

Strengthening Agricultural Resilience in Mahakali

A Need-Based Approach to Promoting Sustainable Farming Practices

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RUWDUC Nepal

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Contents

Abbreviations	5
Acknowledgement	6
Contributors	8
Preface	9
Executive Summary	11
1. Introduction	13
Objective	14
2. Data Analysis	15
Methodology	15
SECTION I	
3. Sudurpaschim Province, Nepal	19
Brief Profile	19
Findings	23
Discussions and Major Inferences	25
Recommendations	31
SECTION II	
4. Uttar Pradesh, India	39
Brief Profile	39
Findings	40
Discussions and Major Inferences	42
Recommendations	46
Endnotes	48
ANNEXURE	
Questionnaire	51

List of Map, Figures and Boxes

Map 1: The Mahakali River	14
Figure 1: Food Grain Cultivation in Four Districts	19
Figure 2: Mean Annual Temperature of Nepal (2012-2022)	21
Figure 3: Mean Annual Precipitation in Nepal (2012-2022)	21
Figure 4: Number of Illiterates and Literates in Respondents' Pool	22
Box 1: Compost Production as a Source of Manure and Rural Income	27
Box 2: Overuse of Pesticides Despite Banning	28
Box 3: Climate-resilient Polyhouse Farming	30
Box 4: The Vegetable Growers of Gabhiya Sahrai	44
Box 5: Weavers of the Tharu Community	45

Abbreviations

ADS	Agriculture Development Strategy
AKC	Agriculture Knowledge Centre
ARC	Agriculture Research Centre
CGWB	Central Ground Water Board
CSOs	Civil Society Organisations
CSV	Climate Smart Village
DAP	Di-ammonium Phosphate
DSR	Direct Seeded Rice
FGDs	Focus Group Discussions
FWEAN	Federation of Women Entrepreneurs Association of Nepal
GDP	Gross Domestic Product
HP	Horsepower
HYV	High-Yielding Variety
INM	Integrated Nutrient Management
INR	Indian National Rupee
IPM	Integrated Pest Management
KII	Key Informant Interview
KVK	<i>Krishi Vigyan Kendra</i>
MT	Metric Tonnes
NAGRC	National Agriculture Genetic Resource Centre
NGO	Non-Governmental Organisation
NPK	Nitrogen, Phosphorus, Potassium
NPR	Nepalese Rupee
NRB	Nepal Rashtriya Bank
ODOP	One District One Product
PMKSY	<i>Pradhan Mantri Krishi Sinchai Yojana</i>
PMPY	<i>Pradhan Mantri Pranam Yojana</i>
RRR	Rivers, Rights, Resilience
SHG	Self Help Group
UPSDM	Uttar Pradesh Skill Development Mission

Acknowledgement

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Preface



Bipul Chatterjee
Executive Director
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This report provides an in-depth analysis of the challenges faced by riparian communities in the Mahakali basin, spanning Nepal and India, due to climate change. These communities, heavily reliant on agriculture, fisheries, and natural resources, are increasingly vulnerable to seasonal shifts, threatening their livelihoods and even leading to significant out-migration. Despite the pressing need for climate-resilient strategies, many farmers in the region have struggled to implement effective measures, further exacerbating their vulnerabilities.

It identifies several key issues, including the sequential occurrence of floods, landslides, and droughts, which severely impact agricultural productivity. Additionally, the lack of proper marketing channels restricts farmers' ability to sell their produce beyond local markets. While some farmers have adopted practices like integrated farming, mixed cropping, and stress-tolerant seeds, a large portion of the farming community has yet to embrace these strategies.

It emphasises the importance of sustainable development, adaptive management, and community engagement in building resilience. It advocates for a collaborative approach involving government agencies, non-governmental

organisations, and local communities to address these challenges. The study, conducted by CUTS International with support from CUTS Geneva, aims to tailor area-specific solutions that enhance the livelihoods of the Mahakali basin's farming communities. The report outlines a pathway toward a sustainable and resilient future for these vulnerable communities through targeted interventions and continuous support.

It highlights its alignment with multiple Sustainable Development Goals (SDGs). In addressing SDG 1, which focuses on eradicating poverty, the study aims to alleviate poverty among female farmers by promoting sustainable agricultural practices and advocating for alternative income sources.

SDG 5, which emphasises gender equality, is also central, as the report underscores the importance of recognising women's contributions to agriculture and enhancing their livelihoods through equal opportunities.

SDG 2, which seeks to achieve zero hunger, is particularly relevant as the study explores strategies to ensure year-round food security for vulnerable communities and address food shortages.

Additionally, SDG 13, which focuses on climate action, is reflected in the report's emphasis on combating the adverse effects of climate change through sustainable and organic farming practices that promote soil health management.

Lastly, SDG 6, concerning water governance, is addressed by advocating for the sustainable management of water resources and ensuring their quality in the face of increasing environmental challenges.

Executive Summary

Addressing the challenges faced by the riparian communities of the Mahakali basin requires a multifaceted approach that combines sustainable agricultural practices with improved infrastructure and market access

Seasonal shifts are increasingly concerning, with the agricultural communities becoming the frontline victims. The riparian communities of the Mahakali basin in Nepal and India constitute a few victims who are highly vulnerable to this environmental hazard. The basin is a critical region for riparian communities' livelihood, mainly because it supports agriculture, fisheries, and natural resources. Despite being increasingly threatened by climate change's adverse effects, most farmers still need to mobilise and use effective climate-resilient strategies.

In some cases, the failure to do so has also forced outmigration in huge numbers. By focusing on sustainable development, adaptive management, and community engagement, their livelihoods can be safeguarded, and the region's resilient future can be ensured. However, this requires the collaborative efforts of various stakeholders, including government agencies, non-governmental organisations and local communities.

This Report focuses on the selected study areas in Nepal (Mahendranagar, Baitadi,

Dadeldhura, Darchula) and India (Lakhimpur Kheri and Pilibhit in Uttar Pradesh). It aims to identify the challenges faced by the farming communities in the basin due to climatic shifts. This would help tailor area-specific solutions to help them adopt climate-resilient measures to improve their livelihoods.

Data was collected mainly in two stages: first, through primary sources using a questionnaire, and then the findings were supported by information gathered in the second round through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). Lastly, the suggestions for the problems raised by stakeholders were validated by discussions with subject experts from both countries in a validation webinar.

Section I highlights Nepal's problems and lists the recommended solutions. In Nepal, the sequential occurrence of floods, landslides, and droughts makes it difficult for farmers to produce a good harvest. Moreover, the absence of proper marketing channels (in most cases) makes getting good sales in diverse markets difficult and restricts sales to the local markets.

Some farmers have adopted integrated farming and mixed grain cropping with commercial crops. However, a significantly large portion of the farmers under study are yet to realise the importance of such practices and adopt them.

Section II highlights the problems faced by the communities in Uttar Pradesh and provides specific recommendations. The farmers are more exposed to heavy floods during most of the year. They also rely heavily on chemical pesticides but with mulching and mixed cropping practices.

Sugarcane, the area's main crop, benefits the farmers economically and environmentally. Economically, since sugarcane is sold not only in its raw form but also in processed forms, it helps the farmers earn a good amount of income. Environmentally because the sugarcane helps hold the soil to the ground. The other crops cultivated in the region are mostly for subsistence due to demand shortage from larger markets.

The common problem noticed in both countries was that most agriculturalists did not acquire crop insurance, while only a few acquired animal insurance. Another common aspect is that most farmers cannot embank the river due to its heavy currents, which cannot be held even by the embanked area. Also, most farmer

cooperatives have no or limited options to switch to sustainable alternative livelihood options.

Given the vulnerable background of the Mahakali basin, it becomes imperative to develop climate-resilient practices for agriculture and allied sectors, which constitute the main occupation of these riparian communities. This study's recommendations are tailored to the problems faced (as highlighted in the main Report). Some include promoting stress-tolerant seeds, green manures, afforestation, improving market connectivity, and organising awareness sessions, among many others.

Addressing the challenges faced by the riparian communities of the Mahakali basin requires a multifaceted approach that combines sustainable agricultural practices with improved infrastructure and market access. By leveraging the strengths of local knowledge and scientific advancements, it is possible to enhance the resilience of these communities against climatic shifts.

Collaborative efforts from all stakeholders are crucial in developing and implementing effective strategies. Through targeted interventions and continuous support, the livelihoods of the farming communities in the Mahakali basin can be safeguarded, paving the way for a sustainable and resilient future.

1

Introduction

Given the increasing incidence of extreme weather events in the basin, climate-resilient agricultural practices have gained significance for ensuring stable farmer income

The Mahakali River Basin, one of Nepal's five significant river basins, is shared with India. Spanning over an area of 14,871 square kilometres, with a catchment area of 17,818 square kilometres, approximately 34 per cent of the basin lies within Nepal. The basin encompasses the Sudurpaschim Province on the eastern side of the Mahakali River, while the Indian states of Uttarakhand and Uttar Pradesh adjoin the western side. The river serves as a border for the following districts of the two countries: Kanchanpur, Dadeldhura, Baitadi, and Darchula in Nepal and Pithoragarh, Champawat, Pilibhit, and Lakhimpur Kheri in India.

The Mahakali River is an integral part of the lives of riverine communities in India and Nepal and has socio-economic and cultural significance. The Indo-Nepal Treaty of Peace & Friendship 1950 allows the cross-border movement of people without visa formalities. Thus, the bordering districts of India and Nepal share close cultural and traditional relationships nurtured by the communities on both sides. The vibrant border markets, the

thriving informal cross-border trade and *melas* are the testimonies. The mirror locations on either side of the border are homogenous, with similar agroecological conditions and cropping patterns.

The Mahakali Treaty of 1996 is the bilateral agreement between these two countries for the integrated development of the Mahakali River, which includes the Sarada Barrage, Tanakpur Barrage, and Pancheshwar Project. The treaty has provisions for water sharing, river management, and infrastructure development. However, there have been concerns, particularly from the Nepal side, about the delay in implementation, creating a deadlock in bilateral water cooperation. The changing political landscape of the region demands a renegotiation of the treaty.¹

Despite this issue, the communities continue to share close tie-ups and kinships across borders. The basin is vulnerable to climate change and mainly experiences flash floods, landslides, and hailstorms. Moreover, due to climate change, these areas also face warmer temperatures, erratic monsoons,

and droughts, which impact cropping patterns and water availability and make rural communities highly vulnerable.

Given the increasing incidence of extreme weather events in the basin, climate-resilient agricultural practices have gained significance for ensuring stable farmer income.

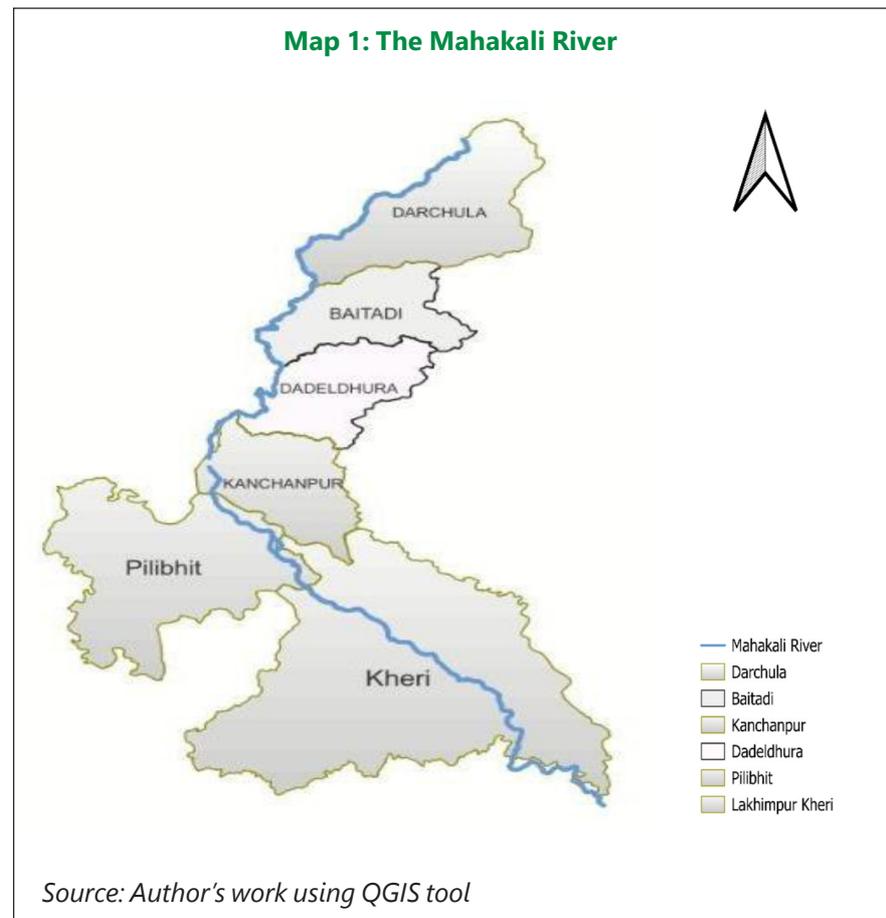
This study explores the challenges faced by the riverine communities in the Mahakali basin engaged in agriculture, the existing practices regarding agriculture and water management, and practices that can be followed in the basin to build the resilience of the farming communities. The rationale of this

study is in tandem with the aim of Rivers, Rights, Resilience (RRR), i.e. to strengthen the resilience of the riverine communities.

