and consultation with the stakeholders, we have noted a few key adaptation measures and proposed technical institutions and financing agencies for financing CSA interventions in Sirmour district of Himachal Pradesh.

PRODUCTION AND POST-PRODUCTION RISKS	ADAPTATION/MITIGATION MEASURES FOR CSA INTERVENTIONS	POTENTIAL TECHNICAL INSTITUTIONS	FINANCING AGENCIES
Hailstorm and cloud formation leading to crop loss	Installation of anti-hail gun	IITs	NABARD, Commercial banks, State government
Draught and low precipitation leading to crop loss	Rainwater harvesting, pond construction near field, sprinkler/drip irrigation	IITs and Netafim/Jain Irrigation	NABARD and Commercial banks
Excessive rainfall and cloud formation	Index-based weather insurance (RWBCIS) and meteorological stations for mitigating 'basis' risk (temporal, spatial, and crop-specific)	SWISS RE, SCOR, Agriculture Insurance Corporation	Subsidies borne by the state and central government
Bumper production of ginger and garlic leading to price risk	Storage, processing, and distribution to marketplaces	Warehousing companies, CFTRI*, NIFTEM**, electronic spot exchanges	State government, NABARD, commercial banks, and impact investors

Table 4.1: Risks, Adaptation and Potential Financing Agencies

\*National Institute of Food and Technology Entrepreneurship and Management

\*\*Central Food Technology Research Institute

Sixth, we mention the potential of blended finance facilities and funds in financing CSA interventions by reviewing the literature, archival information, and database or published research articles. It is learned that financing CSA interventions has received attention from DFIs, project sponsors and private investors embracing a Convergence platform (2021). Blended finance has emerged as a potential climatic risk

risk financing structure that blends various financial instruments, namely grant, concessional loan, credit guarantee and enhancement, technical assistance fund, risk insurance, among others. It enables a strategic use of philanthropic/development funds for mobilizing the additional private capital or commercial finance in sustainable development interventions, CSA intervention is one of them.

Given a mixed evidence of blended finance utilization in CSA in developing and least-developed countries, we propose the NABARD as a refinance agency to initiate lending concessional loans to eligible FPOs for mitigating climatic risks and post-harvest risks in association with insurance agencies. The apex re-finance agency, NABARD needs to attain financial and non-financial 'additionally' to attract private equities or impact investing in CSA interventions, especially for garlic and ginger value cultivation and marketing. GIZ can provide technical support assistance funds to FPOs for CSA interventions—project design and execution on the ground. The impact of such interventions can be evaluated by a third party in the future course, say two to three years post-implementation.

Market linkages through participation in marketplaces, namely electronic spot market, construction of pond, penetration of weather-based crop insurance and multi-peril yield indemnity insurance (PMFBY) for garlic and ginger, and real-time crop and weather advisory services to FPOs can be relevant to mitigate climatic hazards and perils and make the farming system productive, resilient, and enable the system to fetch a remunerative price through market access (Markelova et al., 2009). The convergence of state government promoted schemes, like Krishi Kosh of Himachal Pradesh government scheme with the NABARD/central government schemes is important for addressing moral hazard and adverse selection of beneficiary farmers/collectives and local implementing agencies such as POPIs or cluster development business organization.

COMPONENTS	NATURE OF ASSOCIATIONS	POTENTIAL INSTITUTIONS
Financing mechanisms for mainstreaming CCA (storage and processing units)	Grant, concessional loan and project loan at a market rate, back-ended credit linked subsidy from Krishi Kosh	State government (H.P.), NABARD, Commercial banks and NBFCs
Capacity building for developing climate-resilient business models	Technical assistance fund and grant	GIZ, NABARD and Implementing agencies
Exploring adaptation measures and benefits, and implementation flexibility in garlic and ginger value chains through water-and weather-smart CSA technologies	Grant, concessional loan	NABARD, State government
Market linkages for FPOs through aggregation, grading, storage, certification, and transportation facilities	Grant, concessional loan, credit (loan) guarantee, product, and price insurance	State government, NABARD, Commercial banks, Agriculture Insurance Corporation, and Impact investors

Table 4.2: Components of Blended Finance

We propose capacity development measures for FPOs, POPIs and bankers for mitigating climatic risks and make the farming system resilient and sustainable.



