

NEPAL CASE

# Innovative Financial Instruments for Adaptation

Mobilizing Development Finance for Strategic  
and Scaled-up Investment in Climate Adaptation

- Pragma Sherchan and Prabin Man Singh



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## FOREWORD

This case study was prepared by the Prakriti Resources Centre as an input to the “Mobilizing Development Finance of Strategic and Scaled-up Investment in Climate Adaptation” research project, which was implemented by the International Institute for Sustainable Development (IISD) in partnership with the Prakriti Resources Centre in Nepal, African Centre for Technology Studies in Kenya, and Libélula in Peru. Funding for the project was provided by Canada’s International Development Research Centre (IDRC).

The research project explores the challenges of scaling up finance for adaptation across different contexts and opportunities to overcome these constraints. One area of focus is innovative financial instruments for adaptation, and this case study provides the learning on scaling up finance for adaptation that emerged through the public and private sector collaboration to enhance food security through promoting climate resilient agriculture in Nepal. This case study also informed an IISD research paper that explored the challenges and opportunities related to the use of innovative financial instruments to scale up financing for adaptation.

# TABLE OF CONTENTS

<b>Introduction</b>	<b>1</b>
<b>Methodology</b>	<b>2</b>
<b>Case Study Context</b>	<b>2</b>
<b>Climate Vulnerability And Adaptation Measures</b>	<b>4</b>
<b>Project's Financial Design</b>	<b>6</b>
<b>Financial Instruments</b>	<b>7</b>
<b>Key Enabling Factors</b>	<b>11</b>
<b>Challenges</b>	<b>12</b>
<b>Opportunities</b>	<b>12</b>
<b>References</b>	<b>13</b>

## ABBREVIATIONS

<b>BFI</b>	Bank and Financial Institutions
<b>BO2</b>	Business Oxygen Pvt. Ltd.
<b>CIF</b>	Climate Investment Fund
<b>IFC</b>	International Financial Corporation
<b>PPCR</b>	Pilot Programme on Climate Resilience
<b>SME</b>	Small and Medium Enterprise
<b>USD</b>	United States Dollar

# INTRODUCTION

With rising temperature and an increasing number of extreme precipitation days (DHM, 2017), Nepal faces both direct and indirect impacts of climate change. The Global Climate Risk Index 2020 has ranked Nepal 20th in the global list of countries with high exposure and vulnerability to extreme climate events (Germanwatch, 2020). Nepal's vulnerability to climate change can be attributed to its complex terrain, largely poor and resource-dependent population, and weak institutional capacity to manage challenges (Global Delivery Initiative, 2018). In a study conducted by MoSTE (2014), the direct cost of climate variability and extreme events in key sectors (agriculture, hydropower and water-induced disasters) was estimated to be 1.5 to 2 percent of the annual Gross Domestic Product (GDP) (about USD 270-360 million/year in 2013 price).

In Nepal, agriculture is among the most vulnerable sectors to climate change impact because the agriculture systems in the country are mostly rain-fed and exposed to extreme climate events, such as floods, droughts, landslides, hailstorms, thunderstorms, cold waves and heat waves (MoPE, 2017). More than 69% of the agricultural land in Nepal is not irrigated and therefore, agricultural production is heavily impacted by extreme weather variability and climate change (ibid). Despite the challenges, however, the agriculture sector contributes about one-fourth of the national GDP (MoF, 2021).

Nepal's Agriculture Development Strategy (2015-2030) has put forth several strategies to make the agriculture sector resilient to climate change impact (see MoAD, 2015). Besides prescribing stress-tolerant varieties and breeds, early warning systems, climate information and weather indexation systems, strengthening of reserve systems, and establishment of a fund for preparedness and response to disasters and emergencies, the Strategy also aims to improve investment climate for commercialization of agriculture through diverse finance and insurance instruments, fiscal policy measures, and competitive agricultural value chains. However, small landholding, limited access to technology and services, labour shortages, poor access to technical and technological resources, and depletion in soil quality, among others, remain a significant challenge in addressing climate risks in the agriculture sector.

Against this background, this case study analyzes a project implemented in Nepal titled '**Public and private sector collaboration to enhance food security through promoting climate resilient agriculture**'<sup>9</sup> to provide learning on innovative financial mechanisms that can be used to scale up finance for climate adaptation in developing countries. The project was initiated by International Financial Corporation (IFC) and was implemented from 2013 to 2019. The project provides an example of how private and public sector collaboration can increase farmers' adaptive capacity by minimizing the risk of crop losses from climate hazards.

For the purpose of this case study, innovative financial instruments for adaptation are defined as innovative approaches and mechanisms to acquire, structure, govern, and allocate financial resources. These instruments can include three alterations to traditional finance:

-  Acquisition of new financial resources and blending with traditional resources to finance adaptation actions.
-  Enhanced efficiency in raising and distributing financial resources.
-  Enhanced effectiveness of investments.

This case study first provides an overview of the roles and responsibilities of the main actors in the project, and the key actions taken by small-scale farmers to address climate risks and vulnerabilities. An analysis of the financial design of the project and an elaboration on the financial instruments is presented next in the report, which provides context on the innovative approach adopted by the project. The concluding section discusses the success factors that encourage private sector engagement in climate adaptation actions in the agricultural sector in Nepal and the challenges that could deter such engagement.