Objective

The objective of this study is to identify the challenges faced by the farming communities in the Mahakali-Sharada basin falling in the Sudurpaschim Province of Nepal and the districts of Lakhimpur Kheri and Pilibhit in Uttar Pradesh. It also aims to assess their need for climate-resilient agricultural practices, suggesting opportunities to help them build resilient livelihoods.

Map 1: The Mahakali River



2

Data Analysis

Nepal and India are vulnerable to climatic changes and natural calamities like drought and floods. The challenges faced by the farmers force them to out-migrate to bigger cities or foreign countries in search of better livelihoods

Methodology

For this study, both qualitative and quantitative tools have been used.

In the first phase, qualitative data was collected through surveys of local stakeholders. The questionnaire included demographic and occupational characteristics, farming practices, irrigation facilities and use of climate-resilient practices. The respondents were selected through purposive sampling.

A total of 100 respondents were surveyed on the Nepalese side, 25 each from the districts of Baitadi, Dadeldhura, Darchula, and Kanchanpur in Nepal. Over 78 per cent of the participants were females. The number of respondents from the village of Palia Kalan in Lakhimpur Kheri (Uttar Pradesh, India) was 25.

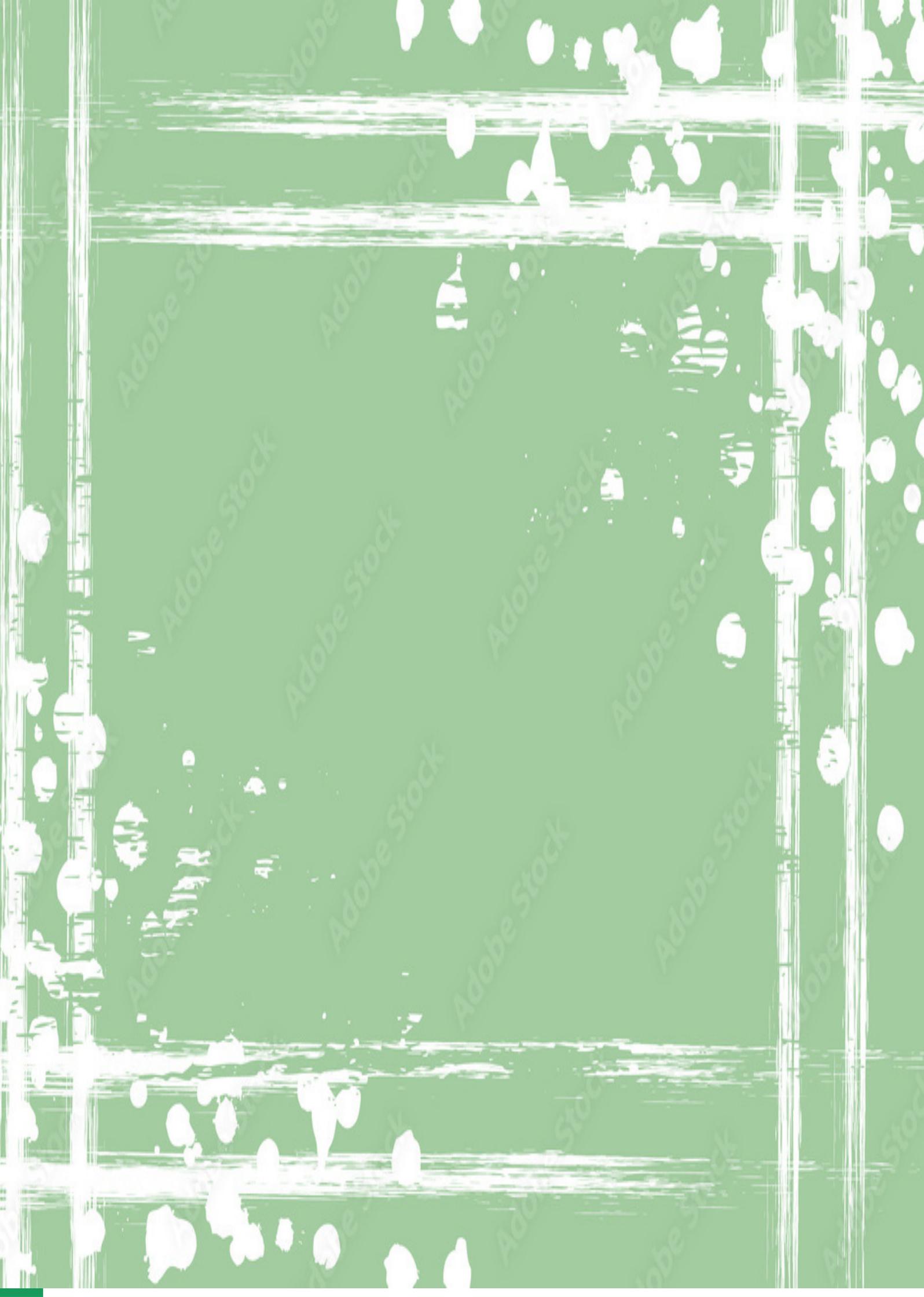
In the second phase, KIIs and FGDs were conducted with a few more stakeholder groups, which included farmer cooperatives, agricultural officers, university researchers and agricultural researchers on similar lines. This was the qualitative data collection method, which was done to

validate the responses collected through the surveys.

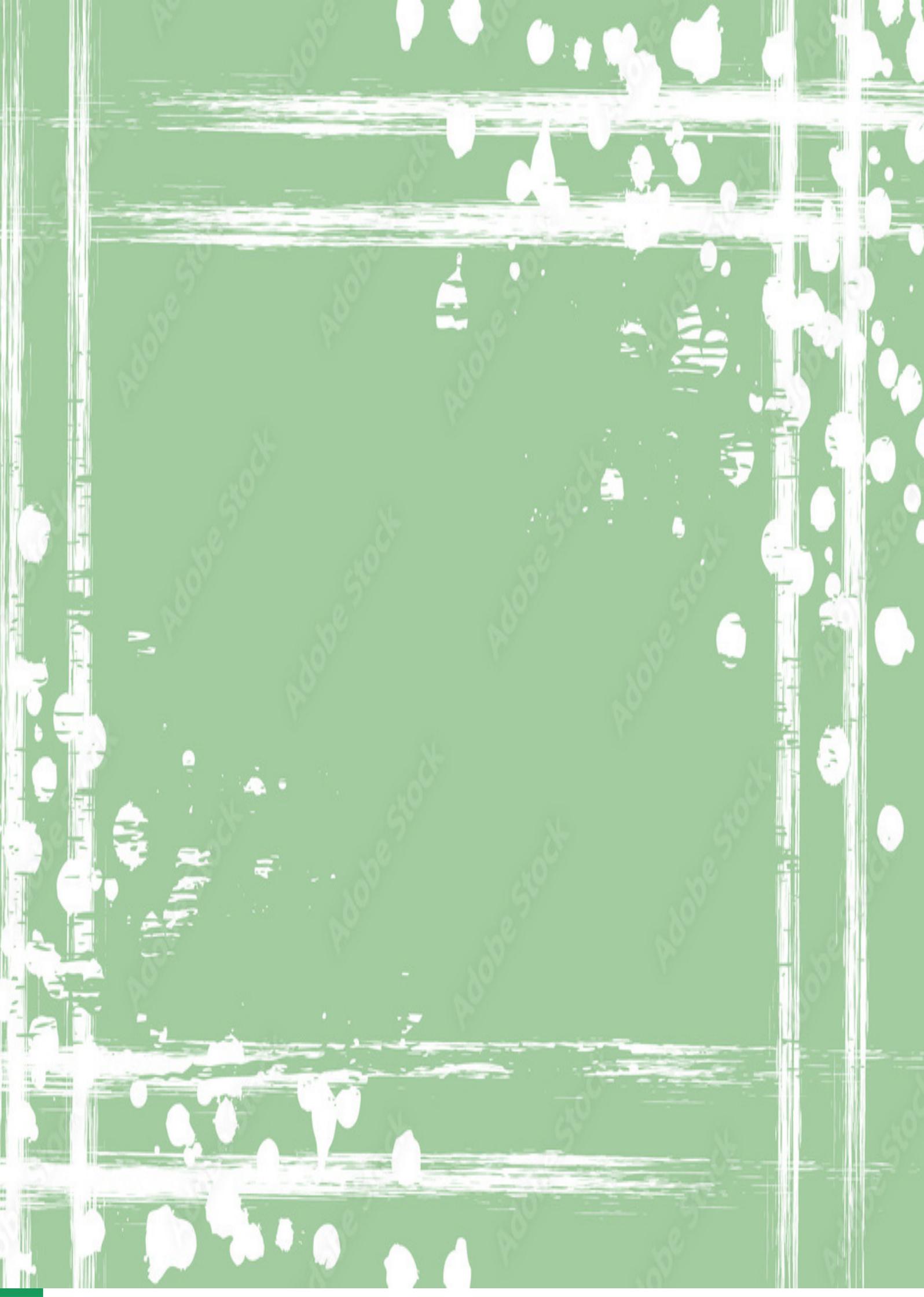
Four all-women farmer cooperatives, three AKC officers, one research centre officer, and one provincial government representative from the training centre were interviewed. These discussions were conducted in Darchula, Dadeldhura, and Kanchanpur in Nepal and Palia (Lakhimpur Kheri) and Gabhiya Sahrai (Pilibhit) in Uttar Pradesh, India.

It has been observed that the surveyed regions in both Nepal and India are vulnerable to climatic changes and natural calamities like drought and floods. The challenges faced by the farmers force them to out-migrate to bigger cities or foreign countries in search of better livelihoods.

This Report has been divided into two chapters, both of which address the agricultural landscape, challenges, and solutions to those challenges in a country-specific manner. Section 1 addresses these in Nepal, while Section 2 addresses these in the Indian context.



SECTION I



3

Sudurpaschim Province, Nepal

Brief Profile

As per the Nepal census 2021, the total population residing in the Sudurpaschim districts is 2,694,783.² This figure was achieved after a 5.52 per cent increase since the 2011 census. Of this aggregate, males constitute 47.23 per cent, while females constitute 52.77 per cent. Household sizes have been shrinking from five persons per household in 2011 to four persons per household in 2021.

