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Making Adaptation a Private Sector Business: Insights from the Pilot Program for Climate Resilience in Nepal

Chiara Trabacchi
Martin Stadelmann

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San Giorgio Group
Case Study

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Contact	chiara.trabacchi@cpivenice.org martinstadelmann@cpivenice.org

San Giorgio Group Case Study Overview

This paper is one of a series prepared by Climate Policy Initiative for the San Giorgio Group, a working group of key financial intermediaries and institutions engaged in green, low-emissions, and climate-resilient finance. The San Giorgio Group case studies seek to provide real-world examples of what works and what does not in using public money to spur low-carbon and climate-resilient growth. Through these case studies, which share a systematic analytical framework, CPI describes and analyzes the types of mechanisms employed by the public sector to catalyze and incentivize private investment, deal with the risks and barriers that impede investment, establish supporting policy and institutional development, and address capacity constraints. Case-studies aim to draw lessons for replicating and scaling up best practices.

About CPI

Climate Policy Initiative is a team of analysts and advisors that works to improve the most important energy and land use policies around the world, with a particular focus on finance. An independent organization supported in part by a grant from the Open Society Foundations, CPI works in places that provide the most potential for policy impact including Brazil, China, Europe, India, Indonesia, and the United States.

Our work helps nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which policy plays a crucial role.

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Disclaimer

This report is based on publicly available information and information retrieved during interviews with key stakeholders. At the time of preparing this report, the project was still in progress so details on some of its aspects were unavailable. We aim to provide the best possible information, but cannot claim to have captured everything.

Executive Summary

In a world on a path to a temperature rise of up to 4°C, the challenge of adapting economies to projected climate impacts is often greatest for developing countries. Private actors, ranging from large businesses to individual farmers, play crucial roles in these countries, particularly in key economic sectors like agriculture, which are highly vulnerable to projected climatic changes. Private sector decisions and behaviors, therefore, have the potential to lock countries into vulnerability profiles for a long time, or to set them on a more resilient path.

Understanding the possible role of the private sector in contributing to countries' adaptation efforts and how to involve it in tackling countries' adaptation priorities, can help nations achieve climate-resilient development goals more effectively. To date, the private sector's potential in adaptation has not been fully tapped. This suggests there is room for the public sector to play a greater role in removing barriers to private sector engagement, and in creating environments conducive to this end.

Benefits could be significant. They include stronger economies, new job opportunities, reduced poverty, and increased food security. Most importantly, private sector involvement is essential for scaling-up and replicating best practices, thereby encouraging transformational results.

The Pilot Program for Climate Resilience in the Nepalese agricultural sector

This case study explores the strategies developed and challenges faced by the Pilot Program for Climate Resilience (PPCR) in Nepal by assessing a private sector project run by the International Finance Corporation (IFC). This project deploys public resources with the aim of promoting climate resilience in the agricultural sector by engaging and developing the capacity of agribusiness firms and local commercial banks to transfer skills and resources to farmers, empowering them to adapt. The PPCR, a program operating within the Climate Investment Funds, is the largest dedicated adaptation funding program for developing countries, and the one most targeted toward private sector involvement. Nepal is the first country within the PPCR portfolio to attract the engagement and interest of private sector participants. It is also the first to see its private sector project moving toward implementation.

The overarching goal of the Nepalese project is to build models for climate-smart agriculture that make climate resilience a long-term business for the private actors involved, thereby creating the conditions for their engagement beyond the project's life.

While private actors have their own interests in adapting to climate threats, a number of barriers can impede their engagement, particularly in Least Developed Countries (LDCs), which are the main target of the PPCR. In LDCs, private actors face additional knowledge and capacity obstacles. As such, PPCR in Nepal can provide early lessons on whether well-targeted public resources can help to overcome barriers hampering private involvement in climate-resilience measures. Table 1 details the obstacles this program faced and how it has sought to address them. Specifically, it highlights three key ingredients that helped to:

- Convince the Nepalese government to allocate a portion of PPCR resources to strengthen private actors in the most vulnerable and most important sector of the Nepalese economy.
- Gain the commitment of three local agribusiness firms to train farmers on how to avert climate-related losses and to increase productivity, and
- Raise the interest of commercial banks in partnering with IFC to expand lending to farmers and other members of the supply chain for the purchase of products that can increase their resilience.