## METHODOLOGY

The case study was developed based on a review of secondary literature about the project and in-depth interviews with key informants directly involved in the project (see Annex 1). A workshop was organised to validate the information.

## CASE STUDY CONTEXT

The agriculture sector is one of the priority investment sectors for the Government of Nepal. In the fiscal year 2020/21, the agriculture sector accounted for 6.15% of the national budget of Nepal (MoF, 2020). Investment in the sector is primarily from the government's coffers, which is also supplemented by development aid received from development partners. The Agriculture Development Strategy has estimated that investment worth USD 5,282 million would be made in the sector between 2014 and 2023 for 232 priority projects, with the private sector investing over USD 600 million (MoAD, 2015).

The government plans to attract private investment in agriculture through policy and institutional reforms and programmatic support, such as promotion of export-oriented agriculture; a subsidized loan facility; insurance on agriculture production; and improved processing, storage and marketing (NPC, 2020). Commercial banks are required to invest at least 15% of their total credit in the agriculture sector by mid-July 2023 to ensure food security and generate employment in the agricultural sector (NRB, 2020). Loan loss provision for specialized crops; provisions of collateral for lease assets, agriculture credit swaps among Banks and Financial Institutions (BFIs) and other related provisions are made to attract private sectors investment in agriculture (ibid). Despite the above policy reforms, private investment in agriculture sector is not growing because of low returns on investment and the high cost of doing business (ADB, n.d.). In addition to the existing constraints, climate change has imposed additional risk for agribusiness and farmers (ibid).

The project **'Public and private sector collaboration to enhance food security through promoting climate resilient agriculture'** aimed to encourage private sector investment in agriculture, particularly in climate resilient agriculture. This project was financed through the Climate Investment Funds' Pilot Project on Climate Resilience (CIF-PPCR) and IFC managed the private sector component of PPCR. Three private agribusiness firms (Eastern Sugar Mill, Pashupati Rice Mill, and Probiotech Industries) and a private equity fund (Business Oxygen) participated in the project with an aim to increase investment in the promotion of climate smart agriculture technologies and practices.

The agri-business firms were involved in building capacity among farmers and agri-supply chain members and piloting climate resilient technologies and practices. These interventions were targeted to enhance agricultural productivity of three major crops, namely, sugarcane, rice and maize, and thereby improve food security in Nepal. The intervention also supported small and medium enterprises to climate proof their businesses with private equity financing. Climate proofing includes identifying risks to a project as a consequence of climate variability and change, and ensuring that those risks are reduced to acceptable levels in the project cycle: planning, design, construction, operation, and decommissioning (ADB, 2005).

The participating agribusiness firms, Eastern Sugar Mill, Pashupati Rice Mill, and Probiotech Industries, are run by Golchha Group, Sharda Group and Probiotech-Nimbus Group respectively. These firms have a good track record of investment in agriculture-based industries in Nepal. Brief profiles of the respective business houses are provided in Box 1. The project supported the agribusiness firms to build climate resilience capacity of sugarcane, rice and maize crops respectively. The agribusiness firms participated in capacity building trainings and piloting, and on-field demonstrations of climate smart technologies and practices to protect the yield of the above three crops from potential climate shocks.

## Box 1: Brief profile of the three business groups involved in the project

**Golchha Group** is one of the largest and most esteemed business houses in Nepal. It carries a legacy and trust for over 100 years in a diverse range of products including jute, steel, electronics, metal, and food grains, among others. Apart from industrial establishments, the Golchha Group has also ventured into the international trade and service sector. In this project, Golchha Group was involved through its Eastern Sugar division from agro-based sector.

**Sharda Group** is one of the most diversified business conglomerates in Nepal. Since its inception, the Group has been involved in a wide spectrum of industrial operations, manufacturing and trading products, ranging from industrial goods to consumer durables and non-durables. Sharda Group started the business from a rice mill namely Pashupati Rice Mill more than six decades ago. Now they have established many manufacturing industries and plants, and also entered in the hydropower sector, trading and banking sectors. In this project, Sharda Group participated through its rice mill.

**Probiotech-Nimbus Group's** journey began as Nimbus Holdings, which used to import confectionary products from India and distribute them all over Nepal's retail and wholesale market. With time, it gradually shifted towards the import and distribution of soya cakes and maize and started investment in agribusiness sector. Nimbus initiated its own plant that produced animal feed supplements as Probiotech Industries and became the first pellet feed manufacturing unit in Nepal.

Besides the three agribusiness firms, **Business Oxygen Pvt. Ltd. (BO2)** joined the project to provide private equity financing to small and medium enterprises (SMEs) to start up or upscale climate smart businesses and to mitigate the potential risks to their businesses because of climate shocks. The BO2 is a part of the IFC's Global SME Ventures with investments from the IFC, Climate Investment Fund's PPCR and the United Kingdom's Department for International Development.

