

Greening of Value Chains in Karnali Province: Understanding Farmers' Knowledge, Attitude and Practice on Climate Resilient Agriculture and Agro-ecological Farming



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Greening of Value Chains in Karnali Province: Understanding Farmers' Knowledge, Attitude and Practice on Climate Resilient Agriculture and Agro-ecological Farming

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CAO	Chief Administrative Officer
CSOs	Civil Society Organizations
DADO	District Agriculture Development Office
DANIDA	Danish International Development Agency
DCA	DanChurchAid
DPR	Detail Project Report
DoC	Department of Customs
FGD	Focus Group Discussion
FYM	Farm Yard Manure
GoN	Government of Nepal
HHs	Households
HVAP	High Value Agriculture Project for Hill and Mountain Areas
ICS	Internal Control System for Group certification
I/NGO	International/Non-Government Organization
INM	Integrated Nutrient Management
IPM	Integrated Pest Management
KADS	Karnali Agriculture Development Strategy
KAP	Knowledge, Attitude and Practice
KII	Key Informant Interview
LG	Local Government
LI-BIRD	Local Initiatives for Biodiversity, Research and Development
M&E	Monitoring and Evaluation
MoLMAC	Ministry of Land Management, Agriculture and Co-operatives
NARC	Nepal Agricultural Research Council
NPC	National Planning Commission
NPR	Nepalese Rupees
PG	Provincial Government
PGS	Participatory Guarantee System
SDGs	Sustainable Development Goals
SOSEC	Social Service Center
SWOT	Strengths, Weaknesses, Opportunities and Threats
ToR	Terms of Reference
UN	United Nations
WTO	World Trade Organization

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- The Study Team

EXECUTIVE SUMMARY

Climate and Gender Responsive Resilient Agriculture and Enterprises in Karnali River Basin (in short: Green Karnali) is a five-year project supported by DANIDA through DCA and being implemented by LI-BIRD and SOSEC in Surkhet, Dailekh and Achham districts with the objective of contributing to local and provincial government's goal of promoting Organic Agriculture in Karnali Province. To advance this objective, the Green Karnali project undertook a study with the following three specific objectives: 1) Understand Knowledge, Attitude and Practice (KAP) of farmers, and local and provincial government entities and value chain actors regarding climate resilient agriculture and ecological farming practices; 2) Analysis of policies, plans, programs and budget of local and provincial governments that either promote or constrain climate resilient agriculture and ecological farming; and 3) Document cases where farmers have applied climate resilient agriculture technologies and green value chain practices for wider dissemination.

In order to accomplish the above-mentioned three objectives, the study employed a combination of qualitative and quantitative data collection tools such as Knowledge, Attitude and Practice (KAP) household survey of 346 households; Focus Group Discussions in eight farmer groups comprising 86 participants (71 female and 15 male); SWOT analysis with officials from the Ministry of Land Management, Agriculture and Cooperatives; Key Informant Interviews with relevant stakeholders from Agriculture and Livestock Business Promotion and Training Center, Agriculture and Livestock Section of Palikas, Technical and Vocational school, market actors (agro-vets and vegetable and fruit vendors), and LI-BIRD and SOSEC staff; and finally, concluded seven cases studies. In total, 466 individuals were reached for information collection during the course of the study, which was completed between 18 August 2022 and 28 September 2022.

The findings from the study reveal that beneficiaries significantly differ in terms of their socio-economic traits, with almost a quarter of beneficiaries falling under illiterate category, with more women than men being illiterate. This finding will have implications on extension and training methods being used for awareness creation, skills transfer, and empowerment measures being applied, so the project has to ensure that the approaches being used are illiterate-friendly. Age has strong bearing on advancement of value chain approach, with younger generation leading the way – they have better knowledge on different value chains suitable to their area, keep abreast of market information, and keep records of their income and expenses. Maybe it would be good to reorient the value chain interventions targeting the younger generation and providing more concerted attention to these individuals rather than approaching everyone in a group.

In terms of knowledge, farmers in general have good awareness on climate change (79%), value chains (54%), and safe and healthy products (71%). However, their knowledge seems to fall short when it comes to specific adaptation technologies and practices (40%), and IPM practices (20%), which is understandable because service provider organizations (government and I/NGOs) in the past mostly focused on awareness raising activities. Henceforth, these organizations need to reorient themselves and adopt a more balanced approach with promotion of relevant technologies and practices along with awareness programs running simultaneously.

The study finding was revealing in a sense that farmers are not able to make a subtle difference between traditional agriculture or agro-ecological practice or organic agriculture, and they treat them in similar fashion (78%). While the proponents of different concepts and approaches

might focus on nuances between these approaches, but when approaching farming community perhaps a more widely accepted approach that encompasses these nuances may be appropriate. Hence, aligning all our works under the banner of Organic Agriculture in Karnali Province may be a better approach with broader appeal to different stakeholders.

Climate change and its consequences on farmers' livelihoods are not fully comprehended by the respondents (17%), nor do they realize the benefits of weather forecasting in their farming operations (10%). This finding may be true to a large extent because a significant gap was observed in farmer's knowledge on climate resilient technologies and practices. Moving forward, on-farm demonstration of climate resilient technologies (drought tolerant crop varieties, early maturing varieties, disease/insect pest tolerant varieties, water harvesting technologies, machinery items, etc.) may help bridge the gap between knowledge and practice on climate resilient, agro-ecological practices including weather forecasting benefits to the farmers.

Majority of farmers (75%) believe inorganic fertilizer is indispensable for obtaining higher yield, which is corroborated by increased use of chemical fertilizer in the province over the past three years from 3081 mt in 2018/19 (2075/76) to 5028 mt in 2020/21 (2077/78), with a jump of 63%. Analysis suggests that respondents with higher education seem to hold the view that inorganic fertilizer is indispensable for obtaining higher yield. A bit of de-learning may be necessary in higher education institutions based on research evidence, e.g. on-farm demonstration of yield trials on crops showing the performance between inorganic fertilizer vs organic fertilizer-applied plots.

For long, the government institutions and I/NGOs have been engaged in distributing freebies to farming communities. Consequently, they have become addicted to these handouts and quite unwilling to

change their attitude towards handouts. On the other hand, government agencies and I/NGOs cannot completely subsidize production, especially under value chain development programs that require considerable resources, hence a more pragmatic and sustainable approach might be to link with banks and cooperatives for soft loan to expand production.

There is a mistrust between farmers and market actors (collectors/wholesalers), and farmers don't believe that they will ever get reasonable price for their produce. This attitude of farmers' need to be changed especially when interacting with markets in commercial production. Maintaining a cost of production (income and expenditure record) diary will help farmers understand their cost factors, volume of production they have to achieve to make profit, minimum price they can afford, etc., which will go a long way in negotiating price with collectors and vendors. Project staff can facilitate in changing farmers' attitude and subsequent behavior, which can happen gradually when farmers start maintaining income and expenditure diary and regularly interact with different markets. Needless to say, this will be a major behavior change for farmers and project staff alike, requiring concerted efforts with constant follow up to ensure proper implementation.

Analysis of farmers' practices reveal that except for mulching (96%), use of quality local or improved seed (84%), and crop rotation (75%), a vast majority of other climate resilient, agro-ecology and gender responsive technologies and practices are adopted by fewer households (20 – 44% households). Still another category of technologies and practices is practiced by only a limited number of households in the project areas. These practices include: soil testing (6%), IPM practices (1 – 5%), crop/livestock insurance (7%), access to government subsidies (17%), and access to soft loan (8%).

Greening of value chain is not possible without a significant uptake of soil testing and integrated nutrient management (INM)

practices rooted on soil analysis results, wide-scale adoption of IPM practices, adoption of crop and livestock insurance by the producers, accessing soft agricultural loan to expand the business, and accessing government and other agency's resources. The project needs to take more focused approach here, targeting INM, IPM, and access to soft loan for value chain promotion purpose.

Ministry of Land Management, Agriculture and Co-operatives of Karnali Province has done commendable job in terms of developing several policies, acts, regulations, guidelines, province organic agriculture standards, etc. pertaining to promotion of Organic Agriculture in Karnali Province. They are also in the process of preparing Karnali Agriculture Development Strategy, and 15-Year Organic Mission Plan to promote the mission. There is a resolute political commitment to the mission at the highest political level. Most of the staff in the ministry are from within the Karnali province and they are highly motivated to work for the mission. Mid-west University and numerous vocational and technical training institutes experimenting with innovative and hands-on teaching approaches such as 'earning while learning', will generate qualified professionals/ technicians on the subject matter. Organic Agriculture Mission has given a purpose and there is an opportunity to collectively bring all the relevant stakeholders under one mission.

Organic Agriculture Mission has innumerable challenges ahead given that Nepal does not have a stellar track record when it comes to proper implementation of the policies on the ground and delivering intended results. Operational level challenges abound, such as lack of harmonization in policies between provincial government and local governments, no clear demarcation of roles

and responsibilities between province and local bodies in the mission, serious lack of technical experts in the field to drive the mission, and farmers not being able to realize immediate benefit of transitioning to organic agriculture, just to name a few. Green Karnali project must find its comparative advantage and carve itself a niche for supporting the mission. Adaptive research and advocacy could be one of the areas to consider.

The proposal put forth here may be beyond the scope of the project, nevertheless, it's paramount for Organic Agriculture Mission to take roots and prosper. Therefore, the project needs to lobby for setting up Organic Fertilizer Plant and Bio-pesticide Production Plant establishment, which will guarantee that these products will be readily available in the market at competitive prices. Government must do whatever it takes to materialize these operations.

Based on organic zoning results, it's absolutely important to focus on a few promising value chains rather than blanket approach to organic agriculture for the whole of province. Green Karnali project may have to focus more on permanent fruit orchards (oranges, lime) because of their climate resiliency and less labor demanding nature. Another advantage with fruit crops is that when grown organically they receive premium price whereas the same is not true for fresh vegetables, thus discouraging farmers to go organic in vegetables. At present, animal shed improvement program should be closely aligned with fresh vegetables production households to take the best advantage of the technology. More emphasis be given to integrated nutrient management highlighting the role of green manuring species. Finally, the project needs to reorient its staff on IPM and value chain approach so that they are able to provide credible technical services to the communities where needed.

GREENING OF VALUE CHAINS IN KARNALI PROVINCE: UNDERSTANDING FARMERS' KNOWLEDGE, ATTITUDE AND PRACTICE ON CLIMATE RESILIENT AGRICULTURE AND AGRO-ECOLOGICAL FARMING

1. INTRODUCTION

Nepal is one of the least developed and most climate change vulnerable countries in South Asia. According to National Planning Commission report (2021)¹, in 2019, 17.4% of Nepalese were multidimensionally poor, with a clear divide between rural (28%), and urban (12.3%) areas. The country ranks fourth in terms of Global Climate Risk Index for 2017 with the fatality of 164 and losses worth 1,910 million USD Purchasing Power Parity (PPP) and 11th in terms of Global Climate Risk Index for the period 1998-2017². In Global Hunger Index (GHI) 2021, Nepal ranks 76th out of 116 countries³. With a score of 19.1, Nepal has a level of hunger that is moderate. Despite Nepal making commendable progress in achieving Millennium Development Goals and subsequent Sustainable Development Goals (SDGs), significant disparity prevails between geographical regions, and rural-urban divide as well as across age, gender, ethnic, and socio-economic class. The hilly and mountainous areas of the western region of Nepal, especially Karnali Province, are worst hit by food insecurity and insufficient calorie intake.

Despite Nepal being agriculture dependent, the country is a net importer of food and farm products⁴. Within two decades (2001-2021), Nepal's import of food and farm products, especially from India, jumped 78 times from 1.42 billion rupees to almost 120 billion, with non-Basmati fine rice accounting for 47.52 billion rupees worth of import in 2021⁵. Similarly, according to the Department of Customs (DoC), vegetables worth NPR 15.18 billion were imported during the fiscal year 2018/19

as compared to imports worth NPR 13.11 billion during the fiscal year 2017/18. Nepal imported vegetables worth NPR 8.59 billion in the past five months (mid-July till mid-December 2021), which is NPR 60 million a day. In 2019/20, Nepal spent 20.74 and 3 billion rupees importing fruits and cashew nuts, and fish and meat products respectively⁶. Nepali market is flooded with cheaper imported vegetables and other agro-products in high volumes resulting in displacement of domestic produce. Thus, many Nepali farmers are facing difficulties to compete with imported agriculture produce in terms of price. This has disincentivized local farmers to further participate in commercial production. Despite these facts, Nepal however can't impose trade barriers on imported vegetables and other farm products because of provisions of various international trade agreements including World Trade Organization (WTO).

Given the above context, Nepal can only formulate and implement domestic enabling policies that can promote efficient production of agricultural commodities that may reduce imports, generate local employment and reduce poverty. Hence, the project 'Climate and Gender Responsive Resilient Agriculture and Enterprises in Karnali River Basin (Green Karnali)', funded by Danish International Development Agency (DANIDA) through DanChurchAid (DCA), Nepal, in Surkhet, Dailekh, and Achham districts in Nepal, and implemented by Local Initiatives for Biodiversity, Research and Development (LI-BIRD) and Social Service Centre (SOSEC), perfectly complements Nepal government's initiatives. Specifically, the project is expected to contribute to local and provincial government's goal of promoting climate resilient and

1 National Planning Commission 2021. Nepal Multidimensional Poverty Index: Analysis Towards Action. Government of Nepal, National Planning Commission, Singha Durbar, Kathmandu, Nepal.

