GRAPE
Green Resilient Agricultural Productive Ecosystems

Green Resilient Agricultural Productive Ecosystems (GRAPE) Project

Highlights and Results

Co-funded by the European Union

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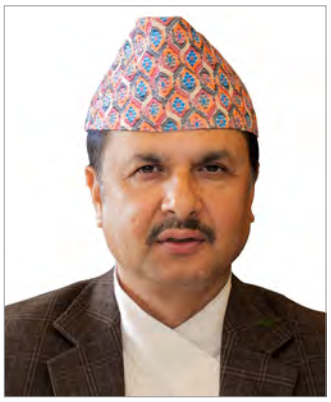
Table of Contents

Message from Ministry of Land Management, Cooperatives and Poverty Alleviation



Arjun Prasad Pokharel
Secretary, MoLCPA

It gives me great pleasure to present this compilation of approaches and practices from the Green Resilient Agricultural Productive Ecosystems (GRAPE) project. Led by the Ministry of Land Management, Cooperatives and Poverty Alleviation and implemented by GIZ with funding support of the European Union (EU), the Ministry for Foreign Affairs of Finland and the German Federal Ministry for Economic Cooperation and Development, GRAPE has been a testament to the power of collaboration and commitment to sustainable development.

The GRAPE project's journey has been one of deep collaboration, action-oriented research and hands-on implementation across nineteen partner municipalities in Sudurpaschim and Karnali Provinces of Nepal. By fortifying local value chains and empowering farmers, businesses and communities, the project has had a direct impact on improving livelihoods and fostering economic growth. We are especially proud of the integration of Climate-Resilient Agriculture (CRA) measures into municipal planning, coupled with co-financing initiatives contributed to establishment of various climate-resilient infrastructures, such as recharge ponds, soil cement tanks, solar lift irrigation systems, rustic stores, cellar stores, and polyhouses, which have ensured sustainable and lasting impacts.

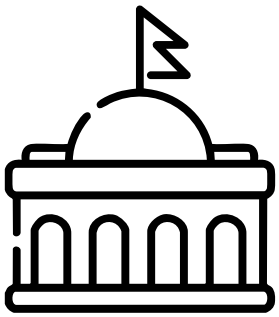
The central focus of the GRAPE project has been supporting cooperatives as key vehicles for economic development and poverty alleviation. By equipping cooperatives and their members with knowledge and resources to adopt the CRA practices, GRAPE has enabled them to build resilient agricultural systems, support sustainable practices and enhance food security in their communities. We take pride in the impact of these initiatives on local economic governance, sustainability, gender equity, and community-led development.

The shared experiences and insights captured in this publication reflect the hard work and dedication of the stakeholders, ranging from local governments, academia, farmers, cooperative members to field staff, to foster sustainable agricultural practices and improve community livelihoods under one umbrella: the GRAPE project. This resource serves as an invaluable guide for practitioners and development partners seeking to replicate and scale the GRAPE project's successes in other regions.

Our ministry is committed to championing similar initiatives across Nepal. We encourage government organizations and development partners to support the expansion of such programmes, advancing poverty alleviation and empowering cooperatives nationwide.

Last but not least, I would like to extend my heartiest thanks to the European Union, the Government of Finland and the Government of Germany for their financial support to this important action and to GIZ and GRAPE partners for their contributions to the project.

We look forward to continuing our mission of fostering sustainable economic development, alleviating poverty and strengthening cooperative networks with the support of local governments and the contributions of partners across the public and private sectors.



Message from Local Governments

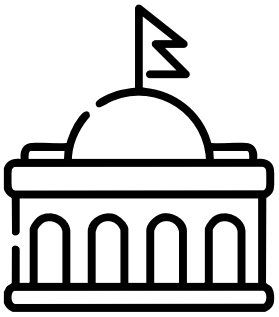
We, the partner municipalities of the Green Resilient Agricultural Productive Ecosystems (GRAPE), wish to express our heartfelt gratitude for the invaluable support we have received in promoting climate-resilient agriculture within our communities. This collaboration has significantly enhanced our initiatives to adopt climate-resilient agricultural (CRA) practices, contributing meaningfully to the green economic development envisioned in both the Green and Resilient Inclusive Development (GRID) Strategic Action Plan and the National Adaptation Plan.

We are particularly thankful for the joint financing efforts that have established an enabling environment for fostering climate-resilient agricultural value chains. The financial contributions from GRAPE have not only provided essential resources but also brought in the technical expertise necessary to integrate CRA into our municipalities' annual plans and strategies. Together, we have made considerable improvements in the conditions for climate-resilient and green economic development.

Our partnership has already yielded tangible results. We have co-financed approximately Euro 930,000 in CRA measures and infrastructure development, which has generated enthusiasm among local value chain actors, especially farmers. Notable achievements include the establishment of various climate-resilient infrastructures, such as recharge ponds, soil cement tanks, solar lift irrigation systems, rustic stores, cellar stores, and polyhouses. These initiatives are crucial for promoting agricultural value chains and enhancing green economic development at the local level. We recognize that these accomplishments are just the initial steps on our journey, and we are committed to building on this foundation in the future. The synergy created by our combined efforts has begun to show promising results, with smallholder farmers already experiencing increased production and income through the adoption of the CRA measures.

With immense appreciation for the support from the Government of Nepal, the European Union, the Government of Finland, and the Government of Germany, we are eager to continue this collaborative journey. We look forward to further strengthening our achievements for the future prosperity of our municipalities and their people.

Aalital Rural Municipality
Amargadhi Municipality
Badikedar Rural Municipality
Barahtal Municipality
Bhagwaimai Rural Municipality
Bhairabi Rural Municipality
Bheriganga Municipality
Birendranagar Municipality
Budhinanda Municipality
Chure Rural Municipality
Dhangadhi Sub-Metropolitan City
Dullu Municipality
Godawari Municipality
Himali Rural Municipality
Jorayal Rural Municipality
Kharpunath Rural Municipality
Naumule Rural Municipality
Simkot Rural Municipality
Swami Kartik Khapar Rural Municipality



साझेदार पालिकाहरूको संयुक्त सन्देश

हामी सबै GRAPE परियोजनाका साझेदार नगर/गाँउ पालिकाहरू, हाम्रो समुदायमा जलवायु उत्थानशिल कृषि प्रवर्द्धन गर्न GRAPE बाट प्राप्त अमूल्य सहयोग प्रति हार्दिक आभार व्यक्त गर्न चाहन्छौं । यस सहकार्यले हरित तथा समावेशी विकास (Green and Resilient Inclusive Development- GRID) रणनीतिक कार्य योजना र राष्ट्रिय अनुकूलन योजनामा परिकल्पना गरिएको हरित आर्थिक विकासको दृष्टिकोणलाई ठोस योगदान पुऱ्याउन जलवायु उत्थानशिल कृषि अभ्यासहरू अवलम्बन गर्ने हाम्रा पहलहरूलाई उल्लेखनीय रूपमा सशक्त बनाएको छ ।

हामी विशेषतः परियोजनाबाट भएका सहलगानीका प्रयासहरू प्रति धेरै आभारी छौं । उक्त सहयोगले हाम्रो क्षेत्रमा जलवायु उत्थानशिल कृषि मूल्य श्रृंखला प्रवर्द्धन गर्न सहयोगी वातावरण सिर्जना गरेको छ। GRAPE बाट आर्थिक सहयोगका साथसाथै प्राप्त भएको प्राविधिक सहयोगले हाम्रो पालिकाहरूको वार्षिक योजना र रणनीतिहरूमा जलवायु उत्थानशिल कृषि अभ्यासहरूलाई समेट्न मद्दत पुऱ्याएको छ । जलवायु उत्थानशिल र हरित आर्थिक विकासका लागि आवश्यक आधारभूत क्षेत्रहरूमा हामीले संयुक्त रूपमा उल्लेखनीय सुधार गरेका छौं।

यसै बीचमा हाम्रो सहकार्यले ठोस परिणामहरू पनि दिएका छन् । जलवायु उत्थानशिल कृषि कार्यक्रम र पूर्वाधार विकासमा हामीले गरेको करीव ९३०,००० यूरो बराबरको सहलगानीले विशेषगरी किसानहरू र मूल्य श्रृंखला कर्ताहरूलाई यस क्षेत्रमा उत्साहित बनाएको छ । विभिन्न जलवायु उत्थानशिल पूर्वाधारहरू जस्तै पुनर्भरण पोखरी, माटो सिमेन्ट ट्याङ्की, सौर्य लिफ्ट सिँचाइ प्रणाली, सेलार स्टोर, रस्टिक स्टोर, र बहुपयोगी प्लास्टिक घर/ग्रीन हाउस जस्ता संरचनाहरूको निर्माण तथा संचालन उपलब्धिपूर्ण छन् । यी पहल/प्रयासहरू कृषि मूल्य श्रृंखला प्रवर्द्धन र स्थानीय स्तरमा हरित आर्थिक विकासलाई सशक्त बनाउन अत्यन्तै महत्त्वपूर्ण छन्। हामी बुझ्छौं कि यी उपलब्धिहरू हाम्रो यात्राका प्रारम्भिक कदम मात्र हुन् तथा भविष्यमा यस आधारशिलालाई अझ सुदृढ बनाउनु जरूरी छ र यसका लागि--हामी प्रतिबद्ध छौं। हाम्रा संयुक्त प्रयासमा भएका विभिन्न क्रियाकलापहरूले साना किसानहरूलाई अहिले नै उत्पादन र आम्दानीमा वृद्धिको लाभ दिइरहेको छ र जलवायु उत्थानशिल उपायहरू अवलम्बन गर्न प्रेरित गरेको छ ।

नेपाल सरकार, युरोपेली संघ, फिनल्याण्ड सरकार र जर्मन सरकारबाट प्राप्त सहयोगप्रति हामी अत्यन्तै आभारी छौं। हाम्रो पालिका र पालिकाबासीहरूको समृद्धिका लागि यस सहकार्यलाई भविष्यमा पनि निरन्तरता दिन र थप सुदृढ पार्न हामी उत्साहित छौं ।

आलिताल गाउँपालिका
अमरगढी नगरपालिका
बडीकेदार गाउँपालिका
बराहताल गाउँपालिका
भगवतीमाई गाउँपालिका
भैरवी गाउँपालिका
भेरीगंगा नगरपालिका
वीरेन्द्रनगर नगरपालिका
बुढीनन्दा नगरपालिका
चुरे गाउँपालिका
धनगढी उपमहानगरपालिका
दुल्लु नगरपालिका
गोदावरी नगरपालिका
हिमाली गाउँपालिका
जोरायल गाउँपालिका
खार्पुनाथ गाउँपालिका
नौमुले गाउँपालिका
सिमकोट गाउँपालिका
स्वामीकार्तिक खापर गाउँपालिका

Message from the European Union

Veronique Lorenzo
EU Ambassador to Nepal

In 2019, the European Union made a bold move with the Green Deal, setting out to reshape its economy and spearhead a sustainable future. Our goal is to make Europe the world's first climate-neutral continent by 2050. This vision promises cleaner surroundings, more affordable energy, innovative transportation, job creation, and a better life for everyone, ensuring no one is left behind.

The Green Deal is not just a fresh start; it is built on the strong foundation of Europe's earlier climate efforts. It is about turning the challenges of climate and environment into real opportunities, while making sure the journey towards sustainability is fair and inclusive for all involved. Achieving such an enormous goal requires teamwork on a global scale, and we are not doing it alone. Nepal is a crucial ally in this journey, not only for its rich diversity, beautiful landscapes and vibrant communities, but also because the Government of Nepal has taken high-level commitment to address climate change and its impact.

At the heart of the European Green Deal is the Farm to Fork Strategy, aiming to make food systems fair, healthy and environment- and climate change-friendly, with an ambition to make European food the global standard for sustainability. The strategy promotes a circular economy model, seeking to make the entire lifecycle of food products and services sustainable: from food production, overprocessing and distribution to consumption—equally paying attention to food loss and waste prevention along the chain. Thus, the approaches to deliver on the strategy include using renewable energy and energy-efficient solutions and making the best use of technology in general. For example, reducing chemical use and ensuring farmers have access to quality solutions.

This is exactly where the Green Resilient Agricultural Productive Ecosystems (GRAPE) project in Nepal fits in. Through GRAPE, we have helped transform environmental and climate-related challenges into opportunities for fairer and more inclusive growth for local communities.

We are facing a stark reality: climate change is a serious threat to our food systems. We need stronger food systems that can withstand the test of time, systems that are sustainable and fortified by local strategies that honour Nepal's rich biodiversity. It is critical that this journey includes everyone; every citizen and stakeholder along the value chain deserves a just transition.

It is no surprise that GRAPE has seen strong support from European Member States present in Nepal, with Germany, Finland and the European Union joining forces. GRAPE is not just a project; it is a partnership dedicated to green growth, an exemplary showcase of Team Europe's collective approach in Nepal. By pooling resources from the European Union and its Member States, Team Europe aims for a bigger and more transformative impact, particularly in the crucial area of climate change.

We have hope and ambition for what GRAPE has achieved in the past years and what we can continue to achieve together. We are also convinced that the private sector and women entrepreneurs could and should play a bigger role in the programme that will succeed GRAPE.

As the GRAPE project comes to a close, I want to express my deepest gratitude to GIZ Nepal and all our partners: the Government of Nepal, in particular the Ministry of Land Management, Cooperatives and Poverty Alleviation, the participating municipalities, academic institutions, civil society organizations, cooperatives and social enterprises. Your collaboration has been vital to the success of the GRAPE project.

Message from the Embassy of Finland

Riina-Riikka Heikka
Ambassador of Finland to Nepal

As we celebrate the conclusion of the Green Resilient Agricultural Productive Ecosystems (GRAPE) project, we extend our deepest gratitude to all partners involved, especially the Government of Nepal, the Ministry of Land Management, Cooperatives and Poverty Alleviation, and the municipalities that have played pivotal roles in this initiative.

GRAPE has been instrumental in advancing sustainable agricultural ecosystems in Sudurpaschim and Karnali Provinces, fostering green local economic development. By empowering farmers, cooperatives and small businesses to create climate-resilient value chains, we have laid a strong foundation for economic viability that aligns seamlessly with the overarching goals of Finland's Country Programme for Nepal. The project has also actively engaged women and worked to improve their status in agriculture, enhancing women's economic development through targeted interventions that empower them as key players in agricultural value chains.

This initiative also highlights the importance of collaboration among a broad spectrum of stakeholders, including local municipalities, academia, civil society organizations, cooperatives, and the private sector. Their diverse contributions have been crucial in shaping innovative approaches to sustainable development. The participation of these actors has enriched the project, allowing for a holistic approach that integrates local knowledge, research and community needs into overall implementation. This multistakeholder engagement has ensured that the project addresses the unique challenges of building climate resilience and promoting sustainable agricultural practices, creating lasting impact.

Moreover, this initiative marks the first Team Europe Project, to which the European Union (EU), Germany and Finland have contributed, reflecting the commitment of all EU nations active in development cooperation in Nepal. Originally designed to complement other Finnish, German and EU-funded projects, this approach embodies the Team Europe spirit of synergy and shared objectives. The collaborative spirit of Team Europe has been essential in our shared mission to support long-term development in the country.

Through multi-actor cooperation, very much highlighted in Finland's development cooperation, we have created a platform for mutual learning and complementarity, allowing us to leverage our diverse expertise. With the participation of Finnish experts from the Natural Resources Institute–Finland and the Finnish civil society organization, Finn Church Aid, we have enhanced our efforts to address the challenges of sustainable development. This collaborative approach has fostered a knowledge-sharing environment that extends beyond the project's lifecycle.

We extend our sincere appreciation to GIZ for their professionalism and commitment to deliver impactful results in this multistakeholder project. Their expertise in sustainable agricultural ecosystems has been pivotal in achieving our shared goals. Furthermore, GIZ's exceptional coordination has effectively fostered collaboration among diverse stakeholders, ensuring that the needs of the communities involved are met and the project's successes are sustained.

As we present this final publication, we honour the significant achievements of the GRAPE project and the shared vision for a sustainable and equitable future for Nepal. Thank you to all stakeholders who have contributed to this journey.

Message from the Embassy of Federal Republic of Germany

Dr. Thomas Prinz
German Ambassador to Nepal

On behalf of the Federal Republic of Germany, I would like to extend our sincere congratulations on the successful conclusion of the Green Resilient Agricultural Productive Ecosystems (GRAPE) project. It is with great pride and admiration that we reflect on the impressive results, impactful achievements and the enduring partnerships that have emerged through this initiative. The GRAPE project stands as a testament to the power of international cooperation, innovation and shared commitment to sustainable development.

The achievements are a result of our close collaboration with the Government of Nepal, in particular the Ministry of Land Management, Cooperatives and Poverty Alleviation, as well as the authorities involved at the provincial and municipal levels. These partnerships have fostered trust and mutual respect, serving as the foundation for meaningful progress. We believe that through collaborative efforts like these, we can contribute to improving the livelihoods of Nepalese citizens, strengthening local governance and enhancing resilience, particularly in the rural areas of Karnali and Sudurpaschim Provinces.

The collaboration under the framework of Team Europe has been particularly valuable. By combining the strengths, resources and expertise of the European Union, Finland and Germany, we have demonstrated how a unified approach can amplify impact and deliver lasting results. This cooperative spirit is crucial as we continue to support Nepal's development aspirations and its journey towards achieving the Sustainable Development Goals.

As part of Team Europe's collective response, the GRAPE project reflects our shared vision of promoting inclusive and sustainable development, reducing poverty and empowering local communities. By enhancing land tenure security and supporting livelihood opportunities, the project has made tangible progress in addressing the fundamental needs of the Nepalese people, while also contributing to long-term stability and prosperity.

In closing, the GRAPE project is more than just a milestone. It represents the strength of our partnership and our shared dedication to building a more equitable and prosperous future for all. This is why the governments of Germany and Nepal agreed to continue the project at the bilateral government-to-government negotiations on September 5–6, 2024. Therefore, we look forward to continue our collaboration with the Government of Nepal and all our international partners to ensure that the gains achieved under the GRAPE project continue to benefit the people of Nepal for years to come.