The project supported five SMEs working in a wide range of sectors, such as dairy and cattle, restaurants, renewable energy, and organic manure, among others. Each SME received up to USD 0.5 million in private equity financing after going through a rigorous eight-step screening process, including due diligence review. The screening process also included two environmental criteria: climate-friendly investment and recycle & reuse.

The project supported farmers growing rice, maize and sugarcane through capacity building interventions. Lead farmers were trained and engaged in piloting and on-field demonstrations of climate smart agriculture technologies and practices. They further imparted the knowledge to other fellow farmers.

Besides these, other public and private organizations were engaged in the delivery of specific tasks under the project with the service providers/implementing partners entrusted by IFC. They are as listed below.

Organizations	Activities
Government officials (Nepal Agricultural Research Council and District Agriculture Development Office)	Observation and monitoring of training and agriculture demonstration plots.
Practical Action Consulting	Technical service provider to the lead firms to complement their agriculture extension services.
Solutions Consulting	Monitoring and evaluation service provider for evaluation of the project's strategic relevance, effectiveness, impact, long-term sustainability, IFC role and contribution, and efficiency.
Climate Change Agriculture and Food Security (NGO) and PricewaterhouseCoopers	Scoping study on climate resilient agriculture and food security in Nepal (knowledge partner).
Midas and mPower from Bangladesh	Provides information and communications technology (ICT) services regarding e-learning packages and agro-meteorological information.
Jain Irrigation (Indian irrigation technology provider)	Promoting access to and adoption of water-efficient irrigation technologies such as solar pumps in the demonstration plots

# CLIMATE VULNERABILITY AND ADAPTATION MEASURES

A scoping study on climate resilient agriculture and food security conducted as a part of the project has identified potential impacts of climate change in the value chain of three crops and listed out required adaptation interventions. The table below summarizes the findings of the scoping study.

## For Rice and Maize

Crop value chain stage	Potential impact of climate change	Constraints	Adaptation/ Coping strategy	Intervention(s)
Production	<ul style="list-style-type: none"> <li>Declining productivity</li> <li>Shift in cultivation period</li> <li>Damage to standing crop due to vagaries of climate</li> <li>Unsuitability of traditional varieties</li> <li>Increased pest/disease incidence</li> <li>Increased chances of crop failure</li> <li>Increased water usage</li> </ul>	<ul style="list-style-type: none"> <li>Traditional cultivation practices and lack of knowledge on climate-resilient crop varieties.</li> <li>Decreasing ability to cope with climate change</li> <li>Lack of access to weather forecasting systems</li> </ul>	<ul style="list-style-type: none"> <li>Transition to improved/scientific farming practices</li> <li>Farm mechanization</li> <li>Use of improved varieties suitable to local agro-climate</li> <li>Access to weather information</li> </ul>	<ul style="list-style-type: none"> <li>Provision of climate-resilient high yield variety seeds</li> <li>Access to farm inputs and farm level extension services through setting up of rural transformation centres and retail centres</li> <li>Capacity building of farmers scientific methods of cultivation for increased productivity</li> <li>Awareness on use of appropriate variety based on climate resilience, requirements and market demand and local conditions</li> <li>Training/demonstration in mechanization of operations in the area of usage of various machineries/implements, repair and maintenance</li> <li>Demonstration on usage and benefits of improved irrigation systems</li> <li>Development of accessible early warning system</li> </ul>
Harvesting	<ul style="list-style-type: none"> <li>Delayed rains</li> <li>Sudden rains/hailstorms resulting in crop loss</li> </ul>	<ul style="list-style-type: none"> <li>Poor climate information services</li> </ul>	<ul style="list-style-type: none"> <li>Early warning system</li> </ul>	<ul style="list-style-type: none"> <li>Development of platform for dissemination of weather and climate information relevant to farmers</li> </ul>
Post- harvest	<ul style="list-style-type: none"> <li>Crop loss and product quality deterioration</li> </ul>	<ul style="list-style-type: none"> <li>Lack of storage resulting in losses and low price realization due to immediate sale after harvest</li> </ul>	<ul style="list-style-type: none"> <li>Creation of storage infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Partnership with private companies for creation of modern storage infrastructure</li> </ul>

## For Sugarcane

Crop value chain stage	Potential climate change impact	Constraints	Adaptation/Coping strategy	Intervention(s)
Production	<ul style="list-style-type: none"> <li>Declining productivity in crop growing areas</li> <li>Increased water requirement</li> </ul>	<ul style="list-style-type: none"> <li>Low productivity and recovery due to traditional practices</li> <li>Long duration crop leading to increased risk</li> </ul>	<ul style="list-style-type: none"> <li>Transition to improved/ scientific farming practices</li> <li>Improved irrigation</li> <li>Intercropping with compatible crops</li> </ul>	<ul style="list-style-type: none"> <li>Development of climate resilient and high yielding varieties</li> <li>Capacity building of farmers in scientific methods of cultivation for increased productivity and sugar recovery</li> <li>Technical assistance for introduction of intercrops like mustard and potato for increased farmer remuneration and diversification</li> <li>Training/demonstration in improved irrigation systems for efficient and effective water usage</li> </ul>

The project supported increasing farmers' adaptive capacity by introducing adaptation actions recommended by the scoping study. These adaptation actions have minimized the risk of crop loss from climatic impacts. Climate resilient practices and technologies included:

- On-field demonstration and distribution of certified seed varieties (the progeny of breeder, foundation or registered seed handled to maintain satisfactory genetic purity and varietal identity) to farmers: High Yielding Variety seeds produce high-quality crops, have high reliance on irrigation and fertilizer, mature early and are resistant to many diseases.
- Fertilizer management by using home-based manure using cow dung and urine, waste straw and other farm and dairy residuals: These substances are rich in organic material that nurture soil organisms and are essential in maintaining an active soil life.
- Improved water and moisture management through mulching practices using biodegradable materials and home-based manure.
- Introduction of a System of Rice Intensification: Such practices reduce seed and water requirements and provide higher productivity with better resistance to drought, storm damage and flood due to larger/ healthier root structure. Due to high pest/ disease resistance, production cost can be reduced, yielding higher benefit/cost ratio.
- Zero tillage: Such practices reduce the cost of cultivation, soil erosion, crop duration, irrigation requirements and weed effects.
- Ridge farming to improve water and irrigation management.
- Distribution of moisture meters (to know the moisture content of grain regarding industrial requirement to maintain quality of crops) and direct seeded rice machine to save irrigation water, lessen weed problems, reduce nutrient deficiencies, deepen root development, and improve efficiency and reduce operational costs (use of the machine requires less time and less labor work).
- Weather-based advisory services through Short Message Services (SMS) to provide relevant timely farm-level weather and climate-informed products and services to farmers for agricultural decision support to better manage weather and climate risk

The above adaptation actions were introduced in partnership with three agribusiness firms. Practical Action Consulting provided technical advisory support to the firms on climate resilient practices and technologies. Agriculture workers of the firms received trainings on climate resilient practices and technologies. These knowledge and skills were transferred to over 15,000 farmers through a series of trainings and on-field demonstration plots.

Interviewed project stakeholders agree that climate resilient practices and technologies introduced by the project have proven effective in building resilience of the three crops to climatic disasters. The following points summarize the effectiveness of the practices and technologies introduced by the project:

- 🌱 Production and productivity of all three crops increased after the introduction of climate smart practices and technologies.
- 🌱 The quality of maize improved after the project intervention. Firms purchased the maize from Nepali farmers instead of importing from India.
- 🌱 Farmers were directly linked with agribusiness firms, and the sale of their crops and market expanded.
- 🌱 Weather-based advisory services supported farmers to better respond to climate-related hazards and minimized crop loss in the 2017 floods in the project districts.
- 🌱 Among the three crops, sugarcane turned out to be the most successful, which was mainly because of a short supply chain, which helped in teaming up of agribusiness and farmers in training and other capacity building activities.

## PROJECT'S FINANCIAL DESIGN

The project was jointly financed by the Climate Investment Fund's PPCR, IFC and the Canada Climate Change Programme. Approximately USD 2.5 million was invested to finance public private partnership-led adaptation actions in the three major crops in five districts in Nepal. CIF-PPCR invested USD 5.6 millions in grant and concessional loan, IFC invested USD 290,000 and the Canada Climate Change Programme contributed grant funding totalling USD 200,000. Besides these institutions, the three agribusiness firms have contributed mainly in the form of human resources and working spaces. In an interview, one of the partner firms reported that the firms' cumulative contribution to the project was equivalent to USD 100,000.

In 2017, the project was restructured with the introduction of private equity financing component. The interviewed stakeholders shared that the project implementation was negatively impacted by the massive earthquake in 2015 and also by the economic blockade by India on Nepal in 2015/16. The project also faced challenges as private commercial banks in Nepal were reluctant to provide loans to farmers. As an alternative, the project introduced Business Oxygen Pvt. Ltd., a private equity fund to invest in small and medium enterprises that were willing to invest in climate smart businesses. The project invested USD 3.6 million in the private equity fund.

The table below summarizes stakeholder contributions to different climate adaptation actions of the project:

Stakeholders	Financing Role	Adaptation actions implemented and/or financed
CIF-PPCR	<ul style="list-style-type: none"> <li>• USD 2 million in grant and USD 3.6 million in concessional loan to the project (See figure in page no. 8).</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity building of agriculture extension workers of the three private agribusiness firms and farmers</li> <li>• Weather based advisory services to farmers</li> <li>• Field-based demonstration plots</li> <li>• Fertilizer management, water, and soil moisture management</li> <li>• System of Rice Intensification</li> <li>• Support to the SMEs to invest not only in adaptation but also in climate smart businesses</li> </ul>