These ingredients, which could inform future interventions targeting private sector participation, are:

- Extensive and early consultations supported by in-depth analyses
- Tailored knowledge and capacity building measures
- Innovative financing instruments

Table 1: Key IFC-PPCR measures to create conditions for private sector engagement in climate adaptation in Nepal

		IFC-PPCR MEASURE		
ACTOR	**ISSUE**	EXTENSIVE AND EARLY CONSULTATION	KNOWLEDGE & CAPACITY BUILDING	FINANCING
Agribusiness firms	Limited awareness of their vulnerabilities to changing climate conditions and how to tackle them.	Raising awareness about climate-induced risks to the agricultural sector, and constraints to enhanced productivity by commissioning a diagnostic study, and conducting early dialogue with firms, farmers and other relevant members of the value chain.		
	Lack of knowledge on climate-adaptive agricultural practices and how to (effectively) train farmers.		Developing crop-specific measures and training companies' technical teams and dealers to enable them to transfer skills on climate-proofed agronomic practices to farmers. Close monitoring of results.	
	Outcome risks on the profitability and success of the project.			Covering part of the training costs with about USD 1 million in PPCR grant resources, and using IFC's expertise.
Commercial Banks	Inadequacy of their capital to the level of risk associated with agricultural lending, particularly directly to farmers.	Raising awareness and identifying constraints		Providing risk coverage by guaranteeing about 50% of the losses incurred in a portfolio of eligible agricultural loans with about USD 10 million in PPCR concessional loan financing blended with the IFC's own resources.
	Poor risk management capabilities.		Strengthening banks' ability to evaluate and manage the risks specific to agricultural lending.	
	Lack of tailored financial products.		Providing technical assistance to support banks in the design of financial products that cater to farmers' needs.	
	High transaction costs of reaching farming households.			Involving agribusiness firms to act as loan intermediaries, collectors, and/or guarantors by harnessing their value and reach within the value chain.
Farmers	Lack of knowledge on climate-adaptive agricultural practices, and little access to finance, stress-resilient seed varieties, and equipment.	Identifying and assessing farmers' needs via survey and analysis	Involving agribusiness companies and experts to provide crop-specific training and facilitate farmers' access to inputs, equipment, finance, and markets for their produce.	Providing risk-sharing arrangements and training to targeted banks.
	Outcome risks.			Covering the full costs of training.
Government of Nepal	Limited understanding about the role and importance of the private sector, and how it could contribute to the country's adaptation efforts. Reluctance to devote PPCR funds to private sector activities.	Engaging government in consultations with private sector players, combined with the commissioning of diagnostic studies to provide evidence-based analysis of climate vulnerabilities and opportunities for private actors to contribute toward the key priority sectors outlined in the PPCR's adaptation program. Explaining the use of PPCR funds in support of private sector's actions.		

The business case for private sector engagement

Our assessment shows that **agribusinesses stand to benefit from their investment in climate-resilient activities.** Their investment of up to about USD 95,000 each in the project (made up of both cash and in-kind contributions of staff time, facilities, and demonstration plots), is projected to be recouped around five years after all targeted farmers are trained, as **improved supply of agricultural products should lead to higher turnover and profits.** The use of PPCR grants to cover the incremental costs associated with training farmers reduces the payback time by several years.[1]

Agribusinesses' reasons for taking part in the project, however, appear to go beyond the short-term financial benefits to include more strategic ones. Our interviews with agribusinesses and other relevant project stakeholders indicate that they are interested in establishing and improving their relationships with farmers via capacity building activities, as this would help them secure more regular and higher quality crop supplies, while potentially reducing margins paid to intermediaries and expanding their supply and customer base. In fact, companies processing highly climate-vulnerable crops such as rice, sugarcane, and maize, currently run their plants below capacity due to low crop yields, or are unable to meet market demand. Expected changes in climate may further reduce the productivity of these crops, by an estimated 4-16% by 2030. Farmers also represent a potential customer base for agribusinesses selling seeds, fertilizers, and other products.