Message from GIZ Nepal

Paulina Campos Monteros
Country Representative
GIZ Nepal

As we approach the conclusion of the Green Resilient Agricultural Productive Ecosystems (GRAPE) project, it is fitting to acknowledge its alignment with the enduring partnership between GIZ and the Government of Nepal. For fifty years, GIZ has supported Nepal's development priorities, building a legacy of collaboration.

The GRAPE project is a Team Europe Initiative, and jointly financed by the EU, the Ministry for Foreign Affairs of Finland and the German Federal Ministry for Economic Cooperation and Development (BMZ). The project focuses on enhancing sustainable agricultural ecosystems in Nepal's Sudurpashchim and Karnali provinces, reinforcing our collective commitment to a sustainable future.

Sustainable Economic Development is at the core of GIZ's partnership with Nepal, centering on inclusive growth, improved livelihoods, and long-term resilience. Given the nation's challenging geography, reliance on agriculture, and pressing threats of climate change, economic growth remains a priority, particularly for rural communities, where agriculture employs most of the population but contributes just 27.67% to the GDP.

GIZ is dedicated to implementing adaptable, effective solutions for sustainable development with capacity development at the heart of our efforts. Since 1974, in partnership with the Government of Nepal, GIZ has contributed to progress across a diverse range of sectors, including health, economic development, renewable energy and energy efficiency, community forest conservation, infrastructure, good governance, reconstruction and heritage conservation. Through technical advisory and implementation roles in numerous projects in Nepal, GIZ strives to advance global development goals, such as the Paris Agreement and the 2030 Sustainable Development Goals, ensuring that economic progress in Nepal is inclusive, sustainable, and equitable for all.

The GRAPE project exemplifies these commitments by integrating climate-resilient agricultural practices and enhancing the livelihoods of marginalized households, including women and socially disadvantaged groups. The project aligns with the Green, Resilient, and Inclusive Development (GRID) approach, ensuring that economic progress is equitable and supports a prosperous and sustainable future for the people of Nepal, particularly those in rural and semi-urban areas.

In closing, I would like to express my heartfelt gratitude to the Government of Nepal, the European Union, the Ministry for Foreign Affairs of Finland, and the German Federal Ministry for Economic Cooperation and Development (BMZ) for their unwavering support throughout this project. I look forward to our continued collaboration in pursuing our shared goals. I also wish to extend sincere thanks to the GRAPE team and partners for their dedication and invaluable contributions to the success of this project.

Acknowledgement

Axel Binder
Project Manager
GRAPE Project
GIZ Nepal

We extend our highest consideration to the nineteen partner municipalities for the excellent cooperation over the past years. With their ongoing commitment and determination to jointly promote green and climate-resilient local economic development in Karnali and Sudurpaschim Provinces and beyond, they decisively contributed to drive sustainable growth in the region. We also extend our heartfelt appreciation to our lead executing agency, the Ministry of Land Management, Cooperatives and Poverty Alleviation, for providing strategic guidance and ensuring that our joint efforts align with the national priorities and aspirations for sustainable development of Nepal.

The approach of GRAPE to foster sustainable partnerships that last over the project run time, involving on equal terms stakeholders of the government, cooperatives, the private sector as well as civil society organisations, was instrumental in making the project the success it became. The challenges that lay ahead in terms of climate-resilient and inclusive economic development can only be solved when joining forces within Nepal and beyond.

We sincerely thank the European Union, the Ministry for Foreign Affairs of Finland and the German Federal Ministry for Economic Cooperation and Development for their guidance and financing, which have been instrumental in enabling the project's activities and achieving its objectives. The project, a multi donor initiative, displayed the potentials that lay in pooling resources for achieving common results.

Additionally, we explicitly thank all partner organizations of the GRAPE project for their invaluable technical expertise, their cooperation and their commitment to foster sustainable partnerships. The dedication shown by our partners has been pivotal to the success of the project, and the achievements showcased in this publication reflect the strength of our collaboration.

Last but not least, I would like to express my sincere thanks for the outstanding expertise, commitment and perseverance of the entire GRAPE team. The results achieved have only been possible through teamwork and the full dedication of all team members. Thank you very much!

This publication highlights the impactful and innovative approaches in climate-resilient agricultural practices implemented over the past three years and celebrates the determination of farmers, households and communities that were involved in the project across Karnali and Sudurpaschim Provinces. The testimonials within this publication serve as a testament to the collective impact of our joint work and the meaningful progress made together.

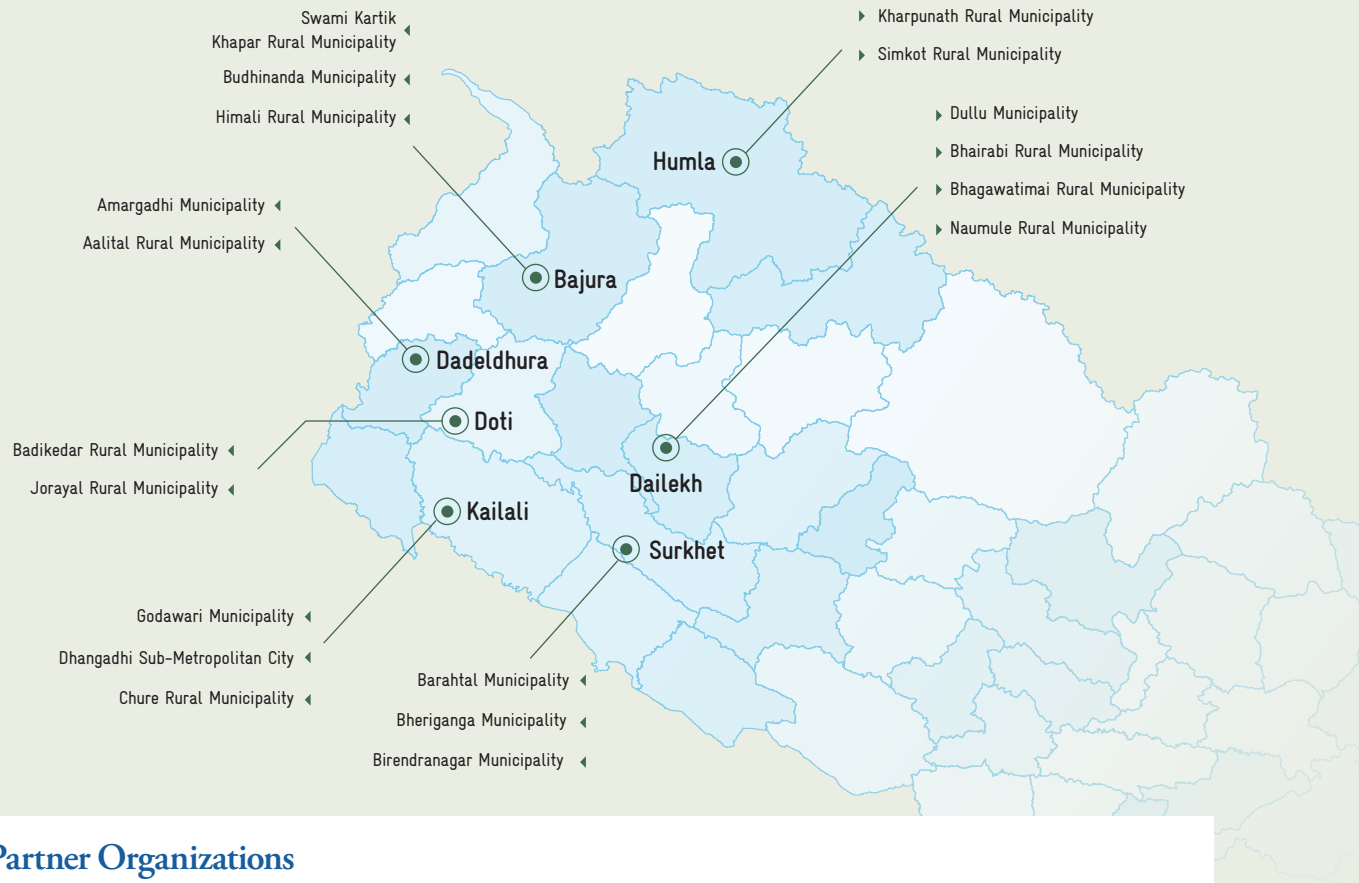
We hope that this publication appropriately reflects our shared achievements and inspires future initiatives that champion climate-resilient and inclusive economic development in Nepal and beyond.

Abbreviations and Acronyms

AHTCS	Animal Health Training and Consultancy Service
AKC	Agriculture Knowledge Centre
BMZ	German Federal Ministry for Economic Cooperation and Development
CAVE	Community Agro-Vet Entrepreneur
CRA	Climate-Resilient Agriculture
CSA	Climate-Smart Agriculture
CSAEC	Climate-Smart Agriculture and Economic Governance
CSLP	Climate-Smart Livestock Practices
CSOs	Civil Society Organizations
DLSO	District Livestock Service Office
EDS	Economic Development Strategy
FFS	Farmers Field School
FMTC	Food Management and Trade Company Ltd.
GDP	Growth Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GRAPE	Green Resilient Agricultural Productive Ecosystems
HBTL	Himalayan Bio Trade Limited
iDPP	Integrated Development Partnership with the Private Sector
IPM	Integrated Pest Management
LCA	Life Cycle Assessment
LED	Local Economic Development
LPED	Local and Provincial Economic Development
LRED	Local and Regional Economic Development
LRP	Local Resource Person
LUKE	Natural Resources Institute Finland
MADSAP	Municipal Agriculture Development Strategy and Action Plan
NFGF	National Farmers Group Federation
I/NGOs	Nongovernmental Organizations
PACA	Participatory Appraisal for Competitive Advantage
SLVC	Strengthening Smallholder Enterprises of Livestock Value Chain for Poverty Reduction and Economic Growth in Nepal
SMEs	Small and Medium Enterprises
ToT	Training of Trainers
TOV	The Organic Valley

GRAPE Implementing Partners

Partner Municipalities



Partner Organizations

1 AN INTRODUCTION TO GRAPE

Nepal, a geographically and ethnically diverse Himalayan country with around 30 million inhabitants, ranks 146th on the Human Development Index in 2024. As a Least Developed Country (LDC), it faces significant challenges, including political instability and a highly climate-dependent agricultural sector. Despite constitutional reforms in 2015 and a move towards a federal republic, the country struggles with the need for agricultural and economic transformations. Agriculture employs 66 per cent of the workforce but contributes only 27.67 per cent of the Growth Domestic Product (GDP). (NRB, 2020) The outmigration of men for work leaves behind women and vulnerable groups to manage local production. Climate change exacerbates issues like biodiversity loss, hill slope erosion and water scarcity. Addressing these challenges requires an enabling policy environment that promotes sustainable climate-resilient agricultural practices. Furthermore, it necessitates close collaboration among public institutions, producers, cooperatives, private sector actors, and civil society organizations (CSOs), with an emphasis on gender equality and social inclusion.

1.1 Local and Provincial Economic Development (LPED)

The Local and Provincial Economic Development (LPED) project started in June 2019. LPED was a bilateral cooperation between the governments of Nepal and Germany and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) under the guidance of the Government of Nepal (GoN), Ministry of Land Management, Cooperatives and Poverty Alleviation (MoLCPA). Commissioned for three years, its objective was to improve the framework conditions for local economic development and value chains at local and provincial levels. Guided by the Participatory Appraisal of Competitive Advantage (PACA) approach and Business Climate Survey (BCS), the project worked with eleven municipalities in Lumbini, Karnali and Sudurpaschim Provinces to boost local economies by identifying their competitive advantages and taking steps to improve the business environment. Additionally, the project facilitated inter-municipal and public–private–cooperative dialogue forums and implemented capacity development measures to strengthen local stakeholders.

Nepal Rastra Bank. (2020). Current Macroeconomic and Financial Situation of Nepal (Based on Annual Data of FY 2019/20).

However, as the COVID-19 pandemic struck during the project's peak implementation period in 2020, greatly affecting most of the activities, the project introduced adaptable initiatives, for example the Small Project Support Fund (SPSF). Following the adaptive measures of the SPSF, beneficiaries received targeted support for income-generating activities, such as small-scale livestock farming and kitchen gardening, which helped farmers to keep operating. The measure also offered market-oriented skills training to cooperative members and enterprises to keep their enterprises operational. For these activities, the project provided technical advisory services, along with essential inputs, including high-quality seed kits, Integrated Pest Management (IPM) tools and watering cans, which enabled the beneficiaries to grow nutritious food on a small scale. Additionally, it engaged returnee migrants and disadvantaged groups, particularly those affected by COVID-19, in farm and off-farm enterprises like stitching and livestock, fruit, vegetable and riverbed farming.

1.2 Green Resilient Agricultural Productive Ecosystems

In 2021, the Green Resilient Agricultural Productive Ecosystems (GRAPE) project was integrated into the LPED project. The GRAPE project is a joint action of the European Union (EU), the Ministry for Foreign Affairs of Finland and German Federal Ministry of Economic Cooperation and Development (BMZ). The project was Nepal's first Team Europe Initiative and emphasized the EU and its member states' cooperation in Nepal.

The GRAPE project contributed to the Green, Resilient, and Inclusive Development (GRID) approach adopted by the GoN and the International Development Partners Group (IDPG) to pursue long-term sustainable economic development.

Aligned with the EU Green Deal and the Farm-to-Fork strategy, the project also contributes to Nepal's Nationally Determined Contributions (NDCs) by supporting scientific research and adaptation strategies to tackle climate change impacts.

The project was aimed at promoting climate-resilient green economic growth in Sudurpaschim and Karnali Provinces. Its specific objectives were to:

- Enhance profitable participation in sustainable and climate-resilient agricultural value chains; and
- Improve the climate resilience and sustainability of market-oriented agricultural ecosystems.

The first objective focused on developing viable climate-resilient agricultural value chains, while the second objective aimed to strengthen stakeholders' capacity to advance resilient and sustainable agricultural practices beyond the project. This initiative sought to build the project's ability to create and share relevant knowledge.

There were four areas of intervention to achieve the project's objectives:

Economic governance:

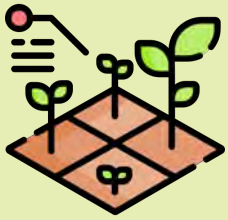
This area of intervention focused on helping local governments create the right conditions for sustainable climate-resilient agriculture and green economic development, for example, through capacity development of municipal officials on planning processes, development of agriculture strategy and action plan for Climate-Resilient Agriculture (CRA).

Action research:

This area of intervention focused on testing new farming methods and tools, such as irrigation methods, direct on farmers' fields, ensuring they aligned with local conditions and market needs. It brought together farmers, university students and professors in a hands-on collaboration for developing practical real-world solutions. Additionally, research institutions and other stakeholders along the agricultural value chain contributed their expertise to refine and enhance these innovations, making them both effective and sustainable.

Scaling up:

This area of intervention focused on knowledge dissemination on climate-resilient and water-efficient farming practices to a broader audience through the learnings gained by the project following implementation. By strengthening Agricultural Knowledge and Innovation Systems (AKIS), it ensured that farmers, institutions and communities adapted to climate change through better access to information and collaboration. Key stakeholders, including municipalities, provincial governments, nongovernmental organizations (NGOs), cooperatives and universities, were equipped to apply and scale these solutions within their areas.



Rolling out:

This area of intervention capacitated farmers, cooperatives and agricultural businesses to adopt and apply proven climate-resilient farming practices. It focused on training value chain actors like farmers, producer groups and businesses on methods that improved productivity and made farming more resilient to climate challenges such as water-efficient measures. By integrating these practices at every stage of agriculture—from input supply and production to trade and consumption, it ensured sustainable solutions that adapted to climate change while protecting crops, livestock and livelihoods.

2 GRAPE JOURNEY

Looking back at Key Results and Achievements

Inception Phase

Project Financing

The GRAPE project implemented on behalf of the EU, the Ministry for Foreign Affairs of Finland and the German Federal Ministry for Economic Cooperation and Development. First Team Europe project in Nepal implemented under the Local and Provincial Economic Development (LPED) Project.

Identification of Municipality Clusters

The GRAPE project has identified 3-4 rural municipality clusters, each containing 4-5 municipalities, to address climate resilience and sustainable development. In total, 19 municipalities are grouped into these clusters to facilitate targeted interventions and community-based strategies.

June 2021- Project Officially Begins

The GRAPE inception period marks the onset of the project activities. The project is made a part of the Team Europe Initiative (TEI) and aligns with the agenda for "Green, Resilient and Inclusive Development" (GRID) which has been agreed upon by Development Partners and the Government of Nepal (GoN).

Cluster Level Planning Workshop

Cluster-level consultations with partner municipalities were conducted to understand local needs, challenges, and opportunities for climate-resilient agriculture

GESI Strategy Overview

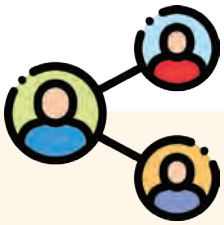
The GRAPE project made commitments to making special efforts to involve disadvantaged groups in the local economy. Improving the economic situation of women, people living with disabilities, and disadvantaged groups

Local Level Value Chain Selection

The programme conducted a value chain selection process across its 19 partner municipalities to identify key local agricultural products, such as potatoes and turmeric, for targeted support.

Rapid Asessment of Agriculture Value Chains

The initiative launched to strengthen Nepal's capacity to adapt agricultural practices best suited to climate change and ensure the participation of the socially disadvantaged groups in value chains that are incorporated into sustainable, climate-resilient agricultural ecosystems.



Virtual Sharing and Information Workshop with National and International NGOs

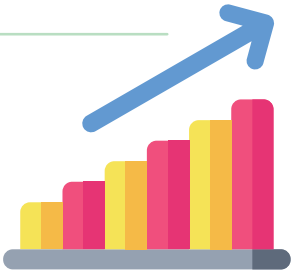
This workshop facilitated knowledge exchange and strengthened partnerships to support sustainable development and climate resilience efforts.

Quantitative Results

Achieved through implementation

The implementation phase of GRAPE focused on improving framework conditions to achieve climate resilience across 19 project municipalities in Karnali and Sudurpaschim provinces.

Over the project period, small-holder farmers have been empowered with Climate Resilient Agriculture (CRA) measures resulting in increased income and agricultural productivity of our target groups. As the project concludes, these achievements mark significant progress towards sustainable development goals in the region.



€930,000

allocated by 19 partner municipalities for co-financing climate-resilient practices

Adoption of Climate Resilient Practices by

16,810

Farmers

53.4%

Average increase in farmers' income.