2 Eckstein, D., Hutfils, M. and Wings, M. 2019. Global climate risk index 2019 who suffers most from extreme weather events? Weather-related loss events in 2017 and 1998 to 2017. Briefing Paper, German watch.

3 <https://www.globalhungerindex.org/pdf/en/2021/Nepal.pdf>

4 Chobhar dry port attracts few traders. The Kathmandu Post (National Daily), June 29, 2022.

5 <https://kathmandupost.com/money/2022/02/02/how-a-country-of-farmers-became-a-food-importer>

6 Nepal agro imports at all time high despite lessons of COVID-19 lockdown: country not likely to be able to feed itself anytime soon. Nepali Times, 2 August 2020.

organic agriculture towards sustainable food system transformation in Karnali Province. From the previous studies, the government has already identified value chain commodities, and they are offseason vegetables, goat, potato, citrus, ginger, and turmeric for Dailekh, while goat, potato and offseason vegetables for Surkhet.

Globally, organic agriculture is practiced by 187 countries, with 72.3 million hectares of agricultural land managed under organic agriculture (1.5% of total agricultural land) by 3.1 million farmers, and the organic market is worth 106.4 billion Euros⁷. In the context of Nepal, barring areas in plains and valleys, majority of farmers still practice traditional farming systems, with potential for conversion of 'uncontaminated' agricultural land for organic farming⁸. Farmers in Karnali Province, to a large extent, practice pristine traditional agriculture (organic by default), with the potential to converting into certified Organic Agriculture and secure benefits to the farmers. Hence, the provincial government committed to promoting Organic Agriculture in Karnali Province through their first cabinet meeting on 18 February 2018 (2074/11/06).

2. RATIONALE

The provincial government has committed to transforming subsistence agriculture into commercial organic agriculture in Karnali province. In the process, the first cabinet meeting has declared to promote organic agriculture in the province. However, declaring organic agriculture is one thing while the real challenge exists in applying the concept, awareness and affordability of the producers, processors, and consumers' willingness to pay premium price for the organically grown agricultural produce. Karnali province has made significant progress in the policy formulation process and now moving forward with the development of Organic mission of the province for the next 10 years. Having right policies is a

prerequisite for moving forward but their effective implementation is what matters that will generate value and benefits producers and value chain actors in the process including end users or consumers. Farmers' knowledge on organic agriculture, the practices they are adopting and their attitudes towards organic agriculture determines the implementation of the formulated policies and to know their knowledge, attitude and practices will have an important role in developing the organic mission of the province for next 10 years and beyond. Success story from elsewhere, especially Sikkim state in India, has shown that massive investment along with the awareness, affordability and heavy promotion of organic agriculture contributed to the success of declaration by the Government of Sikkim as an organic state. Thus, for the promotion of organic agriculture in the Karnali province also, proper documentation of farmers' knowledge, attitude and practice is necessary. It's equally important to understand and analyze the currently available policies on organic agriculture in the province that forms the basis for the transformation of Karnali toward the organic province. Hence, the current study can support for the development of organic mission of Karnali province for the next 10 years, document the present understanding of the farmers of Karnali province in organic agriculture, and suggest the policies to be formulated or policies to be amended.

3. OBJECTIVES OF THE STUDY

The study has three specific objectives:

- » Understand Knowledge, Attitude and Practice (KAP) of farmers, and local and provincial government entities and value chain actors regarding climate resilient agriculture and ecological farming practices;
- » Analysis of policies, plans, programs and budget of local and provincial governments that either promote or constrain climate resilient agriculture and ecological farming; and
- » Document cases where farmers have applied climate resilient agriculture technologies and green value chain practices for wider dissemination.

7 Willer, Helga, Jan Travnicek, Claudia Meier and Bernhard Schlatter (Eds.) (2021). *The World of Organic Agriculture. Statistics and Emerging Trends 2021*. Research Institute of Organic Agriculture FiBL, and IFOAM – Organics International, Bonn (v20210301)

8 Atreya, K., B.P. Subedi, P.L. Ghimire, S.C. Khanal, and S. Pandit (2020). A review on history of organic farming in the current changing context of Nepal. *Archives of Agriculture and Environmental Science* 5(3): 406-418 (2020). <https://doi.org/10.26832/24566632.2020.0503024>

The findings from the assessment study are expected to contribute to: 1) designing capacity building programs in terms of awareness, knowledge and skills enhancement amongst value chain actors, local and provincial government institutions, and beneficiaries; 2) development, refinement and promotion of value chain interventions in Green Karnali project for greening and strengthening climate resilient agro-ecology based farming system; and 3) formulation and/or effective execution of policies at local and provincial levels relating to promotion of climate resilient agriculture and ecological farming practices.

4. STUDY METHODOLOGY

4.1 Study Framework

The study team worked closely with the Green Karnali team to refine the study framework (Figure 1). We applied a combination of different tools and approaches for collecting relevant information from multiple sources, namely, households, community, local and provincial government bodies, value chain actors, etc., primarily guided by the objectives of the assessment study. The primary information was collected

using household survey questionnaire using Knowledge, Attitude and Practice (KAP) approach, Focus Group Discussion (FGD), Key Informant Interview (KII), SWOT (Strength, Weakness, Opportunity and Threat) Analysis, case studies, and direct observation whereas, desk review supplemented secondary information from already published reports and policy documents. Both qualitative and quantitative information were collected using participatory approach. The data was collected, analyzed and reported in a disaggregated format in terms of age, gender, caste/ethnicity, geography (rural-urban; district), and likewise.

An outline of the study approach has been presented in Figure 1, highlighting major steps involved. The KAP study provides valuable inputs for effective programs and project planning by identifying individual's knowledge gaps (what they know), cultural beliefs (what they perceive), or behavioral patterns (how they act) that may facilitate understanding and action. KAP studies are indispensable for evaluating nutrition education and communications⁹, however, the approach is increasingly being applied in agriculture field as well, especially on integrated pest management (IPM) and organic agriculture^{10,11}.

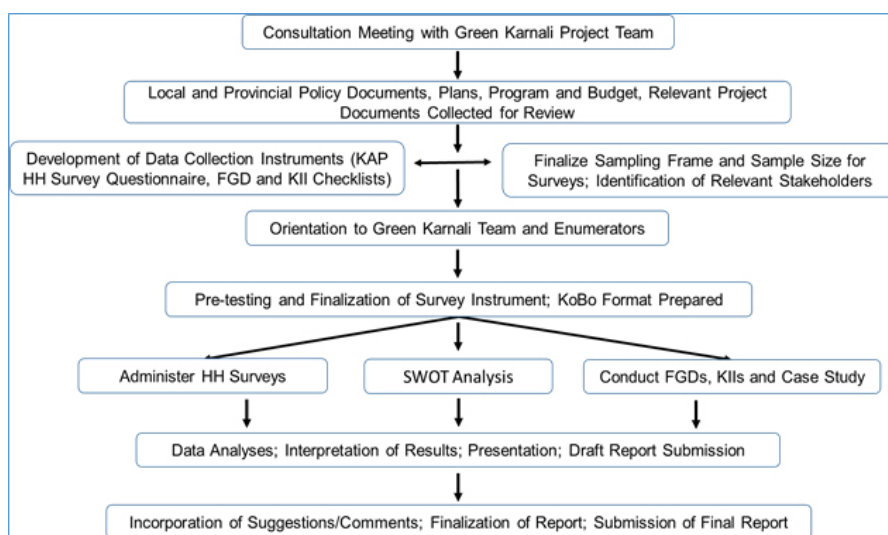


Figure 1. Outline of the study approach proposed for the study, 2022

9 Guidelines for assessing nutrition-related Knowledge, Attitudes and Practices: KAP Manual. 2014. Yvette Fautsch MacFas and Peter Glasauer; Food and Agriculture Organization of the United Nations, Rome, Italy.

10 WHO. 2007. The world Health Report 2007: A Safer Future: Global Public Health Security in 21st Century.

11 Lorenz, A.N., T. Prapamontol, W. Narksen, N. Srinual, D.B. Barr and A.M. Riederer. 2012. Pilot Study of Pesticide Knowledge, Attitudes, and Practices among Pregnant Women in Northern Thailand. International Journal of Environmental Research and Public Health 2012 (9): 3365-3383.

The fieldwork entailed series of interactions with diverse stakeholders (Table 1), with household interview comprising the major undertaking (n=346 HHs), which was accomplished by trained enumerators, whereas rest of the interactions were accomplished by the expert team members. A total of 466 individuals were directly contacted during the study process, with 70% women respondents, mainly in household KAP survey. Interactions with officials from provincial ministry (Ministry of Land Management, Agriculture and Co-operative), Agriculture and Livestock Business Promotion and

Training Center, Karnali Province, technical/vocational school, and Agriculture and Livestock Section of Municipalities have been elevating to understand their readiness to successfully implement the Organic Agriculture Mission in Karnali Province. Likewise, interactions with private sector actors such as agro-vets (input suppliers) and vegetable and fruit vendors (intermediaries) enriched our understanding of the organic agriculture's value chain and market readiness. FGDs and case studies helped us to document some useful climate resilient practices for wider sharing.

Table 1. Number of institutions and households covered in the study, 2022.

SN	Institutions/Households	Planned No.	Actual No.	Number of Individuals		
				Male	Female	Total
1	Ministry of land management, agriculture and cooperative	1	1	4	-	4
2	Agriculture and livestock business promotion training center	1	1	2	-	2
3	Agriculture and Livestock Section (Palika)	4	4	8	2	10
4	Technical/Vocational School	1	1	1	1	2
5	Agro-vet	-	3	2	1	3
6	Vegetables and fruit vendor	3	3	2	1	3
7	LI-BIRD/SOSEC	-	3	2	1	3
8	Focus Group Discussion (FGD)	8	6	15	71	86
9	Case study	12	7	4	3	7
10	KAP Household survey	346	346	99	247	346
Total		376	375	139	327	466

4.2 Tools/Approach Applied in the Study

The study team applied the following tools and approach to collect relevant information from multiple sources.

4.2.1 Desk review

The study team reviewed the existing literature including policy documents to develop a comprehensive understanding of the project background, objectives, indicators, including a better understanding of the local context. Based on the desk review and in-depth interaction with Green Karnali team, a detailed methodology was developed and duly approved by the project.

4.2.2 Household survey questionnaire

The study team developed KAP based structured household (HH) survey questionnaire to collect household specific information based on the stated objectives of the assessment study. Using the KAP approach, the questionnaire had questions designed to capture key individual and household-based variables on which the "Climate and Gender Responsive Resilient Agriculture and Enterprises in Karnali River Basin (Green Karnali)" project is expected to make an impact in the short and long run. Additionally, the survey gathered information on current demography, land holding, and income at household level.

The data collection of household survey was done by using tablet-based application (KoBo Toolbox). The HH interview was conducted by enumerators hired by Green Karnali project team, as specified in the ToR. The final draft of the questionnaire was translated into Nepali language for pre-testing. After pre-testing of the questionnaire, fine tuning of the instrument was done and final questionnaire approved for field application.

4.2.3 Focused group discussions (FGDs)

The FGDs were conducted with community members guided by structured checklists to record information from the FGDs. In most of the FGDs, women were the dominant participants, whereas in some FGDs men also participated. Both women and men producers of priority value chains in the project areas were intended to be the participants. The study team facilitated FGDs and also took notes. We expected to conduct eight FGDs (2 FGDs/Palika) in total, but ended up conducting only six because in some areas the farmers' groups were newly established, so most of the questions included in FGDs were irrelevant to them.

4.2.4 Key informant interviews (KIIs)

Similar to FGDs, KIIs were conducted with key project stakeholders, including local government and provincial government authorities, value chain actors (market actors, and input suppliers), Green Karnali staff, etc. Separate checklists were developed for different categories of stakeholders to ascertain their understanding on climate resilient agriculture, agro-ecological farming practices and greening of value chains.

4.2.5 SWOT analysis

One SWOT analysis was conducted at the provincial level to understand organizational strengths, weaknesses, opportunities and threats in relation to Organic Agriculture Mission of Karnali Province. Using participatory exercise, key government officials, in relation to selected value chains, self-assessed the strength and weaknesses of their organizations in

promoting Organic Agriculture Mission, identified external threats to their operations, and collectively came up with mitigation measures to capitalize on opportunities. A separate report on Policy Analysis has been produced.

4.2.6 Case studies

We concluded eight case studies to document the existing climate resilient practices at household level. Though we planned three cases per Municipality, but after a few cases, we realized that practices overlapped across sites and with what was already reported in baseline study. Therefore, the number of cases was curtailed since only a few new knowledge and practices could be documented with potential for large scale adoption by project beneficiaries.

4.2.7 Direct observations

The study team employed direct observation of conditions in the field to supplement their notes. The observation notes were maintained plus interesting photos taken to enrich the study findings.

4.3 Sampling Frame and Sample Size for Household Level KAP Study

The Green Karnali project team decided to include two municipalities from Salyan district to make the study more representative of Karnali province. Hence, the KAP study was administered in six municipalities instead of four originally proposed. After receiving the sampling frame (beneficiary HHs) from the project team, the study team recalculated the sample size for the study using simple random sampling technique with 95% confidence level and 5% margin of error to arrive at the sample size of 346 HHs. We agreed to administer equal number of samples per municipality, i.e. 58 HHs, except for Bangaad Kupinde where 56 HHs was interviewed.