## 4.2 Capacity development measures

### - FARMER PRODUCER ORGANIZATIONS

FPOs need to evaluate the various CSA technologies in terms of adoption benefits (crop productivity, incomes, and resilience of farming systems) and implementation feasibility keeping in view of its own strengths, weaknesses as well as the farmers' readiness to accept. They should facilitate member access to credit and handhold them to sell their produce in a market that fetches a remunerative price. To achieve this, they should regularly organize workshops for the capacity development of member and non-member farmers on a periodic basis on relevant themes of CSA interventions, namely technical feasibility of intervention, cost of implementation, and convergence of various government schemes and programs, namely crop insurance, Krishi Kosh, and One District One Crop, among others. Market linkage is important besides the CSA interventions to realize a remunerative price. Farmers should, therefore, be exposed to the various market channels and subscribe for crop, weather advisory and market intelligence services. Gradually, their capacities should be strengthened to understand the technical intricacies of marketplaces for accessing real-time price information and promoting their participation. In addition, there can be a renewed attention to improve governance and management of FPOs in terms of fund management, distribution of patronage bonus, and period training of hired professionals and secretaries for the success of these farmer collectives.

### - PROMOTING INSTITUTIONS

Producer Organization Promoting Institutions (POPIs) should continuously guide and monitor the FPOs to make them instrumental in adaptation/mitigation measures for the benefits of member or non-member farmers, which is possible only when they themselves are able to analyse the cost-benefit associated with the CSA technologies. Therefore, POPIs should enhance their skill in this regard and provide services to FPOs for their overall system development through state-of-the-art operating systems, namely MIS, HR etc. A fast and efficient response system is crucial to fight against the uncertainties involved in climate change. POPIs should develop an efficient monitoring and evaluation mechanism for implementing business plans of FPOs for blended finance facilities and funds access and utilization in adoption of CSA technologies.

### - BANKERS/FINANCIAL INSTITUTIONS

The major risk involved in the priority sector lending is (credit) default risk resulting in non-performing assets (NPAs). This is due to lack of adequate collateral provided by the farmers' or their organization. With the adoption of CSA technologies, yield loss and associated income loss will be significantly reduced, which in turn can enhance the confidence of bankers in lending CSA interventions. The banks should impart in-house training on CSA technologies adoption benefits and costs of implementation and should be aware of climate finance modalities, such as, how blended finance structure works in CSA interventions. Additionally, bankers should understand actor-wise activities performed in various nodes of the agri-value chain, risks involved along the value chain, and how these risks can be financed and what solutions are available to mitigate such risks. We propose that bankers can identify and rope in a few CSA projects like ginger and garlic in Himachal Pradesh

and finance the projects in a staged manner in consultation with the NABARD. Eventually, bankers' mainstream finance would stimulate impact investors to pump prime 'additional' commercial finance or private equities in the climate finance landscape.

### 4.3 Implications of the study

This study has important implications to policymakers, climate risk experts, market agencies, NGOs, financial institutions, donor agencies, and agriculture research institutions. We present a few important policy and managerial implications for stakeholders responsible for developing a climate resilient food and agricultural ecosystem in Sirmour district of Himachal Pradesh.