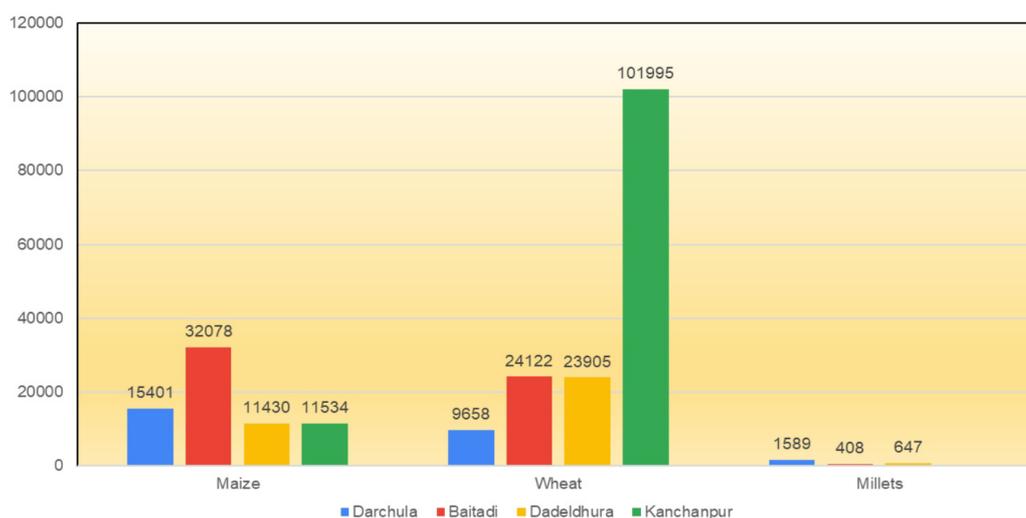
The high outmigration numbers, a primary cause of this pattern, have

also affected the sex ratio of males per 100 females (from 91 males in 2011 to 89 males in 2021).

Migration statistics show that 29.8 per cent of the population lives abroad due to work, business, study, dependent family members, and frequent natural disasters.

While agriculture, forestry and fishery are the primary sources of livelihood and income (constituting 65.2 per cent of the population), people also engage in small-scale enterprises like cottage industry, trade and business, transportation services and others (constituting

Figure 1: Food Grain Cultivation in Four Districts



Source: Ministry of Agriculture and Livestock Development 2023

8.8 per cent of the households).³ Approximately 11.8 per cent of women own or use land, or both. The main source of drinking water is tap or piped water. Tube wells, hand pumps, uncovered wells and river/stream water are some other sources that are not widely used.

The region's agricultural landscape nurtures the cultivation of wheat, rice, corn and millet. Oilseeds, spices, lentils, and fruits and vegetables are also grown. The data from the same period shows that Kanchanpur has the largest share in the production of oilseeds and spices (large cardamom, ginger, garlic and turmeric) at a cumulative rate of 14684 metric tonnes. It is followed by Darchula at 2420 metric tonnes, Dadeldhura at 1836 metric tonnes and Baitadi at 1592 metric tonnes.⁴

In the case of lentils (chickpeas, pigeon peas, black gram and soybean), Kanchanpur ranks at the top with 7637 metric tonnes of production, followed by Dadeldhura at 2981 metric tonnes, Baitadi at 1389 metric tonnes and Darchula at 968 metric tonnes.

Lastly, Kanchanpur produces fruits and vegetables like apples, walnuts, cauliflowers, radishes, cucumbers, and tomatoes, totaling 50248 metric tonnes. It is followed by Dadeldhura, which produces 17888 metric tonnes, Darchula, which produces 12050 metric tonnes, and Baitadi, which produces 9029 metric tonnes.⁵

However, the produce is mainly sold locally and not taken to faraway city markets. Suboptimal

road connectivity is a significant challenge for marketing. Environmental conditions, like torrential rains and extremely high heat, erode the roads in the hilly region.

Irrigation

Farmers in the Sudurpaschim Province of Nepal use different irrigation equipment depending on the crops grown, farm size and government benefits provided. Almost all pumps (solar, electric, diesel, petrol) and their components are imported from India and China. Indian pumps are the most popular, but due to their low cost, Chinese pumps are increasingly gaining market share. Irrigation equipment manufactured domestically comprises largely plastic-based components, including drip kits, sprinklers and tube well fittings.

These manufacturers rely on the provisions of governmental subsidies and other benefits. Similarly, irrigation vendors depend mainly on import-export companies and authorised distributors in the supply chain, as these importers maintain standard stock supply and handle import-related duties. Vendors then deploy irrigation equipment by using regional distribution and sales offices.

The farmers in the study locations still rely on traditional irrigation modes, while only a few have modern technologies. High irrigation costs are the significant barriers farmers face to better irrigation, as most have to rent

expensive diesel pumps. There is a growing need for better irrigation facilities, creating a supply chain, and establishing a sustainable and inclusive irrigation development.⁶

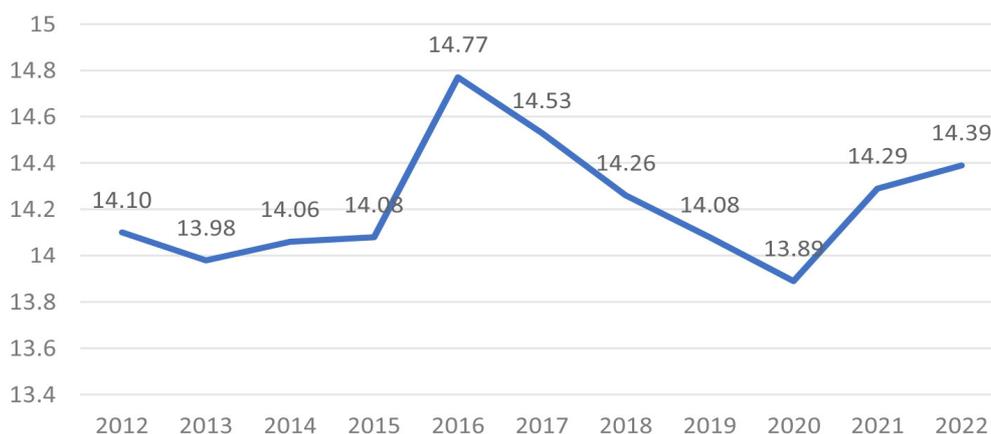
Climate and Weather

In Nepal, the monsoon arrives in June with heavy downpours and thunderstorms. It arrives first in the east in early June, while the far west gets monsoon from the middle of the month. The temperature decreases to 33 degrees in July and August, but the

humidity increases, making the heat muggy. The rain gets more intense, exceeding 300 millimetres (12 inches) per month, while in certain terrains, it exceeds 600 millimetres (23.5 inches) per month.⁷

Due to soaring temperatures, climate and disaster risks in various districts of Nepal are expected to increase progressively, affecting people, the economy, the environment and socio-development gains. Nepal's

Figure 2: Mean Annual Temperature of Nepal (2012-2022)



Source: Climate Change Knowledge Portal, World Bank⁸

Figure 3: Mean Annual Precipitation in Nepal (2012-2022)



Source: Climate Change Knowledge Portal, World Bank⁹

temperature will increase by about 0.9 degrees between 2016 and 2045 under a medium-range emissions pathway. Winters are projected to be drier, and monsoon summers wetter, with up to a threefold increase in rainfall.

The number of people in Nepal annually affected by river flooding caused by climate change is expected to double to around 350,000 by 2030 (from 157,000 in 2010). Climate variability is impacting Nepal through calamities like floods and droughts (caused by untimely rainfall), which is further affecting the economy by lowering agricultural productivity.¹⁰

The precipitation statistics (2023) of the Sudurpaschim area show that the area received average to above-normal rainfall. The temperature statistics revealed that the region had maintained average to below-normal temperatures. There have been cases of severe droughts in some parts of this region.

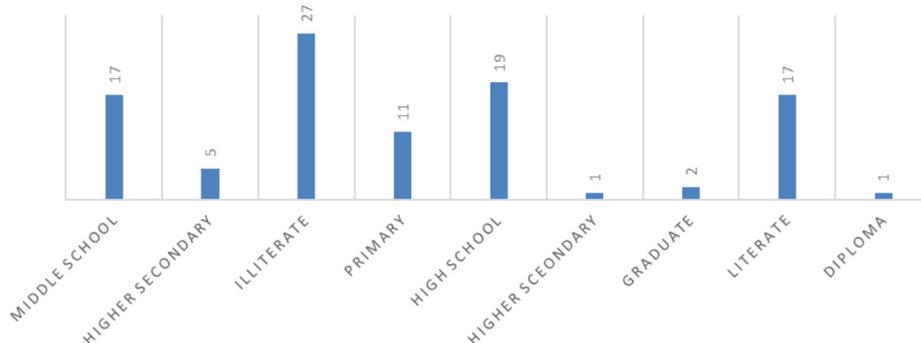
The Kanchanpur district of this province faced extreme drought, with average precipitation levels falling by 30 per cent during

October 2023. Contrastingly, in 2022, the same province recorded more than average rainfall, which also caused floods in regions like Darchula. In September 2022, the over-flooding of the Mahakali River caused casualties, and many people lost their lives in the process.¹¹

It has been noted that floods and droughts remain the two major climatic shocks in the region. While people in the higher altitudes experience untimely rain, droughts and hailstorms, the households in the hilly terrains face torrential floods. Added to these is the problem of pest outbreaks in crops. Most of these outbreaks have become uncontrollable due to the growing resistance of pests to pesticides in use.

Such climatic irregularities and vulnerabilities have caused homelessness, loss of human capital and natural resources, and cropping delays (shifts in the cropping pattern). These, paired with the disrupted and damaged roadways, ultimately lead to market shocks, crop damage, and delays in the supply of relief materials to the victims.¹²

Figure 4: Number of Illiterates and Literates in the Respondents' Pool (Literacy: Enrolment in Different Levels of Education)



The need for more job opportunities keeps pushing up the outmigration rates, with the main job destinations being India and the Gulf countries

Findings

The primary survey done in the first phase gave the following results for the Nepalese side: Among the surveyed individuals, 26.26 per cent are illiterate, while the remaining individuals are either minimally literate or attending school.

The study districts' local communities have access to schools and colleges. The colleges offer courses on different subjects, including agriculture and technology. Healthcare centres are catering to the needs of the local people. At places like Darchula, there are separate hospitals for women's prenatal healthcare. The need for more job opportunities keeps pushing up the outmigration rates, with the main job destinations being India and the Gulf countries.

Of the 100 individuals surveyed, 23 per cent provide a labour share of (60-70) per cent in their families. Also, only 23 per cent of the families experience a higher female labour participation than males, indicating the feminisation of agriculture.¹³

Approximately 80 per cent of the respondents engage in agricultural or farming activities, with a minority involved in salaried jobs. Some individuals work in foreign countries such as India or Saudi Arabia.

Farming Practices

Landholding sizes in Nepal vary widely, ranging from a minimum of two *ropani* to a maximum of two

acres. On average, the land holding size is 10 *ropani*.

The primary crops cultivated in the Mahakali basin include rice (paddy), wheat, corn, soybeans (brown), various pulses (lentils, peas, urad, chickpeas) and oats. Additionally, the region places significant importance on certain fruits like mango and guava. The respondents shared that they use traditional seeds and high-yielding varieties (HYVs), which are mainly sourced from their stock, family members', or neighbours'.

21 per cent of the respondents adopted only chemical fertilisers, 25 per cent adopted only organic manures, while the rest (majority) opted for an integrated approach of organic and chemical fertilisers. Fertilisers are obtained from private shops or, in some instances, from the agricultural department through specific schemes.

Since women are the face of agriculture in the villages, it becomes essential that they have access to the necessary farming technologies that effectively aid them in carrying out their activities. In Parshuram, the women can access small land tilling machines (mini tillers). The AKC in Darchula has installed one thresher for village women who are majorly involved in threshing.

While 30 per cent of respondents own farming equipment, most rely on rented equipment for their agricultural practices. Farm equipment is either bought at subsidies or provided free of cost

Most individuals stated that they need more financial assistance for their farming activities

by the AKCs. Farmers in certain districts like Mahendranagar receive agrarian machinery at a highly subsidised rate of almost 80 per cent. The remaining 20 per cent is to be met by the farmers in the initial phase and later reimbursed by the local government bodies.

Farmers in the region also adopt zero-tillage practices, Integrated Pest Management (IPM), drip irrigation, furrow irrigation, composting, and mixed cropping. Their focus is generally on subsistence farming, producing primarily for personal consumption. Only a small proportion of individuals sell their products in the market, as the marketable surplus in these areas is limited.

Most individuals stated that they need more financial assistance for their farming activities. Others pointed out that they occasionally receive support from local banks or Non-Governmental Organisations (NGOs), as required. 40 per cent of the respondents reported that typically, friends or relatives assist during financial crises.