4.4 Orientation to Enumerators and Pre-testing

Once household survey questionnaire was developed, orientation session was

organized for enumerators (n=6; 3 male and 3 female). Prior to the orientation exercise, questionnaire was provided to the enumerators so that they acquaint themselves with the content of the questionnaire. They were provided with tablet with questions developed in KoBo Toolkit for actual data collection. Face-to-face mock interview exercise was organized for enumerators to ensure that they duly follow the interview protocol and collect accurate and complete information from the field. Once they were confident about the questions in the questionnaire, a pre-testing was conducted in a village (Guptipur, Birendranagar-13) after discussion with Green Karnali team. The completed questionnaires were assessed by the study team and a post-interview discussion with enumerators was arranged to understand what and where in the questionnaire they or respondent had difficulty in answering the questions, and proper guidance provided accordingly.

4.5 Field Administration of Household Survey, FGDs, KIIs, and SWOT Analysis

Sampled household survey was administered by trained enumerators while FGDs and KIIs to different stakeholders were accomplished by the study team. The details of the field plan (Annex 1), list of participants in FGD (Annex 2) and list of individuals contacted for KII (Annex 3) have been annexed to the report.

4.6 Data Collection and Data Analysis

The data collection of KAP household survey was done in KoBo Toolkit (tablet), and cleaned/edited version of the completed questionnaires (HHs interviews) were transferred to the main computer (Excel sheet) on regular basis (every day or alternate days) and analysis of data was done using JASP (Jeffrey's Amazing Statistics Program - JASP Team, 2020; www.jasp-stats.org), which is a free and open-source graphical program for statistical analyses. Frequencies, descriptive statistics, chi-square, ANOVA, correlation, regression, and logistic regression analyses were performed

where relevant to generate outputs for interpretation. Notes and narratives from FGD and KII were analyzed using some key themes/topics, and conditions/results compared and contrasted across municipalities for cross learning and sharing.

The draft report was submitted to Green Karnali team for review and comments. The final report was prepared for submission after incorporation of inputs from the reviewers.

4.7 Limitations of the Study

The study was contemplating to understand farmer's knowledge, attitude and practice (KAP) on climate resilient agriculture, agro-ecological farming, and value chains, which are relatively new and complex concepts for farmers to grasp and respond to different questions. Therefore, enumerators had difficulty explaining these terms/questions to farmers. Consequently, some errors or contradictions are expected in certain aspects of the questionnaire.

5 FINDINGS AND DISCUSSION

Findings and discussion section has been divided into three discrete sections as per the specific objectives of the study: 1) Understanding knowledge, attitude and practice of farmers; 2) Analyses of policies, plans, programs and budgets of local and provincial governments; and 3) Documentation of cases where farmers have applied climate resilient practices and green value chain practices for wider sharing. Findings are accompanied by ensuing discussions in relevant sub-sections.

5.1 Understand Knowledge, Attitude and Practice (KAP) of Farmers on Climate Resilient Agriculture, Agro-ecological Farming and Value Chains

5.1.1 Profile of Respondents and Participating Households

We characterized the respondent's profile in terms of gender, caste, age and education (Table 2). These personal traits have important bearing on individual's

knowledge, attitude and practices on climate resilient agriculture, and agro-ecological farming matters. Of 346 respondents, 71% of respondents were female because the project was focusing on women, and marginalized communities (Dalits). Since the project focused on disadvantaged groups, Dalits are slightly over represented as project beneficiaries (29%) as compared to their population (23%) in the Karnali¹². The average year of respondents was 47 years, and almost a quarter of the respondents (24%) were illiterate, with majority (41%) having basic

reading, writing and numeracy skills, while 35% respondents had secondary and above education. Chi-square test between gender and education revealed that larger proportion of women were illiterate as compared to their male counterparts, and the difference was statistically significant ($p=0.026$). However, the difference in level of educational attainment between male and female was less conspicuous for secondary and college level education. Similar test between caste and education indicated that Dalits were disproportionately more illiterate ($p=0.002$).

Table 2. Respondent's profile of KAP Study, 2022

SN	Respondent's profile	Parameter	Number (n=346)	Percentage
1	Gender	Female	247	71.4
		Male	99	28.6
2	Caste	Brahmin/Chhetri/Thakuri	153	44.2
		Janajati	99	28.6
		Dalit	94	27.2
3	Age	Years (mean value)	47	N/A
4	Education	Illiterate	83	24
		Literate	143	41.3
		Secondary	112	32.4
		College	8	2.3

Analysis of family size by gender, caste, and education of the respondents plus land holding and income of households (ANOVA test) revealed that caste and education have important bearing on family size, with Dalits (6.5 members) having more family members as compared to Brahmins (5.8) and Janajati (5.4), and the difference is statistically significant ($p=0.011$). Illiterate respondents (6.7) have higher family size as compared to other groups (Literate=5.8; College=5.4; $p=0.004$). Other socio-economic parameters (gender, land holding and income) had no significant relationship with family size. Dalit households have higher number of members (2.05) outside Nepal as compared to other two castes ($p=0.018$), and illiterate respondent households had significantly higher number of members (2.7) living outside

village ($p=0.016$). In terms of land holding, male decision-makers (10.6 ropani) owned more land than female decision-makers (6.8 ropani), which was statistically highly significant ($p=0.000$). Dalit households owned less land (5.4 ropani) as compared to Brahmin (9.7 ropani) and Janajati (7.6 ropani), and the difference was statistically highly significant ($p=0.000$). Dalit and women decision-makers maker households seem to be relatively disadvantaged in the community, so project staff will need to factor in this information while proposing interventions to such households. Interestingly, HH income was independent of gender, caste though linked to education, with college/university graduates earning more, but the result is statistically not significant ($p=0.071$).

12. Nepali, G (2018). Socio-cultural identity of Dalits in Karnali. *Tribhuvan University Journal*, Vol. 32, No. 2. Faculty of Humanities and Social Science, Kirtipur, TU, Nepal.

Table 3. Household profile of respondents involved in KAP study, 2022

SN	Household profile	Parameter	Mean Value (no.)	No. of respondents
1	Family size	Male	2.9	344
		Female	3	344
		Total	5.9	346
2	Family member living outside Nepal	Male	1.3	118
		Female	1.4	33
		Total	1.6	121
3	Family member living outside village	Male	1.5	85
		Female	1.5	33
		Total	1.9	94
4	Land holding (ropani) (1 ropani=508 m ²)	Khet	5.1	278
		Bari	4.6	274
		Orchard	2.2	29
		Total	8.1	338
5	Household income	NPR	346,000	345

Results of profile analysis of respondents and households reveal that 24% of the target beneficiaries are illiterate, and more women (28%) falling in this category than men (13%). Similarly, Dalit households own least amount of land compared to other two castes, and male respondents own higher proportion of agricultural land compared to female respondents. Finally, Dalit households have higher number of members outside Nepal eking out a living (remittance), which explains the fact there is no statistically significant difference in income across households (Table 3).

These findings have important implication in terms of delivery of services, such as awareness raising programs and delivery of training programs, especially in climate resilient agriculture, agro-ecological farming and value chains, which tend to be knowledge plus resource-intensive in nature¹². Pictorial awareness raising materials along with hands-on training, exposure visits to model practitioners with limited writing and numeracy exercises will have to be devised while communicating with illiterate beneficiaries. Another limitation is keeping household level diary on cost of production and sales record of value chain products to convert farming as

business. Project staff need to be mindful of this category of beneficiaries and come up with ways to overcome these limitations so that they are not left behind.

5.1.2 Farmer's Knowledge Regarding Climate Resilient Agriculture, Agro-ecological Farming and Value Chain

With a set of 24 questions, we have attempted to elicit farmer's knowledge on soil health, climate change, agro-ecological farming, value chain, and access to government services and credit (Table 4). Only about one-third of the respondents are aware about soil health and more than 50% agree that soil test is essential, and 90% asserted that chemical fertilizer degrades soil health. Almost 80% of respondents indicated that climate change is happening but only about 40% of them know the availability of adaptation technologies/practices such as drought tolerant crop varieties, water harvesting technologies, and agro-ecological technologies and practices thereby indicating a gap in promotion of adaptation technologies (limited options for farmers). Only about 20% of respondents have knowledge on IPM, which is worrisome because IPM is the silver bullet to overcome disease and insect pest damage on crops, and dependable means of producing safe and healthy food. In fact, this is a reflection

¹² Rana, R.B. and L. Sherpa (2021). Farmers' Knowledge, Attitude and Practice Regarding Agrochemicals Application on Crops in Panchkhal Municipality in Nepal. LI-BIRD, Pokhara, Nepal.

of the limitation on the part of service provider organizations, which need to reorient and focus on promotion of relevant technologies and practices rather than just awareness programs. Farmers have decent knowledge on animal shed improvement (71%), bio-fertilizers (96%), mechanization (68%), insurance (77%), and weather forecasting (60%) because government and nongovernment organization programs have played instrumental role in awareness raising on these issues. Whereas, farmers are not so sure about local high value crops because almost half (46%) of respondents had no idea about them, and similar

number reported having no knowledge on seasonal demand of different agricultural produce, which is the cornerstone of any commercial production plan. Farmers usually don't maintain income and expenditure diary (cost of production) except in areas where the projects (HVAP) have intervened (42%). As expected, farmers have limited knowledge on agro-ecological technologies and practices including IPM practices because the focus of the development organizations has been more on awareness creation rather than on actual piloting and promotion of technologies and practices at local level.

Table 4: Knowledge regarding climate resilient agriculture and agro-ecological farming (n=346)

Particulars	Yes	%	No	%
1. Do you have knowledge on soil health status?	109	31.5	237	68.5
2. Do you know chemical fertilizer degrades the soil health?	312	90.2	34	9.8
3. Do you know soil test must be done to know soil health?	187	54	159	46
4. Do you know climate change is happening?	274	79.2	72	20.8
5. Do you know there are drought tolerant crop varieties?	138	39.9	208	60.1
6. Do you know about water efficient technologies?	138	39.9	208	60.1
7. Do you know bio-pesticides can control pests in crops?	208	60.1	138	39.9
8. Do you know about IPM practices?	71	20.5	275	79.5
9. Do you know about improved animal shed?	244	70.5	102	29.5
10. Do you know anything about bio-fertilizers?	332	96	14	4
11. Do you know local high value crops?	187	54	159	46
12. Do you know with agriculture mechanization, human drudgery can be reduced?	236	68.2	110	31.8
13. Do you know you have to maintain income/expense (cost of production) of agricultural operations?	144	41.6	202	58.4
14. Do you know you have to have crop/livestock insurance?	265	76.6	81	23.4
15. Do you know you need to maintain market information?	275	79.5	71	20.5
16. Do you know you can access weather forecast data?	209	60.4	137	39.6
17. Do you know the seasonal demand of agricultural produce in the market?	185	53.5	161	46.5
18. Do you know you can get good price for your produce when production is done as per market demand?	317	91.6	29	8.4
19. Are you aware you can access free government services?	204	59	142	41
20. Do you know you can access soft loan from banks and financial institutions?	259	74.9	87	25.1
21. Do you know about agro-ecology?	161	46.5	185	53.5
22. Do you know how to add value to your products?	169	48.8	177	51.2
23. Are you aware about agro-ecological technologies and practices?	107	30.9	239	69.1
24. Do you know how to make your products safe and healthy?	244	70.5	102	29.5

Output of logistic regression analysis with 24 different knowledge parameters as dependent variable against socio-economic variables as predictor (independent) variables has been presented in Annex 4. The result indicates that project location (district) has the maximum influence on respondents' knowledge on different parameters mainly explained by climate resilient agriculture-oriented and agro-ecological farming related projects being operated in Dailekh as compared to Salyan and Surkhet. Education is another important variable to exert maximum influence on farmers' knowledge in terms of soil health, water harvesting technology, bio-fertilizers, mechanization, access to government services, etc. with educated respondents faring better than non-educated individuals ($p < 0.01$). It's interesting to note that gender has specific influence on value chain related parameters such as knowledge on local high value crops, maintaining income/expense records, market intelligence, value addition, and production of safe food, where women seem to have better knowledge than men except for the last parameter, and the difference in knowledge is statistically significant ($p < 0.05$). Age of the respondent is positively associated with knowledge on soil testing, drought tolerant crop varieties, water harvesting technologies, bio-fertilizers, and production of safe food ($p < 0.01$), whereas age is inversely associated with local high value crops and market information ($p < 0.05$) indicating that younger generation have better knowledge on value chains and market intelligence. Caste is an important determinant about value chain-related information with Brahmin/Chhetri/Thakuri respondents as compared to other two categories having higher awareness about local value chain products, need to maintain income/expense diary, market information, and agro-ecology practices ($p < 0.01$). Households with higher landholding seem to be more aware about value chain products, whereas income of household is negatively correlated with market intelligence and access to government services, which indicates that higher income households are mostly dependent

on non-agricultural activities. Respondents engaged in share cropping are more likely to have awareness on seasonal demands of agricultural produce, mostly fresh vegetables. This is understandable because sharecroppers have taken land to cultivate commercial crops so they will have better intelligence on seasonal demands of different agricultural items thereby allowing them to make higher profits from their operations.