The involvement of agribusinesses as vehicles for building resilience has the potential to generate multiple benefits for up to 15,000 farmers. The project estimates that, by providing farmers with the know-how, equipment, and finance to improve their agronomic practices, farmers could increase their production, and therefore their income by around 20%. Closer links with agribusinesses could ease farmers' access to climate-adaptive farm inputs – such as improved seed varieties and fertilizers – and technologies, and more secure markets for their supplies. Some agribusinesses may, in fact, promote a contract-farming like arrangement, and/or offer purchase guarantees to ensure the loyalty of trained farmers. By acting as loan intermediaries and/or guarantors, agribusinesses can also facilitate farmers' access to finance thereby enabling them to invest in climate-adaptive tools.

Local banks are interested in the agricultural sector's potential for their financial portfolio, but are constrained by the associated risks, and are also motivated to take part in the project by a regulation mandating them to expand lending to the agricultural sector by July 2014. However, at this stage of the project, it is not possible to determine whether banks' engagement will result in a profitable venture. Among other factors, profitability will depend on financial products yet to be developed, demand for such products, borrowers' risk profiles, the interest rate applied, and the conditions attached to the still nascent risk-sharing facility. Nevertheless, skills enhanced during the project can help banks improve their profitability and performance.

IFC is designing its first risk-sharing facility in the context of climate resilience to address local banks' constraints by.blending PPCR resources with its own, IFC aims to use the facility to help local banks increase lending to farmers and others in the agricultural value chain for investment in technologies and practices that increase their climate resilience.

The structure of the facility and its terms and conditions will be critical in determining banks' interest in, and incentives for, boosting climate-relevant lending to the agricultural sector while ensuring their exposure to potential losses is high enough that their lending practices don't become overly risky. The use of PPCR funds to cover part of the initial losses resulting from potential loan defaults is expected to reduce the cost of the facility, possibly enhancing its attractiveness to banks.

The project aims to initially work with one bank and stimulate demand for investments through capacity building measures to generate a deal flow and, subsequently, involve additional institutions.

Looking ahead

While early signs are promising, it is too early to assess the success of the project in meeting its overarching goals. Several risks may hamper the project's ability to achieve its intended short- and medium-term outcomes, important to securing the business case for private actors' long-term engagement. These include:

- The failure of the training to demonstrate and promote adoption of improved agronomic practices in the pilot phase, and/or to prove the economic and commercial viability of the proposed measures;

1 These estimates refer to an agribusiness company processing sugarcane, and assume 340 farmers adopt improved farming practices in the pilot phase. Overall, the project aims to train 15,000 farmers.

- A lack of active participation from farmers in training activities or limited adoption of improved practices due to their low literacy level, socio-cultural diversity, and competing needs;
- A decrease in market prices for sugar, maize, and rice crops, which may negatively influence companies' interest in the project; and
- The inability to actively engage banks due to the low attractiveness of the proposed deal, the inadequacy of the criteria attached to the risk-sharing facility to promote investment in climate adaptation-relevant tools, or banks' lack of motivation to market financial products or expand lending to farmers.

IFC's know-how, experience in similar initiatives as well as relationships with some of the involved partners, can help to manage these risks, thereby enhancing the likelihood of success.

The potential for scaling-up and replicating private sector engagement

If the IFC-PPCR project in Nepal proves to be successful, its model could be scaled-up to reach out to more private entities in the country. The project has the potential to incentivize agribusinesses to sustain the training activities beyond the project's life, as they may have an even clearer business case in the longer term, thanks to economies of scale and learning. The approach could also be extended to other agribusinesses, if adapted to the particular circumstances of other crops and companies.

Replicating private sector engagement in other countries may face context-specific barriers as experiences in some other PPCR pilot countries have shown. Challenges to progress in countries such as Zambia, Mozambique and Niger include:

- Unfavorable investment climates and underdeveloped private sectors;
- Limited awareness of the potential role of the private sector in climate-resilient development, the risks - but also opportunities - that may arise from changing climate conditions, and to which business assets and operations are exposed;
- The mismatch between possible returns on climate investments and investors' time horizons;
- Difficulties in estimating the potential financial benefits associated with climate-resilient investments;
- A lack of data and technical skills that hamper private actors' ability to judge whether projects make business sense, and/or develop products or services that could help to mitigate climate-related impacts.