Stakeholders	Financing Role	Adaptation actions implemented and/or financed
IFC	USD 290,000	<ul style="list-style-type: none"> <li>• Supplement on CIF-PPCR financing in the project</li> </ul>
Canada Climate Change Programme	USD 200,000	<ul style="list-style-type: none"> <li>• Supplement on CIF-PPCR financing in the project</li> </ul>
Agri-business firms: <ul style="list-style-type: none"> <li>• Golchha Group (sugar division)</li> <li>• Sharda Group</li> <li>• Probiotech – Nimbus Group</li> </ul>	<ul style="list-style-type: none"> <li>• Approximately USD 0.3 million (USD 0.1 million each) in cash and in-kind contributions in terms of staff time, equipment, facilities, and demonstration plots</li> </ul>	<ul style="list-style-type: none"> <li>• Contribution to the adaptation actions</li> </ul>
Government of Nepal	<ul style="list-style-type: none"> <li>• Contributed in-kind resources, such as technical expertise, demonstration plots for showcasing irrigation methods, and develops policies and regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring of the adaptation actions through field visits and technical expertise</li> </ul>
Farmers	<ul style="list-style-type: none"> <li>• Invested own resources in climate adaptive inputs and technologies such as moisture meters, direct seeded rice machines, etc. (not quantified)</li> <li>• Participated in training and on-field demonstration plots</li> </ul>	<ul style="list-style-type: none"> <li>• Applied the aforementioned adaptation actions in their farms</li> </ul>
Business Oxygen Pvt. Ltd.	<ul style="list-style-type: none"> <li>• Invested an additional USD 10.7 million to support SMEs investing in climate smart businesses</li> </ul>	<ul style="list-style-type: none"> <li>• Invested private equity in SMEs and encouraged SMEs to invest in climate proofing their businesses and invest in climate smart businesses</li> </ul>
Small and Medium Enterprises	<ul style="list-style-type: none"> <li>• Invested in climate smart businesses equivalent to the equity investment made by Business Oxygen Pvt. Ltd.</li> </ul>	<ul style="list-style-type: none"> <li>• Undertook appropriate adaptation and mitigation actions to climate proof their businesses</li> </ul>

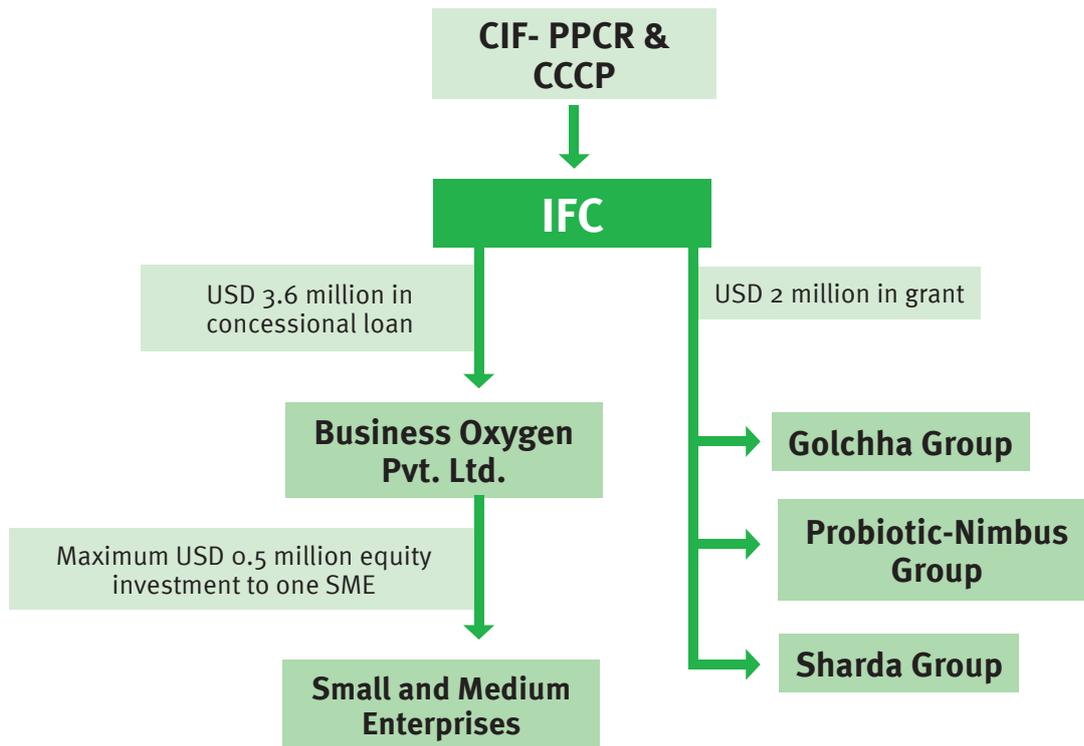
## FINANCIAL INSTRUMENTS

A number of financial instruments were applied in the project to support farmers and agribusiness firms to better adapt and protect yields of three crops to climate-induced risks. These included conventional instruments like grant and concessional lending and innovative instruments like private equity financing. These financial instruments are explained below.

CIF-PPCR contributed USD 2 million as a **grant** to the project through IFC. The amount was utilized to finance adaptation actions including piloting of climate resilient practices and technologies, technical support and also to cover the project administration cost.

CIF-PPCR provided USD 3.6 million to the project in **concessional lending** through IFC. The amount was targeted to finance small and medium enterprises to invest in climate smart businesses. This has also facilitated introducing innovative instruments like equity financing to promote climate related investment.