- CSA interventions take place at the farmer field. So, capacity building of farmers or their collectives is important. On the other hand, accounting the costs and benefits of CSA technologies adoption is critical for farm viability and sustainability. Implementation feasibility is often a challenge to adoption because farmers look for short-term realizations and environmental concern is a long-term undertaking which can only be managed at a systemic level. A bottom-up climate risk modelling is therefore necessary to design and prioritize CSA technologies.
- There should be a synchronization between the activities of different stakeholders to adopt cost-effective CSA technologies in a time-bound manner. Given the short-term orientation of farmers for crop productivity and income, and the concern for environmental sustainability, the research agencies, extension service providers and implementing agencies like NGOs should try to bring a synergy between them.
- There are many central/state government schemes through which CSA technologies could be adopted at the local level without much financial burden to the farmers, their collectives, and financial institutions. Custom Hiring Centre (CHC) is such an example that utilizes government grants for procuring agricultural implements related to CSA technologies. There is thus a need to create awareness about CHC or any government aided public-private partnership model, availability of technologies or implements embracing the existing schemes and their utilities for use in the local environment or setting. Economic/financial and technical feasibility of such technologies should be performed before the adoption.
- Integration of farming systems by diversifying into allied activities seems important to reduce income uncertainties and farmers' vulnerabilities to climatic risks. How to utilize the space and mechanism for optimizing yield and return is a task for the implementing agencies and technical support providers. GIZ can work out such possibilities in vulnerable areas of Himachal Pradesh for promoting a risk averse and resilient farming system.
- An evaluation and prioritization of CSA technologies interventions based on stakeholder participatory assessment can help the policy makers and funding agencies develop climate resilient pathways for crops for vulnerable regions vulnerable to climatic risks and hazards.

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## Appendix 1

Comparative Analysis of Climate Hazards & Vulnerability Assessment for 5 FPOs  
(Based on a workshop organized on 16-21 September 2021 by the GIZ)

PARTICULAR	DEVANSH JAI KISAN FPO	RENUKA AGRO-MARKETING FPO	SHRADHA AGRO MARKETING FPO	VARDAAN FPO	VIJJESHWARI AGRO MARKETING FPO
CBBOs/POPIs	Aravali	Aravali	BJJS	BJJS	Aravali
Vulnerability of the district /Agro Climatic Zone	High Vulnerability as per SAPCC4	High Vulnerability as per SAPCC4	High Vulnerability as per SAPCC4	High Vulnerability as per SAPCC4	High Vulnerability as per SAPCC4
Climate Signals	The extent FPOs have been affected				
Uncertainty in the onset of monsoon	Reduction in FPO's turnover, Decreased income of farmers, Problem in market linkages	Reduction in FPO's turnover, Decreased income of farmers, Problem in market linkages	No Effect	No Effect	Reduction in FPO's turnover, Decreased income of farmers, Problem in market linkages
Shrinking of rainy days	Lack of overall collections of produce for the market due to damage of crops due to no proper storage or processing facility	Lack of overall collections of produce for the market due to damage of crops due to no proper storage or processing facility	Drying of crops	Drying of crops	Lack of overall collections of produce for the market due to damage of crops due to no proper storage or processing facility
Increase in the high intensity of rainfall events in shorter durations	Hampers the storage, transportation and delivery of harvest, results in post-harvest loss	Hampers the storage, transportation and delivery of harvest, results in post-harvest loss	Less production of ginger, garlic. Cannot meet market demands. Land Levelling, soil erosion, roadblocks all affect the FPO. Loss of land, damages property, and road. Road blockage leads to problem in the transportation.	Production is affected	Hampers the storage, transportation and delivery of harvest, results in post-harvest loss