72%

agricultural area managed by women of whom

51.4% are DAG benefecieries

1145

hectares of agricultural land managed with Integrated Pest Management (IPM) tools and water-efficient measures

22 Policy Inputs

810 Students trained on CRA practices

115 agricultural intermediaries supported with new AKIS knowledge products

32
Action-based research finalised

2505
farmer households were advised research-based recommendations

6
economically viable agriculture innovations generated

19
Community Learning Centres(CLC) established

Export of Products to International Market

85.82t
Ginger

14.3t
Turmeric

5 kgs
Sea Buckthorn Oil

3.66t
Citrus

1.6t
Nettle

535
received training on economic governance

92%
farmers received digital agricultural extension services on CRA practices, market prices, and weather information.

19
municipalities supported in the preparation of MADSAP

271
smallholder agri-ecopreneurs were capacitated through business incubation to enhance their entrepreneurial skills

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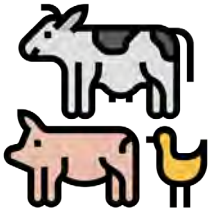

1864 (1,305 female, 559 male)
farmers benefited from the implementation of climate-resilient livestock farming measures and through activities like animal health camps, cattle shed and breed improvements

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176
Climate Field School courses were conducted for farmers with limited literacy levels

24
cooperstives have marketed agri products produced using CRA measures

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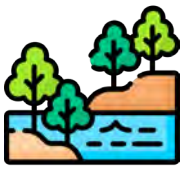
139 (72 women)
received Digital climate risk insurance covering 31.34 hectares of potato, legumes and orange crops

3
Universities integrated CRA courses in their curriculum

916
Polyhouses supported

29
Market centers established



521
Water Collection Ponds supported

7
Agri-processing enterprises established

781
Irrigation facilities supported

75
Other Agriculture Support Facilities solar dryer, seed bank,

178
nurseries established

8
soil testing laboratory and kits

876
Organic fertilizers and manurenproduction Units

26
Storage Structure facilities established

GRAPE directly contributes to Nepal's Nationally Determined Contributions (NDC), specifically to these contribution areas.

409 farmers received support materials for cattleshed improvement

4 vermicompost enterprises producing organic fertilizers

32 climate-resilient practices being researched

3 Transformative Partnerships:

A key element of Grape

Climate change is a global challenge that requires diverse expertise to address it effectively. Central to the GRAPE project's mission of promoting sustainable and climate-resilient agricultural development was its commitment to partner with a variety of stakeholders, including public and private sectors, cooperatives, CSOs, academia and development partners. What distinguishes GRAPE from similar other projects was its focus on transformative partnerships that extended beyond simple exchanges. These partnerships fostered enduring relationships, strengthened local capacities, integrated diverse expertise, facilitated information sharing, and ensured the long-term success of project results.

GRAPE's partnership framework was built on the contributions of various international and national NGOs, cooperative unions and universities—each responsible for specific aspects of project implementation. This coalition enabled comprehensive, innovative and multi-layered activities that leveraged expertise in areas such as climate-resilient technologies and gender and social inclusion. By shifting from a transactional model, where partners come together for specific tasks, to a transformative approach focused on long-term collaboration and mutual growth, GRAPE supported an environment where knowledge and resources are shared for greater good.

A key initiative under this transformative approach is the GRAPE Partnership Platform, which promoted open collaboration, networking and knowledge sharing among partners. Rather than viewing partnerships solely to enhance project delivery, GRAPE considered building these relationships as a core outcome. This aimed to create networks that extended beyond the project's immediate goals, contributing to broader agricultural development efforts in Nepal and aligning with the GRID approach, endorsed by the GoN and sixteen development partners. One of the key initiatives, the Community of Practice (CoP), brought NGOs that advocated for the CRA approach on a common platform to enhance their ability to support CRA. Joint learning and monitoring visit was another element of GRAPE's partnership model, which facilitated exchange of insights and reflections on the best practices, for example in CRA practices. During such visits, partners identified opportunities for improvement in the field. The first visit was in May 2023, when participants from various partner organizations toured Surkhet, Dailekh and Bajura Districts. They observed CRA practices, engaged with farmer groups and shared valuable knowledge with local governments. By the end of 2024, GRAPE had conducted four joint learning and monitoring visits, including one with representatives from the MoLCPA, Ministry of Land Management, Agriculture and Cooperatives of Karnali Province and Sudurpaschim Province, and members from the Youth Sounding Board, initiated by the EU, International Centre for Integrated Mountain Development (ICIMOD) and GIZ, all contributing to better field implementation and a deeper understanding of the project's challenges and opportunities.

The transformative partnerships forged through GRAPE not only led to immediate project success but also laid a groundwork for future collaborations in the agricultural sector. The relationships and networks established will continue to support local economic development and CRA well beyond the project's implementation phase. GRAPE's success exemplifies the power of these transformative partnerships. By fostering collaborations among NGOs, universities and local governments, the project has built a resilient network that enhances local capacity, promotes CRA and paves the way for sustainable economic development in Nepal. This impact was recognized during a high-level delegation visit in September 2024, which included the Hon'ble Minister of Land Management, Cooperatives and Poverty Alleviation and representatives from the German Embassy and the EU Delegation to Nepal. The shift from transactional to transformative partnerships ensures that GRAPE's results will last well beyond its project phase, contributing to a robust and collaborative agricultural future for Nepal.

4 GRAPE Areas of Intervention

4.1 Economic Governance

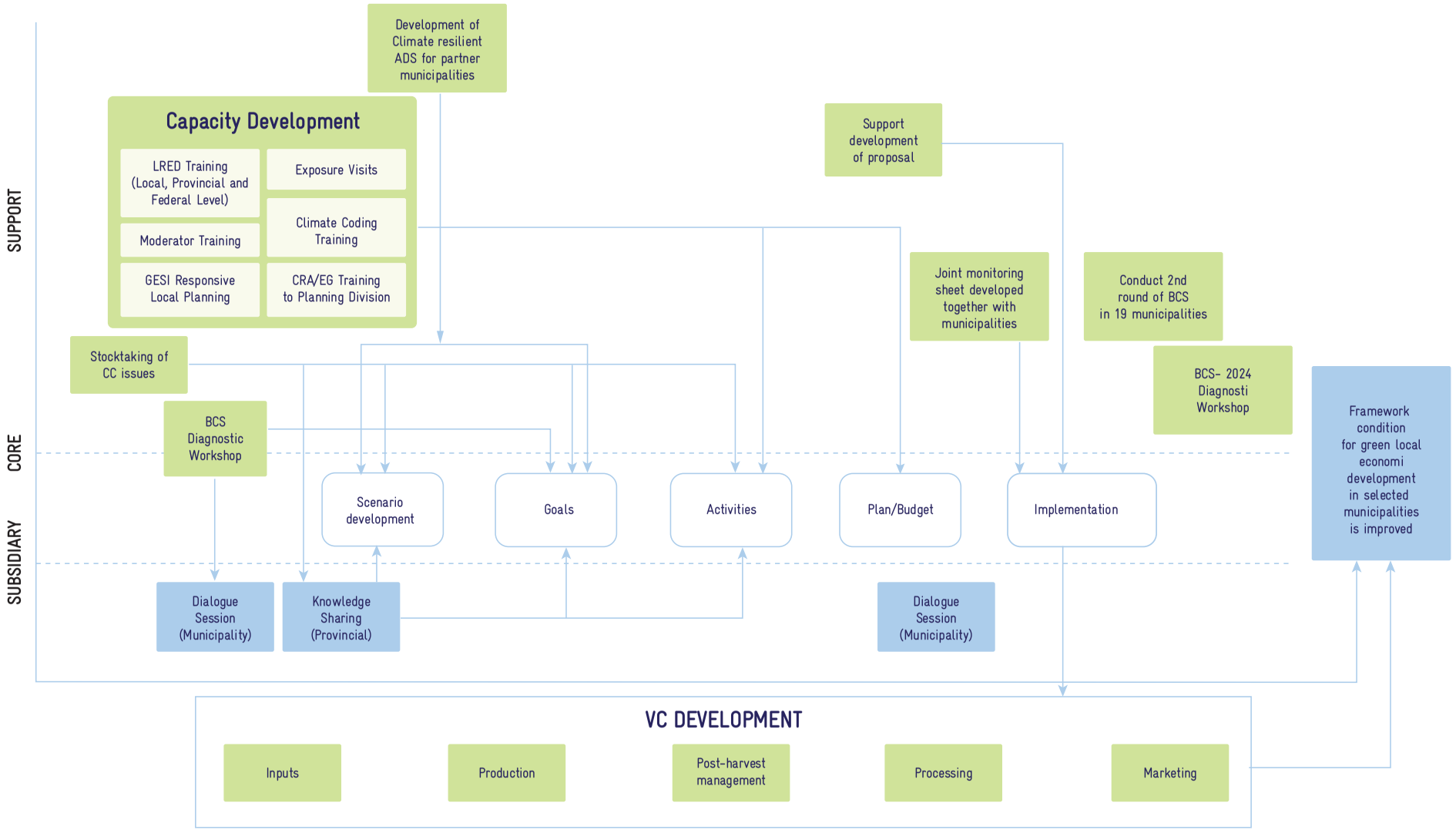
The GRAPE project addressed the need for a robust economic governance approach by establishing favourable framework conditions for CRA value chains and green local economic development. The project supported sustainable development through a comprehensive strategy that emphasized capacity development, collaborative planning and integration of climate-resilient practices into local economic governance. By working closely with municipalities and various stakeholders, including the private sector, cooperatives and civil society, the project bolstered local economies while enhancing climate change resilience.

To facilitate this transformation, GRAPE organized a series of workshops focused on foresight planning, joint goal identification and economic governance in the context of local economic development. These sessions equipped local stakeholders, including elected representatives, municipal staff and members of chambers of commerce, cooperatives and NGOs, with essential tools and knowledge. As a result, local stakeholders are now better prepared to integrate climate risks and opportunities into their planning processes, aligning climate-resilient economic development with local growth strategies.
A significant achievement of the project is the successful integration of climate-resilient activities, such as the construction of recharge ponds, rustic and cold storage facilities, polyhouses, farmyard manure production, and climate field schools, into the planning and budgeting processes of municipalities. This integration not only ensures that green economic development is prioritized within local governance but also secures dedicated financial and political resources. The inclusion of these activities in official plans and budgets reflects a long-term commitment to the United Nations' Sustainable Development Goals.

Additionally, GRAPE facilitated joint identification and prioritization of climate-resilient solutions among local governments. This collaborative approach ensured that the implemented measures were sustainable, practical and aligned with the broader goals of green economic development, enhancing the competitiveness of the partner municipalities. Notably, nineteen partner municipalities have allocated approximately €930,000 for joint financing activities that promote green economic growth, ensuring ownership and support for project initiatives. This is a formidable display of the ownership the partner municipalities had with the GRAPE interventions. As municipalities refine their roles in green local economic development, the emphasis on green growth and climate resilience remains at the forefront of their efforts.

Process Landscape of Partnership with Local Governments

GRAPE offered advisory services in process management to the nineteen selected municipalities to foster favourable economic framework conditions. These processes involved core as well as support processes. The chart below highlights those processes and different interventions under each process.



Process for Integration of CRA Activities in Annual Plans and Budgets of Local Governments

The integration of CRA activities into the annual plans and budgets of local governments is centred on a strong partnership approach. This process supports local governments in their planning efforts by facilitating the identification of joint goals and activities, their incorporation into annual plans and budgets, and joint financing of selected initiatives. A key component of this process involved GRAPE organizing foresight workshops in collaboration with partner municipalities and stakeholders from the public, private, cooperative, and civil society sectors.

These workshops provided a platform for establishing shared visions and identifying pathways focused on agricultural value chains and green local economic development for each municipality. The outcomes of these workshops formed the foundation for setting joint goals and planning activities, which were subsequently integrated into the annual budgets and plans of the municipalities.

By employing a participatory approach, GRAPE engaged a diverse range of stakeholders throughout the process, ensuring that the visions, joint goals and activities reflected the collective interests of the community. This alignment with the local government's planning process has facilitated the effective integration of the CRA activities into the annual plans and budgets of partner municipalities.

Process for Capacity and Strategy Development

The process for capacity and strategy development focused on enhancing the capabilities of stakeholders so that they could effectively contribute to the planning and strategic development of local governments. GRAPE implemented a variety of activities to support this process, including stocktaking of climate change issues, conducting BCSs and diagnostic workshops, and providing targeted capacity development measures.
One of the key activities was the stocktaking of climate change issues in each partner municipality. This initiative sensitized municipal stakeholders to the impacts of climate change on agriculture and helped identify necessary measures for local governments to address these challenges. The findings from this study served as valuable inputs for setting shared visions, establishing joint goals and identifying specific activities to achieve these objectives.

Additionally, the BCSs and accompanying diagnostic workshops provided insights into the economic performance and governance for partner municipalities. This information was utilized in local dialogues and the annual planning processes.

Capacity development measures included training sessions on Local and Regional Economic Development (LRED) tools for ward chairpersons and members, Climate-Smart Agriculture and Economic Governance (CSAEG) training for municipal elected representatives and personnel, and gender-sensitive planning training for elected women leaders. Exposure visits for municipal representatives and officials further enriched their understanding of best practices.

Lastly, the development of the Municipal Agriculture Development Strategy and Action Plan (MADSAP) provided comprehensive guidelines for partner municipalities. This framework assisted in designing plans and projects that promoted CRA-focused economic development at the local level.

Process for Supporting Local-level Dialogues

The activities under this process primarily focused on providing inputs for the identification of activities to be integrated into the annual plans and budgets of local governments. This process not only facilitated the identification of these activities but also enriched the overall process. Support for dialogue sessions at both local and provincial levels proved invaluable in identifying initiatives that could be included in the annual plans and budgets, as well as in developing municipal-level agriculture development strategies.

Moreover, the BCSs and diagnostic workshops significantly contributed to the local-level dialogue process, offering essential insights and data that further informed the identification of relevant activities. Overall, these collaborative dialogues served to ensure that the planning and budgeting processes were well-aligned with the needs and priorities of the community.

As implementing partner organizations of GRAPE, Local Initiatives for Biodiversity, Research, and Development (LI-BIRD) and Asia Network for Sustainable Agriculture and Bioresources (ANSAB) conducted CSAEG training sessions, along with exposure visits, for municipal elected representatives and officials from partner municipalities in Sudurpaschim and Karnali Provinces. In collaboration with GIZ, they also facilitated local-level dialogue sessions on various topics related to CRA and local economic development in these provinces.

Highlights of Local and Regional Economic Development Work

What was the given problem?

In recent years, Nepal's economic development has been strongly influenced by labour migration, low growth and a severe infrastructure deficit, partly triggered by the consequences of the two earthquakes in 2015, along with slow reconstruction initiatives. At the same time, Nepal has been undergoing a political transformation following a civil war that ended in 2006. A new constitution was adopted in 2015, providing a political beginning with a new federal system. These factors contribute to one of Nepal's core challenges: economic structural deficits that hinder sustainable development and competitiveness. The provincial and local governments, empowered by decentralization with new economic development authority, play a central role in addressing these deficits.

Severe structural weaknesses have significantly diminished the entrepreneurial and innovative capacities of the municipal economies in Lumbini, Sudurpaschim and Karnali Provinces. Weak market integration, dysfunctional value chains, lack of cooperation between public, private and cooperative sectors, and inadequate experience and skills to solve economic and sector-related technical problems make innovative approaches to local climate-resilient economic development difficult. This means essential framework conditions for sustainable economic growth at the municipal and provincial levels have yet to be established.

How did the project address the problem?

In this backdrop, the LPED/GRAPE project aimed to improve the framework conditions for local and provincial economic development in selected communities and value chains. The project was built on the GIZ experience with its established approach to LRED and was customized to meet the requirements of urban and rural municipalities in Nepal. LRED is a participatory approach for designing and implementing local economic development initiatives with the participation of local governments and other actors from the public, private and cooperative sectors. It helped improve the competitiveness of local and provincial territories and ultimately contributed to inclusive growth. The LRED process enabled an organically evolving learning process at the local, provincial and national levels. It explored ways to achieve changes in a complex system, such as a local economy or a value chain.

The LPED/GRAPE project cooperated with a total of twenty-six municipalities across three provinces (as of December 2022, in seven municipalities of Lumbini Province) to improve economic framework conditions and promote local economies by implementing capacity development measures for local, provincial and national stakeholders, identifying competitive advantages of municipalities, conducting BCSs, setting up small programme support funds, conducting inter-municipality and public–private–cooperative dialogue forums, and facilitating strategy development processes in municipalities and chambers

What change did the project bring?

The project significantly contributed to improving the capacity of local public, private and cooperative stakeholders by organizing a range of tailored capacity development events on LRED and associated approaches, targeting municipal and other actors. Around seventy municipal elected representatives and officials of seven partner municipalities of Lumbini Province shared that this was the first time they had received such capacity development training. These training efforts were instrumental in enhancing the understanding of economic governance and local-level planning among municipal actors. Furthermore, the exposure visits for municipal staff to districts outside project intervention areas allowed them to learn from the inspiring practices elsewhere and apply them in their areas.

"The LRED training helped me to understand the economic development potentials of my municipality. I learned a few useful tools and concepts which I can use while planning and designing skills and entrepreneurship development projects."

- Rewa Rawat,
an officer at Tulsipur Sub-Metropolitan City

The highly interactive, participatory and inclusive on-site LRED training courses enhanced the capacity of public, private and cooperative actors at the ward, municipal, province and federal levels. Altogether 523 graduates (30% women) were enabled to understand local economies better, support the design, implementation and monitoring of effective LRED interventions, and build the local economy's resilience systematically.

"As a politician, I have attended hundreds of training workshops, but I have never attended a training where I gained such a deep understanding of local economic development."

- L. B. Rawat,
a former Mayor of Kohalpur Municipality

The project also helped municipalities realize their competitive advantages. The project carried out PACA exercises to diagnose and assess local economies and their potentials, formulate projects and plan activities in a participatory manner to stimulate local economies and strengthen their resilience. The various local PACA teams identified feasible LRED initiatives, of which more than 60 percent were implemented within twelve to fifteen months despite the challenges posed by the COVID-19 pandemic. The PACA exercises were scheduled in such a way that the results could feed into the budget planning process of the municipalities the following fiscal year. The full PACA versions (twelve-day exercises) covered ten municipalities, while the shortened version covered two municipalities through the Mini-PACAs (six–seven-day exercises) during the project life.