Nonetheless, respondents have indicated that agricultural practices are becoming increasingly costlier across various aspects, including labour, seeds, fertilisers, irrigation and machinery rental. Almost 15 per cent of the respondents claimed they get financial help from cooperative banks to purchase agricultural inputs.

Irrigation Practices

During summer, farmers encounter water scarcity for agricultural activities. Most respondents have an insufficient water storage system, and only a few mention community tanks and rain harvesting for their farming practices.

60 per cent of respondents have yet to express concerns about water availability or management, which were previously raised in meetings or forums. However, the remaining respondents have raised concerns following consultations with local government, *panchayats*, or NGOs. Farmers occasionally alter their cropping patterns due to reliance on water from other states or nations.

Most respondents emphasised their year-round utilisation of irrigation methods such as tube wells, canal irrigation and lifting water from streams or rivers. Only a few respondents own pump sets, primarily within a community context rather than individually. These pump sets can be used at a nominal fee whenever irrigation is needed.

A few respondents have indicated using Mahakali River water for irrigation, facilitated through water tanks and canal systems. Respondents in Nepal access water supplied by the irrigation department three to four times a year, incurring costs ranging from NPR 1000-1500. Only 10 per cent of respondents are found to have irrigation pumps connected to electricity.

To support the survey results the facts collected were discussed with field-level stakeholders to ascertain their opinions

Climate Resilient Practices

Over the past three years, the Nepali people have experienced various climate-related challenges, such as drought, floods, landslides, earthquakes, pest outbreaks, and market shocks (price collapses). They receive warnings from the government, television, radio, newspapers, neighbours, village elders, etc. Additionally, they rely on their traditional knowledge to navigate unforeseen circumstances.

Only five respondents reported having crop or animal insurance. The low adoption rate is attributed to the perception that insurance is unnecessary. Most community members in the surveyed villages know the government insurance policies on livestock and crops. Only the members of the women's cooperative at Parshuram were unaware.

Despite such awareness, farmers do not adopt crop insurance (though livestock insurance is still prevalent). The main reason for this is the complex paperwork associated with the process. Also, sharecroppers who do not own farming land pastures cannot avail themselves of insurance.

Interestingly, only one respondent shared that they received compensation of NPR 18,000 from Krishi Cooperative Limited.

Merely 10 per cent of the respondents were noted to have received training in climate-resilient agricultural practices, specifically focusing on water

conservation, sustainable use, crop diversification and integrated farming. However, there is a significant demand for additional training in various areas, including climate change adaptive agricultural practices, practical instruction for lift motors, general training, climate change adaptation, technical support for resilient livelihoods, afforestation, embankment work, climate change-related education, waste management, soil testing, mechanisation, seed availability, vegetable farming techniques, equipment support, irrigation, etc.

Discussions and Major Inferences

To support the survey results the first phase, the facts collected were discussed with field-level stakeholders to ascertain their opinions.

To keep up with the changing environmental conditions, awareness about **crop management** practices and other agri-techniques have been introduced to the locals. Interviews with women cooperatives revealed that integrated farming or mixed cropping techniques have been taken up. Although staples like rice, wheat and corn remain the main crops for cultivation on their lands, the fallow areas are now being utilised to grow commercial crops like dragon fruit (in Mahendranagar) and vegetables like tomatoes, broccoli, cabbages, cauliflowers, pointed gourd, mustard, pulses and oilseeds (like soybeans). In higher altitudes (in



Inter-cropping in Dragon Fruit

Darchula), apples, walnuts and kiwis are being grown.

The importance of short-duration variety seeds is being realised gradually. Some of such varieties have already been used in the Mahendranagar province. Yet, most of the farmers in the other districts have accepted that the failure of their crops is due to the shortage of such seeds.

The women's cooperative interviewed in Parshuram spoke about the certainty of crop failure in the upcoming months (from when they were interviewed in March 2024), despite changing wheat and rice cropping patterns. The delay in the arrival of seasons is the primary cause.

Now, they were anticipating hailstorms, which will cause crop loss. Since they use traditional methods and normal seeds, they cannot thwart the losses from such a calamity.

Milletts are not very popular among cultivators since they are not a part of the main diet of the local people and are not in demand much in the other markets. However, some regions in the Dadeldhura district have been growing this crop and producing low-value-added products from millets. Some of these products are ready-to-eat *chapatis*, *halwa*, etc. These regions are also being promoted under the Climate Smart Village (CSV) scheme to let the effects percolate to the other areas.

Box 1: Compost Production as a Source of Manure and Rural Income

In the Maurada District of Dadeldhura, Nepal, a local factory produces, packages, and sells compost. Cow dung and mustard bran are decomposed and processed to prepare the manure. These inputs are sourced from nearby households. By selling a compost bag at NPR600, the company can earn 30 to 35 per cent profits. The seasonal gains from selling 1000 packets amount to NPR600000.



Compost Processing and Packaging Unit

Interestingly, this profit is increasing annually, as the factory owner claims. The business has improved in recent years since the demand for the products has increased from the polyhouse owners, kitchen garden owners, and farmers growing food grains and different vegetables and fruits. The compost is packed, labelled and then marketed. The business provides the workers with a decent income, thanks to sufficient profits from the high sales.

However, the issues faced are mainly in the marketing domain since the business has the potential to capture a larger market share. The number of customers willing to purchase organic fertilisers is also limited. The major crops remaining in this district are paddy and wheat.

Inference: Farmers need to be sensitised to the benefits of organic manures like natural compost and vermicompost. With increased demand, women can run similar small enterprises to produce these composts as an additional source of income.

The field interactions revealed that the farmers have participated in the IPM training organised by the government at the district level. Composting practices (like vermicompost) are rare among the farmers, but training has been provided. Models of vermicompost, drip systems, and

polyhouses are also used at the fairs to enlighten the farmers. Additionally, placards demonstrating the methods to carry out the activities are distributed along with the products sold. However, the adoption level of such practices needs to be higher.

Box 2: Overuse of Pesticides Despite Banning

Increasing instances of disease and insect infestation are impacting crop yields adversely. This was observed in all the survey locations in Nepal. One primary reason for this is the growing immunity of pests against the pesticides used. The change in weather parameters is also a reason for increased pest attacks. The growing concern leads the farmers to source prohibited pesticides illegally into the country.

Since trading is illegal, no authorities can instruct people on using such pesticides. As a result, the farmers likely use these illegally traded pesticides in high quantities to see quick effects. They may do this without realising the adverse impact arising from the ungoverned use.

Although the local AKC has conducted awareness training on the illegal sourcing and unmeasured use of chemical pesticides, farmers continue to buy them. Lawful punishment exists for a person caught in such trading. However, the punishments and warnings are useless as the administration has loopholes that need to be addressed.

Inference: Research institutions and knowledge centres should inform farmers about alternatives to banned pesticides. Civil Society Organisations (CSOs) can train on Integrated Pest Management and bio-pesticide formulations.

The **irrigation facilities** for the farms are generally tube wells and *nehers*. The water bored out is supplied through pipelines to the fields. Some wealthier families own lift irrigation, and water from such systems can be bought from them at a nominal fee. In one of the villages in Darchula, the local community members use the local spring water through pipelines in their fields.

In some other villages, there are arrangements of plastic ponds. Sprinkler structures have been established at the enormous polyhouse structures at Dadeldhura; however, pipeline water remains the main source there. Even in demonstration plots where the drip irrigation system was installed on full subsidy, it was

found ill-maintained and unused. Furrow irrigation was noticed in one of the fields of Mahendranagar, where such arrangements have been made to create water channels to irrigate the cash crops.

The main challenges about **marketing** are the low volume of production, poor transportation facilities, and the predominance of middlemen. In Darchula, transporting goods to other villages or city markets remains tough due to the bad condition of the roads and the absence of efficient transport vehicles. The environmental conditions and the rough terrain increase the transportation time. Marketable surplus is mainly sold through intermediaries.



Women entrepreneurs at a fair in Dadeldhura

The Federation of Women Entrepreneurs Association of Nepal (FWEAN) organises trade fairs where women are involved in different activities like pickle-making, sweater-knitting and making other local food items and set up stalls to sell their products. Such fairs are usually organised during the off-season at various locations, and FWEAN makes all the arrangements to enable women entrepreneurs to sell their products. Such fairs/exhibitions provide a platform for women farmers to sell their products.

Climate-resilient Practices

Given the presence of such climatic adversities, drought-resistant varieties of crops are required. Farmers can cultivate crops that grow well in dry lands or use the technologically modified drought-resistant variety seeds of their usual crops. While the villages in the southern districts use these varieties, seeds for the northern districts like Darchula have not yet been developed.

The community revealed that although they were given some hybrid seeds to cultivate, those led to failed crops due to the non-suitability of the

local topographic conditions to the seeds. Similarly, since the district of Mahendranagar is flood-prone, flood-resistant seeds are required for their usual crops or to cultivate other crops that can grow well in the flooded fields.

Some other climate-resilient activities include using polyhouses, nutrient application based on soil health status, cold storage for the past season's produce, and organic manures and pesticides. Of these, only the cold storage facility remained missing in all the sites surveyed. Since farmers could not immediately trade their surplus in other markets due to transportation constraints, the AKC Darchula's officer supported the establishment and operation of cold storage units.

Other than grains, the local farmers of this district grow perishable agri-products like fruits (apples, citrus and mango are highly produced), which can be stored for sale later. The barrier of the Mahakali basin is yet to be built in Parshuram since it is believed that the barrier will not be able to withstand the rough currents of the river. However, bio-fences of bamboo and sugarcane have been laid in certain parts of Mahendranagar.

Box 3: Climate-resilient Polyhouse Farming

Guma Awasthi of Maurada, Dadeldhura, Nepal, has built almost 43 polyhouses over the last seven years and grown crops like tomatoes, broccoli, and bell peppers. She and her husband shifted from Kathmandu to Dadeldhura and entered the farming business. She has availed herself of the subsidies provided by the provincial government body of Dadeldhura.

A polyhouse provides controlled climatic conditions for crop growth in different seasons. Ms Guma mentioned that she had not benefitted from any training programme organised by the local government or CSOs, except for specific technical fittings like installing bamboo structures in polyhouses. Instead, she relies on the internet to learn about polyhouse farming. The couple was trained online by an expert based in Kathmandu. Now, the couple provides training to other farmers for installing polyhouses.

Guma says that the use of organic pesticides is still limited due to their restricted efficacy. The pest control is mainly done through chemical pesticides. The Nepalese government and the different ARCs must invest in Research and Development for effective pest control.

Their harvests fetch the couple a monthly income of NPR200,000. Local traders and middlemen collect the produce to sell it in the nearby Haats/Bazaars. The most popular vegetables grown in such structures are tomatoes, radish (grown in Mahendranagar's polyhouses as well), cauliflower, and cabbages.



Polyhouse Owner, Guma Awasthi

Due to the high initial investment cost and inadequate subsidies, many farmers refrain from using these structures. Only those who can afford to buy the materials and other set-up tools or receive them through subsidies go for polyhouse farming. In Darchula, only plastic is subsidised, and most locals have yet to construct the entire structure without any assistance.

In Mahendranagar, although CSOs construct polyhouses, the farmers need to manage and use them correctly. Usually, females head their households, so they have time constraints to manage farming (in polyhouses) and their household chores. Those polyhouses were established with total subsidies using family labour for construction. However, a sense of ownership needs to be present, which has also led to the neglect of those structures.

Inference: Initial heavy investment for polyhouse is a challenge for marginal farmers. Such farmers can adopt low-tech polyhouses using locally available resources like bamboo, which can be used as a shelter for crops during heavy rainfall. Tailored and customised models need to be promoted based on the requirements of farmers with subsidies. However, a mandatory beneficiary contribution must be laid in the policy to inculcate a sense of ownership.

Alternative Sources of Livelihood

The local topography supports sand mining (in Mahendranagar), poultry and fishing activities. Although sand mining is a remunerative alternative livelihood, fishing is not practiced much due to the contractual fees levied by local middlemen for this activity in parts of the Mahakali waters. Also, since the river is known for its frequently occurring irregular tides, the water fails to guarantee a regular supply of fish stock for sale.

Similar is the case with poultry. In high-risk areas like Mahendranagar, poultry rearing for commercial purposes is rare. This is because the frequent floods wash away the reared animals, causing loss of animal life. In other places, too, only cows are commercially reared due to the facility of a dairy cooperative nearby.