SAPCC- State Action Plan for Climate Change

Less rainfall during monsoon season	Low productivity due to pest and disease attack in ginger, garlic with no proper storage/management practices	Low productivity due to pest and disease attack in ginger, garlic with no proper storage/management practices	Production & quantity affected	Production & quantity affected	Low productivity due to pest and disease attack in ginger, garlic with no proper storage/management practices
Delay in the end of monsoon season	Drop in quality of crops resulting in lower market price.	Drop in quality of crops resulting in lower market price.		No Effect	Drop in quality of crops resulting in lower market price.
Abnormal increase in average temperature; Abnormal Increase in min. temperature	Low productivity due to pest and disease attack in ginger; garlic with no proper storage/management practices	Low productivity due to pest and disease attack in ginger, garlic with no proper storage/management practices	Crops affected	Production is affected	Low productivity due to pest and disease attack in ginger, garlic with no proper storage/management practices
Increased frequency of Hailstorms in May and June, increase in the size of hailstorms	Drop in quality of crops resulting in lower market price.	Drop in quality of crops resulting in lower market price.	Hampers the storage, transportation, and delivery of harvest, resulting in post-harvest loss and sometimes missing the market demands.	Hampers germination and growth of the plant in the early stage of production and transportation	Drop in quality of crops resulting in lower market price.
Fluctuations in snowfall	Drop in quality of crops resulting in lower market price.	Drop in quality of crops resulting in lower market price.	Hampers germination and growth of plant in the early stage of production and transportation	Hampers the storage, transportation, and delivery of harvest, resulting in post-harvest loss and sometimes missing the market demands.	Less snowfall causes a drop in the quality of crops resulting in lower market prices.
The current capacity of FPO to adapt/cope with the hazard	Not able to cope with	Not able to cope with	Not able to cope with	Not able to cope with	Not able to cope with

## Appendix 2

Adaptation measures emerged from climate risk assessment workshop held in September 2021 at Nahan, Sirmour

Short-term measures (0-1year)	Medium-term measures (2-5 years)	Long-term measures (6-10 years)
Change in seed variety as planting material	Mixed cropping/crop diversification (like turmeric, fruit crops such as Kiwi, Citrus, etc.)	Setting up of own processing unit
Interchanging of seed from one region to another	Construction of water reservoir	Own cold storage unit
Construction of pond near field	Irrigation facilities like solar pump, renting of pipes for water diversion	
Bunding of agricultural field	Availability/use of solar dryer	
Better storage facilities	Market linkages	
Provision of processing facilities	Facilities for pre-cooling and cooling of harvested/processed produce	
Grading and sorting equipment		



## Appendix 3

Developing a Bankable Business Plan for Co-Ops/FPOs engaged in Garlic and Ginger value chains in Sirmaur district of Himachal Pradesh

### Checklist for FPOs/Co-Op Societies

Form No \_\_\_\_\_

- Name of the respondent (s):
- Complete name of the FPO/Co-op.:
- Name of the village:
- District:
- Agricultural situation of garlic and ginger value chains in the village:
- Number of skilled workers (labour) employed by FPO:
- What sub-sector/value chain activities does the FPO focus on or engage in? (Primary production, input procurement, processing, transport, etc.)
- What are the important commodities provided based on the values/turnover? Approximate share of each commodity in the annual turnover (approx. in rupee values):
- Number of established market linkage partners
- Are you participating in eNAM platform: If yes, since when? How much transaction in quantities and values held?
- No. of established partnerships with input suppliers:
- Have you participated in organization's meeting in the last 12 months?
- Have you participated in any productivity program promoted in the last 12 months?
- Have you taken loans and subscribed for crop insurance products namely PMFBY or WBCIS for your members in the last 12 months?
- Have you received technical assistance or participated in training sessions in the last 12 months?
- What support is available to you from the SFAC/NABARD/other implementing agencies?
- What type of financial support is available to you from the NABARD?
- Are you aware of Climate-Change Adaptation? If yes, have you ever tried implementing it in the cultivation of garlic and/or ginger crops?
- Are you aware of Climate-Smart Agriculture technologies and practices through Climate Change Adaptation? If yes, have you ever tried to adopt it?
- Have you ever tried to adopt Climate-Smart Agriculture technologies and practices in the cultivation of Garlic and/or Ginger crops?
- What costs you incurred, and benefits realized in rupee values?
- What is the current process of input procurement, aggregation, and marketing? Where do you market your produce?
- How do your members perform the various stages of agricultural operations from pre-planting to post-harvest? What challenges do you face in this process?