## FUND FLOW CHART OF THE PROJECT



Besides applying conventional financing instruments, the project led to the establishment of Business Oxygen Private Limited (BO2) as Nepal's first private-equity fund with a climate focus. In Nepal, climate adaptation projects and programs are mainly financed by international finance and the government's budget. Adaptation actions are executed by government agencies and non-governmental development organizations. But the project was successful in not only engaging with private agribusiness firms to pilot climate adaptation actions but also in introducing the concept of climate-focused private equity and venture capital (PEVC) fund, which is a special purpose vehicle (SPV) which pools investment from different investors and invests in portfolio companies.

In 2013, the project had designed a USD 10 million risk sharing facility with commercial banks that aimed to increase farmers' access to finance by lending money for non-traditional agriculture practices and tapping the sector's potential. The project had approached a few commercial banks in Nepal for collaboration and investment. Back then, the banks were reluctant to provide loans, as they described lending to the agriculture sector as 'high risk' because of high transaction costs, relatively small loan size, difficulty in assessing farmers' credit worthiness, lack of adequate collateral, and lack of agriculture insurance. The project decided not to carry out the risk sharing facility. Instead, in 2017, IFC invested in a private equity fund managed by BO2 through a USD 3.6 million concessional loan.

The loan to BO2 was for a 10-year period and had to be paid back with capital gains from the investments made. BO2 utilized the funding to invest in the scaling up of SMEs. Equity financing was only introduced in the business sector in Nepal in the early 2000s, so BO2 targeted SMEs that generally faced difficulties in accessing finance from BFIs because they lacked pledging collateral like land and buildings (ADB, 2016). These SMEs were not getting business loans from banks and financial institutions mainly because of lack of collateral. The equity financing supported these SMEs with additional capital to expand their climate smart business and/or climate proof their business with added adaptation actions. A large proportion of BO2's climate allocation was on renewable energy with adaptation co-benefits such as Nepal's largest bio-gas plant, a solar energy company and a bio-pellet manufacturing company.

The following case of Gandaki Urja Pvt. Ltd is based on an interview with Mr. Kushal Gurung, a proprietor of the firm, who explained the modality of private equity investment by BO2.

## **Box 2: The case of Gandaki Urja Pvt. Ltd.**

Gandaki Urja Private Limited is an investee of BO2. It produces biogas from cow/buffalo dung, pig manure, poultry litter and vegetable/agricultural wastes. It also produces enriched organic fertilizer, which is a key factor of multiplying agro-production while maintaining environmental sustainability. In 2020, it had the capacity to process up to 45 tons of waste daily and to generate 5 tons of organic fertilizer and 1600 kg of biogas. It produced 200 tons of organic fertilizer in 2020.

Organic fertilizer is a substitute to chemical fertilizer and nourishes and maintains soil moisture. It has proven to be an effective adaptation action to protect agriculture from drought. There is a growing demand for organic fertilizer, as farmers are aware of the ill effects of chemical fertilizers. According to Mr. Gurung, the cost of organic fertilizer is high in initial years but in the long run it is more cost effective than chemical fertilisers. Further, consumer awareness and increasing demand for organic food among urban dwellers have also increased demand for organic fertilizers. Besides adaptation benefits, the firm claimed that it saved greenhouse gases emissions equivalent to 14,000 ton of carbon dioxide equivalent every year. It has created employment for 40 persons and has reached out to 100 families across Nepal in all its value chains. The end-users of the fertilizers are farmers, the most vulnerable population to climate change impacts.

The firm started with initial capital of approximately USD 1.5 million, of which USD 1 million is the proprietors' private investment and USD 0.5 million is loan from Nepal Investment Bank Ltd. Business Oxygen Pvt. Ltd. supported in scaling up the business (Phase 2) with USD 0.5 million equity investment. The equity money is used to pay back the bank loan and interest and partly as operation expenditures. BO2 paid a 25% premium on the share price. Besides equity finance, IFC provided a grant of USD 25,000 to the firm for technical assistance, which was utilized in marketing, building accounting capacity and enhancing the knowledge gap on understanding the fertilizer value chain and markets. IFC covered 75% these costs and the firm covered the remaining amount.

The firm has benefitted from the Government of Nepal policy that provides a 40% subsidy on the import of equipment and a 5% rebate on bank interest on agricultural loans. The firm's return on investment is calculated at 35% for 3.5 years. However, the firm has faced challenges in recent years because of the COVID-19 pandemic, as demand for organic manure declined and transportation became a challenge due to lockdown. Lack of coordination among government agencies like the ministry, the customs office and the like caused delay in bringing the government subsidies into practice. A shortage of skilled human resources and spare parts domestically had been another challenge in operating the firm. It was also pretty challenging for the firm to convince local residents who complaint of foul odour, land pollution and land value might decrease as they see the firm as a 'dumping site'. Local residents are convinced after dialogues and visit to the landfill site.

BO2 and Gandaki Urja share risks and benefits equitably. BO2 targets to double its investment in the firm and exit in 5 years. The firm can either buy the shares or sell to other investors. The firm has the first right to refuse or accept to buy the shares. However, in case of loss, BO2 has the first right to claim and clear their equity investment through sells of assets and only remaining amount goes to the proprietors. There are two modalities of repayment. The firm can pay double the equity amount in year five or pay annual dividends. The dividend amount is deducted from total return on investment in the last year.