5.1.3 Attitude of Farmers Regarding Climate Resilient Agriculture, Agro-ecological Farming and Value Chain

By asking respondents 22 different questions, we have attempted to ascertain their attitude, beliefs or perception on above matters (Table 5). Majority of farmers believe that good local variety or improved variety can produce comparable yield to hybrids. Majority of farmers (75%) believe inorganic fertilizer is indispensable for obtaining higher yield, and soil test is unnecessary (88%), which might be the reflection of past experiences where soil tests were done but results seldom shared with farmers. Climate change is a real phenomenon (73%) but farmers are not convinced that it is negatively impacting their livelihood (17%). Farmers are not able to make a subtle difference between traditional agriculture and agro-ecological practice or organic agriculture (78%), and they treat them the same. While proponents of different concepts and approaches might focus on nuances between these approaches, but when approaching farming community perhaps a more widely accepted approach like organic farming that encompasses these nuances may be appropriate. Farmers know that organic produce in local markets do not receive premium price, and this fact has been corroborated by wholesale market vendors/operators. Therefore, there is no price incentive for farmers to adopt agro-ecological or organic practices, especially on fresh vegetables. Farmers seem to have negative attitude towards insurance mechanism, which is obvious given the fact that insurance has been effective only in livestock sector. Respondents believe the

weather forecasting is trustworthy (74%) but play limited role in minimizing risks to their operations (90%). Perhaps a more pragmatic approach with demonstration of how weather forecasting can benefit farmers needs to be documented and shared widely with farmers. There is a mistrust between farmers and vendors/collector and they don't believe that they will

ever get reasonable price for their produce (7%). This attitude of farmers' need to be changed especially when interacting with markets in commercial production. Project staff have an uphill task when it comes to changing this attitude, which can happen gradually when farmers start maintaining income and expenditure diary.

Table 5: Attitude regarding climate resilient agriculture and agro-ecological farming (n=346)

Particulars	True	%	False	%
1. Good local variety/Improved variety can produce as good as Hybrid variety	204	59	142	41
2. Without using inorganic fertilizer, organic farming can also give good yield	86	24.9	260	75.1
3. Use of chemical fertilizer is indispensable for higher yield	258	74.6	88	25.4
4. Soil test is a myth (there is no difference whatsoever)	306	88.4	40	11.6
5. Climate change is a natural phenomenon, so not real	93	26.9	253	73.1
6. Climate change is negatively affecting our livelihood, so we need to do something about it	59	17.1	287	82.9
7. Organic farming is difficult to practice	125	36.1	221	63.9
8. Produce obtained without the use of chemical fertilizer is organic	7	2	339	98
9. Organic products receive higher price in the market	24	6.9	322	93.1
10. Bio-pesticide is more expensive, less effective, and not readily available as compared to agro-chemicals	6	1.7	340	98.3
11. Animal urine collection and application to vegetables and crops is cumbersome	153	44.2	193	55.8
12. Urine collection and use is effective, good for the environment, and human health	9	2.6	337	97.4
13. Crop/livestock insurance is not worth the hassle	278	80.3	68	19.7
14. Crop/livestock insurance reduces the risk	14	4	332	96
15. Production based on market demand can fetch higher price	23	6.6	323	93.4
16. Weather forecast is not trustworthy	91	26.3	255	73.7
17. By using weather forecast data, potential risk can be minimized	34	9.8	312	90.2
18. Access to government subsidy is difficult for real farmers	65	18.8	281	81.2
19. Taking loan from bank is a cumbersome process	20	5.8	326	94.2
20. For commercial farming, accessing bank loan is a prerequisite	13	3.8	333	96.2
21. There is no difference between agro-ecological and traditional agriculture	269	77.7	77	22.3
22. Agro-ecological farming is as productive as modern agriculture	151	43.6	195	56.4

Socio-economic variables such as location (district), gender, education, caste and age play important role in explaining the differences in attitude of respondents towards various aspects of climate resilient agriculture, agro-ecological farming, and value chain (Annex 5). On the other hand, land holding and household income had limited role in shaping different attitudes amongst respondents. For instance, respondents with higher education seem to hold the view that inorganic fertilizer is indispensable for obtaining higher yield ($p < 0.01$). Male, Brahmin, older respondents, better educated have more access to government services than their counterpart. Gender, caste, and education have important bearing on respondent's views on difference between traditional agriculture and agro-ecological farming ($p < 0.01$). Their views are also shaped by how project interacts with the community in conveying messages, and what respondents perceive that we would like to hear from them, e.g. in Dullu, Barahatal and Birendranagar, respondents overwhelmingly believe that agro-ecological farming is as productive as modern agriculture (which has been reinforced by the project), whereas the reverse was the case in Aathbis, Kalimati, and Bankatta sites, where the same level of messaging by the project may not be evident. Another example of project's influence in shaping farmer's response is seen in the case of trustworthiness of

weather forecasting, except for Dullu site (Climate Smart Village program) all other sites indicated the weather forecasting to be less trustworthiness.

5.1.4 Practice Adopted by Farmers Regarding Climate Resilient Agriculture, Agro-ecological Farming and Value Chain

Finally in the KAP approach, we wanted to understand farmers' practices pertaining to different climate resilient agricultural, agro-ecological and value chains (Table 6). Except for mulching (96%), use of quality local or improved seed (84%), and crop rotation (75%), a vast majority of other climate resilient, agro-ecology and gender responsive technologies and practices are practiced by fewer households (20 – 44% households). There is a third category of technologies and practices, which is practiced by only a limited number of households in the project areas. These practices include: soil testing (6%), IPM practices (1 – 5%), crop/livestock insurance (7%), access to government subsidies (17%), and access to soft loan (8%). Greening of value chain is not possible without a significant uptake of soil testing and integrated nutrient management based on soil analysis results, wide-scale adoption of IPM practices, adoption of crop and livestock insurance by the producers, accessing soft agricultural loan to expand the business, and accessing government and other agency's resources.

Table 6. Practice regarding climate resilient agriculture and agro-ecological farming (n=346)

Particulars	Yes	%	No	%
1. Did you use good quality local or improve seed?	290	83.8	56	16.2
2. Have you ever tested your soil?	22	6.4	324	93.6
3. Are you applying recommended dose of chemical fertilizers?	72	20.8	274	79.2
4. Have you adapted cropping pattern as per the climate change?	128	37	218	63
5. Have you planted drought tolerant crops/varieties?	128	37	218	63
6. Are you using water efficient technology?	115	33.2	231	66.8
7. Are you using bio-pesticides to control disease/pests?	134	38.7	212	61.3
8. Are you practicing conservation agriculture technologies such as mulching and cover crops?	331	95.7	15	4.3
9. Are you practicing crop rotation in your land?	261	75.4	85	24.6
10. Do you collect animal urine and use on crops?	114	32.9	232	67.1

Particulars	Yes	%	No	%
11. Are you using pheromone trap to kill insect pests?	16	4.6	330	95.4
12. Are you using Yellow Sticker to attract and kill insect pests?	18	5.2	328	94.8
13. Are you using light trap to attract insect pest and kill them?	3	0.9	343	99.1
14. Are you using Trichoderma in your soil or for spraying?	3	0.9	343	99.1
15. Are you using liquid fertilizer in your crops?	108	31.2	238	68.8
16. Are you using only organic fertilizers in your crops?	138	39.9	208	60.1
17. Are you involved in production and sale of high value crops?	121	35	225	65
18. In order to reduce human drudgery, are you using any agriculture machine or tools?	153	44.2	193	55.8
19. Have you insured your crops and livestock?	23	6.6	323	93.4
20. Do you access market price before selling your produce?	146	42.2	200	57.8
21. Do you access weather forecast information before planting or harvesting your crops?	121	35	225	65
22. Have you accessed any government subsidies/programs?	57	16.5	289	83.5
23. Have you accessed soft loan from the banks?	26	7.5	320	92.5

Various socio-economic factors plus knowledge and attitude shape farmers' practice or behavior. Here we would like to assess how farmers' different practices relating to climate resilient agriculture, agro-ecological farming and value chain are explained by socio-economic factors (Annex 6). Location of the project sites significantly influenced different practices adopted by the farmers ($p < 0.01$). Education of the respondents has strong bearing on adoption of climate resilient technologies, use of bio-pesticides and organic fertilizers, and use of weather forecasting information ($p < 0.001$). Caste of the respondents influenced collection and use of animal urine, engagement in high value crops production and sale, application of drudgery reducing technologies, and accessing government's subsidy programs, with Brahmins practicing these technologies more than other two castes, except in case of accessing government's subsidy programs where Brahmins and Dalits have better access than Janajati ($p < 0.01$), which is the reflection of government's special program for Dalits. Gender of the respondent influenced collection and use of animal urine, engagement in high value crops, insurance of crops/livestock, and access to government subsidies/programs ($p < 0.05$), where male fared better in latter two parameters while female did the same in former two parameters. Age of the

respondent was not an important factor in adoption of any of these technologies. Landholding and income had positive association with adoption of certain technologies such as pheromone trap, crop/livestock insurance, and access to soft loan ($p < 0.05$).

As a final analysis, knowledge index (0-24), Annex 4, was created by adding all the positive responses, and similar exercise was done for attitude index (in case of attitude, negative but true value was first converted into positive response before adding; 0-22), Annex 5, and practice index (0-23), Annex 6. Pair-wise correlation tests were run and results obtained, which showed that farmers' practices were positively correlated to knowledge, and the relationship was statistically highly significant ($p < 0.000$). Similarly, farmers' practices were also correlated to attitudes but negatively, with statistically significant correlation ($p < 0.00$), which indicates that despite the fact that farmers hold negative attitude towards some of the concepts and approaches, they are swayed by other factors such as benefits from the projects or government subsidies or grants to adopt the practices. This goes to show that farmers having negative attitude towards some technologies and practices may not significantly influence their adoption behavior.

5.2 Analysis of Policies, Plans, Programs and Budgets of Local and Provincial Governments Regarding Organic Agriculture Mission in Karnali Province

This sub-section has been arranged into eight inter-related themes construed to be paramount while delivering the stated mission, and they are: 1) Policy framework/documents on organic agriculture; 2) Coherent programs, framework and mechanism for program delivery; 3) Budget; 4) Human resources; 5) Research and training support; 6) Networking and coordination amongst stakeholders; 7) Partnership with private, co-operative and civil society sectors; and 8) Monitoring and evaluation framework/mechanism. All the findings are corroborated and enriched with results from elsewhere in ensued discussions.

5.2.1 Advances in Preparation of Policy Documents on Organic Agriculture

SWOT analysis exercise with officials from the ministry (Annex 7) revealed that there has been unwavering political support for Organic Agriculture Mission at the highest level. Over the past four years, umpteen efforts have gone into preparing relevant background policy documents on organic agriculture, testified by the list of completed policy documents and documents under

preparation (Table 7). Four Acts related to organic agriculture, co-operatives, food right and food sovereignty, and agriculture enterprise promotion have been constituted. Food sovereignty regulation has been formulated and *Mulyawan* logo prepared to ensure that the products from Karnali are valued in terms of health safety. The slogan 'Karnali Sells Value not the Product' seems interesting due to the fact that the province does not have sufficient cultivable land to produce huge amount of agri-products but whatever is produced is produced in small amount but has significant contribution on human health with respect to food and environment safety.

More than two dozen operational guidelines have been prepared and approved for smooth implementation of different agriculture and livestock programs in the province (<https://molmac.karnali.gov.np/#/pages/category/type?slug=procedure>). Several seminal documents such as Karnali Agriculture Development Strategy and 15 Years Organic Mission Plan are under preparation. Having these policies generated awareness amongst general public and consumers about organic products from Karnali Province. Opportunities emerged to seek help on policy issues from the Federal Government.

Table 7. Policy documents prepared and under preparation in relation to organic agriculture, 2022

SN	Policy Documents Already Prepared	SN	Policy Documents Under Preparation
1	Organic Agriculture Act, 2019 कर्णाली प्राङ्गारिक कृषि ऐन, २०१६	1	Karnali Agriculture Development Strategy (KADS) कर्णाली कृषि बिकास रणनीति
2	Co-operative Act, 2019 सहकारी ऐन, २०१९	2	15-Year Organic Mission Plan प्राङ्गारिक कृषि रणनीतिक योजना
3	Food Right and Food Sovereignty Act, 2020 खाद्य अधिकार तथा सम्प्रभुता ऐन, २०१७	3	Provincial Organic Standard कर्णाली प्रदेश प्राङ्गारिक कृषिको मापदण्ड
4	Agriculture Enterprise Promotion Act, 2022 कृषि ब्यबसाय प्रबर्द्धन ऐन, २०१८	4	Guideline on Internal Control System (ICS) for Group Certification सामुहिक प्रमाणीकरणका लागि आन्तरिक नियन्त्रण प्रणाली संचालन निर्देशिका

SN	Policy Documents Already Prepared	SN	Policy Documents Under Preparation
5	Food Sovereignty Regulation, 2022 खाद्य अधिकार तथा सम्प्रभुता नियमावली, २०७९	5	Guideline on Participatory Guarantee System (PGS) सहभागितामुलक गुणस्तर निर्धारण प्रणाली (PGS) संचालन निर्देशिका
6	Standards for using <i>Mulyawan</i> Logo, 2021 मूल्यवान लोगो प्रयोग सम्बन्धि मापदण्ड, २०७८	6	

Some caveats in policy formulation process remain such as delay in preparing number of regulatory documents primarily due to lack of policy experts related to organic agriculture. However, imminent threats to these policies as highlighted in SWOT analysis include: 1) Challenges in proper implementation of these policies because of differences in understanding at different levels (provincial government, local government, and farmers); 2) Nepal's poor track records in policy implementation; 3) Lack of harmonization of policies pursued by Provincial Government and Local Governments; 4) Local Governments not obligated to Provincial Government policies; and 5) Farmers not being able to realize the immediate benefits of organic agriculture (premium not passed onto producers).

5.2.2 Coherent Programs, Framework and Mechanism for Program Delivery

Ministry officials acknowledged that decision-making authority at province level resulted in development of relevant projects, e.g. Apple and Walnut Development Project. They also foresee the opportunity to develop projects and attract donor funding. However, there are weaknesses in the current programming system where resource commitment to multi-year initiative like Organic Agriculture is difficult thereby creating uncertainty in implementation. Threats to multi-year projects with longer gestation period include instability of the government (frequent change of political representatives) leading to non-commitment to longer term projects.