The cooperative members in Darchula expressed their need for more information about different types of livestock feed other than green grass. For them, livestock rearing is authoritarian since fresh grass cannot be sourced daily from the higher altitudes of their village. In Mahendranagar, the locals also practice seasonal migration, mainly to provide agricultural labour in other cities.

In Parshuram, the local women have been trained in stitching. Similarly, in Mahendranagar, the local government has given some training to the locals on making stitched dolls and pickles.

However, such training for alternative livelihoods is insufficient since these products do not garner enough demand to earn them sufficient income.

Recommendations

- Cultivation of **stress-tolerant (water stress-tolerant in particular), short-duration, less water-intensive, and highly nutritious variety seeds (including HYV and hybrid)** should be promoted. These can enhance the climate resilience of farming communities. Farmers need to be enlightened about their benefits. Research institutions should develop and test these varieties to ensure they are compatible with the local agro-climatic conditions.
- Local governments should collaborate with institutions like the National Agriculture Genetic Resource Centre (NAGRC) or Genebank¹⁴ to preserve **traditional (indigenous) varieties** to regenerate germplasm through **breeding programmes**. Such programmes would further help promote both in-situ and ex-situ conservation of agrobiodiversity. Farmers should also be encouraged to continue using **traditional knowledge** to produce **local seeds** instead of entirely depending on hybrid seeds for production.
- To promote sustainable rice production, **Direct Seeded Rice**

(DSR) should be adopted, replacing the traditional method of sowing pre-sprouted saplings, since the former requires less water, labour and financial inputs. Another sustainable practice to consider is the **organic mulching technique** (utilising living, stubble, vegetable or straw mulches). Additionally, farmers can adopt **alternative cropping patterns** for their main commercial crops, such as cowpea and soybean, which enhance biological nitrogen fixation in the soil. Traditional practices like walking barefoot through the fields can improve crop productivity through natural tillering.

- There is a need for improved and effective delivery of extension services and capacity building. CSOs can contribute by organising training/capacity-building programmes tailored to meet the needs of the local communities. For instance, training on bio-pesticides and bio-fertilisers, using traps, integrated farming, pest management, agroforestry and water resource management, sewage and waste management, controlling forest fires and grafting and pruning techniques can be provided.

Additionally, it is important to sensitise the farmers on the rational use of fertilisers [like Di-ammonium Phosphate (DAP)] and pesticides and raise awareness about the dangers of using low-quality seeds to prevent soil and water

pollution. Emphasis should also be laid on designing subsidies for organic fertilisers to regulate the use of chemical fertilisers, hybrid and HYV seeds.

- In Dadeldhura, many farmers are excluded from the training programmes. To address this, government funds must be properly disbursed to arrange for knowledge materials and broadcasting equipment to disseminate the information to the excluded farmers.
- Promoting the use of plants like agave and asuro (Malabar nut) as green manures and practices such as retaining crop residues and using farmyard manures for composting can improve soil moisture content and water use efficiency. Additionally, using biochar and cattle urine can increase soil's organic matter and moisture levels. Training farmers on grafting and pruning techniques, zero tillage, and afforestation in dry lands is also essential to increase forest covers and fodder stock.
- Organising awareness-generation programmes on government schemes and subsidies, the advantages of soil testing, and crop and livestock insurance is essential. Camps can be organised with the support of AKCs and concerned departments to distribute application forms and perform on-site verification of supporting documents.

- Awareness campaigns can be conducted to educate the farmers about the importance and benefits of crop and animal insurance.
- Schemes for benefit sharing and carbon trading (where industries can adopt self-degrading carbon practices), associated with carbon sequestration should be developed. There should be financial incentives for ecosystem services to encourage tree planting. Also, since many farmers wanted to secure livelihoods by learning to farm off-season vegetables instead of focussing on on-season vegetables, it is essential to enlighten them about the high input costs associated with off-season farming.
 - Organising coordinative/consultative workshops with government representatives from provincial, district and municipality levels is essential to discuss investments and design interventions for the agricultural sector. CSOs can lead these efforts, facilitating better coordination and preventing duplication of investments/interventions. Often, aid is received from all the levels simultaneously for the same cause, while at other times, none of the levels may channel the funds on time.
 - The *Nepal Rashtriya Bank* (NRB) has the provision of 10 per cent allocation of government funds for crop insurance; however, many farmers are yet to realise the benefits of this provision.
 - To promote trade, existing trade policies should be amended to make provisions for trade in agri goods. Additionally, some youth policies should be linked to encourage youth engagement in agriculture, contributing to the Gross Domestic Product (GDP) and reducing the migration pattern.
 - Developing value chains for potential crops like cucurbits and establishing cattle feed industries through forward and backward linkages can improve farmers' incomes. Aligning crop production to meet market needs is another way to improve farmer incomes. In Darchula, cold storage units were lying idle due to insufficient electricity. Training local people to harness solar energy to power these units could solve this issue. Also, local-level agro-storage bins should be created to store such products and aid in the creation of value-added processed products (such as jams and jellies) from orchard fruits. This would help farmers earn a relatively high-profit margin.

- Growing commercial crops like sweet corn along road corridors and developing seedlings for orchard plants in low tunnel polyhouses can enhance farmers' economic status. For subsistence crops with export potential, local Self-Help Groups (SHGs) should collect agri goods from various households and then collectively commercialise and market them.
- Promoting entrepreneurship among women by offering alternative livelihood options like rolling incense sticks, designing handicrafts, making bamboo stools, doll making, and pickle manufacturing can enhance economic opportunities. Additionally, assisting women with the necessary paperwork to increase insurance coverage for livestock and crops is crucial.
- Many women in Darchula complained that a shortage of grasses for livestock fodder is a key reason why only a few households keep livestock. To address this, they can be encouraged to produce alfalfa grasses, which are excellent for fodder and also help control erosion and improve soil quality. Livestock and community forest resources should be promoted as primary livelihood resources. Also, artificial insemination of livestock species to improve their genetic quality should be promoted.
- In Darchula, poor transportation infrastructure hinders farmers from selling their produce in other markets. Additionally, inadequate electricity supply prevents the operation of cold storage facilities, limiting farmers' ability to store their produce for a long time. Storage would ensure that these products can later be transformed into higher value-added products and sold in the market for higher prices. Under the aegis of the Agricultural Development Strategy (ADS)¹⁵ the Nepal government has made increasing market access one of its major aims. The local and provincial governments can be mandated to improve and maintain existing transportation routes and develop new alternative road connections.
- CSOs can collaborate with FWEAN (for buyer-seller meetings) and government agencies to organise trade fairs, providing a platform to market agriculture and processed products. Training on harnessing alternative energy sources (like solar energy) for operating farm machinery should be done to reduce operating costs and make farm machinery more accessible to farmers from diverse economic backgrounds.
- Some measures that can be taken up for better irrigation practices are the following: conserving rainwater in ponds during the dry season, reviving

natural springs, promoting infiltration in cement and concrete reservoirs, using excess water from dams for groundwater recharge, reducing water loss in the canal distribution system, constructing check dams wherever necessary and maintaining them, promoting micro-irrigation schemes and low-water intensive crops.

- The local administration should ensure proper operation and maintenance of the canal network by involving the community to promote a sense of ownership among the farmers. This will also help them manage irrigation on their own. It is essential to break the hard pan in the subsoil to increase infiltration and use rain guns and sprinklers. Also, the *Terai* of Kanchanpur farm plains can be used for riverbed farming.

SECTION II

4

Uttar Pradesh, India

Brief Profile

The survey was conducted in Palia Kalan of Lakhimpur Kheri district, Uttar Pradesh and was supplemented with interviews and FGDs in Palia Kalan and Gabhiya Sahrai of Pilibhit district. Lakhimpur Kheri is known as the **sugar bowl of India** due to the presence of a sugarcane belt. Both districts share their northern border with Nepal. The Mahakali River enters these two districts as Sharda after flowing across the Indo-Nepal border as Mahakali.

According to the 2011 Census, the total population in Lakhimpur Kheri was 40.2 lakhs. Of the total workers, 33.4 per cent are agricultural producers, and 41.8 per cent are cultivators. Women cultivators comprise 24.2 per cent, and women agricultural labourers comprise 34.7 per cent. The mean household size of the Kheri district is 5.4, with most households having 7-10 members.¹⁶

The total population of Pilibhit was recorded as **20.19 lakhs**. Of the total working population, **29** per cent are cultivators, and **30.3** per cent are agricultural labourers. **20.3** per cent of women engaged

in agriculture are cultivators, and **32.9** per cent are agricultural labourers. The average size of households is **5.6** persons as per the 2011 census, which has fallen from **6.5** persons per household as per the 2001 census.¹⁷

The total cultivated area in Kheri is 235092 hectares, and the total irrigated area is 2.25 lakh hectares (96 per cent of the total area). The major source of irrigation is canals. The Central Ground Water Board (CGWB) has constructed tube wells for drinking water in the villages.

The major crops grown in Kheri are sugarcane (20474169 MT), rice (640169 MT), and wheat (802091 MT), as well as peanuts, potatoes, mustard, and lentils.¹⁸ The cultivators in the region follow different farming systems, which involve agriculture, animal husbandry, sericulture and horticulture.

The cropping system in Pilibhit is similar. The major crops are rice (509274 MT), wheat (629534 MT), and sugarcane (5501266 MT). Potatoes, mustard, lentils, *urad*, *moong*, pea, and turmeric are also grown.¹⁹

Irrigation

A barrage was designed near Banbasa to support irrigation in the catchment area around the Sharada River. The total length of the Sharada canal is 44.3 km. In Pilibhit, about 72 per cent of the gross irrigation is through groundwater and the remaining by surface water via the Sharada canal. There is the added problem of water logging, and the water is rich in iron, fluoride and arsenic.²⁰ Areas in Kheri also face similar problems with arsenic-contaminated groundwater. Relief has been provided by arranging tube wells in Palia, Nighasan, Ramia Bihar, Dharuhera, and Issanagar.

waterlogged throughout the year, is 123.22 hectares, approximately 92.27 per cent of the total area. Canal water seepage is one of the main reasons for this.

Approximately 25.55 per cent of farmers' lands are waterlogged.²¹ This problem drains the soils of their nitrogen content. High levels of water are not drained from the fields, which reduces the ability of the plant nodules to fix nitrogen. The plants also lose their ability to absorb nutrients from the soil.²²

To mitigate the effects of increased floods in the region, the district's farmers have significantly reduced the cultivated area under different food grains and increased the share of sugarcane cultivation.

Respondents note that agricultural practices are becoming more expensive, encompassing labour costs, seeds, fertilisers, and irrigation

Climate and Weather Data

The rainfall pattern in Pilibhit district shows that precipitation rates had been reduced from 1017.2 millimetres in 2011 to 465.2 millimetres in 2017, with an average precipitation level of 769.88 millimetres. Contrastingly, in Lakhimpur Kheri, the precipitation levels have remained almost steady, with an average of 1044.22 millimetres (since 2011), coming down to 897.3 millimetres in 2020. Winter rains occurring in January and February are not a common scenario. The main shift has been in the peak monsoons, from July to August-September, affecting the crop cycle.

Impact of Climate Change

The district has been victim to flash floods due to heavy rainfalls. The total area in Lakhimpur Kheri, which remains permanently

Findings

Over 76 per cent of the survey respondents were females. Half of the surveyed individuals are identified as illiterate, while the rest are either minimally literate or currently attending school.

Occupational Details

Each of the respondents is involved in agriculture or farming activities. Additionally, 18-25 respondents emphasised engaging in labour, related to non-agricultural activities during lean periods.

Farming Practices

Landholding sizes in Kheri vary widely, ranging from a minimum of one Bigha to a maximum of 53 Bigha, with an average size of five to seven Bigha. Hybrid seeds and high-yielding varieties are

Electricity availability poses a challenge, impacting irrigation and other mechanised activities. Respondents emphasise the need for improvements in energy availability to address these challenges effectively

prevalent, occasionally supplemented by traditional varieties. Farmers source their seeds from privately owned seed shops, cooperative societies, government seed shops, or their stock.