Unlocking private sector potential for adaptation

Although challenging, exploring ways to engage the private sector in Least Developed Countries and learning from these experiences is part of the reason for pilot initiatives. The early insights drawn from the PPCR and the ongoing efforts of the public and private sector arms of Multilateral Development Banks within the PPCR and beyond, suggest that the following approaches to strengthening the business case for private sector engagement in climate resilience may be worth exploring further:

- **Market studies** can help to identify viable opportunities or how to fill gaps to harness them, and disseminate knowledge or promote awareness, paving the way for future interventions. They can also help to support the development of public-private sector partnerships and inform recipient governments on how to tap the private sector's potential.
- **Dedicated private sector funding windows** can provide further opportunities to experiment. This is exemplified by the submission of eleven project concepts – six of which were recently endorsed – for funding under the USD 70 million PPCR private sector competitive reserve established last November 2012.
- **Piloting and testing private sector adaptation approaches in Middle Income Countries** can also help to identify best practices and learn lessons that may then be transferred to Least Developed Countries.

As PPCR private sector projects move past the implementation stage, in-depth analysis across its portfolio, and comparative analysis of a wider range of private sector-oriented adaptation projects and programs, will offer additional evidence about how and where to make climate resilience a private sector business.

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1. Introduction

This is the first San Giorgio Group case study on finance for climate resilience.[2] It focuses on the Pilot Program for Climate Resilience (PPCR), a target program of the Climate Investment Funds that supports highly vulnerable countries – mainly least developed ones – in adapting to climate variability and change (see Box 1). One of the aims of the PPCR is to catalyze private sector involvement in climate resilience.

This case study examines the strategies and levers used within the PPCR to incentivize private actors to contribute towards countries' adaptation efforts. It does this by examining a particular project within the PPCR portfolio: "Promoting climate-resilient agriculture" in Nepal. Implemented by the World Bank Group's private sector arm, the International Finance Corporation (IFC),[3] this project is the first within the PPCR portfolio to attract the interest of private actors and engage them in the delivery of adaptation outcomes. It is also the first to move to the implementation phase.

To draw early lessons for future adaptation projects, this case study explores the following key questions:

- Why is private sector engagement important to build climate resilience and what role can it play?
- How can the public sector encourage private actors to engage in building climate resilience while aligning private interests with public objectives?
- Which drivers and incentives can the public sector use to create a business case for long-term private involvement in resilience?

These inquiries aim also to enhance understanding on the San Giorgio Group[4] overarching questions:

- What is the role of public money?
- How can public money be best delivered (instruments and institutional channels)?
- How to ensure alignment of international and national public investment flows with each other and with private investment?
- How can continued learning be ensured?

Section 2 provides an overview of the PPCR's agricultural project in Nepal and the context in which it developed by introducing the PPCR's arrangements for private sector engagement in climate resilience efforts, and then providing a brief overview of Nepal's Strategic Program for Climate Resilience (SPCR) – further discussed in Appendix A – before going on to describe the project in detail.

Section 3 examines the costs and benefits of the project for key stakeholders focusing on the incentives driving agribusinesses to engage in building farmers' resilience by training them in improved agronomic practices, and facilitating their access to agricultural inputs, water-efficient irrigation technologies, and finance.

Section 4 reviews the risks different actors face in the project, and explores the elements that can help to mitigate, share, or transfer risks among actors. In particular, it focuses on how the project's arrangements aim to use risk allocation mechanisms to unlock local bank lending to investments in climate resilience.

Section 5 examines the potential sustainability, scalability, and replicability of the project's approach to private sector engagement. It first discusses whether a long-term business case for agribusinesses involvement can be created to ensure the sustainability of the project's results beyond its lifetime. Then, it discusses the potential for scaling-up and replicating efforts to foster private sector participation in climate-resilience, also using early insights from other PPCR pilot countries.

2 '[Climate] resilience' is *"the ability of a system [...] to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration or improvement of its essential basic structure and functions"* (IPCC 2012). Adaptation measures can enhance resilience (Parry et al. 2007). This study uses the words 'building climate resilience' and 'adaptation to climate change' interchangeably.

3 In the Nepalese Strategic Program for Climate Resilience this project is part of component no. 4 titled "building climate-resilient communities through private sector participation". See CIF (2011a) and CIF web site.