The results of the PACA exercises provided a foundation for designing mid-term Economic Development Strategies (EDS) in various municipalities in Lumbini Province. The project supported five municipalities in developing EDS to accelerate their local economic growth, apart from reviewing existing EDS in two other municipalities.

In Sudurpaschim and Karnali Provinces, the project facilitated a participatory and systematic local planning process, increasing local actors' abilities in foresight planning, joint goal setting, activity identification and proposal writing. Each step of planning and capacity development focused on facilitating the integration of CRA interventions in annual programmes. As a result, municipal actors' ability to facilitate the participatory process of formulating MADSAP has improved.
The project designed and conducted BCSs to measure the economic development progress and economic governance of municipalities. The BCS has proven itself as a promising tool for assessing and benchmarking Nepal's economic governance and development dynamics. The project conducted three BCS editions in 2020/21, 2021/22 and 2024. As a result, Business Climate Index (BCI) ranked municipalities on economic governance and performance, triggering competition among local entities and encouraging them to improve performance. Diagnostic workshops in each participating municipality were instrumental in bringing all stakeholders together for improving the various indicators impacting local economic performance. The following year's financial plans often included measures to improve the BCI indicators. The chairperson or mayors of Simkot, Amargadhi and Dhangadhi stated that the BCSs helped them understand and assess how municipalities progressed on key indicators.
Dialogues are essential platforms in the LRED process. Public–Private Cooperative Dialogue (PPCD) refers to structured and moderated interactions between the public, private and cooperative sectors to define and analyse problems, discuss and agree on specific reforms and coordinate efforts to make these ideas a reality. The project facilitated intra-municipal, inter-municipal and provincial-level PPCDs to stimulate stakeholder exchanges on specific topics, such as economic governance or CRA. The most significant change that has been achieved is the introduction of the PPCD as a structured interaction and engagement tool in the Nepalese context. Additionally, the PPCD forums have assisted stakeholders in discussing specific topics, reaching agreements, understanding other perspectives better and deciding on joint actions for policy reforms.

	BCS 2020/21	BCS 2021/21	BCS 2024
Municipalities	11	42	19
Enterprises	1.788	5.690	2.472

The LPED/GRAPE project co-designed a participatory process for developing organizational chamber strategies. It supported formulating organizational strategies for different chambers in Nepal, including CCI–Butwal, CCI–Surkhet, FNCCI–Lumbini, FNCCI–Karnali, and the national-level FNCCI.

"The strategy development process has illustrated our potential and opened our eyes to the challenges we face as well as presented their solutions. We take it as a recipe for organizational growth and to improve our relationship with federal officials and other stakeholders."

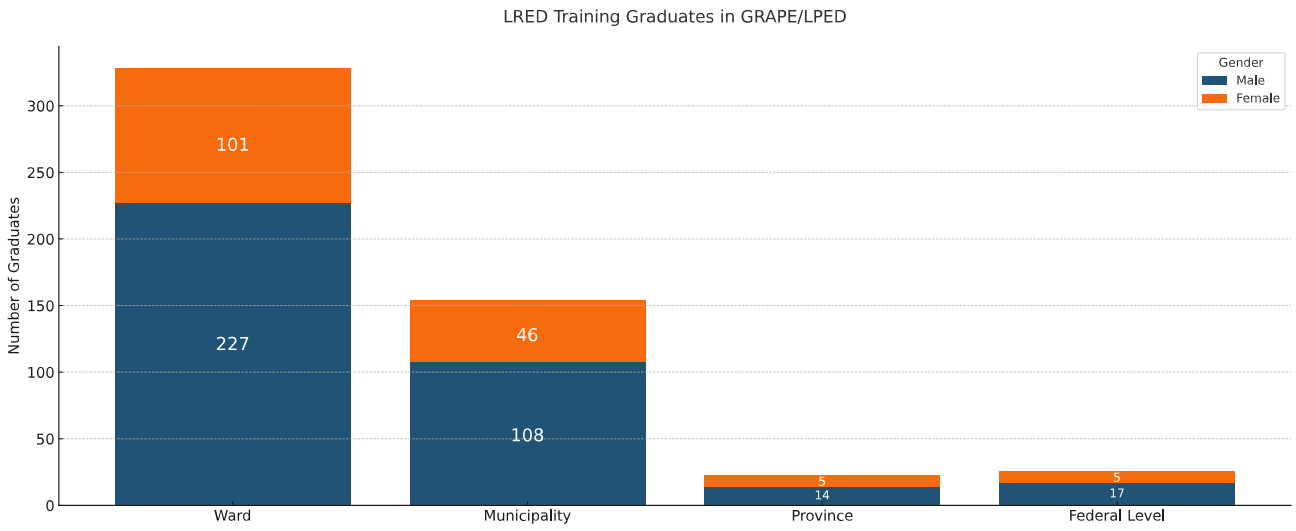
- Krishna Prasad Sharma, President of FNCCI–Lumbini

The project helped establish an expert pool with trained LRED moderators and consultants and prepared several manuals and handbooks on PACA, dialogue facilitation, BCS, chamber strategy development, and an LRED booklet. The expert pool, together with the knowledge products, will help sustain the LRED approach and the application of its tools beyond the project's lifetime.

Most importantly, the project has sparked renewed interest in LRED at various administrative levels nationwide. This was achieved through customization and testing of LRED tools, sharing success stories and results, and training individuals at municipal, provincial and federal levels. As a result, the project has played a significant role in drawing greater attention to LRED. At the federal level, the Ministry of Federal Affairs and General Administration (MoFAGA) has initiated a flagship programme to support innovative local economic development (LED) solutions, which include identifying eligible local projects, prioritizing and funding them, and monitoring their implementation. The provincial-level actors play a strategic role in knowledge sharing and upscaling the LRED activities. They can facilitate and expedite the LRED process throughout the province. At the local level, municipalities are increasingly ready to adopt the LRED concept. In Nepal, the conditions for LRED are notably better than ever before. Nine years after the new constitution was enacted, the time seems ripe for implementing LRED on a large scale nationwide.

"The tools introduced by the LPED/GRAPE project, such as PPCD, PACA, EDS, and BCS, are very useful and applicable to the local government level. We want to continue the cooperation and sign an MoU with GIZ. The Government of Nepal aims to achieve sustainable economic growth based on LED innovations in all 753 municipalities".

- Raj Kumar Bohora, MoFAGA, 2023



4.2 Action Research on Climate-Resilient Agriculture

Collaboration between research institutions, universities and agricultural practitioners is essential for fostering innovation and promoting sustainable development. It helps understand the real problems on the ground and work for pragmatic solutions. The GRAPE project exemplified this approach, with a strong focus on bridging the gap between academic research and practical agricultural solutions. How GRAPE partnered with academic institutions to enhance agricultural knowledge, drive climate-resilient practices and ensure sustainability in Nepal's agricultural sector is briefly described below.

Collaborative Approach to Strengthening Agricultural Knowledge and Innovation Systems

GRAPE's collaboration with universities and research institutions was a core aspect of its effort to strengthen AKIS. AKIS refers to the networks of people and organizations involved in generating, sharing and utilizing agricultural knowledge and technologies. GRAPE implemented various initiatives to facilitate mutual learning and innovation, creating a robust platform for knowledge exchange between scientists, farmers, cooperatives, and other key stakeholders.

The project collaborated with prominent universities, such as the Agriculture and Forestry University (AFU), Mid-West University (MWU) and Far Western University (FWU), to promote student exchanges, joint colloquia and research projects that advance academic knowledge and address the real-world challenges that farmers face in Nepal. Such integrative approach is vital for aligning academic research with practical agricultural needs.

Leveraging the Advantages of Collaboration Bridging the Gap between Science and Practice

One key advantage of GRAPE's approach was its ability to bridge the gap between academic research and practical agriculture. Through collaborative action research, GRAPE ensured that research findings were not just theoretical but tested and refined in real-world farming contexts. For example, the project's collaboration with ICIMOD focused on researching and developing value chains in mountainous regions, where traditional farming methods were increasingly challenged by climate change.

This approach brought together researchers, students and farmers to co-design solutions that were directly relevant to local farming communities. By involving multiple stakeholders, GRAPE ensured that research outputs were scientifically sound as well as practical and contextually appropriate for farmers.

Sustainability through Climate-Resilient Agriculture

Sustainability was a cornerstone of GRAPE's collaborative efforts. The project emphasized the adoption of the CRA practices, developed and validated through partnerships with research institutions. The Community Learning Centres (CLCs) established under GRAPE played a crucial role in this process. These CLCs served as regional hubs for knowledge dissemination, where farmers, researchers and agricultural practitioners came together to learn about and demonstrate the CRA technologies.

The CLCs used a participatory approach to integrate both modern scientific research and traditional agricultural knowledge, ensuring that solutions were tailored to the specific needs of each community. This included context-specific technologies, like biofertilizers, vermi wash, drip irrigation and soil cement tanks, which were showcased in hands-on demonstrations to enable farmers to replicate these practices on their farms. By making these technologies accessible and affordable, GRAPE enhanced the long-term sustainability of agricultural practices in Nepal's diverse agroecological zones.

Participatory Action Research for Empowerment

GRAPE strongly emphasized participatory action research—a methodology that involved farmers and local communities in the research and development processes. By actively engaging those most affected by agricultural challenges, GRAPE empowered farmers to take ownership of innovations. This participatory approach was key to the success of the CLCs, where farmers experimented with new techniques, provided feedback and validated technologies alongside researchers. The combination of academic rigour and practical application enabled GRAPE to enhance the effectiveness of its interventions, ensuring that they were both scientifically validated and socially accepted.

This co-creation of knowledge ensured that solutions were not imposed from above but were developed with a deep understanding of local realities. As a result, farmers are more likely to adopt and sustain these innovations, leading to greater resilience and productivity in the face of climate change.

Scaling Knowledge for Wider Impact

GRAPE's collaborative approach was not limited to individual farms or local communities; rather, it scaled up successful agricultural innovations at provincial and national levels. Through its partnerships with universities and research institutions, GRAPE generated scientific evidence that supported the broader adoption of climate-resilient practices.

Proven CRA technologies were scaled through the CLCs, where farmers from different regions could witness the effectiveness of these solutions firsthand. The knowledge generated in these centres was shared with local government agencies, cooperatives and private sector actors, facilitating broader dissemination and scaling of innovations across Nepal. This scaling process was supported by GRAPE's collaboration with international organizations and donor agencies, ensuring that the project's impact was felt beyond its immediate geographical scope.

The collaboration between research institutes, universities and the GRAPE project serves as a model for how academic knowledge can be effectively integrated within practical agricultural solutions. By leveraging the strengths of both academia and field practitioners, GRAPE brought meaningful changes in the agricultural landscape of Nepal. Its focus on participatory action research, climate resilience and sustainability ensured that the innovations were scientifically robust apart from being practically viable for farmers to increase their productivity and income.

Findings from Action Research

In the GRAPE project, ICIMOD took the lead in conducting action research in Karnali and Sudurpaschim Provinces. The action research aimed to generate evidence-based knowledge by engaging in collaborative research with local communities, government entities, NGOs, and academic institutions. The project executed thirty-two distinct action research initiatives with a focus on identifying inclusive, affordable and scalable CRA technologies.

In addition to the four collaborating universities mentioned earlier (viz Agriculture and Forestry University, Far Western University, Mid-West University and Kathmandu University), three agencies were engaged in the action research: Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Centre for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED) and Global Institute for Interdisciplinary Studies (GIIS).

More than fifty students and young researchers (with 80% being women) participated in the action research. Furthermore, 250 farmers (with 79% being women) were directly involved in these initiatives. The action research demonstrated over thirty-five different CRA technologies, and the findings were disseminated through thirty-two knowledge products, including flyers, booklets, blogs and manuscripts. So far, thirty manuscripts have been finalized and will be peer reviewed. Information about the tested CRA measures that have already been published after peer review is presented in brief below.

Zigzag Furrow Irrigation for Water and Labour Efficiency

Potato is a staple crop in Nepal, cultivated across diverse regions with varying climatic conditions. Their growth is water-sensitive, requiring precise irrigation during key stages such as stolon formation, tuber initiation and maturation. However, traditional surface irrigation methods, such as in Surkhet, are labour-intensive and inefficient. The migration of men and youth further exacerbates labour shortages, presenting challenges in potato farming. Zigzag furrow irrigation offers a promising alternative, with interconnected furrows optimizing water use and reducing labour demands. This technique involves strategic planning of furrow patterns and levelling fields, ensuring uniform water distribution. Implemented in sandy-loam soils, zigzag furrow irrigation emerges as a sustainable solution, addressing water conservation and labour efficiency while maintaining crop productivity.

Research demonstrated that zigzag furrow irrigation significantly reduces labour and water usage compared to traditional surface irrigation. Specifically, it saves 8 person days per 1,017 square metres of potato cultivation, maintaining comparable yields. Therefore, zigzag furrow irrigation is recommended for improving water and labour efficiency in potato farming. It reduces labour input without compromising on yields, making it ideal for regions with labour shortages. This method alleviates labour shortages and enhances resource management, proving particularly relevant in regions with water scarcity. The structured layout minimizes water leakage and ensures efficient distribution. Despite the efficiency gains, the yield comparisons showed no notable differences, indicating that zigzag furrow irrigation maintains productivity while optimizing resources. This method's adaptability to different terrains, including flat and terraced fields, and soil types positions it as a practical solution for sustainable agricultural practices in Nepal. It has been found to have broader adoption scope as an economically viable and environmentally sustainable solution. By integrating additional techniques like mulching and organic matter application, its effectiveness can be further enhanced. This approach supports resource management and agricultural resilience, crucial for Nepali farming communities facing environmental and labour challenges.

Straw Mulch: A low-cost practice for enhancing productivity

Mulching involves covering soil with materials like straw, dry leaves, or stones to conserve moisture, suppress weeds and enhance soil health. While plastic mulching is popular, traditional methods remain crucial, especially in regions with climate challenges. In Nepal, straw mulching is used in crops like ginger and garlic, particularly in hilly terrains. As climate patterns shift, straw mulching offers an adaptive strategy to maintain soil health and productivity.

Research conducted in Bajura to evaluate the effects of straw mulching on potato yield compared to plastic mulch and no-mulch scenarios in order to assess its agronomic benefits and cost-effectiveness found that straw and plastic mulching significantly outperformed non-mulched fields in yield, weed suppression and water efficiency. Straw mulched fields increased yield to 13.6 tons per hectare (ha), compared to 10.33 tons in non-mulched fields. Straw mulch reduced weed incidence, requiring fewer irrigation cycles. A cost analysis revealed straw mulch's economic advantages, it being significantly cheaper than plastic mulch. Beyond cost and yield benefits, straw mulch helped moisture retention and contributed organic matter to the soil, enhancing its fertility. These findings affirm straw mulch as a viable and cost-effective solution for moisture conservation and yield enhancement, especially in arid climates.

Straw mulching is recommended for enhancing potato yield and conserving soil moisture, particularly in arid climates. Its cost-effectiveness and environmental benefits make it a sustainable agricultural practice. While the study did not address pest and disease incidence, the observed benefits in yield and resource efficiency support broader adoption. Future studies could explore its impacts on pest dynamics and long-term soil health to optimize its application across diverse agroecological contexts.

Banana Stem Sheath and Leaf Bag for Vegetable Seedling Raising

Effective nursery management is vital for cultivating healthy seedlings and ensuring high crop yields. Traditional nursery practices in Bajura often lack organization, leading to increased costs, disease incidence and plastic pollution. Farmers typically use plastic polybags, which contributes to environmental degradation. To address these challenges, the research explored banana stem sheaths and broad leaf bags as sustainable alternatives. These materials offer an eco-friendly solution, reducing the use of plastic and enhancing seedling quality. By exploring these methods, the research aims to promote sustainable practices that improve seedling quality, reduce costs and align with environment-conscious farming.

The research revealed that banana stem sheaths and leaf bags are effective alternatives to plastic polybags, offering comparable germination rates of around 90 percent. Seedlings in banana stem sheaths exhibited lower disease incidence, particularly damping off and fusarium wilt. The cost analysis demonstrated that these materials are relatively economical, eliminating costs associated with polybags. Beyond cost and disease benefits, these biodegradable materials improve soil health by adding organic matter. Farmers reported healthier and more vigorous seedlings with reduced transplantation shock, validating practical benefits of this method. The study supports the broader adoption of these eco-friendly techniques, emphasizing their potential to improve agricultural productivity sustainably.

Banana stem sheaths and broad leaf bags represent a sustainable and cost-effective approach to nursery management. They offer clear advantages over traditional plastic polybags, aligning with environmentally-conscious practices. The success of these techniques in Bajura suggests potential for broader application across diverse agricultural

settings. By utilizing local materials, farmers can achieve high-quality seedlings with minimal environmental impact, supporting sustainable farming practices. This innovative approach empowers communities to adopt eco-friendly solutions, promoting resilience and productivity in agriculture.

Local Technology for Controlling Cutworms in Vegetable Seedlings

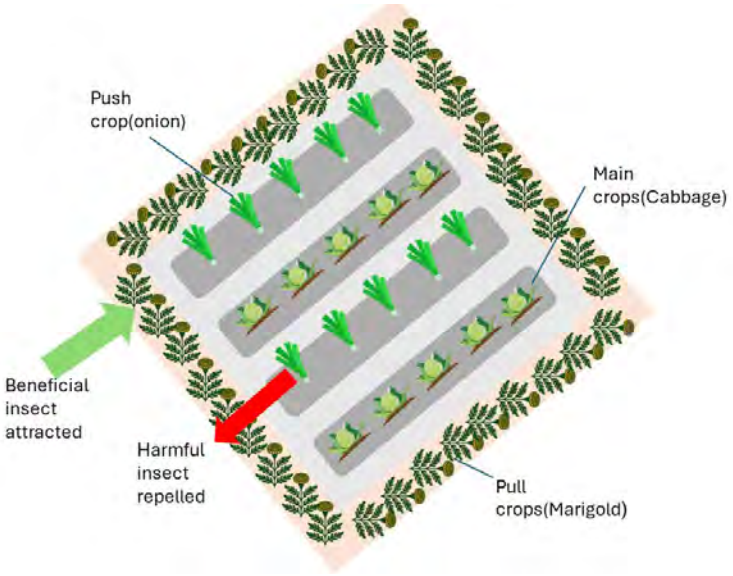
Cutworms—nocturnal larvae of moth species—cause significant damage to vegetable seedlings by cutting their stems at the soil level. Commonly affecting crops like beans, tomatoes and peppers, cutworms pose a challenge for farmers who often rely on chemical pesticides, which are costly, environmentally harmful and potentially pest-resistant. An eco-friendly alternative is using bamboo sticks as physical barriers around seedlings, preventing cutworms from reaching them. This simple and cost-effective technique uses locally available materials, providing an effective solution for controlling cutworms and enhancing seedling survival.