The common practice among farmers is the application of urea, DAP, and Nitrogen, Phosphorus and Potassium (NPK) mixtures obtained from private shops or government agricultural shops through specific schemes. Chemical farming is a prevalent approach, complemented by mulching, mixed cropping and traditional farming practices. This local assistance in using organic fertilisers and pesticides is rare due to their low efficacy and long-drawn processes and results.

The farmers practice subsistence farming and have a limited marketable surplus. Over 75 per cent of respondents are members of SHGs. Financial assistance for farming activities is generally uncommon, though some individuals occasionally receive support from local banks or cooperative societies.

Most respondents own their farming equipment, with only a few relying on rented equipment. However, respondents note that agricultural practices are becoming more expensive, encompassing labour costs, seeds, fertilisers, and irrigation.

Irrigation Facilities

The respondents emphasised that water availability has remained the same over the past three years, and they do not experience water scarcity for irrigation. The prevalent practice for farming irrigation involves flood irrigation, and respondents must utilise water storage facilities.

Tube wells have been a common choice for irrigation over 8-10 years, incurring an annual cost of approximately INR10,000. Additionally, some farmers procure water from private water sellers for three to four months annually. Expectations for water access and availability improvements vary, with some respondents looking to the government for assistance. In contrast, others express hope that NGOs play a significant role in facilitating improvements.

None of the respondents own pump sets for irrigation; instead, they uniformly rely on rented pump sets with capacities ranging from 6.5 to 10 HP. The rental cost for pump sets varies from INR 1000 to 2000, depending on capacity and duration.

Electricity availability poses a challenge, impacting irrigation and other mechanised activities. Respondents emphasise the need for improvements in energy availability to address these challenges effectively.

Farmers should be made aware of the importance of micronutrients in soil. Limited knowledge about government schemes and flagship programmes is another challenge

Climate-resilient Practices

Over the last three years, the people of Kheri and Pilibhit have faced diverse climate-related challenges, such as droughts, floods, pest outbreaks, animal diseases, and market shocks, such as price collapses. Some respondents received flood warnings from the KVK of Palia Kalan. Such interventions are carried out to create awareness and protect the crops against root rotting. KVK, Lakhimpur Kheri, also recommends mulching as a resilient practice.

Only a small number of respondents, specifically five, reported having crop insurance, with the low adoption rate attributed to the perception that insurance is unnecessary. Interestingly, only three respondents mentioned receiving compensation amounts of INR 2,000 and INR4,000 from flood compensation, respectively.

All respondents expressed the need for technical support in various aspects, including techniques for crop improvement to prevent damage, changing seed varieties, information on early crop varieties, technical awareness of crop sowing (vegetable and spice crops), climate-resilient agriculture, information on new irrigation equipment, seed sowing techniques, changing cropping patterns and information on reducing crop investment.

Furthermore, it is essential to tackle these issues: raising farmers' awareness about government agricultural schemes, preventing premature crop harvesting, selecting crop varieties suited to monsoon conditions, and encouraging mixed cropping systems.

Discussions and Major Inferences

Discussions with field-level stakeholders were conducted to ascertain the facts from the first phase of the survey. Consultations with governmental bodies and farmer communities were conducted at Palia Kalan, Lakhimpur Kheri, and Gabhiya Sahrai in Pilibhit. Even though the consultations had certain coinciding points, many contradicted the ground reality. The local communities of Lakhimpur Kheri surveyed have access to schools, colleges, and healthcare units near their areas of residence. However, for the community interviewed at Gabhiya Sahrayi of Pilibhit, it was revealed that for a college education, the students have to travel to the nearby city.

The out-migration among people is not as prevalent in the villages of Lakhimpur Kheri as much as it is in the Sudurpaschim Province of Nepal. However, the local men are not hired in the big sugarcane mill,²³ since they lack the necessary

skill sets required at the mills. The main workers at the mills are migrants from western India, such as Haryana, Rajasthan, Madhya Pradesh, and Uttarakhand.

Erratic rainfall and other weather inconsistencies in agricultural conditions have caused havoc on crop production. Moreover, many farmers (approximately 25 to 30 per cent) kept their fields barren by not planting rice in fear of losing crops to raging monsoons. The major climatic shifts were noted in the last two years when the monsoons shifted from their usual peak season in June-July to August-September.

The water table in Palia increases during the monsoons (Kharif season) because the clayey soil has a high water retention capacity. This feature turns the fields into wetlands. The area is also frequently flooded due to the increased water levels from the neighbouring canal. So, the Kharif season is worrisome for the farmers since it can destroy the paddy.

In areas suitable for crop rotation, farmers grow sugarcane, followed by wheat and then rice. Although inter-cropping sugarcane with rapeseed, potato, kidney beans, coriander and gladiolus are possible, most farmers need more training to practice it. The KVK promotes gladiolus since it has good commercial value and can be grown in the local topographic conditions.

Only resourceful farmers could purchase heavy machinery in Palia

and Gabhiya Sahrai, availing themselves of subsidies. Marginal farmers hired machinery and implements on a rental basis from big farmers.

The issue of arsenic contamination in drinking and irrigation water is widespread, and more awareness needs to be generated about the consequences and health hazards.

Climate-resilient Practices

The field consultations revealed that the sugarcane-based cropping system could accommodate short-duration varieties of wheat and rice. Intercropping in sugarcane provides additional income and nutritional security. Since the soil's water retention capacity is very high, many sugarcane growers do not uproot the crop during harvest. They keep the crop roots intact and only cut the juicy stem. This helps the plantlets to regrow from the cut stalks (setts) of the crop in a practice known as Ratooning. This practice helps prevent the desilting of the soil. Training programmes can be organised to intercrop sugarcane.

Soil health management through integrated nutrient management, mulching, and pest management is significant. As mentioned by the scientists in KVK, there is a Boron deficiency in Palia. Farmers should be made aware of the importance of micronutrients in soil. Limited knowledge about government schemes and flagship programmes like soil health cards and crop insurance is another challenge.

Some community members are also involved in kitchen gardens in

their courtyards, where they cultivate fruits and vegetables to ensure the nutrition security of the family.

Alternative Sources of Livelihood

Despite the communities' proximity to the Mahakali River, the water quality needs to support production of quality fish for commercial purposes. Some two to three per cent of poor marginal farmers source forest items like dry branches and twigs as firewood and sell them, even though this activity is illegal. It helps them sustain since they have no other income alternative.

Certain farmers have benefited from the successful production of bananas. Besides selling the fruit in the market, the fibres extracted from the banana plant are also used to produce a unique variety of thread called Musa fibre. This thread is then sold to the buyers who have a high demand for it for producing fashionable apparel. The demand for this fibre has increased in Uttar Pradesh, especially after being recognised under the One District One Product (ODOP) scheme.²⁴ It is widely used to produce various items like mats, ropes, wall hangings, tapestries and other handloom articles.

Box 4: The Vegetable Growers of Gabhiya Sahrai

The community in Gabhiya migrated years ago from East Pakistan during the Indo-Pak war. The Uttar Pradesh government had given each family five acres of land close to the Sharda River.

The community actively engages in agriculture and grows rice, gourd, and other vegetables. The produce from this field is consumed or sold in the local shops. The interference of middlemen is a significant issue in these areas. Some farmers also sell the daily produce door-to-door, riding on their bicycles or carts.

Farmers also produce leafy vegetables, mainly for sustenance. Hybrid seeds are generally used to improve yields.

As the land is undulating, the community grows vegetables in the higher elevation and rice in the lower elevation. They also produce turmeric, chillies, radish, taro root, and pumpkin seeds. None of them possess any tractors, either small or big. However, there is a provision for using tractors on an hourly basis.

Farmers are drinking arsenic-laden water, which adversely affects their health. Yet, an improved flood-resistant seed variety is needed.

Inference: *The community mainly undertakes subsistence vegetable farming. They also grow the seeds used as inputs. The community does not benefit from government schemes or subsidies and uses farm machinery and tractors on a sharing basis within the community.*

Although many farmers previously had adopted livestock rearing, only some have continued to do so today. One main reason is the scarcity of quality fodder for livestock. Grasses rot due to water-logging problems. Furthermore, the current milk suppliers meet the local demand well. Also, no provisions exist for exporting milk and its products to other cities or towns.

Box 5: Weavers of the Tharu Community

Arati Rana, a class five graduate tribal woman from Pilibhit, has made various handicraft and handloom items since 1997. One can understand the labour and precision required by looking at the remarkable items and intricate designs. Her very thoughts towards nature are noteworthy. Being tribal by birth, she and her team only resort to natural raw materials like water hyacinth and jute to make products like baskets, containers, corner chairs, laundry bags and many more. Apart from these items, she also mastered producing 'dharis' (carpets).

She has mobilised almost 15,000 tribal women to create *Mahila Hatkarna Sahakari Samiti* to produce handicrafts, empowering them. Even though the organisation's annual income is ten to eleven lakhs, their demand is stagnant nowadays. Among the issues that surfaced, it was noticed that they are facing a crunch of funds to invest in their raw materials. As an alternative source of income, the women weavers, along with Arati, practice small-scale subsistence farming, but they need more income. Since the men of their houses have out-migrated in search of better income sources, they are left by themselves to earn their means of livelihood through this cottage industry.

They wholesale products to other states of India and have established a self-owned shop in Lucknow. Improving production and marketing will help expand the business and allow them access to international markets, increasing the income of the tribal women.



Aarti Rana of Tharu Mahila Hatkarna Sahakari Samiti and her workspace

Inference: Arati Rana's success story is inspiring, and she has received recognition and awards. However, business promotion through online platforms is required for better outreach in the digital era. Capacitating women by using social media and other online marketing platforms would create new market opportunities for these women.

Recommendations

- Pilibhit and Lakhimpur Kheri communities are vulnerable to climate change, with economic disadvantages (especially for the Gabhiya community) making them even more susceptible. Since the community is engaged in vegetable production, targeted training programmes should be organised on vegetable farming, seed production, and construction of *pandals/machan* for cultivating bottle gourd, bitter gourd, etc., to improve the production scale. Additionally, efforts should be made to reduce **drudgery** for both male and female farmers, thereby lowering the high labour costs associated with sugarcane production in Lakhimpur Kheri.
- Recent shifts in peak rainy months and prolonged dry spells are compelling farmers to adjust the crop cycles. KVKs can facilitate knowledge dissemination workshops on contingency crop planning, crop management, and DSR practices to help farmers adapt to irregular weather patterns. Similar workshops should also be held to promote Integrated Nutrient Management (INM) and IPM and decrease Urea, DAP, and NPK use. **Hybrid/stress-tolerant** varieties should be promoted to replace the susceptible varieties of crops and plantations. Since many farmers focus on subsistence vegetable cultivation, they should be encouraged to cultivate more high-demand vegetables like cucumber, pointed gourd, and spiny gourd to tap into broader market opportunities.
- Intercropping sugarcane with rapeseed potatoes and chickpeas is profitable. The KVK suggests and promotes various such models to be adopted by more farmers. Other methods that farmers can adopt are INM, IPM, and skip furrow irrigation of sugarcane (as part of climate-resilient practices). However, farmers will need training and capacity-building to implement these practices effectively.
- Local government should develop plans for the village/ panchayat that address the specific needs of their communities. Farmers need to be informed about various government initiatives, like the **PM Pranam Yojana**²⁵ (**PMPY**) which encourages reducing chemical fertiliser use by providing subsidies for biofertilisers and other organic options. Additionally, the **PM Krishi Sinchai Yojana**²⁶ (**PMKSY**) promotes the adoption of **drip and sprinkler** irrigation systems and **rain guns**. Awareness sessions should be organised to inform farmers about the benefits available under these government schemes.

- In Pilibhit, where persistent waterlogging hampers crop growth, farmers are left with more fallow lands, reduced harvests and lower earnings. Managing these waterlogged areas by growing water-based plants like water chestnuts could offer a viable solution. The fruits can also be sold in various processed forms like flour, chips, etc., allowing local communities to develop value chains and enhance their economic prospects.
- Developing community leadership, especially among women, through continuous engagement and tailored programmes is crucial. The youth in Palia should be trained in the skills necessary for employment in sugarcane mills through the **UP Skill Development Mission (UPSDM)**. Local governments should implement flagship programmes that promote waste into valuable products, such as turning crop residues into straws, seed bran, and cakes and transforming livestock waste into manure. In regions of Lakhimpur Kheri and Pilibhit, home to a tiger reserve and a national park, local communities involved in forest resource procurement should be educated about the importance of afforestation and the benefits of carbon sequestration.
- There is also a need for cross-learning sessions among agricultural research institutes, government officials, and NGOs in the two countries. By sharing knowledge and success stories from their respective countries, these stakeholders can leverage similar geographical conditions to implement effective extension services.