- Direct benefits received:
  - a. Monetary:
  - b. Material:
  - c. Awareness/training:
- Beneficiary contribution, if any:
- Impact of the interventions on:
  - a. Income
  - b. Productivity
  - c. Nutrition/dietary requirements of member producers
  - d. Awareness
  - e. Institution
  - f. Education
  - g. Health
  - h. Women farmers – inclusion and participation
- Difficulties faced in implementation of climate-risk financing measures yet or to be faced in future
  - a. Formation of committee
  - b. Selection of beneficiaries
  - c. Responses of people or local populace
  - d. Local politics
  - e. Any other
- How are the difficulties you have coped with?
- Name of the implementing agency:
- Role of implementing agency:
- Relations of people with implementing agency officials:
- Participation of women in business:
- Participation of SC/ST in the project:

## Appendix 4

Developing a Bankable Business Plan for FPOs/Co-Ops engaged in Garlic and Ginger value chains in Sirmaur district of Himachal Pradesh

### Check list for POPIs/ CBBOs

- Date\_\_\_\_\_ Form No \_\_\_\_\_
- Name of the respondent: \_\_\_\_\_
- Designation of respondent: \_\_\_\_\_
- Complete Name of the FPO/Co-op.: \_\_\_\_\_
- Name of the village: \_\_\_\_\_
- District: \_\_\_\_\_
- Why was the FPO promoted?
- Any of the following factors considered before formation:
  - a. Awareness creation before the formation of the FPO/Co-op
  - b. Types of small-scale producers in the target area, volume of production, socioeconomic status, marketing arrangement
  - c. Sufficient demand in the existing market to absorb the additional production without significantly affecting the prices
- What is the process of forming the FPOs- selection of region, farmers, how the members were identified etc.? What is the approach followed?
- What is/was your key role as a promoting agency & what among the followings were performed:
  - a. Cluster identification
  - b. Baseline/feasibility Studies
  - c. Business Planning
  - d. Mobilisation of producers for registration and incorporation of FPO
  - e. Resource Mobilisation, formation of critical/Farmer Interest group
  - f. Development of Management Systems and Procedures
  - g. Business Operations
  - h. Assessment and Audits
- How was the expectation setting and awareness about the purpose of the FPO done?
- Have you provided any training and handholding support to the staff and management of the FPO?
- Do you have a fixed timeline or duration to provide techno-managerial support? How do you decide the area of support to be rendered?
- Is there any process followed to track if the objective of the formation of FPO is not being met?
- Do you have an exit strategy when the FPOs are formed?
- What are the key challenges in the entire engagement period with the FPO? Do you see opportunities in the business environment and render the support needed?
- What are the key lever/motivational factors for the FPO members to mobilize & participate in the FPOs/Co-Ops' collective decision-making?
- How do you engage in capacity building of FPOs in the prioritization and adoption of Climate-Smart Agricultural technologies and practices?

- How do you address climate hazards and vulnerabilities faced by a particular FPO in Himachal Pradesh?
- What are the short-term, medium-term measures being adopted?  
Impact of the CCA interventions on:
  - a. Income of FPO/member producers
  - b. Costs of operations
  - c. Productivity
  - d. Nutrition
  - e. Awareness
  - f. Institution linkage
  - g. Education
  - h. Health
  - i. Women farmers – inclusion and participation
- Difficulties faced in implementation of CSA technologies and practices' adoption measures yet or to be faced in the future course
  - a. Formation of the Committee
  - b. Selection of beneficiaries
  - c. Responses of people or local populace
  - d. Local politics and social exclusion
  - e. Any other
- How were the difficulties coped with?