Interaction with duty bearers (Agriculture and Livestock Officials) at Municipality level indicated that they are aware of the Provincial Government's commitment to Organic Agriculture. However, they lamented that no mechanism or framework for collaboration exist between Provincial Government and Local Governments. On a few occasions, local government bodies expressed antagonistic views towards provincial government's initiative. Perhaps, bridge-building exercises will have to be initiated from the province to gain trust and confidence of local governments.

5.2.3 Budget for Organic Agriculture Program

Provincial ministry has the authority to allocate budget for Organic Agriculture Mission and implement the program accordingly. Officials at the ministry perceive the opportunity to attract donor funding for the mission. However, the downside of the current budgeting system is the perpetual insufficient budget allocation coupled with inconsistency in budget allocation for multi-year programs leading to creation of uncertainty in program implementation. This fact has been amply demonstrated by the Figure 2, where there is erratic budget allocation over the years. Since the budget allocation to the provincial ministry is entirely controlled by the Federal Ministry, the budget allocation may not reflect the priority of Provincial Government. Moreover, accessing donor funding for provincial level programs is cumbersome and time consuming.

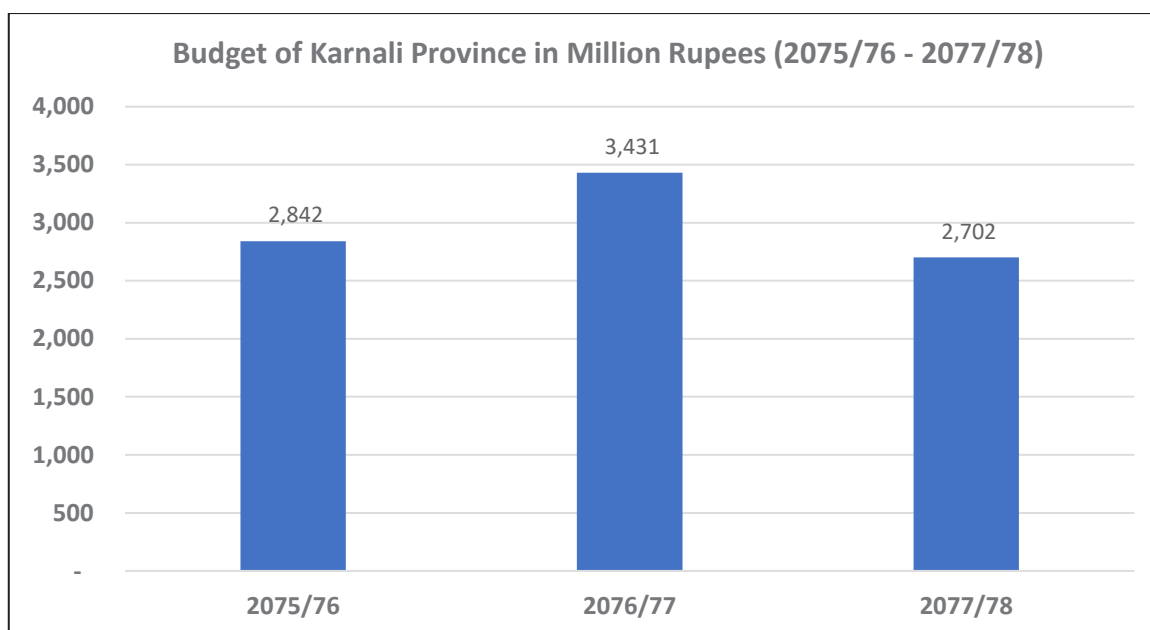


Figure 2. Budget of Karnali Province for the past three years, 2022 (Source: MoLMAC, Annual progress report of consecutive three years).

5.2.4 Human Resources for Delivering Organic Agriculture in Karnali Province

Majority of staff in the ministry come from within the province thereby giving a strong motivation towards Organic Agriculture Mission. Mid-West University has introduced organic agriculture curriculum, and more than 70 vocational/technical institutions are expected to generate required human resources for the mission. The ministry officials see the opportunity to unite the available human resources under Organic Agriculture Mission and contribute to socio-economic transformation of the province.

Having said the above, there are caveats to the current human resources with almost 90% of senior positions and 50% officer level positions lying vacant at the ministry. Shortage of qualified human resources (experts) to advance organic agriculture is conspicuously missing in the team, which might jeopardize the mission. The federal agriculture and livestock development ministry has provisioned some budget for organic mission program for Karnali province. However, the technical support in terms of organic farming seems to be lacking. There is no clear policy on

developing and skill upgrading of existing human resources to promote organic agriculture. The greatest threat to the mission is lack of experts and inability of the ministry to attract external experts and retain them for longer term, which is a prerequisite to deliver results in organic agriculture. Evidences from Higher Education Institutions in West African context reveal that most of the staff members possessed inadequate critical skills (specialization) to contribute to organic agriculture (out of 29 areas of specialization: 8 adequate; 13 inadequate; and 8 grossly inadequate)¹³.

Analysis of staffing situation at municipality level indicates that young technicians are quite proficient and they could articulate the provincial level vision, but they emphatically expressed the need for capacity building of municipality level staff on different contemporary issues (organic agriculture, climate resilient agriculture, value chains, value additions, entrepreneurship development, Integrated Pest Management, etc). Capacity building of municipality level staff on organic agriculture will be a value added intervention

¹³ Ajyelaagbe, I.O.O., P.J.C. Harris, and V.I.O. Olowe (2016). Skills gaps in organic agriculture and SWOT analysis in higher education institutions (HEIs) in Anglophone West Africa. *Organic Agriculture*, Volume 6, pages 109-118.

on the part of provincial government that could serve as bridge-building exercise and yield to harmonious working relations with frontline staff of municipalities, which at present is seriously lacking.

5.2.5 Research and Training Support to Delivering Organic Agriculture Mission

Preliminary research work on Organic Zoning of 42 Palikas is complete, and the organic zoning of remaining Palikas has been planned for the fiscal year 2079/080. The Detail Project Report (DPR) on Organic Agriculture Research Center and Development Farm (in collaboration with Nepal Agricultural Research Council - NARC) has been prepared. Some 20 agriculture technicians have been trained as Field Inspectors to oversee the organic production process. The ministry provides thesis grants to students conducting research on organic agriculture topics. Collaboration with national and international research institutions need to be doubled.

Innovative approaches (apprenticeship; Earning while Learning approach) in training have evolved, and institutions are applying these approaches with outstanding results. The Ministry needs to utilize the human resources therein for conducting relevant researches in organic agriculture as well as promoting the same. Role of agro-vet vendors in influencing farmers' purchasing behavior cannot be overemphasized because they are in many instances the first point of contact for information and inputs. Therefore, reorienting agro-vet vendors (input supplier) on bio-pesticides, organic fertilizers, agri-tools, harm to human health and environment with abuse of agro-chemicals, etc. and instigating them to promote these environment-friendly products through some incentive mechanism would have to be thought of.

5.2.6 Networking and Coordination amongst different Stakeholders

Networking and coordination take time and effort to make them functional. Some of the networking and coordination mechanisms include: presence of district-level network to

promote organic agriculture, and provincial level Organic Agriculture Promotion Steering Committee. However, the province level committee has been unable to organize regular meetings. Participants of the SWOT exercise recognize weak implementation as a lacuna, which has the potential to derail the mission. Other gaps include absence of municipality level and district level implementation committees. Given no obligations from local governments, implementation of the mission at grassroots level is viewed as a challenge by the provincial government. While on the other hand, local governments view extension of district-level mechanisms and other entities of the province as empire building undertaking. Strong views have been expressed from the local government bodies that the province needs to work more closely with the local governments and avoid duplication of programs in the field, work together in joint programs, delineate clear roles and responsibilities in joint programs, capacity building of local government staff, etc. These are valid demands for the provincial government to deliberate and deliver value added services.

For the sake of the mission, the deficiencies will have to be converted as opportunities for coordination and collaboration. The herculean task of declaring Organic Agriculture in Karnali Province, followed by myriad actions guaranteeing the quality of produce, ensuring fair price to producers, facilitating access to organic fertilizers and bio-pesticides at competitive rates, establishing functional value chain for organic products, etc. demand for flawless vertical and horizontal coordination amongst government entities. The ministry will have to rise up to the occasion and take stewardship role in coordinating different entities at various levels.

5.2.7 Partnership with Private Sector, Co-operatives and Civil Society Organizations

The ministry has some partnership programs with private sector, especially commercial banks and co-operatives, in the provision of soft loan to smallholder

producers and small agri-businesses, where the ministry provides subsidy on the interest. The scheme has been able to mobilize over NPR 72 crores by providing interest subsidy worth about three crores. The ministry also has some partnership programs with UN, INGOs and NGOs (GRAPE, GreenKarnali, Trichovermicompost project, etc.). In partnership with UN, I/NGOs and other stakeholders, the ministry has organized Stakeholders Dialogue with donors to have common understanding on Organic Agriculture Initiatives of Karnali Province and garner their support for joint programs and project implementation. Evidence from Indonesia clearly support the need for stronger collaboration and cooperation amongst different actors for fostering innovation¹⁴.

Exploratory interactions with key market actors (wholesale market in Birendranagar; collector in Barahatal; retailer in Aathbis) and input suppliers in Birendranagar, Dullu, and Aathbis have been insightful to understand how market behaves and how consumers value organic products vis-a-vis non-organic products, including production inputs. Market Promotion Committee in Birendranagar Wholesale Market has set aside two dedicated outlets for farmer groups/retailers to sell organic products, however, there is a dearth of organic products. Some stalls sell organic beans (not certified) brought from Jumla and other places, with apples from Jumla marketed in volume commanding good price. Organic products from Karnali will have to look for markets in Kathmandu and other cities in Nepal and beyond, where premium price can be expected to motivate farmers to GO ORGANIC. Interaction with input suppliers reveal that bio-pesticide options are limited combined with exorbitant high price compared to chemical pesticides. A case in point includes, King Killer (broad spectrum insecticide) which sells for NPR 170 whereas Closer 1500 (bio-pesticide) sells for NPR 760, 4.5 times more expensive than chemical pesticide. Market actors indicated that consumers

in Karnali province have lower purchasing power as compared to consumers in other parts of Nepal, and they are price conscious, always looking for attractive, clean and undamaged products, especially fresh vegetables, which means organic vegetables are less appealing and thus fetch lower price in the market thereby discouraging producers. They also suggested to apply commodity approach for organic production, such as apple and walnuts, citrus, turmeric and Sichuan Pepper, beans, etc. which are less perishable, already have established market network, and production system is organic by default (except apples). Their suggestion is worth deserving wider discussions amongst the key stakeholders.

5.2.8 Monitoring and Evaluation Framework for Organic Agriculture

Last but not least, we analyzed the monitoring and evaluation (M&E) framework of the government system. One of the good things about the system is that M&E is an integral part of an organization and included in all the documents. All districts have M&E part institutionalized. However, the government's M&E system has serious limitations: lack of impact level indicator monitoring system; no practice of social auditing; lack of qualified human resources for the job; and weak monitoring system leading to corruption and misappropriation of resources. Major challenges include geographical difficulty (inaccessibility) resulting in higher M&E costs, and limited budget allocation for M&E functions. Despite these limitations, opportunities abound to develop programs in Project Model in partnership with strategic actors, with Impact Level indicators and effective M&E system constituted. It's high time that ministry in Karnali Province take leadership role and mobilize government apparatus and private, co-operative, I/NGO partners to develop viable projects to transform agriculture in Karnali Province.

¹⁴ Schreer, V. and M. Padmanabhan (2020). The many meanings of organic farming: framing food security and food sovereignty in Indonesia. *Organic Agriculture*, Volume 10, pages 327-338.

5.3 Climate and Gender Responsive Resilient Agriculture Technologies and Practices

Farmers in the project area have been implementing a myriad of technologies and practices that can be characterized under Climate Resilient Agriculture and Agro-ecological farming practices but less so regarding gender responsive technologies. Exhaustive list of such technologies and practices (19 technologies/practices) has been documented in baseline study of the project¹⁵, which formed the basis for in-depth analysis of some promising technologies/practices that may be promoted widely by the project.

5.3.1 Crop Species and Varietal Diversity

Use of appropriate crop species and varietal diversity (drought tolerant, cold tolerant, early maturity, disease and pest resistant, etc.) within species comprise one of the most effective and low-cost solutions available to farmers to combat the negative impacts of climate change. Interaction with farmers reveal that a few of them have information regarding some of the promising varieties, yet more needs to be done. For instance, farmers in Birendranagar-13 in Surkhet, grow Lal Gulab variety of potato, which is susceptible to late blight disease prompting farmers to apply fungicide as prophylactic measure to prevent disease. This action not only increases cost of production for farmers but also negatively impacts human health and the environment. Evidences from elsewhere (Panchkhal Municipality, Kavre) prove that with the introduction of disease-tolerant varieties of potato, prophylactic sprays can be significantly reduced (>50%), and cost on agrochemicals reduced by 4.8 times from NPR 7,029 to 1,454¹⁶. Researchers are constantly developing climate resilient varieties suitable to different agro-ecological domains, hence farmers need to be exposed to these promising materials through on-farm testing using Participatory Variety Selection approach.

¹⁵ LI-BIRD (2022). A Report on Baseline Study of Climate and Gender Responsive Resilient Agriculture and Enterprises in Karnali River Basin. LI-BIRD, Pokhara, Nepal.