The research conducted in Dailekh and Surkhet demonstrated that bamboo stick barriers effectively reduced seedling damage by 90 percent compared to the control groups without barriers. This method of placing bamboo sticks around seedlings creates a protective ring that deters cutworms and other pests. Cut to 8 inches and sharpened, the bamboo sticks extend 2 inches above and 6 inches below the soil, forming an impenetrable barrier. Farmers reported significant improvements in seedling survival and reduced pest damage. This simple and effective method makes it an attractive alternative to chemical pesticides, promoting sustainable pest management practices.

Using bamboo sticks as physical barriers offers a practical and sustainable solution for controlling cutworms in vegetable seedlings. This method effectively reduces pest damage without chemical pesticides, aligning with environmentally-friendly practices. Its low cost and reliance on locally available materials make it accessible for farmers, supporting eco-conscious agriculture. By adopting this technique, farmers can protect their crops, improve yields and contribute to sustainable farming practices. The study's success suggests potential for broader application, empowering communities to adopt innovative solutions for pest management.

Push and Pull Technology: Integrated Pest Management in vegetable crops

Originating in the IPM practices, the push and pull technology is an advanced intercropping system used



for pest management. It manipulates pest behaviour through the strategic use of push crops, which repel pests, and pull crops, which attract pests away from the main crop. This method leverages natural plant defences to protect crops from pest infestations, promoting increased productivity and reduced reliance on chemical pesticides. This technique has multiple advantages. It minimizes the need for harmful pesticides by naturally managing pest populations, attracting beneficial insects that support pollination and improve yields, and provides additional income through intercrops and reduced pesticide costs.

Crop Type	Characteristic	Examples
Push crops	Emit odours or chemicals that drive pests away from the main crops.	Onion, garlic and basil, which repel pests like aphids and diamondback moths
Pull crops	Attract pests and beneficial predatory insects, creating a trap away from the main crops.	Marigold flowers and Napier grass

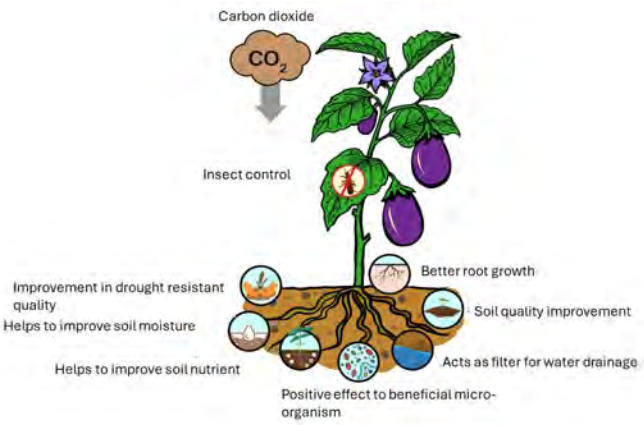
Studies indicate that the push and pull method can reduce pest infestation by 50 percent and increase the crop yield by 45 percent, demonstrating its efficacy as a sustainable agricultural practice. The push and pull technology offers a comprehensive eco-friendly solution for pest management, benefiting farmers with improved yields and reduced environmental impact.

Biochar: An innovative approach to enhancing soil health and combating climate change

Biochar is a charcoal-like material produced by pyrolyzing organic waste materials at high temperatures (400°C to 800°C) with limited oxygen. This process transforms waste into a stable carbon-rich substance with high porosity. Biochar serves primarily as a soil conditioner and nutrient carrier, improving soil's chemical, physical and biological properties. It is made from various agricultural and forestry waste, including invasive plant species, sawdust, rice husk, maize stalk, and biomass. This technology not only enhances soil health but also mitigates climate change by sequestering carbon and reducing greenhouse gas emissions. Biochar enhances soil structure, moisture retention, nutrient supply, pH balance and water-holding capacity of soil. Furthermore, it is a carbon sink that stores atmospheric carbon and manages invasive plant species.

Biochar production using a soil pit kiln is feasible for rural farmers with minimal technical support. The process involves digging a pit, igniting dry feedstock and layering additional feedstock until the pit is filled with biochar. Quenching is done using water or cattle urine to extinguish the fire.Biochar is collected and crushed into powder to increase its effectiveness as a soil amendment.

Biochar has significant impact on soil chemical properties and nutrient availability, leading to increased crop productivity. The application of biochar, especially when enriched with urine and farmyard manure, has shown promising results in various crops, including maize, cauliflower and pumpkin.



A versatile and sustainable agricultural innovation that enhances soil fertility, biochar reduces reliance on chemical fertilizers, promotes sustainable agriculture and mitigates climate change impacts. The technology is simple and easy for farmers to adopt, offering a simple solution to enhance crop productivity. Its cost-effectiveness and ease of use make it an attractive solution for farmers seeking to improve crop yields and environmental sustainability.

Uses of Biochar	
Direct application	Used as a soil conditioner before field preparation, enhancing fertility and moisture retention
Nutrient-enriched biochar	Combined with urine and farmyard manure or compost to create a nutrient-rich amendment that supports plant growth and productivity

Interventions in Nepal's Food Systems Research

Nepal's food systems face significant challenges, including the impacts of climate change and rapid urbanization, and these are worsened by the lack of data on key aspects of the system, such as rural–urban connections, food loss and waste, and the links between different stages of the food supply chain. This lack of data makes it harder to address existing problems and develop effective strategies for improving resilience and sustainability. The food systems in western Nepal, especially in Sudurpaschim and Karnali Provinces, are particularly vulnerable to these challenges. Climate change, lack of access to resources and sociocultural factors limit resilience, which is exacerbated by the lack of strategies to improve resilience in these areas.

A priority is measuring the environmental impact of farming practices to determine strategies that can reduce climate stress on soil, water and air. This can be achieved through internationally standardized methodologies like Life Cycle Assessment (LCA), Social Life Cycle Assessment (SLCA) and Life Cycle Costing (LCC). Through LUKE's interventions, the knowledge of LCA/SLCA/LCC methods has been disseminated among Nepalese scholars and researchers. Additionally, Luke identified a set of leverage actions to enhance resilience, explored the potential for developing local food policies, particularly in rural municipalities and shared participatory action techniques and foresight planning with local stakeholders, including policymakers and consultants, to better address local food system transformation.

Key Interventions and Changes

Local Food Systems Transformation: Possible pathways for research and policy

The research team contextualized and developed frameworks for resilient, fair and sustainable food systems tailored to Nepal's unique geographical and socioeconomic landscape. The combined intervention—food system transformation framework and capacity development of universities—drew fresh attention to the potential of municipal food policies, focusing on participatory governance rather than top–down plans.

Moreover, the literature review demonstrated that some specific stages of the food supply chain lacked data that should be filled in the future, especially at the distribution stage, which concerns food loss and waste, rural–urban linkages for production and consumption, and changing dietary patterns.

The few available preliminary data on the topics suggest that urbanization is already pushing for dietary changes, such as decrease of cereal consumption and increase in the consumption of ultra-processed food (FAO et al., 2022) [fig. 1] and leading to nutrition transition problems (increasing overweight and obesity rate, OWOB) (Shakya et al., 2023).

Based on this preliminary food system transformation assessment, the nexus between changing consumption patterns in urban areas, particularly among people with medium to high socioeconomic status (income, education and employment) and agricultural production in rural areas should be further explored in research and testing activities, to boost resilient agricultural production through tailored innovations that respond to urban food demand. Strengthening the processing stage and marketing to ensure the linkages between rural and urban areas, as well as extending the shelf life of food commodities, is essential for achieving market-oriented agricultural development that can compete with food imports from neighbouring countries.

Enhancing Food System Resilience

The research identified twelve key leverage points to improve resilience in western Nepal's food systems. These include enhanced rural–urban connectivity, improved food self-sufficiency, sustainable forest management, and better access to irrigation and farming inputs. By addressing tangible and intangible factors, such as community cultural identity and justice in food systems, we introduced a more holistic approach to building resilience beyond just increasing food production. The research shows that resilience is not only about resources but also about how communities envision their future. Future research and policy should be built on these foundations to further strengthen resilience.

Foresight Planning for Strategic Change

One of the most transformative aspects was the introduction of foresight methodologies for municipalities. Through six workshops and a training of trainers programme, local government officials and community representatives from nineteen municipalities were trained in participatory planning and foresight techniques. This allowed them to collaboratively develop long-term visions, set actionable goals, and create strategic plans for sustainable and resilient food systems. The backcasting methodology, in particular, proved valuable for guiding long-term municipal planning, and our approach is now recommended for future annual planning processes. Participatory methods and techniques are the basis for promoting shared change with a common vision, rather than top–down reforms, which have low effectiveness due to lack of stakeholder engagement.

Capacity Development in Sustainability Research

Capacity development intervention also addressed a critical gap in Nepal's research infrastructure, particularly in agricultural sustainability. The research team collaborated with faculty members from three major Nepali universities (Far Western University, Mid-West University and Agriculture and Forestry University) to conduct studies through the Life Cycle Sustainability Assessment (LCSA) methodology. This collaborative effort resulted in co-authored academic output and strengthened the universities' capacities to conduct future research in the field through the same methods. This has laid groundwork for ongoing collaboration between Finnish and Nepalese researchers, ensuring continued advancement in sustainable agriculture research in Nepal.

In addition, a ten-part webinar series was developed in collaboration with the faculty members from the three Nepali universities mentioned above, with about 150 attendees so far. This series covered a wide range of topics, including agroecology, agronomy, agroeconomics, entomology, horticulture, local supply chain, and municipal food policies. This initiative facilitated knowledge exchange and strengthened research and academic networks, providing participants with new insights to enhance their research and teaching in sustainable agriculture.

Overall Result

As part of the GRAPE project, the LUKE interventions brought potential changes to Nepal's food systems, particularly by integrating local and participatory strategies into municipal governance and policy development and by advancing scientific collaborations between the two countries. Research gaps and new opportunities for science and policymaking collaboration have been set up through a specific roadmap.

By integrating foresight methodologies for long-term planning, strengthening research capabilities in sustainability, and focusing on resilience and inclusivity at the local level, the food system transformation in Nepal shifts from reactive to proactive, becoming a benchmark of the global-level process for LDCs and developing countries.

4.3 Climate-Resilient Value Chain Development

Climate change is widespread and unequivocal in Nepal, significantly affecting the country's agricultural sector. Rising temperatures and shifting precipitation patterns directly impact agricultural productivity and yield. Post-harvest activities are also hindered by climate-related disasters; storage facilities may be damaged due to excessive moisture or extreme temperatures; and poor road conditions caused by erratic rainfall make market access challenging. Poor and marginalized farmers, particularly those practising subsistence rainfed agriculture, are especially vulnerable to these climate impacts. Key barriers preventing farmers from effectively adapting to climate change include limited access to knowledge of climate-resilient agricultural practices, such as soil fertility, disease-resistant crops and improved irrigation techniques. Furthermore, most Nepalese farmers lack access to quality inputs, advanced technology and advisory services, including improved seed varieties, fertilizers, machinery. and market opportunities.

The GRAPE project promoted the CRA measures, including climate-resilient livestock (CRL), across all value chain stages—input supply, production, trade, and consumption—to address the impacts of climate change. The CRA value chain development involves designing agricultural processes that can withstand climate challenges while integrating sustainable practices and innovative solutions. By helping farmers and other value chain actors adapt to shifting climate conditions, the GRAPE project served as a model for scalable CRA technologies and practices. It focused on developing farming systems that maintained or increased productivity and also reduced carbon emissions. These efforts were crucial for ensuring food security, reducing poverty and advancing sustainable development in Nepal.

Value Chain Selection

The product conducted a rapid value chain analysis following the ValueLink 2.0 methodology. Based on the recommendations of the study and stakeholder consultations, GRAPE selected specific value chains for Nepal's three agroecological zones: the Terai, Mid-hills and Mountains. Fresh vegetables and potato were chosen for all zones, with ginger or turmeric, citrus and goat promoted in the Mid-hills and the Inner Terai and the Terai. In the Mountains, the focus was on unique crops like apples, indigenous varieties and medicinal and aromatic plants (MAPs).

Rolling out modality

The GRAPE project advanced CRA by promoting both tested and proven measures. Tested measures emerged from GRAPE's action research initiatives, while proven measures were those that value chain actors had already applied, though often on a smaller scale. Initially, proven measures were introduced and the tested ones integrated subsequently. This approach increased the adoption of climate-resilient farming practices through capacity building and scaling up of replication efforts, focusing on vulnerable communities, particularly women, the poor, indigenous groups and persons with disabilities, and engaging the youth to curb outmigration by providing opportunities in CRA.

GIZ directly implemented project activities on the ground to strengthen the capacity of value chain actors. In collaboration with key partners, GIZ has advanced CRA measures across the partner municipalities.

Organization	Type of Implementation Support
ANSAB	Implemented in nine municipalities of Karnali Province
LI-BIRD	Implemented in ten municipalities of Sudurpaschim Province
Heifer Nepal	Implemented livestock-related measures in fourteen municipalities across the Inner Terai and Mid-Hills of Karnali and Sudurpaschim Provinces
District Cooperative Unions of Kailali, Surkhet and Dailekh	Supported implementation of CRA measures in their respective districts
Multi-purpose Development Society (MPDS) and GIFT Nepal	Supported implementation of CRA measures in Doti and Dadeldhura and Bajura Districts respectively

Additionally, Finn Church Aid (FCA) conducted farmers' field schools in ten municipalities across Surkhet, Dailekh and Bajura Districts, while Welthungerhilfe (WHH) and Youth Innovation Lab (YIL) implemented a business incubation programme in seven municipalities in Surkhet and Dailekh. Pathway Technologies (Geokrishi) and PlatSat by Seed Innovations delivered digital climate advisory services and digital climate risk insurance respectively. Pathway Technologies provided services in all fourteen municipalities in the Inner Terai and Terai and Mid-Hills of Karnali and Sudurpaschim Provinces, whereas Seed Innovations provided services in Doti and Dadeldhura of Sudurpaschim and Dailekh of Karnali Province.

GIZ also partnered with private companies to enhance value addition and market linkages for organic products. The Organic Valley (TOV) supported the value chains for citrus, nettle, ginger, turmeric, and MAPs, while Himalayan Bio-trade Private Limited (HBTL) focused on developing the value chain of sea buckthorn from Humla. GRAPE supported TOV in stablishing a satellite for processing of ginger, turmeric, citrus, and nettle in Chure Municipality of Sudurpaschim.

Roll out of CRA Solutions

For a value chain to thrive, all actors need to be interconnected with efficient business models and linkages. GRAPE introduced innovative solutions that were water-efficient, climate and energy-smart and aimed at making agricultural value chains climate-resilient. These innovations targeted actors across the value chain from farmers to entrepreneurs involved in transporting, storing and processing of agricultural products. Capacity-building efforts focused on input supply, production, processing,

marketing, and consumption to foster Climate Resilient Agriculture/ Livestock (CRA/L) solutions.

Input supply: Agrovets and cooperatives—the primary input suppliers for seeds, fertilizers and technologies—were made aware of the business benefits of CRA/L inputs through orientations, exposure visits and interaction workshops. These events helped in bridging information gaps, such as availability of technology in the market and requirement on the ground between national and regional technology suppliers and local agrovets and cooperatives.

Production: GRAPE promoted nature-based and sustainable farming solutions to enhance farmers' resilience against climate shocks. By integrating traditional knowledge with modern innovations, the project empowered farmers to adapt while preserving their livelihoods. The CRA technologies were promoted in water, soil and crop management:

- **Water management:** Practices like drip irrigation, soil cement ponds and solar irrigation reduce dependency on rainfall, ensuring reliable water supply during droughts.
- **Soil management:** Techniques like organic liquid manure (jholmal), vermicompost and improved farmyard manure improve soil fertility and structure, leading to sustainable farming and better yields.
- **Crop management:** Plastic tunnels, IPM and drought-resilient crop varieties help improve growing conditions and safeguard crops, all while maintaining environmental sustainability.

Improved sheds, changes in feed composition, promotion of high nutrient fodder species, and breed improvement are a few examples of CRL promoted by the project in the livestock sector.

Processing: To add value to agricultural products, GRAPE provides skill-based training on developing products, such as pickle-making, dried apple slice-making, and grading and packaging training, especially for women. The project also provided essential technologies, including potato-sorting machines, solar dryers for apples, ginger and turmeric, and threshing machines for indigenous crops.

Market linkage: GRAPE supported the actors involved in market linkage, such as traders and cooperatives, by establishing value chain committees to address challenges and opportunities. Two value chain committees were established—one in each province—and strengthened. Interaction workshops on challenges and opportunities on the marketing of different agriculture commodities and market visits to explore potential markets were organized to facilitate the linkages between farmers, cooperatives and traders. To enhance storage and ease trade, the project helped establish cellar stores, mini-cold stores and collection centres for agricultural products and livestock, alongside providing packaging materials.

Consumption: Public awareness campaigns, including street dramas and radio jingles, emphasized the nutritional value of climate-resilient crops, particularly indigenous varieties, and highlighted their health benefits.

In summary, developing climate-resilient agricultural value chains is essential for more than just food security in Nepal. With most of the population dependent on agriculture for their livelihoods, failure to adapt to climate change could lead to widespread poverty, increased migration and social instability. CRA value chains help mitigate these risks, ensuring agriculture remains a sustainable source of income. GRAPE highlighted the potential of climate-resilient strategies to strengthen farmers' adaptive capacity and support sustainable rural development. By prioritizing these resilient value chains, Nepal can protect its agricultural productivity, secure rural livelihoods and build long-term resilience against the climate change impacts.