Endnotes

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Annexure

Need Assessment for Climate Resilient Agricultural Practices

जलवायु अनुकूल कृषि पद्धतियों के लिए मूल्यांकन की आवश्यकता

Survey Questionnaire

सर्वेक्षण प्रश्नावली

Name of Surveyor:
(सर्वेक्षक का नाम)

District:
(जिला)

Date of Survey:
(सर्वे की तिथि)

Municipality:
(नगर पालिका)

Partner NGO:
(सहायक एन जी ओ)

Block/ Tehsil:
ब्लॉक / तहसील

Village:
(गांव):

Assurance of Privacy and Consent

You are invited to participate in this one-to-one interview on issues related to agricultural practices and climate change. This is undertaken under the regional programme 'Transboundary Rivers of South Asia'. The interviews are being organised by Grameen Development Services, Lucknow.

Your answers are very important to us and will be used to assess the need for climate-resilient agricultural practices. The interview will take about half an hour. Your participation in this research study is voluntary. At any time during the interview, you may ask questions for clarification. We assure you that this information is purely for research and strict confidentiality of information will be maintained. Your name will not be attached to the interview.

Consent YES ----- NO -----

गोपनीयता और सहमति का आश्वासन

आपको कृषि पद्धतियों और जलवायु परिवर्तन से संबंधित मुद्दों पर इस व्यक्तिगत साक्षात्कार में भाग लेने के लिए आमंत्रित किया जाता है। यह क्षेत्रीय कार्यक्रम 'दक्षिण एशिया की सीमा पार नदियाँ' के तहत किया जाता है। साक्षात्कार ग्रामीण विकास सेवा, लखनऊ द्वारा आयोजित किये जा रहे हैं।

आपके उत्तर हमारे लिए बहुत महत्वपूर्ण हैं और इनका उपयोग जलवायु-अनुकूल कृषि पद्धतियों की आवश्यकता का आकलन करने के लिए किया जाएगा। इंटरव्यू में करीब आधे घंटे का समय लगेगा। इस शोध अध्ययन में आपकी भागीदारी स्वैच्छिक है। साक्षात्कार के दौरान किसी भी समय, आप स्पष्टीकरण के लिए प्रश्न पूछ सकते हैं। हम आपको आश्वासन करते हैं कि यह जानकारी पूरी तरह से शोध के लिए है और जानकारी की सख्त गोपनीयता बनाए रखी जाएगी। आपका नाम साक्षात्कार के साथ संलग्न नहीं किया जाएगा।

सहमति हां ----- नहीं-----

SECTION A (खंड – क)

*Please darken the box for the relevant option with a Pen

कृपया, पेन की सहायता प्रासंगिक विकल्प के बॉक्स को काला करें

Farmer Data किसान संबंधित आंकड़े

Name नाम.	
Mob. / Contact No. (Mandatory) मोबाइल / संपर्क नंबर (अनिवार्य)	
Gender लिंग	Male पुरुष / Female महिला
Age आयु	
Caste / Category जाति / श्रेणी	i. General सामान्य ii. Scheduled Caste अनुसूचित जाति iii. Tribal community अनुसूचित जनजाति iv. Backward Caste अन्य पिछड़ी जाति v. Religious minority धार्मिक अल्पसंख्यक vi. Other Minority (specify) अन्य अल्पसंख्यक (निर्दिष्ट करें)
Education शिक्षा	i. Graduate or Above स्नातक या ऊपर ii. Diploma or Certificate डिप्लोमा या सर्टिफिकेट iii. Higher Secondary (Class 12) उच्च माध्यमिक (कक्षा 12) iv. High School (Class 10) उच्च विद्यालय (कक्षा 10) v. Middle School (Class 6-8) मिडिल स्कूल (कक्षा 6-8) vi. Primary (Class 1-5) प्राथमिक (कक्षा 1-5) vii. Illiterate निरक्षर viii. Literate साक्षर
No. of Members in family परिवार में सदस्यों की संख्या	Adult Males (>18 years) वयस्क पुरुष (>18 वर्ष): Adult Female (>18 years) वयस्क महिलाएँ (>18 वर्ष): Children बच्चे:
No. of family labour परिवार में श्रमिकों की संख्या	Male पुरुष: Female महिलाएँ: Children बच्चे:
Primary source of income आय का प्राथमिक स्रोत	i. Agricultural कृषि ii. Non- Agricultural (Specify) गैर कृषि (निर्दिष्ट करें) _____ iii. In-Service/Salaried Job सेवा में / वेतनभोगी

Farm Data फार्म संबंधित आंकड़े

Who owns the land? भूमि का मालिक कौन है?	
<i>Land Holding Cultivated Per Season</i> मौसम के अनुसार खेती हेतु कृषि भूमि उपयोग	
Owned Land (Acer/Bigha) स्वामित्व वाली भूमि (एकड़/बीघा)	
Leased In (Acer/Bigha) पट्टे पर लेना (एकड़/बीघा)	
Leased Out (Acer/Bigha) पट्टे पर (एकड़/बीघा)	
Total Land holdings under cultivation (Acer/Bigha) खेती के अंतर्गत कुल भूमि जोत (एकड़/बीघा)	

SECTION B

I. Agriculture Data कृषि संबंधित आंकड़े				
1.	Cropping Pattern फसल के तरीके (Name of crop) (फसल का नाम)	A Monsoon (July-Sept.) अ मानसून (जुलाई-सितंबर)	B Winter (Oct.-Mar.) ब शीतकालीन (अक्टूबर-मार्च)	C Summer (April-June) स ग्रीष्मकालीन (अप्रैल-जून)
i	Crop 1 फसल 1			
ii	Crop 2 फसल 2			
iii	Crop 3 फसल 3			
iv	Crop 4 फसल 4			
The following questions may have more than one answer (Darken the relevant boxes) निम्न सवालों का एक से अधिक उत्तर हो सकता है (प्रासंगिक बक्सों को काला करें)				
2.	What kind of seed varieties do you use? आप किन बीज की किस्मों का इस्तेमाल करते हैं? Multiple answers (एक से अधिक उत्तर)		i. Hybrid मिश्रित ii. High Yielding Variety (HYV) उच्च उत्पादक विशेषता (HYV) iii. Traditional पारंपरिक iv. Stress tolerant तनाव सहिष्णु v. Others (Specify) अन्य (विशिष्ट करें)	
3.	Where do you obtain the seed varieties from? आप कहां से बीज किस्मों को प्राप्त करते हैं? Multiple answers (एक से अधिक उत्तर)		vi. Own seeds अपने बीज vii. Family members परिवार के सदस्य viii. Neighbours पड़ोसियों ix. Seed banks बीज बैंक x. Privately owned seed shops निजी स्वामित्व वाले बीज दुकानें i. Cooperative Society सहकारी समिति ii. Government seed shops सरकारी बीज दुकानें iii. Provided by contractor ठेकेदार द्वारा प्रदान किया गया iv. Others (Specify) अन्य (निर्दिष्ट करें) _____	
4.	Type of fertilisers used प्रयुक्त उर्वरकों के प्रकार Multiple answers (एक से अधिक उत्तर)		i. Farm Yard Manure खेत की खाद (फार्म यार्ड मैन्योर) ii. Urea यूरिया iii. DAP डीएपी (डायमोनियम फॉस्फेट) iv. NPK (Mixture) एनपीके (मिश्रण) v. Bio fertilizers (microorganisms, fungi etc.) जैव उर्वरक (कीटाणु, कवक आदि) vi. Others (Specify) अन्य (निर्दिष्ट करें) _____	
5.	Where do you obtain the fertilisers from? आप कहां से उर्वरक प्राप्त करते हैं? Multiple answers (एक से अधिक उत्तर)		i. Privately owned fertilizer shops निजी स्वामित्व वाले उर्वरक दुकानें ii. Government fertilizer shops सरकारी उर्वरक दुकानें iii. Provided by contractor ठेकेदार द्वारा प्रदान किया गया iv. Cooperative Society सहकारी समिति v. Agriculture Department (through any scheme) कृषि विभाग (किसी भी योजना के माध्यम से) vi. Others (Specify) अन्य (निर्दिष्ट करें) _____	
6.	What kind of Agricultural practices do you follow?	Organic Farming (pesticide /chemical free) जैविक खेती (कीटनाशक/रसायन मुक्त) i. Chemical farming रासायनिक खेती		

	आप किस तरह कृषि की पद्धतियों का पालन करते हैं?	ii. Integrated approach एकीकृत दृष्टिकोण
7.	Do you follow any of these practices? आप इन तरीकों में से किसका पालन करते हैं? Multiple answers (एक से अधिक उत्तर)	i. Mulching पलवार करना ii. Zero Tillage शून्य खेती iii. Integrated Pest Management एकीकृत कीट प्रबंधन Organic Farming (pesticide /chemical free) जैविक खेती (कीटनाशक/रसायन मुक्त) iv. Laser Levelling लेजर समतुलन v. Drip Irrigation बूंद से सिंचाई vi. Sprinkler Irrigation स्प्रींकलर सिंचाई vii. Furrow Irrigation खाद्य सिंचाई viii. System of Rice Intensification धान उत्कृष्टिकरण प्रणाली ix. Soil Testing मिट्टी परीक्षण x. Dry Sowing सूखी बोना xi. Stress Tolerant Varieties तनाव सहिष्णु विशेषज्ञता xii. Crop Diversification फसल विविधीकरण xiii. Soil Reclamation मिट्टी पुनर्स्थापन xiv. Community Nurseries समुदायिक नर्सरियाँ xv. Vermiculture कीटाणुर्मि xvi. Composting कम्पोस्टिंग xvii. Mixed cropping मिश्रित फसली खेती xviii. Others (Specify) अन्य (विशिष्ट करें) _____
8.	From where did you get information about these practices? इन प्रथाओं के बारे में आप कहां से जानकारी प्राप्त करते हैं?	i. Traditional knowledge पारंपरिक ज्ञान ii. Government department/ extension officer सरकारी विभाग / प्रसार अधिकारी iii. Agricultural University कृषि विश्वविद्यालय iv. NGO गैर सरकारी संगठन v. Cooperative Society सहकारी समिति vi. Progressive farmers प्रगतिशील किसान vii. Migrants from other state/ country/ province अन्य राज्य / देश / प्रांत से प्रवासी viii. Newspaper/ magazine समाचारपत्र / पत्रिका ix. Radio रेडियो x. Others (Specify) अन्य (निर्दिष्ट करें)
9.	Do you sell the excess farm produce after household consumption? क्या आप घरेलू खपत के बाद अतिरिक्त कृषि उपज बेचते हैं?	Yes / No हां / नहीं
10.	Where do you sell it? अतिरिक्त कृषि उपज आप कहां बेचते हैं? Multiple answers (एक से अधिक उत्तर)	i. At farm gate खेत द्वार पर ii. At own stall in the market अपने स्टॉल पर बाजार में iii. Trader comes and collects it from the farm व्यापारी खेत से आकर इसे एकत्र करता है iv. Open Market खुला बाजार v. Government procurement centre सरकारी खरीद केंद्र vi. Contract Farming ठेकेदारी खेती vii. Others (Specify) अन्य (निर्दिष्ट करें) _____