¹⁶ Rana, R.B. and L. Sherpa (2021). Farmers' Knowledge, Attitude and Practice Regarding Agrochemicals Application on Crops in Panchkhal Municipality in Nepal. LI-BIRD, Pokhara, Nepal.



Pic 1: Cattleshed improvement

5.3.2 Animal Shed Improvement

Animal shed improvement is one of the flagship programs of the government and the civil society organizations. Shed improvement needs to include farm yard manure (FYM) improvement component along with manger, paved/cobbled bed, and urine collection pit. This component plays vital role in sustainable soil nutrient management because urine, which contains 60% of the nitrogen excreted by animals, is the rich source of nitrogen (liquid manure) and organic pesticide¹⁷. However, there are a couple of points that need to be taken into consideration while implementing animal shed improvement program: 1) shed improvement works best for buffaloes and improved cattle rather than local cattle because decent amount of urine can be collected in the former two; 2) shed improvement scheme needs to be combined with commercial vegetable production to make proper use of animal urine, so priority should be given to commercial vegetable growing areas; 3) the scheme is capital-intensive, so match fund amount should vary with socio-economic status of the beneficiaries.

5.3.3 Plastic Tunnel and Drip Irrigation

Plastic tunnel has become synonymous with modern agriculture development, hence government institutions and I/NGOs are aggressively promoting the technology on cost-sharing mechanism. Whereas, private firms have made significant investments in this technology. Needless to say, tomato cultivation in plastic tunnels has taken off in a big way in semi-urban

¹⁷ Collection of cattle urine in improved cattle sheds for use as liquid manure and organic pesticide. <https://www.icimod.org/solutions/improved-cattleshed-for-urine-collection/>



Pic 2: Pheromone trap

areas credited to increased domestic production of fresh vegetables during off-season, rainy and post-rainy seasons. In recent times, there has been shift from temporary bamboo structure to permanent metal structures. Given that LI-BIRD works with socio-economically disadvantaged households, cost-sharing mechanism may have to be tweaked to reflect the ground reality of the beneficiaries, with most socio-economically poor households paying the least while better off households pay higher proportion of the total cost. Other aspects to consider in plastic house construction include: technical specification depending on the altitude of the location; compulsory adoption of drip irrigation technology (drudgery reducing technology); imparting knowledge on most profitable vegetables to grow in the tunnel; and skill enhancement of farmers to derive the maximum benefit from their investment.

5.3.4 Mechanization of Agricultural Practices

Mechanization of agricultural operations is the epitome of modern agriculture drastically improving efficiency, effectiveness, and quality of operations performed. With mechanization of agricultural operations, heavy labor-demanding farm operations have been consigned to machines thereby greatly reducing the human drudgery involved. Nepal desperately needs mechanization of agricultural practices to reduce drudgery, especially of women, to combat labor shortage in agriculture, and to attract youths in the agricultural businesses. Hence, the project needs to explore

different machinery and tools (mini-tiller, tractor, thresher, chaff cutter, corn sheller, rake, dryer, potato planter, etc.) to support farming operations.

5.3.5 Integrated Pest Management (IPM) Practices

Integrated pest management (IPM) practices comprise the most crucial component in transition to organic agriculture, and IPM provides an alternative to the use of agrochemicals to control disease and pests in farmers' field. Wide scale adoption of IPM practices by farmers may be necessary to observe intended results in the field. Farmers in many project sites are already applying some elements of IPM, e.g. disease resistant crop varieties, use of bio-pesticide, use of pheromone traps, yellow stickers, etc. Having said that, some farmers lamented that bio-pesticides were less effective to control insect pests and the community members complained about the foul smell of the bio-pesticides. Project frontline staff need to have better understanding of the IPM practices so that they can provide credible services to the farmers. This aspect is especially important while dealing with commercial farmers. Therefore, capacity building of project staff and leader farmers will be crucial to expand the wider application of IPM practices in the community to realize the intended results.

5.3.6 Shift to Permanent Fruit Crops/ Orchards

In the hill context where farm labor is an acute problem, a shift to permanent fruit orchards is one of the viable climate and gender responsive resilient agricultural options. At the moment, the project does not seem to have a clear strategy of promoting fruits as per the agro-ecological suitability of project sites. Major investment in orchards merit attention for several advantages: fruit trees are more climate resilient as compared to annual crops; less labor-intensive as compared to annual crops; more profitable than annual crops except vegetables; easier to convert to organic production with higher market potential for the produce. Some caveats to

large scale promotion of orchards include: high initial investment costs, which farmers might find prohibitive, and longer gestation period to realize the profits thus discouraging farmers to shift to fruits, especially when farmers have limited land. Perhaps, a gradual transition to fruit orchards can be planned for in consultation with farmers.

5.3.7 Soil Testing and Integrated Nutrient Management

Soil testing is not common in the project areas, with only 6.4% of the respondents had their soil tested in the past. However, this needs to change, especially when farmers are engaged in commercial production of different value chain items. Going organic entails following integrated nutrient management where bio-fertilizers, green manuring, FYM, animal urine etc. need to be applied based on the soil test results. Where necessary, soil pH correction and micronutrients may have to be supplemented to ensure higher yield. Project areas are endowed with variety of green manures such as dhaincha (*Sesbania bispinosa*) and asuro (*Adhatoda visica*), which are excellent sources of nitrogen and other fertilizers plus asuro is known to have medicinal properties as well. Better utilization of these abundantly available natural resources will go a long way in minimizing cost of production, at the same time, increase productivity thereby making farming more competitive.



Pic 3: Ashuro as green manure

5.3.8 Cost of Production Diary Maintenance

Diary maintenance at household level to record all the expenses incurred in the production process, yields achieved, amount sold in the market, price obtained, etc. is the prerequisite to transform subsistence-oriented agriculture to commercial agriculture. Maintaining diary at household level is easier said than done, especially when almost a quarter of the beneficiaries are illiterate. Perhaps a school going children in the family may have to be engaged to record the expenses on weekly basis. Without the accurate record on cost of production, amount produced, amount sold, etc. farmers will have no clear indication of how their operations are performing. Besides, having accurate cost of production data will empower farmers to negotiate price of their produce with collectors and wholesalers. Another benefit of maintaining a proper production record at household level facilitates government entities to enact Minimum Support Price for the produce in case market prices fall below the cost of production plus 20% margin to the farmers.

It was interesting to note that some farmers (Tariya in Dullu-2, Dailekh) actually maintained an elaborate diary at household level, which was supported by High Value Agriculture Project (HVAP). The Green Karnali project can adopt the diary and scale up in its working areas. While doing so, we have to remember that maintaining a cost of production diary is a major behavior change for farmers and project staff alike, requiring concerted efforts with constant follow up to ensure proper implementation. MoLMAC is also trying to develop the cost of production of major crops in the coming fiscal year. The information thus generated will be used for business plan preparation in interest subsidy program, topping up insurance program, etc. The Green Karnali could leverage with MOLMAC for this activity too.

6 CONCLUSION AND RECOMMENDATIONS

A study comprising of three components: the KAP study, policy analysis of Karnali Province in relation of organic agriculture, and documentation of promising climate resilient agricultural practices for wider adoption by project beneficiaries was successfully accomplished. Based on the study findings and subsequent discussions, the following conclusions and recommendations have been proposed:

1. Beneficiaries significantly differ in terms of their socio-economic traits, with almost a quarter of beneficiaries falling under illiterate category, with more women than men being illiterate, will have implications on extension and training methods being used for awareness creation, skills transfer, and empowerment measures being applied thereby ensuring that this category is not left behind. There is a clear age factor when it comes to advancement of value chain approach, with younger generation leading the way – they have better knowledge on different value chains suitable to their area, keep abreast of market information, and keep records of their income and expenses. The findings seem obvious but it's important what we do with the findings. Maybe it would be good to reorient the value chain interventions targeting the younger generation and providing more concerted attention to these individuals rather than approaching everyone in a group.
2. In terms of knowledge, farmers in general have good awareness on climate change, climate resilient agriculture, value chains, agro-ecological farming and so on. However, their knowledge seems to fall short when it comes to specific adaptation technologies and practices, drudgery reducing technologies, IPM practices, etc. A gap in promotion of these technologies (limited options for farmers) may be the reflection of the limitation on the part of service provider organizations because these organizations in the past have mostly focused on awareness raising activities. Henceforth, these organizations need to reorient themselves and adopt a more balanced approach with promotion of relevant technologies and practices along with awareness programs running simultaneously.
3. Farmers are not able to make a subtle difference between traditional agriculture and agro-ecological practice or organic agriculture, and they treat them in similar fashion. While the proponents of different concepts and approaches might focus on nuances between these approaches, but when approaching farming community perhaps a more widely accepted approach that encompasses these nuances may be appropriate. Hence, aligning all our works under the banner of Organic Agriculture in Karnali Province may be a better approach having greater appeal to broader stakeholders including governments, CSOs, private sector actors, and general consumers.
4. Climate change and its consequences on farmers' livelihoods are not fully comprehended by the respondents, nor do they fully realize the benefits of weather forecasting in their farming operations. This finding may be true to a large extent, which is corroborated by findings presented in Point 1 above, where significant gap was observed in farmer's knowledge on climate resilient technologies and practices. Perhaps a more pragmatic approach with on-farm demonstration of climate resilient technologies (drought tolerant crop varieties, early maturing varieties, disease/insect pest tolerant varieties, water harvesting technologies, machinery items, etc.) may help bridge the gap between knowledge and practice on climate resilient, agro-ecological practices including weather forecasting benefits to the farmers.

5. Majority of farmers (75%) believe inorganic fertilizer is indispensable for obtaining higher yield, which is corroborated by increased use of chemical fertilizer in the province over the past three years from 3081 mt in 2018/19 (2075/76) to 5028 mt in 2020/21 (2077/78), with a jump of 63%. One can only imagine the increased use of chemical fertilizer if there were no perennial shortages of fertilizers during planting seasons. It was observed that respondents with higher education seem to hold the view that inorganic fertilizer is indispensable for obtaining higher yield. Perhaps, a bit of de-learning may be necessary in higher learning institutions, but whatever we propose has to be firmly grounded on solid evidences generated in our context, e.g. on-farm demonstration of yield trials on crops showing the performance between inorganic fertilizer vs organic fertilizer-applied plots (seeing is believing; participatory research).
6. For long, the government institutions and I/NGOs have been engaged in distributing freebees to farming communities. Consequently, they have become addicted to these handouts and quite unwilling to change their attitude towards handouts, which was vehemently defended by farmers in several focus group discussions. Shift in farmers' attitude towards cost-sharing mechanism is inescapable, especially for implementation of value chain projects because the scale of operation at household level needs to be increased several fold from the current subsistence level of production to have impact on livelihood. Obviously, government agencies and I/NGOs cannot completely subsidize production at the required scale, hence a more pragmatic and sustainable approach might be to link with banks and cooperatives for soft loan to expand production.
7. There is a mistrust between farmers and vendors/collector and farmers don't believe that they will ever get reasonable price for their produce. This attitude of farmers' need to be changed especially when interacting with markets in commercial production. Maintaining a cost of production (income and expenditure record) diary will help farmers understand their cost factors, volume of production they have to achieve to make profit, minimum price they can afford, etc., which will go a long way in negotiating price with collectors and vendors. Farmers also need to be vigilant about the prevailing market prices in different major market hubs. Project staff have an uphill task when it comes to changing farmers' attitude and subsequent behavior, which can happen gradually when farmers start maintaining income and expenditure diary and regularly interact with different markets. Needless to say, this will be a major behavior change for farmers and project staff alike, requiring concerted efforts with constant follow up to ensure proper implementation.
8. Except for mulching (96%), use of quality local or improved seed (84%), and crop rotation (75%), a vast majority of other climate resilient, agro-ecology and gender responsive technologies and practices are adopted by fewer households (20 – 44% households). Still another category of technologies and practices is practiced by only a limited number of households in the project areas. These practices include: soil testing (6%), IPM practices (1 – 5%), crop/livestock insurance (7%), access to government subsidies (17%), and access to soft loan (8%). Though there is a strong and positive relationship between farmers' knowledge and the practices they follow ($p < 0.00$), still the gap between knowledge and practice is enormous, suggesting that not all knowledge can be translated into practice in real situation. Nevertheless, the project needs to narrow down the gap between what farmers know and what they practice.