Climate-Resilient Agriculture: Technologies and Practices

CRA integrates scientific knowledge to develop agricultural practices that enhance productivity, adapt to climate variations and mitigate environmental damage, taking into consideration the human dimension. These technologies conserve resources, improve crop yields and strengthen resilience against adverse climatic conditions. In doing so, GRAPE supports CRA and helps secure livelihoods and food security for farmers in some of Nepal's most vulnerable regions.

In Nepal, where smallholder farmers' livelihoods are dependent on agriculture, they are also most susceptible to the impacts of climate change, such as erratic rainfall, unpredictable monsoons, prolonged droughts, and shifting growing seasons. Considering these challenges, where smallholder farmers grapple with the harsh realities of climate change, the impact of climate-resilient technologies and practices become profoundly evident. To address these challenges, GRAPE promoted affordable climate-resilient technologies and practices across nineteen municipalities in the Karnali and Sudurpaschim regions, helping farmers adapt to these changing conditions and secure their livelihoods.

Narinda Rokaya, a farmer from Bajura, was faced with extreme weather conditions and limited resources, struggling to support her family. Through GRAPE's technical advisory and input support in CRA, she learned techniques like drip irrigation, IPM tools and biofertilizer (jholmol)-making. These innovations improved the quality of her soil, reduced pests and minimized harvest loss. "Now, I grow crops that were difficult to grow before, earn from fresh produce and secure my children's education," she shares, highlighting how these practices have positively impacted her farming and her family's future

Soil Cement Tank

Constructed with a mix of cement and locally-sourced clay, these ponds store water for irrigation in water-scarce areas.

Plastic/Bio-Mulching

Mulching retains moisture, reduces weed growth and regulates soil temperature using plastic sheets or organic materials.

Drip and Sprinkler Irrigation

Constructed with a mix of cement These systems deliver water direct to plant roots through a network of tubes, reducing wastage and eliminating the need for constant watering.

Vermi Wash

A liquid biofertilizer and biopesticide extracted from earthworms in a vermicompost bed.

Vermi Compost

Nutrient-rich organic matter produced by decomposing waste with earthworms, enhances soil health and reduces the use of chemical fertilizers.

Pheromone Traps and Lures

Attracts and captures harmful insects, reducing the need for chemical pesticides.

Bio-fertilizer (Jholmal)
A traditional biofertilizer and insect repellent made from fermented organic matter, enhances soil fertility and plant health.

Polyhouse
A plastic-covered structure that protects crops from adverse weather and pests, extending the growing season.

Climate-resilient Crop Varieties
Crop varieties designed to withstand and adapt to climate change, including extreme temperatures, droughts and pests.

Gumbos/Low Tunnel
Small temporary structures that create a favourable microclimate for crop production, especially at higher altitudes and in the winter season.

Solar/Electric Lift Irrigation
Energy-efficient systems that lift water using solar panels or electric pumps, ensures a reliable water supply and replaces the fossil fuel.

Rainwater Harvesting
Collection and storage of rainwater for future use, reduces dependency on external sources.

Nursery Development for Quality Seedlings
Ensures healthy high-yielding seedlings for farmers, boosting crop productivity and resilience.

Community Learning Centres
Demonstrate different CRA solutions and foster community engagement and capacity building.

Recharge Ponds
Maintain groundwater levels by storing rainwater, supporting sustainable water management in water-scarce regions.

Agroecological Farm
Integrating ecological principles into farming, agroecological farms promote biodiversity, soil health and sustainable production.

Rustic Store
Low-cost rustic stores reduce spoilage and post-harvest loss, enabling effective storage and sale of agricultural produce, mainly potato.

Application of Bordeaux Mixture
A blend of copper sulfate, lime and water, Bordeaux mixture effectively controls diseases in fruit trees.

Plastic Ponds

Cost-effective and easy-to-install, plastic ponds are ideal for water management in the Himalayan region with soil challenges and high cost of cement.

Biochar

Produced from organic material in low oxygen, biochar improves soil health, sequesters carbon and mitigates pollutants..

Fodder Forage Promotion

By promoting high-quality, nutrient-rich fodder and forage, livestock farmers gain access to consistent feed, improving animal health and productivity, reducing reliance on commercial feed and supporting soil conservation and carbon sequestration for climate-resilient farming.

Breeding Buck with Higher Genetic Potential

Breeding bucks with superior genetics enhances livestock productivity and resilience, passing on desirable traits like faster growth rates and better feed efficiency. This results in healthier herds, higher meat production, and greater resilience to disease and climate variations.

Offspring from Breeding Buck

Offspring from genetically superior bucks have shown an average of 15% higher birth weight than local populations, with projections to reach a marketable weight of 35 kg by ten to twelve months, improving the overall productivity of herds.

Climate-smart Goat Shed

Climate-smart goat sheds provide protection from heat stress, improve ventilation and offer shade, helping boost animal welfare and resilience to extreme weather. They also reduce parasite risks and improve manure management, lowering environmental impacts.

Fodder Forage Nursery

Fodder and forage nurseries enable livestock farms to have a steady year-round supply of nutritious feed, lowering dependence on external sources and reducing feed costs. The nurseries also support soil improvement and sustainable agriculture with diverse climate-resilient species.

Silage-making Plant

Silage production ensures a steady supply of nutritious feed during scarce seasons, maintaining livestock health and productivity while reducing feed costs and dependency on external sources. This improves overall farm management and livestock growth.

Goat Collection Centre

The goat collection centre centralizes goat aggregation and sale, making market access easier and reducing transportation costs for individual farmers. It also supports quality control and fair pricing, and enhances farmers' collective bargaining power for better income.

Climate Field Schools: Changing the Narratives of Livelihood

As part of the GRAPE project, FCA, with its consortium partner, Rupantaran Nepal, designed Climate Field School (CFS), targeting marginalized and less literate people to help them adapt to climate change by improving their understanding of climate, weather patterns and climate-resilient agricultural practices. The CFSs serve as hands-on community learning platforms, empowering smallholder farmers from vulnerable, marginalized and often less literate communities to understand their agroecological and climatic contexts, identify climate-related agricultural challenges and adopt resilient crop-specific practices. Implemented in Surkhet, Dailekh and Bajura Districts, CFSs foster practical and interactive learning through demonstration plots, helping farmers build climate resilience and enhance agricultural sustainability.

The CFSs impart knowledge of farming methods, such as climate-resilient farming techniques, like trichoderma, compost, vermi wash, vermicompost, mulching, and drip irrigation, to farmers. This has helped farmers increase their productivity, especially in areas with scarce water. Additionally, these technologies help farmers mitigate the severe impacts of climate change.

With the help of the CFSs, farmers learn CRA techniques to grow vegetables with minimal water and organic manure. Techniques like tunnel farming, drip irrigation, mulching and making of organic fertilizer, like jholmal, have tripled production.

Furthermore, the CFS teaches the participants scientific goat management, which has significantly improved livestock productivity, efficiency and livestock care. The participants learn about silage making, improved goat sheds, planting goat-friendly grasses, using mineral blocks, and building dipping tanks. These techniques have led to overall productivity growth in farming.

The CFS participants expressed their confidence that they would continue to increase their productivity and convert this growth into greater earnings. They believed that the knowledge gained from the sessions had helped them manage their farms more efficiently.

> *"We received ten CFS sessions, which gave us entirely new knowledge compared to traditional farming methods. We learnt about climate-resilient farming techniques, like using trichoderma, compost, vermi wash, vermicompost, mulching, and drip irrigation. This has increased our productivity, especially in areas with scarce water. These technologies have helped us mitigate the severe impacts of climate change."*
>
> ***- Dipa Sesi,***
> ***a participant and CFS facilitator***

> *"We face severe water shortages, and the land has been barren due to droughts. Our community relies on a single deep boring pump for all household needs, and we depended on rain for farming. Despite our efforts, we could not achieve much. Now, with the help of the CFS, we've learned Climate-Resilient Agriculture techniques, which has enabled us to grow vegetables with minimal water and organic manure. Techniques like tunnel farming, drip irrigation, mulching, and making organic fertilizers, like jholmal, have tripled our production."*
>
> ***~ Hira BK,***
> ***a farmer participant at CFS***

> *"The Climate Field School taught us scientific goat management, which has significantly improved our productivity, efficiency and livestock care. We used to rely on traditional goat farming methods, but now we have learnt about silage making, improved goat sheds, planting goat-friendly grasses, using mineral blocks, and building dipping tanks. These techniques have led to overall growth in our farming."*
>
> ***~ Gita Kumari Shahi, president of Malika Pashupakshi Palan Samuha***

Business Incubation Approach

Although the region is rich in agricultural potential, Karnali Province faces numerous challenges that hinder its ability to achieve food security and economic resilience. A World Food Programme survey conducted in April 2023 revealed alarming statistics: 4.26 million people, or 14.6 percent of Nepal's population, face insufficient diets. Karnali stands out with the highest food insecurity rate, at 22.5 percent, underscoring the urgency for intervention. The province's rugged terrain, limited infrastructure, impacts of climate change, lack of entrepreneurial skills, and poor access to markets and support services make it difficult for smallholder farmers and ecopreneurs to thrive.

In response, the Business Incubation for Strengthened Food System in Karnali project, implemented by Welthungerhilfe (WHH) and its consortium partner, Youth Innovation Lab (YI-Lab), under the GRAPE project, has adopted a holistic approach to empower local ecopreneurs. The project focus is on promoting sustainable agri-based enterprises that can create resilient livelihoods while strengthening the food system in the province. By providing business incubation services, such as facilitating development of business plans and building skills in accessing market information and understanding market dynamics, to 300 agri-entrepreneurs (ecopreneurs) and forty business intermediaries, the initiative is transforming the agricultural landscape in Karnali into one driven by environmentally sustainable and profitable businesses. The ecopreneurs are smallholder farmers that are producing agricultural produce like vegetables, fruits and indigenous crops and farming goats in an ecological-friendly manner. Likewise, business intermediaries, which are individuals or companies, act as a bridge between ecopreneurs and consumers or actors at the higher level of the value chain.

The Approach: Empowering ecopreneurs and supporting agri-businesses

At the heart of this initiative is the goal of building green marketplaces across several municipalities in Surkhet and Dailekh Districts, including Barahtal, Bheriganga, Birendranagar, Bhagawatimai, Bhairabi, Dullu, and Naumule Municipalities. By equipping ecopreneurs with business incubation services, the project helped transform traditional agricultural practices into profitable ventures. A key aspect of the approach is its emphasis on empowering women and marginalized communities, ensuring that the benefits of the initiative contribute to economic empowerment and social inclusion, creating a more equitable agri-business landscape.

The incubation process includes tailored support for developing and growing agri-enterprises. Digital platforms, such as www.merokheti.org and www.shikshya.org, are used to call applications from ecopreneurs to enrol in the project and access critical learning resources. Through eleven agri-business boot camps, 300 ecopreneurs (173 women and 127 men) have been trained in essential entrepreneurial skills, financial literacy and business plan development. These boot camps are fostering an enabling environment that supports the shift from traditional farming practices to modern, profitable and sustainable agri-business models.

Similarly, forty agri-business intermediaries (twelve women and twenty-eight men) participated in boot camps designed to enhance their entrepreneurship skills and create business plans to scale up their operations. Continuous business counselling and mentorship from technical experts have provided ongoing guidance and support, boosting the confidence of the participants to grow their enterprises.

Achievements: Catalyzing economic growth and building resilience

The result of the project has been profound. Ecopreneurs and intermediaries have not only gained vital entrepreneurial skills but also strengthened their market linkages through networking opportunities. For example, an exhibition held in Surkhet, brought together over 300 participants, including government representatives, including Mr Rajib Bikram Shah, Minister, Karnali Provincial Ministry of Economic Affairs and Planning, along with the Karnali Provincial Ministry of Land Management, Agriculture and Cooperatives, and Karnali–FNCCI. The event facilitated crucial connections between ecopreneurs and market actors, enabling better access to markets and ensuring fair pricing for local products.

By empowering local ecopreneurs, fostering market linkages, and collaborating with government and private sector stakeholders, the project addresses immediate food security challenges while promoting sustainable economic growth and social equity. Through continued support and innovation, the project is paving the way for a thriving agri-business ecosystem in Karnali Province.

Private Sector Partnerships to Foster Green Growth

Partnerships with the private sector significantly increase the impact and sustainability of development projects. In the GRAPE project, collaboration with private companies enhances the ability to achieve key development goals such as economic growth, while driving innovation, sustainability and economic growth in the country.

In Nepal, the private sector involvement is moving beyond mere financing; it offers innovative solutions, skilled resources and technological expertise crucial for addressing complex challenges, like climate change. By fostering sustainable growth and expanding market access, the private sector strengthens the business environment and creates new opportunities for smallholder farmers, small and medium enterprises (SMEs), and young and women entrepreneurs. GRAPE recognizes the pivotal role of the private sector in fostering green growth, particularly in Karnali and Sudurpaschim Provinces.

Unlocking Regional Potential for Herb and Spice Value Chain

Karnali and Sudurpaschim Provinces have significant potential for cultivating and sourcing high-value spices and medicinal herbs, such as ginger, nettle, sichuan pepper, citrus, turmeric, sea buckthorn, and cardamom. These products are primarily produced, processed and sold by smallholder farmers, who often face challenges in receiving fair prices and accessing reliable markets for their organic produce.

Despite increasing international demand, particularly in Europe, for organically produced high-quality spices, logistical barriers, a lack of know-how among farmers regarding organic certification and limited production capacities have restricted the export potential of these goods. As a result, smallholder farmers remain vulnerable to market fluctuations and economic instability, preventing them from fully benefiting from their organic premium-quality products. In this context, private companies like TOV and Himalayan Bio Trade play a crucial role in bridging these gaps for the betterment of the whole ecosystem.

Development Partnership with The Organic Valley

The Organic Valley (TOV) in Bheriganga Municipality, Surkhet, promotes organic agriculture and semi-processed spices like ginger, turmeric, Himalayan pepper, and cardamom. These products are mainly exported to the EU, particularly to the Martin Bauer Group. TOV works together with

1,500 organic-certified farmers across Karnali, Sudurpaschim and Lumbini Provinces. GRAPE and TOV join forces as an integrated development partnership with the private sector (iDPP), in which both sides bring in their respective strengths and expertise. This partnership aims to promote climate-resilient cultivation and processing practices, fostering business-to-business (B2B) relationships with smallholder farmers, which have the freedom of choice in the partnership. This collaboration had established a decentralized processing unit in Kailali District, Sudurpaschim Province, for year-round standardized processing of nettle and citrus. The processing unit is owned jointly by four cooperatives and ToV. By diversifying the range of products, the unit aims to operate continuously throughout the year rather than seasonally.

Specific targets include increasing the production of ginger, citrus and nettle and promoting organic and regenerative agricultural practices for sustainable farming.

Quantitative Figures from the iDPP with TOV	
Organic Certification	1,500 farmers certified across Rukum, Salyan, Doti, Surkhet and Rolpa
Decentralized Unit	1 processing unit established in Milanpur, Kailali
Greenhouse Installation	2 greenhouses installed in Surkhet
Citrus Sapling Plantation	50,619 saplings distributed to 1,092 farmers in Bheriganga, Badikedar, Doti and Jorayal Municipalities
Strengthening Existing Enterprise	Supported Shree Hamro Achar Udhyog tatha Phalphul Prasodhan Kendra Pvt. Ltd, Chure Rural Municipality, Kailali The project focuses on exporting citrus peel, leaving the fruit itself unused. To maximize resource utilization, TOV supplied citrus pulp to this enterprise for processing into value-added products like lemon concentrate and pickle. Through this initiative, the enterprise installed a citrus juice evaporator machine, funded with a 51 percent contribution from the enterprise and 49 percent from the project.
Citrus Processing and Export	• Ginger: 85.82 tons, NPR43,600,934 (€304,901.64) • Turmeric: 14.3 tons, NPR6,580,302 (€46,016.10) • Citrus: 3.66 tons, NPR1,742,526 (€12,185.50) • Nettle: 1.6 tons, NPR568,463 (€3975.27)

Scaling Up Sea Buckthorn within an iDPP with Himalayan Bio Trade Limited

Sea buckthorn, a native shrub with numerous health benefits, holds untapped commercial potential. In an iDPP with Himalayan Bio Trade Limited (HBTL), the GRAPE project and HBTL joined forces to develop the sea buckthorn value chain in Karnali Province for the betterment of the local economy at large. This initiative focuses on building resilience in climate-vulnerable communities by scaling up production, creating market linkages and generating employment.

A private enterprise owned by Nepal's Himalayan communities, HBTL markets certified organic and fair trade products across thirty-seven districts, exporting to over 200 companies worldwide. The development impact of the iDPP includes enhanced product quality, increased market access and diversified sea buckthorn products such as juice, jam and oil, which contribute to the economic growth of local farmers and fruit collectors. The value addition lies in the introduction of new technologies, such as a sea buckthorn pulp extraction machine, and organic certification, helping streamline production, introducing high-value processed products, like oil and jam, and improving market competitiveness.

This partnership emphasized sustainability by addressing constraints at the various functions of the value chain through farmer training, organic certification, marketing, and product diversification. GRAPE's technical resources helped strengthen connections between farmers and markets, promoting long-term viability while maintaining market balance without distortions. By leveraging the strengths of the private sector, this collaboration fostered sustainable growth and created a self-sufficient ecosystem for organic and fair trade products.

Quantitative Figures from the iDPP with HBTL	
Organic Certification	220 farmers certified from three community forest user groups (CFUGs) in Simkot Rural Municipality, Humla
Capacity development	44 farmers trained in Organic and Fair Wild Certification documentation
Equipment support	2 expellers, 1 solar dryer, 200 secateurs and 200 gloves distributed
Product diversification and export	Sea buckthorn juice, jam and oil products • exported 5 kg of sea buckthorn oil, totalling NPR200,000 (€1,398) • produced and sold in Nepal 370 litres of juice, totalling NPR129500 (€905) • produced and sold in Nepal 75 kg of jam, totalling NPR47500 (€332

Value Chain Committee for Sustainable Value Chain Development

The GRAPE project focused on improving access to climate-resilient agricultural measures, aiming to strengthen the agricultural ecosystem through collaboration among value chain actors. By enhancing agricultural market systems, such as quality production, marketing, value addition and post-harvest management, the project fostered a supportive environment for sustainable development.