## Appendix 5

Developing a Bankable Business Plan for Co-Ops/FPOs engaged in Garlic and Ginger value chains in Sirmaur district of Himachal Pradesh

### Semi-structured survey questionnaire for farmers (members/ Non-members)

Date \_\_\_\_\_

Form No \_\_\_\_\_

I. BASIC INFORMATION FOR MEMBERS/ NON-MEMBERS OF CO-OP/FPOS						
1	Name of the respondent					
2	Age (in years)					
3	Sex (Male/Female)					
4	Address					
	Village					
	Hamlet/Sahi					
	Gram Panchayat					
	Block					
	District					
5	Social Category (SC/ST/OBC/General)					
6	Poverty Status (APL/BPL/AAY/PHH cardholders)					
7	Membership since (please specify the year when you became the member)					
8	Shareholding (contribution to issued capital in INR)					
9	Services and benefits received from Co-ops/FPCs	Inputs	Output/procurement	Credit	Insurance (crop/health/life)	Others

II. OCCUPATIONAL INFORMATION					
10.	Occupation	No. of members involved		No. of days involved	Income per annum (INR)
		Male	Female		
	Agriculture				
	Livestock/poultry/others, please specify				

III.	ASSET BASE	
11	Land	in acres
	Irrigated land	
	Rainfed land	
	Total land owned	
	Area leased in (if any)	
	Area leased out (if any)	
12	Total lands under cultivation Well (yes/no) or any irrigation system availed (drip/micro irrigation system) please specify	

III.	CROP PRODUCTION/INCOME STREAM				
13	Agricultural crops (ginger & garlic)				
	Season	Crop	Area in acres	Production in quintals	Price per quintal (INR)
	Kharif				
	Rabi				
14	Total income from agricultural activities/ operations for last three years in INR				
15	Any major change in cropping pattern in the last three years	2019	2020	2021	

IV.	Climate Hazards and uncertainties faced		Particulars		
16	Temperature – variation (maximum and minimum)		----- Degree Celsius		
	Rainfall – variation(maximum and minimum)		----- in mm precipitation		
	Water table in summer/winter in feet		----- in mm/any unit		
	Depth of tube well (if any, in feet)				
	Whether water available in summer adequately		Yes/No		
V.	COST OF AGRICULTURAL/OTHER INPUTS				
17	Chemical fertilizers	Quantity used in quintals /year	Quantity purchased	Quantity produced	Amount spent
	Urea				
	DAP				
	Any other				
18	Manure				
	Cow dung				
	Vermicompost				

	FYM				
	Any other				
19	Biofertilizer				
20	Pesticide/insecticide				
	Other inputs	Particulars		Amount spent (INR)	
21	Amount paid for irrigation if any				
22	Amount spent on hired labourer	(Quantity)			
23	No. of hired labours	(Quantity)			
24	Agricultural implements hired (CHC used)	(No. of hours)			
25	Total Amount spent on agricultural inputs				

VI.	CREDIT/INSURANCE				
		2021-22	2020-21	2019-20	2018-19
27	Requirement in INR				
28	Purpose (production/consumption)				
29	Could avail or not? (Yes/No)				
30	Sources of financing/credit (Name the agencies: banks or money lenders)				
31	Whether subscribed for PMFBY/RWBCIS? If yes, then answer Q. 32	YES/NO			
32	Interest rate if any and premium for insurance paid (in INR)				

VII.	MARKET ACCESS	Response				
33	Have you accessed any market to sell your produce? (Yes/No)					
	What type of market it is? Haat/APMC/retail/eNAM/any other, please specify	Haat	APMC	Retail	eNAM	Distant (inter-state)
	Is it remunerative in accessing that market? What are transportation costs, and searching and monitoring costs?					
	Do you use any technology in market access?					
	What benefits do you receive by participating in group through Co-Ops/FPOs/C0-Ops when selling your produce in that market?					