9. Greening of value chain is not possible without a significant uptake of soil testing and integrated nutrient management (INM) practices rooted on soil analysis results, wide-scale adoption of IPM practices, adoption of crop and livestock insurance by the producers, accessing soft agricultural loan to expand the business, and accessing government and other agency's resources. The project is already undertaking some of these interventions, however, more focused approach may be necessary here, targeting INM, IPM, and access to soft loan for value chain promotion purposes. The province agriculture ministry is adopting the interest subsidy program via commercial banks, province level cooperatives and local municipal cooperatives for commercialization of agriculture sector where commercial, semi-commercial and subsistence farmers can take advantage of the provision while at the same time the ministry can manage subsidy effectively. So the Green Karnali project interventions should align with this approach too.
10. Ministry of Land Management, Agriculture and Co-operative of Karnali Province has done commendable job in terms of developing several policies, acts, regulations, guidelines, etc. pertaining to promotion of Organic Agriculture in Karnali Province. They are also in the process of preparing Karnali Agriculture Development Strategy, and 15-Year Organic Mission Plan to promote the mission. There is a resolute political commitment to the mission at the highest political level. Most of the staff in the ministry are from within the Karnali province and they are highly motivated to work for the mission. Mid-west University has initiated organic agriculture course, which will be instrumental in generating qualified human resources on the subject matter. More importantly, there are numerous vocational and technical training institutes experimenting with innovative and hands-on teaching approaches such as 'earning while learning', responsible for attracting young students in agriculture discipline. Organic Agriculture Mission has given a purpose and there is an opportunity to collectively bring all the relevant stakeholders under one mission.
11. Having said the above, there has to be a cautious optimism regarding the Organic Agriculture Mission given that Nepal does not have a stellar track record when it comes to proper implementation of the policies on the ground and delivering intended results. There are several operational level challenges, such as lack of harmonization in policies between provincial government and local governments, no clear demarcation of roles and responsibilities between province and local bodies in the mission, serious lack of technical experts in the field to drive the mission, farmers not being able to realize immediate benefit of transitioning to organic agriculture, etc. Green Karnali project must find its comparative advantage and carve itself a niche for supporting the mission. Adaptive research and advocacy could be one of the areas to consider. A more rigorous exercise within the organization is warranted for LI-BIRD to play a strategic partnership role in the mission.
12. For Organic Agriculture Mission to take roots and prosper, Organic Fertilizer Plant and Bio-pesticide Production Plant at commercial scale must be established thereby ensuring that these products will be readily available in the market at competitive prices. Government must do whatever it takes to materialize these operations. Forging partnership with private sector may be a viable option with provision of grant support, soft loan as well as subsidy from the government to companies producing organic fertilizer along with minimum volume and price guarantee. On the other hand, subsidize organic fertilizers to farmers so that their price is comparable to inorganic fertilizers.

13. Based on organic zoning results, it's absolutely important to focus on a few promising value chains rather than blanket approach to organic agriculture for the whole of province. Green Karnali project may have to focus more on permanent fruit orchards (oranges, lime) because of climate resiliency and less labor demanding nature. Another advantage with fruit crops is that when grown organically they receive premium price whereas the same is not true for fresh vegetables, thus discouraging farmers to go organic in vegetables. Link animal shed improvement program with fresh vegetables production, which is not obvious at present. More emphasis be given to integrated nutrient management highlighting the role of green manuring both in situ and cut and carry system. Finally, the project needs to reorient its staff on IPM and value chain approach so that they are able to provide credible technical services to the communities where needed.

Annex 1. Detail field visit plan for the assignment, 2022

Days	Date	Day/Place	Activity	Remarks
1	22.08.2022 (2079.05.06)	Monday Birendranagar	Interaction meeting with Green Karnali team for detailed field planning	LI-BIRD to write to Ministry for meeting
2	23.08.2022 (2079.05.07)	Tuesday Chhinchu	LCPL team prepare KAP questionnaire; FGD and KII checklists; workout detailed sample...	Selection of enumerators
3	24.08.2022 (2079.05.08)	Wednesday Chhinchu	Submission of Inception Report including KAP questionnaire and FGD and KII checklists for review/ comments, and inputs	LI-BIRD team to provide inputs within 2 days
4	25.08.2022 (2079.05.09)	Thursday Chhinchu	Review of policy documents; preparation for enumerators' orientation; addressing comments	LI-BIRD team submit inputs
5	26.08.2022 (2079.05.10)	Friday Chhinchu	Orientation to enumerators on KAP survey questionnaire; role play for conducting interviews	Birendranagar De Namaste Hotel
6	27.08.2022 (2079.05.11)	Saturday Chhinchu	Continue pre-testing exercise and practice run; review and reflection; finalization of questionnaire; preparation for field work	Pre-testing at Guptipur, Birendranagar-13
7	28.08.2022 (2079.05.12)	Sunday Chhinchu	Interaction meeting with MoLMAC officials for SWOT Analysis	SWOT Analysis exercise
8	29.08.2022 (2079.05.13)	Monday Chhinchu	Meeting with Agriculture/Livestock Section; KII with market intermediary at Birendranagar; KII with Province Level Training Center	
9	30.08.2022 (2079.05.14)	Tuesday Birendranagar	Conduct FGDs in the community @ Birendranagar – 13; conduct case studies	Monitor KAP HH survey
10	31.08.2022 (2079.05.15)	Wednesday Dullu	KII with Agriculture Officer of Barahatal in Birendranagar	Teej festival; monitor KAP HH survey @ Barahatal
11	01.09.2022 (2079.05.16)	Thursday Aathbis	KII with Agriculture/Livestock Unit of the Barahatal Rural Municipality; meeting with CAO; KII with Technical School teacher; KII with Collection Center operator	Monitor KAP HH survey @ Dullu
12	02.09.2022 (2079.05.17)	Friday Birendranagar	Conduct FGDs in the community @ Barahatal; conduct case studies	Monitor KAP HH survey @ Aathbis
13	03.09.2022 (2079.05.18)	Saturday Bangsadi	Travel to Dullu and KII with Green Karnali team	Travel to Birendranagar for night stay
14	04.09.2022 (2079.05.19)	Sunday Butwal	FGD and case studies at Dullu; KII with Agriculture/Livestock Section; Meeting with CAO; KII with agro-vet vendor at Dullu	Follow up with enumerators - KAP
15	05.09.2022 (2079.05.20)	Monday Pokhara	Travel to Aathbis for overnight stay	Parshu moves to Butwal; Ram flies to KTM

Annex 2. List of participants of FGDs

Date	District	Name	Sex	Name of group	Address
2079 Bhadra 13	Surkhet	Gita Koirala	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 13	Surkhet	Bhumisara BK	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 13	Surkhet	Krishna Pokhrel	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 13	Surkhet	Kumbu Devi Nepali	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 11	Surkhet	Rita BK	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 11	Surkhet	Archana BK	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 12	Surkhet	Haijali Budha	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 12	Surkhet	Manju Sunar	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 12	Surkhet	Ritu Sunar	Female	Pragatishil Mahila Krishak Samuha	Bi.Na.Pa.13
2079 Bhadra 12	Surkhet	Ninsara Saru	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Nima Rai	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Pabisara Saru	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Jeet Kumari Paudel	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Gauri Dahana	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Ganga Subedi	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Tika Thapa	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Geeta Pokhrel	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Gau Maya Thapa	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Purna Acharya	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Tika Kumari Pokhrel	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Belmati Dahal	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Dhal Kumari Chapai	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Tara Kumari Dahal	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2079 Bhadra 12	Surkhet	Khagisara Dahal	Female	Namuna Mahila Krishak Samuha	Bi.Na.Pa.13, Kahare khola
2070 Bhadra 15	Surkhet	Sumitra Sijali	Female	Bhaneri Krishi tatha Pasupalan Samuha; and Pashu tatha Krishi Utpadan samuha	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Nansingh Sinjali	Female	" "	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Sunita Sijapati	Female	" "	Barahataal-8, Belchaur

Date	District	Name	Sex	Name of group		Address
2070 Bhadra 15	Surkhet	Nirmala Darmala	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Gita Gurung	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Laxmi Sijali	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Manisara Balami	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Jaya Bdr Bohara	Male	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Hira Bohara	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Bhim Bdr Saru	Male	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Pramila Saru	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Bimi Saru	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Dil maya sijapati	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Lal Bdr Gharti	Male	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Sita Gautam	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Rama Gautam	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Gaumata Sinjjali	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Nanda Pande	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Gita Paudel	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Shanti paudel	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Manisara Gautam	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Runa devi sijali	Female	"	"	Barahataal-8, Belchaur
2070 Bhadra 15	Surkhet	Prem Bdr gaudam	Male	"	"	Barahataal-8, Belchaur
2079 Bhadra 16	Dailekh	Purna Bhandari	Male	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Kaushila Bhandari	Female	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Sakuntala Bhandari	Female	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Kokila Bhandari	Female	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Mandara Bhandari	Female	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Dambar Bhandari	Male	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Tejendra Bhandari	Male	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Bhim Bdr Bhandari	Male	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Reshma Bhandari	Female	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol
2079 Bhadra 16	Dailekh	Geeta Karki	Female	Bhandari tol Krishak Samuha		Dullu-4, Bhandari tol

Date	District	Name	Sex	Name of group	Address
2079 Bhadra 16	Dailekh	Laxmi Bhandari	Female	Bhandari tol Krishak Samuha	Dullu-4, Bhandari tol
2079 Bhadra 17	Dailekh	Namsara Karki	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Balika karki	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Durpati Karki	Female	Chetanshil Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Sapana sahi	Female	Chetanshil Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Padma Karki	Female	Gaurishankar Krisak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Kaushi karki	Female	Gaurishankar Krisak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Janaki Karki	Female	Gaurishankar Krisak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Bela Karki	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Padma Karki	Female	Gaurishankar Krisak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Niruta BK	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Pabitra Kathayat	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Hajura Karki	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Nani Devi Shahi	Female	Chetanshil Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Bimala Karki	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Belu Karki	Female	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Dharmaraj Karki	Male	Barpipal Krishak Samuha	Aathbis-3, Kamalkhada
2079 Bhadra 17	Dailekh	Karna Bdr Thapa	Male	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Kalika Thapa	Female	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Jaya Bdr Thapa	Male	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Tuli thapa	Female	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Bal Bdr Thapa	Male	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Parbati Thapa	Female	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Lal Bdr Thapa	Male	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Jaya Mani Thapa	Male	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Padam Thapa	Male	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Hima Thapa	Female	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Nandakali Thapa	Female	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya
2079 Bhadra 17	Dailekh	Chandrakala Thapa	Female	Shree Tariya Bemaushami Tarkari Utpadan Krisak Samuha	Dullu-2, Tariya

Annex 3. List of consulted stakeholders, 2022

Date	District	Informant type	Name	Sex	Organization	Address
2079 Bhadra 11	Surkhet	Ministry	Ramesh Khadka	Male	MoLMAC	Birendranagar Municipality
2079 Bhadra 11	Surkhet	Ministry	Dhan Bdr Kadayat	Male	MoLMAC	Birendranagar Municipality
2079 Bhadra 11	Surkhet	Ministry	Raju Bhoj	Male	MoLMAC	Birendranagar Municipality
2079 Bhadra 11	Surkhet	Ministry	Ram Bhakta Adhikari	Male	MoLMAC	Birendranagar Municipality
2079 Bhadra 12	Surkhet	Training center	Padam Subedi	Male	Agriculture and livestock business promotion training center	Birendranagar Municipality
2079 Bhadra 12	Surkhet	Training center	Dipak Bhandari	Male	Agriculture and livestock business promotion training center	Birendranagar Municipality
2079 Bhadra 12	Surkhet	Veg Mandi	Keshar Raskoti	Male	Tarakari mandi	Birendranagar-12
2079 Bhadra 12	Surkhet	Veg Mandi	Bishnu Neupane	Male	Tarakari mandi	Birendranagar-12
2079 Bhadra 12	Surkhet	Agrovet	Dilli Pd Pande	Male	Sital Agro	Birendranagar-12
2079 Bhadra 12	Surkhet	Palika	Yagya Pande	Male	ASC, Surkhet	Birendranagar-12
2079 Bhadra 12	Surkhet	Palika	Man Kumari Bist	Female	ASC, Surkhet	Birendranagar-12
2079 Bhadra 12	Surkhet	Palika	Rabina Sharma	Female	ASC, Surkhet	Birendranagar-12
2079 Bhadra 13	Surkhet	Case Study	Maniram Lamichhane	Male	Pashu tatha fresh vegetable production group	Bi.Na.Pa.-13, Indrapur
2079 Bhadra 13	Surkhet	Case Study	Tulsi P. Gautam	Male	Pashu tatha fresh vegetable production group	Bi.Na.Pa.-13, Indrapur
2079 Bhadra 13	Surkhet	Case Study	Banita Yogi	Female	Pashu tatha fresh vegetable production group	Bi.Na.Pa.-13, Indrapur
2079 Bhadra 13	Surkhet	Palika	Guru Pd Adhikari	Male	Agriculture Branch, Baddichaur	Barahatal Gaupalika
2079 Bhadra 14	Surkhet	Palika	Lalit Kumar Thapa	Male	Barahatal Gaupalika	Barahatal RM-5
2079 Bhadra 14	Surkhet	Palika	Dipak Sinjapati	Male	ASC, Baddichaur	Barahatal RM-5
2079 Bhadra 14	Surkhet	Palika	Dharmaraj Thapa	Male	ASC, Baddichaur	Barahatal RM-5
2079 Bhadra 14	Surkhet	Palika	Rajendra BK	Male	Barahatal Gaupalika	Barahatal RM-5
2079 Bhadra 14	Surkhet	Vendor	Chandra Sijapati Magar	Male	Karnali and Barahatal Sabji mandi	Barahatal-5, Baddichaur