In consultation with value chain actors, GRAPE facilitated the formation of value chain committees (VCCs) in the Surkhet–Dailekh and Dhangadhi–Dadeldhura clusters. These committees, comprising representatives of producers, traders, agri-input suppliers, processors, and chambers of commerce, play a crucial role in addressing the challenges faced across the value chains. Their collective leadership approach aims to ensure smooth functioning of the value chains as well as improve their performance and sustainability.

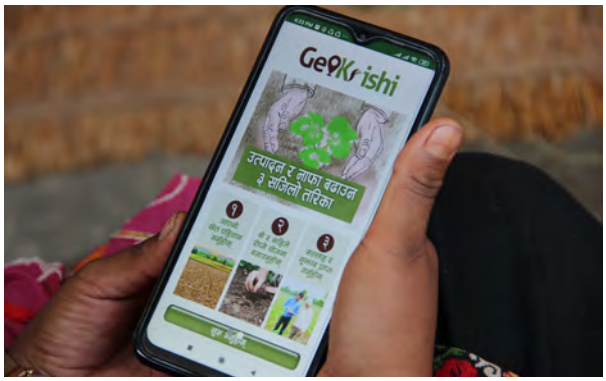
To ensure effective decision-making, GRAPE facilitated the setting up of executive committees in both clusters, supported by a three-member advisory committee. The project also facilitated several capacity development measures, including a two-day workshop, which drew a roadmap for promoting the CRA value chains. This workshop identified key challenges and developed a prioritized action plan, while clarifying the roles and responsibilities of VCC members.

Following a capacity needs assessment, exposure visits were organized for VCC members to strengthen their understanding of the market system and build networks for fresh vegetable, potato and fruit markets. Regular meetings were held to maintain collaboration and explore potential backward and forward linkages for input supply and product marketing, ensuring the value chain remained functional.

The VCCs have played a pivotal role in engaging with local and provincial governments, advocating for infrastructure improvements to support the flow of agricultural commodities, particularly during the rainy season. In addition, they have facilitated discussions with market centres and chambers of commerce in Butwal, Tilottama and Pokhara to enhance trade between markets, especially for indigenous crops from Karnali and Sudurpaschim Provinces. These discussions have led to understandings on product trade, exchange, market information sharing and joint advocacy for policies supporting sustainable value chain development. Through these efforts, the VCCs continue to foster an enabling environment for the growth of resilient and sustainable agricultural value chains.

Bridging the Agri-Extension Gap through Digital Innovation

Nepal's agricultural extension system faces a significant challenge: each agri-extensionist is responsible for supporting over 1,800 farming households, far exceeding the global recommendation of 200 households per extension worker. This imbalance raises serious concerns about the quality and efficiency of agri-advisory services across the country, particularly in the face of climate change, which has widened the knowledge gap among farmers. However, with 73 percent of Nepalese households having access to smartphones, the potential for digital solutions to revolutionize agriculture has become increasingly clear.



GeoKrishi (Geo: location-specific, Krishi: agriculture) is a digital agriculture platform addressing this challenge by facilitating agri-advisory services and e-market systems. Supported by the GRAPE project, GeoKrishi ensures that farmers receive timely and relevant information tailored to their specific needs. Its primary goal is to enhance information delivery from municipal offices to farmers, using digital tools to improve both the quality and accessibility of agricultural advice.

Digital Solutions for Inclusive Agri-Advisory

With GRAPE support, fourteen agriculture information centres were established across fourteen partner municipalities of the GRAPE project in Surkhet, Dailekh, Kailai, Dadeldhura, and Doti Districts of Karnali and Sudurpaschim Provinces, utilizing the GeoKrishi platform. These centres are designed to improve farmers' access to agri-advisory services and raise their awareness of the CRA. A dedicated GeoKrishi representative was stationed at each centre to guide farmers through the platform and promote the adoption of digital tools.

GeoKrishi employs a multifaceted approach to overcome the diverse levels of digital accessibility and literacy among farmers. Farmers with smartphones are connected through the GeoKrishi Farm app, enabling them to receive personalized real-time advisory services after registering their land and production plans. Those with limited or no digital access are engaged through the "e-Chautari" webinar programmes held at municipal centres, ward offices or community hubs. This blended approach ensures that all farmers can access essential agricultural information regardless of their digital literacy.

Building a Digitally Connected and Climate-Resilient Farming Community

The establishment of the fourteen agriculture information centres has been instrumental in providing digital skills training to over 16,000 farmers, 55 percent of whom are women. These training sessions helped digitize farm and farmer profiles, equipping participants with the tools to access weather forecasts, market prices, expert consultations and best practices for over thirty CSA techniques.

The project also introduced e-marketplaces where farmers can access CSA inputs at competitive rates. These digital platforms have motivated farmers to adopt sustainable farming practices, thereby increasing productivity and profit margins while promoting environmental stewardship.

Digital Inclusion and Long-Term Sustainability

Digital inclusion has been a key priority for GeoKrishi, especially in overcoming the digital divide in rural Nepal. The "e-Chautari" webinars provided a critical platform for digitally disconnected farmers to interact with agricultural experts and learn modern production techniques. This inclusive model ensured that no farmer was left behind in the transition to digital agriculture.

A key achievement of the project is the institutionalization of digital services through partnerships with local municipalities and farmer cooperatives. Despite challenges such as low digital literacy and weak infrastructure, GeoKrishi has successfully established sustainable partnerships, ensuring that digital services continue to extend to more farmers even after the project's completion.

As Nepal continues its journey towards digital evolution, GeoKrishi's ongoing work promises to nurture new opportunities and strengthen the country's agricultural sector. Through innovative approaches and sustainable partnerships, the platform not only addresses immediate challenges but also ensures long-term impact and resilience for Nepalese farmers.

Climate Risk Insurance in Nepal

In September 2023, PlantSat by Seed Innovations, in collaboration with the GRAPE project, piloted and achieved a significant milestone by enrolling 270 farmers from Doti, Dailekh and Dadeldhura Districts into a pioneering digital crop insurance programme. This marked the introduction of digital availability of crop insurance in these remote areas, harnessing technology to safeguard farmers' livelihoods and bolster their resilience to climate risks. Notably, 144 of the enrolled farmers were women, highlighting the programme's commitment to gender inclusivity. The total insurance coverage amounted to NPR40,469,015.11 (USD301,827.38) across key crops such as potato, orange, soyabean, beans, and cauliflower.

Key Achievements	
Nepal's first legume insurance	Introduced the country's first-ever insurance policy for legumes, beginning with the coverage of 0.21 ha of soyabean in Dadeldhura.
Innovative digital claims processing	Implemented a digital claim verification system, combining satellite imagery and photo-based evidence, resulting in five claims being processed fully online, reducing time and effort.
Capacity development of farmers	Conducted 15 workshops and 14 community engagement programmes, educating over 800 farmers across Doti, Dailekh and Dadeldhura on the benefits of digital crop insurance and climate resilience.
First orange insurance in Doti	Insured 8,700 orange plants, covering 29 ha, with the first successful claim settlement of NPR22,980.00, providing critical protection for orange farmers.
Faster enrolment and claim settlement	Reduced insurance enrolment time to just 15 seconds with instant policy delivery and claim settlement within twenty-five days, offering farmers timely security and compensation for crop losses
Enhanced transparency and security for remote farmers	Ensured instant digital confirmation of insurance policies through the PlantSat Krishi Beema app, allowing farmers in remote areas to track their insurance status and farm conditions, providing clarity, peace of mind, and easy access to policy details.

A New Standard for Agricultural Insurance in Nepal

This initiative has set a new benchmark for agricultural insurance in Nepal by leveraging digital innovation to protect farmers from climate risks. With a focus on inclusivity, efficiency and transparency, PlantSat has empowered farmers to secure their livelihoods and build resilience against climate challenges.

The programme's success in enrolling farmers, settling claims quickly and expanding insurance coverage to previously uninsured crops has laid the groundwork for a more sustainable agricultural sector in Nepal. Through PlantSat and GRAPE's collaborative efforts, Nepalese farmers are now better equipped to weather uncertainties of climate change and continue to thrive in the face of adversity.

Empowering Women Farmers through Tools and Technology

In Nepal, both men and women have traditionally been participating in farm operations. However, with increasing outmigration of men, women have taken on additional responsibilities, including tasks typically performed by men, such as ploughing, spraying and threshing. Despite their growing role, many women farmers struggle to use agricultural tools and machines effectively, as these tools are designed with male physical characteristics in mind, making them unsuitable for women. The ergonomic differences between men and women, such as aerobic capacity, strength and anthropometry, create challenges in the efficient use of farm equipment by women, leading to increased physical strain for them.

In the remote areas where GRAPE operated, women farmers lacked awareness and access to women-friendly agricultural tools and technologies. These farmers used labour-intensive outdated farming methods, which not only increased their workload but also reduced the efficiency of agricultural operations, ultimately affecting productivity and income.

While reversing the trend of male migration is not feasible in the short term, improving women's access to women-friendly modern tools and technologies can significantly reduce their workload and increase farm productivity. In line with this, the GRAPE project focused on addressing the drudgery experienced by women farmers and enhancing their work efficiency through the provision of appropriate tools and equipment.

"I have been planting potatoes for twenty to thirty years, but I didn't know about insurance. Now, I see we get compensation if crops are damaged. The insurance was hassle-free, with field staff handling paperwork, and the digital system made the enrolment easy. I will keep insuring my crops in the future."

- Mangala Kumari Bista Hamal, a local farmer from Dadeldhura

Intervention and Results

GRAPE responded by raising awareness of the availability and benefits of women-friendly agricultural tools. The project developed and implemented training programmes on the proper use, maintenance and safety of these tools, prioritizing technologies that reduce women's unpaid labour. The project introduced and distributed various women-friendly tools, including mini tillers, mini tillers with potato ridge makers, jab planters, apple-picking ladders, automatic hand sprayers, and millet threshers. These tools were selected based on their ability to reduce the physical strain on women and make farm work more efficient.

The introduction of women-friendly tools has led to significant improvements in the lives of women farmers. These tools have helped women perform farm operations more efficiently and on time, leading to increased production and productivity. In addition to reducing the physical burden of labour, the tools have enabled better utilization of agricultural inputs, lowering the cost of production. As a result, women's work efficiency and income have improved, making tangible difference in their lives. For example, interviews with women farmers in Swamikartik Rural Municipality of Bajura confirmed that the tools significantly reduced labour-intensive tasks and saved time. Not only are the tools more suited to women's physical characteristics, but they have also enhanced crop yields and improved overall farm productivity. Although GRAPE had only one crop cycle to demonstrate the effectiveness of these tools, the training provided and the linkages established with the suppliers and repair service providers have ensured that women farmers can maintain the equipment and handle minor repairs. This has empowered women to take full advantage of the tools, even beyond the project's involvement.

The transformation of women's agricultural practices through the adoption of women-friendly tools is a gradual process but one with significant potential to improve their comfort, efficiency, income, and quality of life. GRAPE believes that, with sustained promotion of women-friendly agricultural mechanization technologies, women's burdens can be reduced, enabling them to invest more time in education, awareness and other income-generating activities.

Nevertheless, further promotion of women-friendly agricultural mechanization is needed. Tools should be designed to meet the specific needs of women farmers, considering the crops they grow as well as the local context. Furthermore, technology transfer should be accompanied by comprehensive training on the proper usage, maintenance and repair of equipment to ensure that women farmers can use these tools effectively and independently.

In conclusion, GRAPE's contributions to empowering women farmers through tools and technology have improved their work efficiency and also enhanced their overall quality of life. By continuing to prioritize gender-sensitive agricultural mechanization, we can support the transformation of women's roles in agriculture and contribute to a more equitable and sustainable farming future.

4.4 Scaling up Climate-Resilient Agriculture through AKIS

The GRAPE project scaled up climate-resilient and water-efficient approaches in agricultural value chains by expanding access to the project's insights, tools and innovations. This approach emphasized the importance of disseminating good practices and recommendations to a broader audience beyond the immediate project areas, with the ultimate goal of fostering widespread adoption of sustainable agricultural practices.

Key to this field of action was strengthening the AKIS, which significantly supported farmers, institutions and communities in adapting to the challenges posed by the climate change. GRAPE achieved this by facilitating the flow of information and connecting key stakeholders, ensuring that the right knowledge reached the right people.

To do so, the project provided targeted exchanges ranging from public entities to intermediary organizations, including municipalities, provincial governments to intermediary organizations, including NGOs, sector associations and cooperatives at the national, provincial and local levels. These organizations were advised on how to adopt and apply the approaches and instruments developed through GRAPE's interventions, equipping them to scale these innovations within their own jurisdiction.

A variety of interactive and educational formats were used to strengthen AKIS and promote the wider adoption of climate-resilient practices. Peer learning sessions, talk series and exchange programmes were some of the formats that were used for stakeholders to exchange insights and collaborate on common challenges. Webinar series offered accessible learning opportunities, enabling the participants to explore new strategies in agriculture and climate adaptation. Summer schools provided an immersive experience for students and young professionals, inspiring the next generation of agricultural innovators. Universities and educational institutions played a vital role in this process. By encouraging the integration of updated knowledge into academic curricula, GRAPE fostered cooperation between students, researchers and professionals, ensuring that the latest advancements in sustainable agriculture were applied in practice.
Through this multifaceted approach, the GRAPE project actively promoted the scale-up of climate-resilient agricultural solutions, building a network of informed, equipped and resilient stakeholders across the agricultural value chain. This ensures that sustainable practices, informed by the latest innovations, can take root on a larger scale, contributing to the long-term resilience of Nepal's agricultural sector.

Strengthening AKIS: Institutionalizing knowledge and youth engagement on climate-resilient agriculture

In Nepal, where the youth, aged 16–40, make up 42.6 percent of the population (Census 2021), it is imperative that young voices are heard and their ideas nurtured, as they will soon become leaders, policymakers, decision-makers, and change agents within their communities. Nepalese youth, including students, are increasingly drawn to higher education, research, agri-entrepreneurship, and expertise building in agriculture. Yet, despite their growing interest, they often lack access to resources, knowledge of climate-resilient agriculture, updated curricula and specialized training in agriculture. Addressing these gaps is crucial to empowering them with the skills, knowledge, education, training, capacity development, and investments in technology, all of which are needed to lead Nepal's agricultural future, fostering resilience, innovation, and sustainability in the sector.

The GRAPE project understands the importance of empowering the next generation of students, researchers and professionals to take ownership of Nepal's agricultural future. Through a series of targeted interventions, GRAPE ensures that youth engagement is at the heart of its sustainable development efforts.

Developing Capacities of Agriculture Students

A key focus of GRAPE's youth engagement strategy lay in capacity development through education and hands-on learning experiences that extended beyond the confines of traditional classroom.

This approach recognized the importance of equipping young minds with the practical skills and knowledge needed to tackle pressing agricultural challenges, particularly in the context of climate change.

One such initiative was the five-day students exchange programme, which brought together students from AFU, MWU and FWU. This programme provided a platform for twenty-five students from these universities for immersive learning delving into the topics in CRA.

By engaging students in practical sessions, the programme helped bridge the gap between theoretical education and real-world applications, fostering a deeper understanding of how to implement climate-adaptive solutions on the ground. These learning experiences are essential in cultivating future leaders who are equipped to drive innovation and advocate for the CRA practices in Nepal's unique and diverse agricultural landscape.

Integrating CRA into Curricula: Building future-ready knowledge

Agriculture remains the backbone of Nepal's economy; yet, its sustainability is increasingly challenged by climate change. To address this, GRAPE, in collaboration with ICIMOD, worked with AFU, MWU and FWU to integrate CRA into their agricultural degree programmes. The aim was to equip future graduates with the knowledge and skills required to become competent agriculture professionals, ultimately driving the development of a climate-resilient economy.

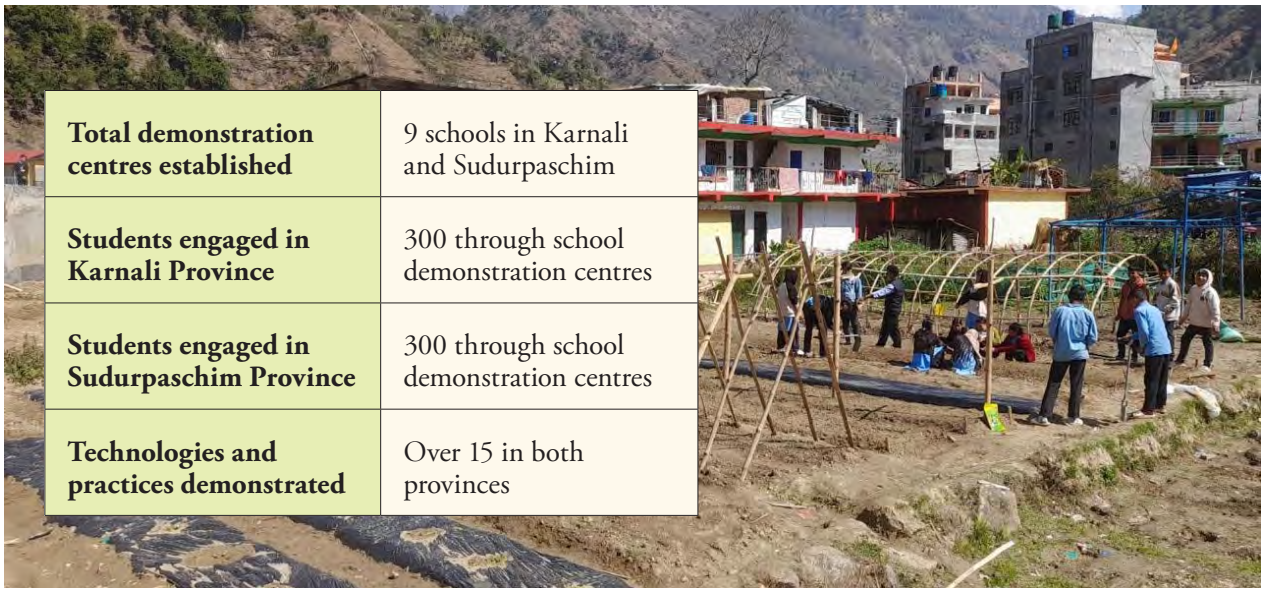
As a result, the revised curriculum now includes essential subjects like rainfed farming for indigenous crops, organic farming practices, gender dynamics in agriculture, and the impact of climate change on farming systems. These additions prepare students not only for meeting the practical demands of the agricultural sector but also for addressing the challenges posed by the climate change.