VII.	OBSERVATIONS ON CCA Measures	Response					
34	What are the benefits accrued to you after your association with Co-Ops/FPO in ginger and/or garlic cultivation and production?						
	How do you foresee the scope for the Climate Change Adaptation measures getting instrumental for climate risk mitigations?						
	Do you/your organisation receive timely inputs on package of practices, credit, and capacity building on Climate-Smart Agriculture technologies and practices?						
	Which are the organizations involved in providing services – technical and capacity building?						
	How does your organization help in prioritization of CSA technologies and practices						
	What do you think most important measure for CSA? (Please respond in 1-5 scale; where 1 is least important and 5 is highly important)	Water Nutrient Carbon/ Energy Weather Knowledge	1	2	3	4	5

## Appendix 6

Bankers' responses on financing challenges and opportunities in agriculture in Sirmour district of Himachal Pradesh

PARTICULARS	RESPONDENT 1	RESPONDENT 2	RESPONDENT 3
Name	Rajeev Arora	Sunil Karir	Himani Gupta
Bank/Branch	UCO Bank, Nahan	Baghat Urban Cooperative Bank, Nahan	Himachal Pradesh Gramin Bank, Nahan
Type of Bank (Public/private)	Public	Cooperative Sector Bank	Public (Regional Rural Bank)
Designation	Lead District Manager	Exec. Assistant	Branch Manager
Experience in years	30 years	20 years	8 years
Working since	2 years. In my earlier position at previous branch, many farmers were there.	3 years.	2 years.
How often do you interact with farmers?	Since the branch is located district head-quarter so not much interaction with farmers.	Into expansion stage, trying to fulfil the Priority Sector Lending.	Agriculture is one of the focus areas, farmers approach for various requirements.
What is the proportion of loans taken by farmers (in percent)?	5	10	25
Have you given any loans for agriculture?	Not much	Yes, sanctioned INR 59 lakh as agricultural advances in 2020-21.	Yes
If Yes, how often do you deal with garlic-ginger farmers?	Often	Substantial involvement of farmers	Often
If No, is there any specific reason thereof?	Lack of awareness	-	-
What are the issues with lending to farmers in general, and garlic-ginger farmers in particular?	A high value of NPAs	A high rate of NPA, hence given loan on target basis.	Not able to provide collateral
What can be done to improve inclusion of such farmers in bank finances?	Awareness creation	Proper training to farmers to adopt CSA technologies and de-risking financing	Loans should be given based on the viability of the projects

What is the potential of garlic-ginger cultivation here?	High potential	High potential	Very high and received a large number for loan applications
Do you think it can be promoted as a viable enterprise?	Of course. Markets shows several blocks in Sirmaur have shown an exponential increase in the production of these crops	No. There is a problem of collateral which small farmers cannot provide	Yes, of course
Are you aware of the government's RWBCIS/PMFBY and other programs?	Yes.	Yes. They are helping farmers in situation of adverse climate scenario and climate hazards.	Yes. They are helping famers in a large way.
Are you aware of the CAFRI-NABARD project managed by GIZ?	Yes	Yes	No
Do you think bankers require some training/exposure on garlic-ginger value chain?	NABARD being the supervisory body, should organize training programs	Yes	Given the potential of these crops, exposure on garlic-ginger value chain needed
Your comment/suggestions on Climate-risk financing.	Strengthening economic capital of banks	Necessity of blended finance instruments	Risk-mitigation instruments
Are you aware of blended-finance instrument?	Yes. Instruments like guarantees, risk insurance, technical assistance fund, grants, and concessional loans etc.	Yes, different financing mechanisms	Yes, blended finance impacting development objectives and providing risk-adjusted returns to investors



Deutsche Gesellschaft für  
International Zusammenarbeit (GIZ) GmbH  
Registered offices  
Bonn and Eschborn, Germany

Climate Adaptation and Finance in Rural  
India  
A2/18 Safdarjung Enclave  
New Delhi 110029  
Phone +91 49 49 53 53  
Fax +91 49 49 5391  
[Shailendra.dwiwedi@giz.de](mailto:Shailendra.dwiwedi@giz.de)  
[www.giz.de/India](http://www.giz.de/India)