Date	District	Informant type	Name	Sex	Organization	Address
2079 Bhadra 14	Surkhet	School	Dhimraj Jolmi Magar	Male	Jajajyoti Ma.vi.	Barahatal-5, Baddichaur
2079 Bhadra 15	Surkhet	Case Study	Jaya Bdr Bohora	Male	Farmer	Barahatal-8, Belchautara
2079 Bhadra 15	Surkhet	Case Study	Manisara Gautam	Female	Farmer	Barahatal-8, Belchautara
	Surkhet	LIBIRD	Sagar GC	Male	LI-BIRD	Birendranagar
2079 Bhadra 15	Dailekh	SOSEC	Ranjita DC	Female	SOSEC	Dullu
2079 Bhadra 16	Dailekh	Case Study	Sima Bhandari	Female	Bhandari tol Krishak Samuha	Dullu
2079 Bhadra 16	Dailekh	Case Study	Jurasingh Bhandari	Male	Bhandari tol Krishak Samuha	Dullu
2079 Bhadra 16	Dailekh	Palika	Gyanmani Nepal	Male	Dullu Na.Pa.	Dullu
2079 Bhadra 16	Dailekh	Palika	Bina Karki	Female	Dullu Na.Pa.	Dullu
2079 Bhadra 16	Dailekh	Palika	Rajan Kumar Bist	Male	ASC, Dullu	Dullu
2079 Bhadra 16	Dailekh	Palika	Chiranjibi Upadhyaya	Male	ASC, Dullu	Dullu
2079 Bhadra 16	Dailekh	Agrovet	Tarun Khadka	Male	Nepal Agrovet	Dullu
2079 Bhadra 17	Dailekh	Palika	Roshan Kumar Nepal	Male	ASC, Aathbis	Aathbis
2079 Bhadra 17	Dailekh	Palika	Bipin Gyawali	Male	ASC, Aathbis	Aathbis
2079 Bhadra 17	Dailekh	Palika	Dekendra BK	Male	LSC, Aathbis	Aathbis
2079 Bhadra 17	Dailekh	Agrovet	Pabitr Khanal	Female	Pabitra Pashu Panchhi Clinic	Aathbis-4, Rakam
2079 Bhadra 17	Dailekh	Veg Mandi	Bhagawati Sijapati	Female	Tarkari pasal	Aathbis-4, Rakam
2079 Bhadra 17	Dailekh	Case Study	Padma Karki	Female	Farmer	Aathbis-3

Annex 4. Knowledge Regarding Climate Resilient Agriculture and Agro-ecological Farming Vs Socio-economic Variables, 2022

Resilient technologies /Parameters	Age	Sex	Education	Caste	District	Share-in/out	Member living outside village /country	Annual income	Land holding
1. Do you have knowledge on soil health status?			0.000		0.000				
2. Do you know chemical fertilizer degrades the soil health?				0.016					
3. Do you know soil test must be done to know soil health?	0.008		0.000		0.008				
4. Do you know climate change is happening?					0.000				
5. Do you know there are drought tolerant crop varieties?	0.004				0.000				
6. Do you know about water efficient technologies?	0.013		0.000		0.035				
7. Do you know bio-pesticides can control pests in crops?			0.006						
8. Do you know about IPM practices?					0.000				
9. Do you know about improved animal shed?					0.000				
10. Do you know anything about bio-fertilizers?	0.009								
11. Do you know local high value crops?	0.014	0.04		0.001	0.000		0.039		0.034
12. Do you know with agriculture mechanization, human drudgery can be reduced?	0.038		0.013		0.000				
13. Do you know you have to maintain income/expense (cost of production) of agricultural operations?		0.004		0.000	0.000				
14. Do you know you have to have crop/livestock insurance?					0.000				
15. Do you know you need to maintain market information?	0.024			0.001	0.002		0.05		
16. Do you know you can access weather forecast data?				0.048	0.000				
17. Do you know the seasonal demand of agricultural produce in the market?			0.021		0.026	0.042		0.05	

Resilient technologies /Parameters	Age	Sex	Education	Caste	District	Share-in/out	Member living outside village /country	Annual income	Land holding
18. Do you know you can get good price for your produce when production is done as per market demand?		0.05			0.004				
19. Are you aware you can access free government services?			0.000		0.000			0.05	
20. Do you know you can access soft loan from banks and financial institutions?					0.000				
21. Do you know about agro-ecology?			0.000	0.003	0.000				
22. Do you know how to add value to your products?		0.018			0.000				
23. Are you aware about agro-ecological technologies and practices?			0.035		0.000				
24. Do you know how to make your products safe and healthy?	0.044	0.013	0.002	0.016	0.000				

Annex 5. Attitude Regarding Climate Resilient Agriculture and Agro-ecological Farming Vs Socio-economic Variables, 2022

Resilient technologies /Parameters	Age	Sex	Education	Caste	District	Share-in/out	Member living outside village / country	Annual income	Land holding
1. Good local variety/Improved variety can produce as good as Hybrid variety					0.000				
2. Without using inorganic fertilizer, organic farming can also give good yield	0.002		0.001		0.000				
3. Use of chemical fertilizer is indispensable for higher yield			0.017		0.000				
4. Soil test is a myth (there is no difference whatsoever)	0.023				0.000				0.007
5. Climate change is a natural phenomenon, so not real		0.011	0.010	0.000	0.000				
6. Climate change is negatively affecting our livelihood, so we need to act	0.018	0.001	0.000	0.001	0.000			0.003	
7. Organic farming is difficult to practice				0.006	0.000				
8. Produce obtained without the use of chemical fertilizer is organic									
9. Organic products receive higher price in the market					0.005				
10. Bio-pesticide is more expensive, less effective, and not readily available as compared to agro-chemicals									
11. Animal urine collection and application to vegetables and crops is cumbersome		0.040		0.002					
12. Urine collection and use is effective, good for the environment, and human health									
13. Crop/livestock insurance is not worth the hassle					0.000	0.04			

Resilient technologies /Parameters	Age	Sex	Education	Caste	District	Share-in/out	Member living outside village / country	Annual income	Land holding
14. Crop/livestock insurance reduces the risk		0.05							
15. Production based on market demand can fetch higher price					0.000				
16. Weather forecast is not trustworthy		0.004	0.000	0.000	0.000				
17. By using weather forecast data, potential risk can be minimized					0.000				
18. Access to government subsidy is difficult for real farmers		0.001	0.001	0.001	0.000				
19. Taking loan from bank is a cumbersome process									
20. For commercial farming, accessing bank loan is a prerequisite									
21. There is no difference between agro-ecological and traditional agriculture		0.021	0.000	0.027	0.000				
22. Agro-ecological farming is as productive as modern agriculture		0.014	0.003	0.001	0.000				

Annex 6. Practice Regarding Climate Resilient Agriculture and Agro-ecological Farming Vs Socio-economic Variables, 2022

Resilient technologies /Parameters	Age	Sex	Education	Caste	District	Share-in/out	Member living outside village / country	Annual income	Land holding
1. Did you use good quality local or improve seed?					0.000				
2. Have you ever tested your soil?					0.000				0.038
3. Are you applying recommended dose of chemical fertilizers?			0.001		0.000		0.003		
4. Have you adapted cropping pattern as per the climate change?			0.005	0.05	0.000				
5. Have you planted drought tolerant crops/ varieties?	0.046		0.05		0.000				
6. Are you using water efficient technology?			0.000		0.000				
7. Are you using bio-pesticides to control disease/ pests?			0.000		0.000	0.017	0.029	0.044	
8. Are you practicing conservation agriculture technologies such as mulching and cover crops?									
9. Are you practicing crop rotation in your land?					0.000				
10. Do you collect animal urine and use on crops?		0.036		0.000	0.000				
11. Are you using pheromone trap to kill insect pests?									0.028
12. Are you using Yellow Sticker to attract and kill insect pests?									
13. Are you using light trap to attract insect pest and kill them?									
14. Are you using Trichoderma in your soil or for spraying?									
15. Are you using liquid fertilizer in your crops?			0.001		0.000				
16. Are you using only organic fertilizers in your crops?			0.003		0.011				
17. Are you involved in production and sale of high value crops?		0.023		0.004	0.000	0.044			

Resilient technologies /Parameters	Age	Sex	Education	Caste	District	Share-in/out	Member living outside village / country	Annual income	Land holding
18. In order to reduce human drudgery, are you using any agriculture machine or tools?				0.038	0.000		0.018		
19. Have you insured your crops and livestock?		0.035		0.046	0.012				0.022
20. Do you access market price before selling your produce?					0.000				
21. Do you access weather forecast information before planting or harvesting your crops?			0.001	0.034	0.000				
22. Have you accessed any government subsidies/programs?		0.027		0.006	0.004				
23. Have you accessed soft loan from the banks?					0.001			0.021	

Annex 7. Organic Agriculture Vision of Karnali Province: Findings of SWOT Analysis, 2022

Parameters	Strength	Weakness	Opportunities	Threats
Acts, Policies, Strategic documents, Regulations, Guidelines	<p>Declaration of Organic Agriculture Karnali Province by the Provincial Government with continued political commitment at the highest level.</p> <p>Following policy documents are prepared: 1) Organic Agriculture Act; 2) Co-operative Act; 3) Food Right and Food Sovereignty Act; 4) Agriculture Enterprise Promotion Act; 5) Food Sovereignty Regulation; 6) <i>Mulyawan</i> Logo</p> <p>Following documents are under preparation: 1) Karnali Agriculture Development Strategy (KADS); 2) 15 Years Organic Mission Plan; 3) Provincial Organic Standard; 4) Internal Control System for Groups (ICS)/Participatory Guarantee System (PGS)</p>	<p>Delay in preparing some regulatory documents</p> <p>Absence of Law Section and lack of policy expert related to organic agriculture</p>	<p>Awareness amongst general public regarding sustainable agriculture products from Karnali Province creating premium market</p> <p>Partnership opportunity with different stakeholders</p> <p>Support in the policy level from the Federal Government</p>	<p>Challenges in implementation of formulated policies because of differences in understanding at different levels</p> <p>Lack of harmonization in policies between Provincial Government and Local Governments</p> <p>Local Governments are not obligated to Provincial Government policies</p> <p>Farmers not being able to realize immediate benefits with the adoption of organic agriculture practices</p>
Coherent programs (e.g. multi-year activities)	<p>Decision-making authority at province level resulting in development of relevant projects, e.g. Apple and Walnut Development Project</p> <p>While working in project mode, the M&E part becomes straight forward with clear link between Activity-Outputs-Outcomes</p>	<p>Lack of resource commitment for multiple-year projects like Organic Agriculture creating uncertainty in implementation</p>	<p>Donor funding can be attracted through project model</p> <p>Easy target-focused implementation in project mode due to pre-budgeting and planning</p>	<p>Political instability leading to insecurity of multi-year program commitment</p> <p>Government expected to serve each and every community rather than project-focused project beneficiaries</p>

Parameters	Strength	Weakness	Opportunities	Threats
Budget for programs	Budget allocation and implementation authority to the Provincial Ministry	Insufficient budget for the Organic Agriculture Mission Inconsistency in budget allocation across years creating uncertainty of programs Cumbersome process in accessing donor funding for provincial-level programs	Opportunity to explore funding from donors for the Organic Agriculture Mission	Overall budget allocation for the Provincial Ministry determined by the Federal Ministry, which may not fully understand and appreciate Provincial Government's mission
Human resources for delivering Organic Karnali Province program	Majority of human resources come from within the Province having high motivation towards Organic Agriculture Mission Mid-West University have included Organic Agriculture in their curriculum, which will generate required human resources >70 vocational level technical colleges or institutes producing necessary skilled human resources	Ministry has several positions lying vacant, e.g. 90% senior positions vacant, and 50% officer level positions vacant Organic agriculture related experts unavailable in the team No clear policy on developing required human resources for the Organic Agriculture Mission	Opportunity to unite available human resources under Organic Agriculture Mission and translate the vision into reality and contribute to socio-economic transformation of farmers in Karnali Province	Owing to geographical inaccessibility, Ministry finds it challenging to attract external experts and retaining them for longer term commitment Lack of experts on Organic Agriculture at present leading to gaps in realizing the Organic Agriculture Mission
Research and training support	DPR ready for Organic Agriculture Research Centre and Development Farm (collaboration with NARC) Research on Organic Zoning is complete ToT to field level technicians (20 Inspectors trained) Thesis grant supported to students conducting research on Organic Agriculture issues in Karnali Province	No research mandate to Provincial Government Research is not given due priority in our system, in general, which is true for organic research as well	Scope of conducting research in organic agriculture is unlimited because not much research has been done in this field Scope of research collaboration with national and international universities and institutions	Human resource/expert constraint within NARC to conduct Organic Research on priority basis

Parameters	Strength	Weakness	Opportunities	Threats
Networking and coordination	Presence of district-level network to promote organic agriculture Institution of Provincial level Organic Agriculture Management/Promotion Steering Committee	Absence of Municipality level and District level Implementation Committee Weak implementation Inability of Province level Committee to organize regular meetings	Scope for cost-effective implementation of programs M&E becomes easier and cost-effective With networking and effective coordination ownership of the program amongst stakeholders can be fostered	Given no obligation from Local Governments, implementation at grassroots level becomes a challenge Coordination is easier said than done (horizontal and vertical links difficult)
Partnership with private, banks, CSO and Co-operative sectors	Agriculture soft loan program with commercial banks and co-operatives where the Ministry provides partial subsidy on interest (72 crores mobilized with >3 crores of subsidy interest provisioned) Dedicated staff for facilitating soft loan program Partnership programs with UN, I/NGOs (GRAPE, Green Karnali, Trichovermicompost project, etc.)	Limited resources in co-operatives Limited awareness amongst farmers and stakeholders at grassroots level	In partnership with several partner organizations, the Ministry is able to organize a Donor Forum to highlight Organic Agriculture initiative of the Karnali Province Partnership opens up fund raising opportunities to realize our vision Possibility of developing joint action plan, joint M&E, joint ownership, and collective sharing of credits, etc.	Cash crunch in financial institutions limiting the partnership program with banks
Monitoring and evaluation	All documents include M&E as integral component Organizational structure has M&E section All districts have M&E part institutionalized	No impact level indicator monitoring system No practice of social auditing Lack of qualified human resources Weak monitoring system leading to corruption and misappropriation of resources	Opportunity of producing development programs in Project Model with inclusion of Impact Level indicators and effective M&E system instituted	Geographical difficulty (inaccessibility) resulting in higher M&E costs Budget constraints for effective M&E system implementation

Some photographs







For more information



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