11.	Are you a member of क्या आप किसीके सदस्य हैं? Multiple answers (एक से अधिक उत्तर)	i. Farmer Producer Organisation किसान उत्पादक संगठन ii. Cooperative Society सहकारी समिति iii. Self Help Group स्व-सहायता समूह iv. Non-Governmental Organisation गैर-सरकारी संगठन v. Joint Forest Management Committee संयुक्त वन प्रबंधन समिति vi. Water User Association जल उपयोगकर्ता संघ vii. Others (Specify) अन्य (विशिष्ट करें) viii. None कोई नहीं _____ Top of Form				
12.	Have you received any financial assistance from any of the institutions given above? उर्पयुक्त किसी भी संस्था से आपको वित्तीय सहायता मिली है?	Yes/ No हां /नहीं If yes, specify यदि हाँ, तो निर्दिष्ट करें _____				
13.	Source of agricultural finance (Tick the relevant boxes) Multiple answers कृषि वित्त के स्रोत (प्रासंगिक बक्से को चिन्हित करें) एक से अधिक उत्तर					
	Source स्रोत	A. Agricultural Inputs कृषि आदानों	B. Livestock/Fisheries/ Poultry पशुधन / मत्स्य / पोल्ट्री	Machinery (tractor, harvester etc.) मशीनरी (ट्रैक्टर, फसल काटने की मशीन, आदि)	Water Harvesting Structures जल संचयन संरचनाएं	Renewable Energy Sources अक्षय ऊर्जा स्रोत
	i. Nationalised Bank राष्ट्रीयकृत बैंक					
	ii. Cooperative Bank सहकारी बैंक					
	iii. Private Bank निजी बैंक					
	iv. Cooperative Society सहकारी समिति					
	v. Local Money Lender स्थानीय साहूकार					
	vi. Self Help Group स्वयं सहायता समूह					
	vii. Non-Governmental Org गैर सरकारी संगठन					
	viii. Friends मित्र					
	ix. Family/Relatives परिवार / रिश्तेदार					
14.	Type of Agricultural Machinery (Tick the relevant boxes) कृषि मशीनरी के प्रकार (प्रासंगिक बक्से को चिन्हित करें)					
	i) Owned					
	ii) Rented					

15. Do you operate the machinery on your own? : Yes /No

क्या आप मशीनरी को अपने आप चलाते हैं? : हां / नहीं

16	In farming, which of the given components cost you more? खेती में, दिए गए घटकों में से किस पर आप ज्यादा खर्च करते हो?	i. Labour (land preparation and harvesting) श्रम (भूमि तैयार करने और कटाई) ii Seeds बीज ii. Fertilizers उर्वरक iii Irrigation सिंचाई (डीजल / बिजली) i. Hiring machinery किराए की मशीनरी पर
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II. Water Data पानी संबंधित आंकड़े

17	Do you experience any change in water availability over the last three years? आपने पिछले तीन वर्षों में पानी की उपलब्धता में कोई बदलाव अनुभव किया है?	Yes / No हां / नहीं
18.	Water scarcity on farm for आपके खेत पर कितने समय तक पानी की कमी रहती है?	i. >9 months > 9 महीने ii. 3-9 months 3-9 महीने iii. <3 months <3 महीने
19.	Type of irrigation सिंचाई के प्रकार <i>Multiple answers</i> (एक से अधिक उत्तर)	i. Drip ड्रिप ii. Sprinkler फव्वारा iii. Furrow लीक सिंचाई (हल-रेखा) iv. Flood सतह सिंचाई (अजस्र जल-प्रवाह) v. Lift लिफ्ट (उद्वाहक) vi. Canal नहर vii. Others (Specify) अन्य (निर्दिष्ट करें) _____
20.	Water conservation/storage structures used आप किस प्रकार की जल संरक्षण / संग्रहण संरचनाओं की विधियां प्रयोग करते हैं	i. Farm Ponds खेत तालाब ii. Community Tanks सामुदायिक टैंक iii. Rain harvesting वर्षा जल संकलन iv. Dams बांधों v. None कोई नहीं
21.	Do you agree with water sharing between neighbouring states/country? आप पड़ोसी राज्यों / देश के बीच जल बंटवारे से सहमत हैं?	i. Completely agree with sharing water with neighbouring states/country पूरी तरह से सहमत ii. Partially agree (condition specify) आंशिक रूप से सहमत (शर्त निर्दिष्ट करें) iii. Do not agree at all (reason specify) बिलकुल सहमत नहीं (कारण बताएं) iv. Don't Know पता नहीं
22.	Have your concern on water availability/management ever been raised in any meetings/forum? पानी साझा करने की बात को कभी आपने किसी भी बैठक / फोरम में उठाया है? If yes, who organized the meeting? यदि हाँ, तो बैठक का आयोजन किसने करवाया था?	Yes/ No हां / नहीं i. Government सरकार ii. Panchayat/local self-government पंचायत / स्थानीय स्व-शासन iii. NGO गैर सरकारी संगठन iv. Other specify अन्य (निर्दिष्ट करें) _____

23.	<p>Have you experienced any of the following issues with water sharing between neighbouring states/country?</p> <p>आपने पड़ोसी राज्यों / देश के साथ पानी के बंटवारे को लेकर निम्न मुद्दे में से किसी को भी अनुभव किया है?</p>	<p>i. Release of dam water without warning बिना किसी चेतावनी के बांध से पानी की रिहाई</p> <p>ii. Water scarcity during crop season फसल के मौसम के दौरान पानी की कमी</p> <p>iii. Change in cropping pattern due to dependence on water from other states/nations अन्य राज्यों / राष्ट्रों से पानी पर निर्भरता के कारण फसल पद्धति में परिवर्तन</p> <p>iv. Conflicts विवाद</p> <p>v. Any other issues (specify) अन्य मुद्दे (बताएं)</p> <p>vi. Not relevant प्रासंगिक नहीं</p>
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24.	<p>Sources of irrigation (Preference rank as 1, 2, 3 etc...)</p> <p>आपके द्वारा उपयोग किये गये सिंचाई के स्रोत (उपयोगिता के आधार पर रैंक 1, 2, 3,.... आदि लिखिये)</p>			
Source स्रोत	Monsoon (July-Sept.) मानसून (जुलाई-सितंबर)	Winter (Oct.-Mar.) शीतकालीन (अक्टूबर-मार्च)	Summer (April-June) ग्रीष्मकालीन (अप्रैल-जून)	
i. Open well खुला कुआँ				
ii. Tube well नलकूप				
iii. Canal नहर				
Lift from storage tanks iv. भंडारण टैंक के पानी से				
Lift from stream/river v. धारा / नदी के पानी से				
Lift from dams/water reservoirs vi. बांधों / जलाशयों के पानी से				
Others (specify) vii. अन्य (निर्दिष्ट करें) _____				
25.	<p>Institutional Structures in irrigation सिंचाई में संस्थागत संरचनाएँ</p>			
Supplier/Agency of water पानी का आपूर्तिकर्ता/एजेंसी उपयोगकर्ता	User for (no. of years) उपयोगकर्ता (वर्षों की संख्या) के लिए	Cost of service per annum प्रति वर्ष सेवा की लागत	Frequency of supply आपूर्ति की आवृत्ति	
i. Self-Owned / स्व-संचालित				
ii. Irrigation department सिंचाई विभाग				
iii. Community समुदाय				
iv. Water User Association जल उपयोगकर्ता संघ				
v. Private water seller निजी जल विक्रेता				

vi. Non-Governmental Org. गैर-सरकारी संगठन			
vii. Others (specify) अन्य (निर्दिष्ट करें) _____			

26. What are your expectations from state and non-state actors to improve access and availability of water?
पानी के उपयोग और उपलब्धता में सुधार हेतु सरकारी और गैर सरकारी संस्थाओं से आपकी उम्मीदें क्या हैं?

27.	Irrigation Pump Details सिंचाई पंप विवरण	A. Grid connected electricity ग्रिड से जुड़ी बिजली	B. Fossil fuels (Petrol/ diesel/ biofuel/kerosene जीवाश्म ईंधन (पेट्रोल/डीजल/जैव ईंधन/मिट्टी का तेल	C. Off grid electricity (Please tick relevant) Solar/Bio Gas/Hydro/Wind ऑफ ग्रिड बिजली (कृपया प्रासंगिक पर निशान लगाएं) सौर/बायो गैस/हाइड्रो/पवन
i. Pump Size/Capacity (hp) पंप का आकार / क्षमता (एचपी)				
ii. No. of pumps पंपों की संख्या				
iii. No. of hours used (per day) दिन में उपयोग किए जाने वाले घंटों की संख्या				
iv. How much do you pay for the power source (per month) आप विद्युत स्रोत के लिए कितना भुगतान करते हैं (मासिक प्रति माह)				

28. What are your expectations from state and non-state actors to improve access, availability and efficient use of energy?
राज्य और गैर-राज्य कार्यकर्ताओं से ऊर्जा के पहुंच, उपलब्धता और कुशल प्रयोग में सुधार की आपकी क्या उम्मीदें हैं?

III. Climate Change Data जलवायु परिवर्तन डेटा		
29.	Type of climatic shocks observed in the last 3 years (<i>Multiple answers</i> with frequency of occurrence) पिछले 3 वर्षों में देखे गए जलवायु संबंधी झटकों के प्रकार (घटना की आवृत्ति के साथ एकाधिक उत्तर)	i. Drought सूखा _____ ii. Flood बाढ़ _____ iii. Landslide भूस्खलन _____ iv. Earthquake भूकंप _____ v. Hailstorm बर्फबारी _____ vi. Pest outbreak कीट प्रकोप _____ vii. Animal disease पशु रोग _____ viii. Market shock (collapse in prices) बाजार की चोंक (मूल्यों की गिरावट)
30.	Do you get warning/alerts on any of the shocks identified? क्या आपको पहचाने गए किसी भी झटके पर चेतावनी/अलर्ट मिलती है? Please mention the type of shocks for which you receive warning कृपया उन झटकों के प्रकार का उल्लेख करें जिनके लिए आपको चेतावनी प्राप्त होती है	Yes/No Specify हाँ /नहीं उल्लिखित करना
31.	From where do you get the warning? आपको चेतावनी कहाँ से मिलती है?	i. Government सरकार ii. Neighbours/ Village elders पड़ोसियों / गाँव के बुजुर्ग iii. TV टीवी iv. Radio रेडियो v. News papers अखबार vi. Traditional knowledge पारंपरिक ज्ञान vii. Others, specify अन्य, विशिष्ट करें viii.No warning कोई चेतावनी नहीं
32.	Have you insured your crop/animal? क्या आपने अपनी फसल/पशु का बीमा कराया है?	Yes/No Specify हाँ /नहीं उल्लिखित करना
33.	If not, why? यदि नहीं तो क्यों?	
31.	Have you received any compensation for loss of damage of crop/animal/property? क्या आपको फसल/पशु/संपत्ति के नुकसान का कोई मुआवजा मिला है?	Yes/No हाँ /नहीं
32.	If Yes from whom? यदि हाँ तो किससे?	
33.	Have you received any training on climate resilient agriculture practices क्या आपने जलवायु अनुकूल कृषि पद्धतियों पर कोई प्रशिक्षण प्राप्त किया है?	i. Yes/No हाँ /नहीं ii. Water conservation and sustainable use of water जल संरक्षण और जल का सतत उपयोग iii. Crop diversification फसल विविधीकरण iv. Agro-forestry कृषि-वनस्पति वन्यकृषि v. Agro-horticulture कृषि-बागवानी vi. Integrated farming एकीकृत कृषि vii. Improved crop management सुधारीत फसल प्रबंधन viii. Others specify अन्य निर्दिष्ट करें

34. What kind of technical support do you need to build resilience against climate change?

जलवायु परिवर्तन के विरुद्ध लचीलापन बनाने के लिए आपको किस प्रकार की तकनीकी सहायता की आवश्यकता है

SECTION D (खंड – घ)

35. Local Innovation or Practice for Water Management, Energy Management or Sustainable Agriculture:	
(Anything that is not covered in the questionnaire)	
जल प्रबंधन, ऊर्जा प्रबंधन और स्थायी कृषि के लिए स्थानीय नई पद्धतियां व अभ्यास:	
(जो सर्वेक्षण प्रश्नावली में शामिल नहीं है)	
Any other observation:	
कोई अन्य अवलोकन	
Date:	Surveyor's Signature:
तिथि:	सर्वेक्षक का हस्ताक्षरः:



CUTS International

Established in 1983, CUTS International (Consumer Unity & Trust Society) is a non-governmental organisation, engaged in consumer sovereignty in the framework of social justice and economic equality and environmental balance, within and across borders. More information about the organisation and its centres can be accessed here: <http://www.cuts-international.org>.



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