According to Mr. Gurung, equity financing has three clear advantages over bank lending. Equity financing does not require collateral, unlike a bank loan that demands it. Bank loan also incurs service charges, property valuation, insurance and other costs. Second, risks and benefits in the business are shared equally between the SME and BO2. Third, IFC and BO2-led equity financing also provides technical assistance support to SMEs to increase technical and knowledge gaps in operating the business. It demands auditing and accounting protocols and standards that help in transparency and building confidence of foreign investors. After a successful venture on this investment, Mr. Gurung is now encouraged to start the next project, a solar mini grid project with adaptation benefits.

BO2 has invested in four other small and medium enterprises that are running climate smart businesses or working to climate proof their businesses. These SMEs and their climate smart actions as provided by BO2 are briefly explained below:

Name of SMEs	Climate smart businesses
<p><b>Saral Urja, Raksirang</b></p>	<ul style="list-style-type: none"> <li>• The enterprise has installed solar panels to provide 30KW of electricity, which also provides electricity to the solar-generated pumps to distribute 150,000 liters of water per day, which is used to irrigate fields and provide drinking water to households. Since its installation, every household has its own water tap and irrigation is now possible for 3 hectares of land, in which villagers farm red chillies commercially.</li> <li>• The enterprise has pioneered rooftop systems to build a diversified energy mix model in Nepal, displacing thermal plant-generated imported electricity. Rooftop solar panels of 200KW capacity installed under the Renewable Energy Service Company model with overall capacity of 2.5 MW is expected to generate 7,300 MWh of energy in 25 years displacing thermal power generated electricity imported from India, thereby lowering the foreign currency deficit in Nepal.</li> <li>• Generating electricity from climate-resilient infrastructure such as solar is less prone to damage from natural calamities.</li> </ul>
<p><b>BAKAS Renewable Energy</b></p>	<ul style="list-style-type: none"> <li>• The enterprise manufactures biomass pellets using forest undergrowth, farm field biomass, sawdust and agriculture waste, which also helps create job opportunities for the local communities, largely women and disadvantaged groups by engaging them in collection and processing of the raw materials.</li> <li>• Manufacturing biomass pellets also creates an alternative source of income for many people in Province 2. Province 2 has the highest number of poor populations representing 35% of all poor Nepalis according to the Multidimensional Poverty Index released by the Nepal Government. A total of 200 local people will be employed in the project's various operations.</li> <li>• Using forest undergrowth to produce biomass pellets help reduce forest fire risk in Sagarnath forest area. Prevention of forest fires implies not only prevention of loss of lives and properties but also prevention of carbon dioxide emissions.</li> <li>• Replacing fossil fuels by biomass pellets help increase access to clean fuel for rural households by improving kitchen air quality and also reduces greenhouse gas emissions by reducing the dependency on firewood for cooking.</li> <li>• The enterprise produces 19,824 tons of pellets annually by using 30 tons of forest waste, which is a locally available resource Replacement of fossil fuels by renewable biomass energy helps mitigate the adverse impacts of climate change.</li> </ul>
<p><b>Godawari International</b></p>	<p>The enterprise produces chhurpi (a kind of hardened cheese), working with 300 micro dairies and 4,015 smallholder farmers to build its value chain.</p> <p>The enterprise has created an alternative source of income for farmers living in remote pockets in Ilam, Panchthar, Rasuwa and Makwanpur (Province 1 and 3 of Nepal). The enterprise has been working with 7 arbitrage suppliers, providing direct employment to 38 people, and with 300 micro dairies in the supply chain, employing over 1,600 people and supporting livelihoods of 4,015 smallholder farmer households who supply milk to these micro dairies. The farmers have low income, and over 80 % of them are female as most men have left villages to seek employment elsewhere. On average, a micro-dairy produces 300 kgs of chhurpi per month, requiring a milk collection of 250 litres per day. A farmer earns NPR 50 per litre from milk sold to micro-dairies. A farmer's average daily milk production is 2.5 litres.</p> <p>Two dairies in Ilam received training to manufacture chhurpi as per export market requirements which helped Godawari International reduce its processing costs and processing time while also decreasing product waste during processing by 20%.</p> <p>Resource efficiency has been achieved through installation of a natural air vent. Installation of a de-humidifier and air conditioner has helped maintain moisture level in chhurpi, thereby increasing product lifespan and product hedging during monsoons.</p>

Name of SMEs	Climate smart businesses
<b>Dalle Restaurant chain</b>	<p>Dalle has generated employment for semi-skilled and unskilled labor workforce, with a strong representation of women and youth in its work force. 35% of the workforce is represented by women. Dalle has created job for more than 22 vulnerable young women and most importantly instilled economic independence among such girls, created awareness for social responsibility in the private sector in Nepal.</p> <p>Emphasis has been given to reduction of food wastage and efficient management of energy use through a centralized kitchen.</p>

## KEY ENABLING FACTORS

The project was successful in its objective to engage the private sector in climate adaptation actions in the agriculture sector. It introduced innovative financing instruments that encouraged private investment in climate adaptation actions that have the potential to be replicated and scaled up to finance climate adaptation actions in Nepal and elsewhere. Some of the key internal and external enabling factors that contributed to the project success are as follows:

-  The Agriculture Development Strategy of Nepal has prioritized smart technologies and practices to protect the agriculture sector from the adverse impacts of climate change. Such a conducive environment policy worked in favour of the project.
-  The private sector generally lacks technical knowledge on climate change adaptation and how their businesses are directly and indirectly affected by climate change impacts. In the reviewed project, a series of dialogues were held with the private firms early in the project timeline to convince them of the benefits of investing in adaptation and to internalize the project ideas at the beginning. This was followed by capacity building activities that significantly helped the private firms to internalize problems caused by impacts of climate change and think about the solutions.
-  Besides financing, technical assistance to SMEs was essential to build internal capacity of SMEs and enhance competitiveness. This built confidence in SMEs and made them eligible for competitive international financing that support climate adaptation actions.
-  Private sector firms are less known for research and development, particularly in the agriculture sector. This project engaged the agribusiness firms on field research work together with farmers. This clearly showed that the private sector will prioritize and invest in research and capacity building if they are adequately consulted and trust is built.

## CHALLENGES

The project has also revealed several challenges for private sector engagement in climate financing in the agriculture sector. Key challenges are identified as follows.

- ✎ The private sector is not, in general, fully aware of climate-related risks and opportunities, even if climate change can directly affect its assets and revenues. Knowledge, technical, financial, and risk barriers can hinder their engagement (Trabacchi, 2013). The project increased awareness of agribusiness firms about the potential impacts of climate change on their supply value chains and how their businesses are directly and indirectly being affected by climate hazards. Prior to participating in this project, the partner agribusiness firms had little or no knowledge about the practical climatic and non-climatic challenges faced by farmers in crops cultivation or about climate smart practices and technologies that were introduced by the project. However, many actors in the private sector may continue to see adaptation actions as a financial burden when the direct benefits are unclear.
- ✎ Agri-lending by BFIs in Nepal is low and adding climate adaptation to lending could reduce the willingness of BFIs to provide loans. Adaptation projects generally have a low return on investment and may not be of interest to private investment. Innovative financing instruments like equity financing requires project with good return on investment and are more suitable for mitigation projects with adaptation co-benefits.
- ✎ Access to finance is a major impediment to scaling up adaptation actions by SMEs in Nepal. BFIs also have limited knowledge on climate financing products. Innovative financing instruments like equity finance have good prospects to leverage SMEs investment on climate smart businesses. Innovative instruments like equity financing require concessional lending to scale up the investment on climate smart businesses. Blended financing modalities are needed to leverage private money for climate smart businesses.
- ✎ There is still much to do in removing policy barriers and lowering transaction costs to promote private sector engagement in climate financing in agriculture. For instance, the government policies on interest subsidy and tax subsidy have supported SMEs' investment in climate adaptation actions by helping them lower capital expenditure and increase internal rate of return. However, the systems and policies need to be more simplified for all SMEs to benefit from these provisions. Likewise, the government policy to restrict foreign direct investment in agriculture sector has restrained the private equity funds' investment in agribusiness.

## OPPORTUNITIES

Despite challenges, there are also opportunities to be harnessed. Key opportunities can be stated as follows:

- ✎ Climate change may offer opportunities to private sector firms to start up new businesses/enterprises by developing unique products, identifying local customers' demand, capitalizing the benefit of going green, and finding innovative ways to reduce costs while going green and natural. For instance, knowledge and technical know-how gained by the agribusiness firms participating in this project helped them to expand their businesses as improved quantity and quality of crops yield not only benefited farmers but also the firms with improved supply of raw materials.
- ✎ There is also increasing awareness among people on climate actions. The emergence of new and aspiring young entrepreneurs willing to explore investment opportunities in new sectors and the global phenomenon for investment in green business could be leveraged to promote private sector climate financing. Likewise, climate-conscious customers may be willing to pay extra for 'green' products, thus strengthening the demand side of climate smart services and products.

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## ANNEX: LIST OF KEY INFORMANTS

A list of key informants interviewed for the case study are listed below.

SN	Name	Position	Organisation
1	Akira Dhakwa	Programme Coordinator	International Financial Corporation
2.	Ritu Pradhan Malla	SEMs point person and Sr. Investment Manager	Business Oxygen Pvt. Ltd.
3.	Kushal Gurung	Executive Director	Gandaki Urja Pvt. Ltd.
4.	Dr. Dinesh Gautam	Executive Director	Probiotic Nimbus Pvt. Ltd.
5.	Milan Kumar Joshi	Technical Advisor	Practical Action Consulting

## Prakriti Resources Centre

Prakriti Resources Centre (PRC) is furthering the notion of sustainable development and environmental integrity in Nepal. PRC engages in national and international climate policy processes, low carbon development pathways and resilience-building & disaster risk reduction and loss and damage associated with climate change impacts. In these areas, PRC conducts research and study, carries out policy intervention, builds awareness, knowledge and capacity of civil society organizations, government and the private sector, and facilitates dialogue. PRC works in alliance and collaboration with government and other national, regional and global actors in these areas. Together with the allies, it also advocates for environmental-friendly development practices. Gender equality, social inclusion, and good governance cross-cut all PRC projects, activities and practices.



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