Additionally, in collaboration with the municipality's education section and the GRAPE team, a local curriculum was developed for Grades 1–8 of Budhinanda Municipality in Bajura District. This curriculum integrates the CRA technologies and practices tailored to the region's diverse ecological zones, further ensuring that young learners grow up with an understanding of sustainable farming practices.

Learning by Doing: School demonstration centres

In addition to formal training, hands-on learning plays a crucial role in fostering youth engagement in agriculture. The principles of "seeing is believing" and "learning by doing" are central to GRAPE's contributions in this area. One of the most impactful examples of this approach is the establishment of school demonstration centres across Karnali and Sudurpaschim Provinces. These centres provide students enrolled in Junior Technicians/Junior Technical Assistants (JT/JTA) and diploma courses in agriculture with real-world exposure to the CRA technologies, such as vermicomposting, drip irrigation, mulching, and biofertilizers.

By engaging over 600 students in these provinces, the school demonstration centres not only provided technical knowledge but also served as income-generating sites, with the produce being used in school meal programmes. This dual purpose reinforces the importance of sustainable agricultural practices while fostering a sense of ownership and responsibility among the youth. Students are encouraged to transfer the knowledge they gain to their families and communities, creating a ripple effect that extends beyond the classroom.



Total demonstration centres established	9 schools in Karnali and Sudurpaschim
Students engaged in Karnali Province	300 through school demonstration centres
Students engaged in Sudurpaschim Province	300 through school demonstration centres
Technologies and practices demonstrated	Over 15 in both provinces

Supporting Female Students in STEM: Research grants and exposure visits

Despite the growing recognition of the importance of gender equality, women remain underrepresented in STEM (Science, Technology, Engineering, and Mathematics) fields, particularly in Nepal's agricultural sector. To address this gap, GRAPE invested in supporting the research of women scholars working on climate change, environmental impacts and sustainable agriculture as well as practical exposure visits to encourage the transfer of knowledge back to students' home communities.

Female STEM researchers awarded with grant	9
University students (women) trained on CRA with an exposure visit to ICIMOD LML	33

These grants are instrumental in helping scholars overcome financial barriers that often hinder women's participation in research. Beneficiaries such as Reeya Shrestha and Suprabha Timalsina have noted the crucial role the grants played in completing their projects and in time. Sujata Karki, another beneficiary, highlighted the significant impact of the grants in providing financial support, skill development, networking, and mentorship opportunities. By supporting women in STEM, GRAPE not only fostered individual growth but also contributed to a more inclusive and diverse scientific community.

Partnering with Youth-Led Organizations: Role of Global Shapers

In addition to formal educational programmes and practical training, GRAPE recognized the importance of partnering with youth-led organizations to ensure that development initiatives resonate with the needs and aspirations of young people. Global Shapers, a youth-led community organization, brings unique insights and experiences that inform relevant and effective dialogues around sustainable development.

Under the GRAPE partnership, the Climate Protector Handbook and a teacher's guidebook were developed and distributed to 965 students in the Sudurpaschim and Karnali Provinces, promoting climate change awareness and adaptive practices for students in Grades 7–9. Additionally, fifty youth (twenty-five from each region) were trained in climate-resilient agriculture and value-added business strategies, with a dedicated handbook to support the training's practical application. To scale up this knowledge, four talk series were held, fostering dialogues on agricultural insurance, water management and policy frameworks for CRA, encouraging collaboration among stakeholders and advancing climate resilience in agriculture.

Based on their experience in implementing the project with GRAPE, Global Shapers advocated for several key policy recommendations, urging multistakeholder actions emphasizing the importance of prioritizing climate education, enhancing carbon finance mechanisms and fostering partnerships between policymakers, farmers and private sector actors to accelerate sustainable agricultural practices in Nepal. Through these efforts, they called for stronger collective actions to build climate resilience at the local and national levels. The collaboration ensures that the youth are not only beneficiaries of these programmes but also active participants in shaping resilient agricultural practices for the future.

Youth engagement is crucial for building a sustainable agricultural future in Nepal. GRAPE's initiatives, which include education, training, hands-on learning and partnership with youth-led organizations, highlight the transformative potential of empowering young people. By equipping the next generation with the skills and knowledge to implement the CRA practices, GRAPE fosters a sense of ownership among the youth, ensuring that they are not only beneficiaries of sustainable

development but also active change agents.
As Nepal confronts the challenges of climate change, the role of youth in leading the agricultural sector toward sustainability is paramount. GRAPE's dedication to youth empowerment is shaping a new generation of leaders who will continue to innovate, adapt and build resilient communities capable of thriving in the face of future challenges.

Community of Practice for Climate-Resilient Agriculture

- How often do we engage in common learning, sharing and discussing the most important agendas of the nation?
- While we all work and contribute to our respective sectors, what impact would it have if organizations in the same field came together to share their experiences, challenges and insights?
- Would it be beneficial or just an added responsibility?

To answer these questions, the organizations working in CRA at the federal level in Nepal have come together by forming a Community of Practice (CoP). The CoP for CRA is a collaborative platform for civil society practitioners, including NGOs and INGOs. It is the first of its kind and now has fifty-four member organizations where sessions are conducted once every two months.
The primary objective of CoP for CRA is to enhance learning and sharing opportunities, providing a collaborative space for networking, peer learning and scaling up successful CRA models. To date, it has organized eight successful events, fostered deeper collaboration and shared what they have learned among its members.

These sessions on various themes related to CRA encourage broader discussions among organizations focusing on key themes, such as crop management, water management and livestock management. The themes are selected based on the needs assessment done for the CoP members.

Total organizations	54
NGOs	19
INGOs	35
Knowledge website	www.copforcra.org

CoP for CRA at a glance

CoP for CRA: Building Momentum for a Climate-Resilient Agricultural Nation

Moving from its initial vision to its current form, the CoP for CRA has made significant progress, with each session leading to visible outcomes among the member organizations. The platform provides opportunities to exchange knowledge, ideas and experiences, which may help agricultural experts to improve their practices. The CoP for CRA platform has shaped thoughts and plans for programme and project implementation, fostering connections and exchanging ideas and lessons learnt. Sharing and learning by other organizations in the CoP are taken as reference to gather ideas on available resources and options in CRA/L interventions.

"This platform provides opportunities for exchanging knowledge, ideas and experiences, which may help us improve our practices."

- Shankar Bhattarai, ANSAB

"The CoP for CRA platform has been instrumental in shaping our thoughts and plans for programme and project implementation, fostering connections, and exchanging ideas and lessons learnt. I also take references from sharing and learning by other organizations in the CoP to gather ideas on available resources and options in CRA and livestock interventions."

- Anupama Mahat, Renewable World

While coming together, the platform is now advocating for updated policies affecting the implementation of CRA that should benefit the agricultural sector. The collective voice is now stronger and more evidence based.

"As farmers, we often feel our voices are not heard, even though we continually advocate for a system that benefits everyone. But thanks to the CoP, we can now share this with others who are here for the same purpose."

- Pancha Kaji Shrestha,
National Farmers Group Federation (NFGF)

"COP is not only about advocating to the government on behalf of farmers. As CoP members, we also feel the need to envision and provide pathways for what CRA looks like, using the collective voice we have formed through the CoP."

- Menila Kharel,
Practical Action

Advocating for Unheard Voices

In the changing landscape of Nepali agriculture, where women are now taking substitutional farming responsibilities in addition to their traditional roles of household duties, the CoP for CRA has prioritized these gender issues along with other issues that are kept on the back burner. It is advocating and providing space for the discussion of promotion of women-friendly technologies and innovations, especially in rural Nepal.

This space has also provided a platform for advocating for the voices of indigenous, Dalit and other marginalized communities and the impact they are facing in agriculture due to the rigid structure of society and government to build a continuous momentum in making the CRA system well governed.

"Often, we forget how climate change is impacting communities like Dalits, especially in terms of the unequal distribution of resources. These sorts of platform like CoP for CRA should encourage good policies so that they are not left behind."

- Tanka Bahadur Bishwokarma,
Dalit Welfare Organization

As the first of its kind, the CoP for CRA has set an exemplary discourse that a collective group of committed people can bring transformative changes when there is mutual understanding for collaboration and collective voices.

Voices of Women Leadership in Agriculture

"I never realized that my voice would matter. The confidence in me would only suggest letting things happen the way they wanted. Why would I even want to give my opinion?"

~ Lalita Bist, Agricultural Officer, Jorayal Rural Municipality, Doti

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"Marrying early in one's career puts us on the backfoot. You tend to accept all the gender roles imposed by society, and gradually you prepare to accept that advancing in your career is for others without realizing that you can change your life just by stepping up for change."

~ Debu Rana Magar, a social mobilizer from Naumule Rural Municipality, Dailekh

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"There is always a subtle question of validation, a sense that the work we do is insufficient. For the same task our male colleagues perform, we have to prove ourselves ten times over—a 'perk' of being a woman."

~ Saki Singh, a working professional at the federal level

These cases represent the scenario of women's leadership in the agricultural sector in Nepal, whether working in the capital city with access to resources or in rural areas supporting local communities. Women face layers of barriers imposed by patriarchal structures and mindsets, making it difficult to advance, even in what may outwardly appear to be a progressive system.

Currently, 32 percent of Nepalese households engaged in agriculture are led by women. This is primarily due to male outmigration for employment, which leaves women with additional responsibilities on the farm, on top of other household duties. However, key decision-making power still often rests with male members. The lack of decision-making power for women in the agricultural sector is evident at the household, local and federal levels.

Women's Academy for Leadership: Shifting the drivers and gears

The representation of women in leadership roles in Nepal's agricultural sector is highly disproportionate. Even though women remain the frontrunners in farming, their leadership and representation remain minimal. To address this, a fundamental shift in the concept of leadership is required, starting with a change in the mindset.

In response, the GRAPE project established the Women's Academy for Leadership (WAL), targeting women professionals at both federal and provincial levels in Sudurpaschim and Karnali Provinces. WAL leadership modules are based on feminist and inclusive principles, redefining leadership by embracing everyone's strengths, ensuring inclusivity and providing equal spaces for all. The programme was tailored for both federal- and provincial-level women leaders, with some fundamental elements shared across groups and some customized based on the specific needs of each cohort.

A total of sixty-five women leaders from thirty-eight organizations enrolled with the modules set out to introduce feminist leadership, strengthen general leadership skills and enhance technical skills.

WAL Participants at a Glance

Particulars	Federal Level	Karnali Province	Sudurpaschim Province
Organizations	19	9	10
Female professionals	21	26	17

The Change

When women leaders are provided with a platform for collective learning and sharing, we witness significant changes. WAL became not only a space to learn skills and gain information but also a place where these leaders could reassess and re-learn their leadership through sessions, exposure visits and by exercising innovative approaches, such as peer support and inclusive discussions through mentorship and InterVision sessions. These methods provided an "X-factor" in their leadership approach, allowing them to redefine their leadership.

"We used to believe that feminist leadership was only about changing women's leadership, but now I understand it is transformative leadership– uplifting all those hindered by patriarchal structures. Breaking traditional leadership, recognizing oneself, and embracing inclusivity and equality in leadership enables collective growth and transformation."

- Gita Upadhyay, a female professional from Sudurpaschim Province

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"We had to struggle for basic opportunities for growth and participation in our offices. However, this leadership platform allowed us to realize our strengths, harness our skill sets that apply to our work in agriculture and, above all, build confidence to speak up and make our voices heard."

- Anju Bista, a female professional from Karnali Province

"I remembered my own struggles when interacting with my mentee during my mentorship journey. Providing my knowledge and experience to help her grow in leadership made me realize that peer support can help eliminate barriers. Now, they do not have to face the same obstacles that we did, which helps them climb the leadership ladder faster."

- Sumnima Shrestha, a female professional from federal level

ICIMOD's Living Mountain Lab

The Living Mountain Lab (LML), formerly known as the ICIMOD Knowledge Park, serves as a hub for researching and demonstrating innovative solutions to critical challenges faced by mountain communities in the Hindu Kush Himalaya (HKH) region. Through the GRAPE project, GIZ has significantly contributed to enhancing the LML's capacity to promote CRA solutions.

Bridging Knowledge Gaps through Enhanced Outreach

One of the primary challenges in the HKH region is the limited dissemination of climate-resilient technologies and practices to remote mountain communities. The support of the project has enabled the LML to strengthen its outreach to key stakeholders, including academia, government agencies and NGOs.

- **Academic engagement:** The LML expanded its collaboration with local and regional universities, resulting in over 500 university students visiting the laboratory over the past two years—more than twice the previous number. These visits not only increased awareness of CRA solutions but also led to actionable research, such as innovative techniques for producing organic soil enhancers, now adopted as best practices.
- **Government partnerships:** Exposure visits were organized for mayors or chairpersons and agricultural staff from twenty municipalities in western Nepal. Several municipalities have since begun implementing practices demonstrated at the LML, particularly nature-based erosion control for sloping farmland.
- **NGO collaboration:** Technical training hosted at the LML facilitated peer learning on nature-based solutions. Over 100 participants from various organizations received training in areas such as spring shed management, sustainable beekeeping and wild medicinal plant stock management.

Supported by these efforts, the LML monthly visitor count has more than doubled since 2020, amplifying the dissemination of climate-resilient technologies and increasing revenue generation—critical steps towards financial self-sufficiency.

Introducing New Climate-Resilient Solutions

Addressing the evolving needs of mountain communities requires continuous innovation. GIZ support allowed the LML to expand its portfolio by incorporating new nature-based solutions developed through action research.

- **Technology transfer**: A total of fifteen new technologies and approaches were added to the LML exhibits. These were selected from successful interventions by GIZ, ICIMOD and other development partners, ensuring they are scalable and cost-effective. They include innovative low-cost hydroponics devices and low-tech extractors of essential oils.
- **Gender-friendly innovations:** Special attention was given to gender-friendly and mountain-specific technologies. By prioritizing solutions that are accessible and beneficial to women, the LML addressed gender disparities in technology adoption. Added technologies include women-centred design of bins for vermi-composting as well as biochar kilns.
- **Interactive exhibits:** New exhibits were created with physical and digital elements, complete with explanatory signboards to enhance visitor understanding and engagement.

Strengthening Regional Knowledge Exchange

The LML acted as a nexus for knowledge transfer between regional institutions and national organizations.

Allied institutional collaboration: Exchange visits were organized with over fifteen allied institutions across four countries in the region to foster knowledge exchange and strengthen partnerships. This initiative led to the formalization of collaborations through memorandums of understanding (MoUs) and exchange of technical experts among institutions such as the Centre for Mountain Futures, China.

Agricultural knowledge centres (AKCs): Exposure visits to the LML were organized for all nineteen AKCs from Karnali and Sudurpaschim Provinces, to upscale LML solutions, with a focus on innovations generated through GRAPE action research.

Sustained Commitment and Future Outlook

ICIMOD demonstrated substantial commitment by mobilizing its resources to complement the GIZ support, covering staff costs and acquiring new technologies recommended by GRAPE that were beyond the grant's scope.

The interventions facilitated by the GRAPE project have significantly enhanced the LML's ability to disseminate CRA solutions. By expanding its technological offerings, strengthening stakeholder engagement and focusing on gender inclusivity, the LML is better positioned to drive sustainable development in mountain communities across the HKH region.

5 FUTURE OUTLOOK:

Green Resilient Agricultural-Centred Private Sector Economic Development (GRAPE II)

In Nepal, women and women-led businesses face significant challenges due to limited access to essential resources, like financing, technical support and larger market opportunities. Although women represent a substantial portion of the agricultural workforce, social norms and traditional views often restrict their roles, confining them to lower levels of the value chain and limiting their economic potential. Building on the experiences of the GRAPE project, the aim is to support the growth of women-led businesses, enhance market access for rural producers, and promote the adoption of climate-resilient agricultural practices across Nepal.

GRAPE II focuses on gender equality, climate resilience and biodiversity protection, particularly in the agricultural sector. Recognizing that women make up most of Nepal's agricultural workforce, yet often remain limited to lower value roles, the project aims to empower women and marginalized groups by expanding access to business development resources, improving market connections and strengthening local policies to promote sustainable economic growth.

The project aims to work on the five areas mentioned below:

- **Improving business support for producers and MSMEs**: It focuses on giving farmers, producer groups and micro, small and medium enterprises (MSMEs) tools to grow their businesses. The project will strengthen local business service providers to offer essential support, such as training, marketing advice and access to finance. To empower women, the project will provide gender-focused programmes and encourage networking among women entrepreneurs to help them expand their reach and improve political representation.
- **Creating market connections through partnerships:** To help producers access larger national and international markets, the project will partner with private companies and local businesses. By promoting products, including niche products like medicinal herbs, organic produce and indigenous crops, the project aims to create new market opportunities, especially for women-led businesses.
- **Supporting local governments for sustainable development:** To assist local governments in developing policies that promote gender equality, climate resilience and biodiversity, municipalities committed to sustainable economic growth will receive training and support to build frameworks that encourage women's entrepreneurship. Additionally, regular meetings between public, private and cooperative sectors will be organized, prioritizing women's needs, to strengthen local economic plans.
- **Raising awareness and changing perceptions:** Awareness campaigns will be conducted at the local, provincial and national levels to highlight the importance of women's economic roles and to inspire more women to pursue entrepreneurship. The campaigns will feature successful women entrepreneurs as role models and work closely with local CSOs to challenge traditional views and encourage positive social change.
- **Expanding and institutionalizing good practices:** Building on previous successes of the GRAPE Project and good practices from GRAPE II, the focus is on scaling sustainable economic development practices that support gender equality, climate resilience, and biodiversity. To make these practices widely adopted, the project will work with training institutes, universities, and provincial government centers to incorporate these practices into their programs.

GRAPE II builds on the results of GRAPE I and the achievements in Nepal's local economic development, and will specially focus on empowering women's participation in the agricultural value chain. By strengthening business support systems, fostering private sector partnerships and market linkages, improving local government policies, raising awareness and scaling successful practices, the project aims to create lasting economic growth that supports gender equality, climate resilience and biodiversity conservation.