4 See the CPI website for additional information on the San Giorgio Group and further case studies: http://climatepolicyinitiative.org/sgg/.

Box 1. A snapshot of the Pilot Program for Climate Resilience (PPCR)

The Pilot Program for Climate Resilience is a targeted window of the multi-donor Climate Investment Funds established in 2008 to provide technical assistance and financial support to public and private investment. Its main aim is to support countries to integrate climate risk and resilience into development planning and implementation (CIF 2009a).

Administered by the World Bank, it supports projects and programs in 18 pilot countries and has allocated almost USD 1 billion for these countries' Strategic Programs for Climate Resilience (SPCRs).[1] Endorsed SPCRs are at different stages of implementation (CIF 2013a, CIF 2013b).

The features distinguishing the PPCR from other adaptation financing facilities are:

- A program-oriented approach – based on the development of SPCRs – as opposed to project-based approaches;[2]
- Recipient country governments' ownership and leadership of SPCR planning and implementation;
- A broad-based stakeholder consultation process during the preparation of investment plans and related projects;[3]
- A specific focus on and arrangements for private sector involvement (e.g., CIF 2009a, CIF 2013c);
- The provision of both grants and near-zero interest rate/concessional credits.[4]

The activities of the PPCR are executed by six implementing agencies which are both the public and private sector arms of Multilateral Development Banks (MDBs).[5]

1 The SPCR is a document outlining countries' priorities, vision and strategy for integrating climate resilience into development planning. It defines the underlying investment plan proposed for PPCR support (CIF 2009a).

2 A programmatic approach aims to develop projects within a multi-sectoral strategy so as to plan and implement resilience to climate risks in a coherent manner at strategic, regulatory, budgetary, and operational levels (CIF 2009a).

3 Stakeholders include civil society, private actors, relevant UN and bilateral donor agencies, and governments' representatives.

4 In projects with public sector partners, the grant element of concessional loans amounts to 75%, at a 0.1% service charge. Loans have a maturity of 40 years and a grace period of 10 years. In projects with private sector partners, the level of concessionality is determined on a case-by-case basis, according to the specific barriers identified in each project/program. This is in order to provide the minimum subsidy needed to induce the intended investment without causing market distortions (CIF 2010).

5 The involved MDBs are: Asian Development Bank (ADB); African Development Bank (AfDB); European Bank for Reconstruction and Development (EBRD); Inter-American Development Bank (IADB); World Bank Group (WBG, including the International Bank for Reconstruction and Development (IBRD), and IFC as separate implementing entities in the context of the CIF). See CIF web site.

2. Context and overview

Private actors can make important contributions to adaptation efforts in Nepal, particularly in its vulnerable agriculture sector. By offering products and services that can smooth the path to adaptation, and making their assets and businesses more climate-resilient, private actors can help to reduce the country's vulnerability to changing climate conditions.

The PPCR is piloting ways to engage private actors in initiatives that build climate resilience. Nepal is the first country within the PPCR portfolio where a number of private players have committed to participate.

The PPCR is the largest dedicated adaptation funding program, and the one most targeted toward private sector involvement. The program is designed to allow for private sector involvement at several different "entry points": in its governance structure; at the country-level, in the planning and design of investment plans, programs and projects; and in their implementation (see Box 2).

Nepal is the first country within the PPCR portfolio to gain private actors' formal commitment to participate in climate resilience interventions; it is also the first to see its private sector project moving from design to implementation (see Appendix C for the status of other private sector projects under the PPCR).

2.1 PPCR private sector activities in Nepal

The private sector, consisting of individuals, households and businesses, is a critical partner in building Nepal's' resilience to climate impacts. This is because the private sector:

- Dominates in key economic sectors vulnerable to climate change such as agriculture, which constitute a large share of the country's employment and gross domestic product;[5]
- Makes many decisions relevant to adaptation that could either 'lock' Nepal into a vulnerability profile or put the country on a path toward greater climate resilience (e.g. smallholder farmers decide on crops, irrigation and harvesting);
- Owns, operates, and manages assets and business operations with broader socio-economic relevance such as energy plants;[6]
- Has specific competencies, expertise, products, and services that can smooth the path to adaptation, such as water-efficient technologies or financial services.

Realizing this private sector potential for strengthening the country's resilience to climate-related challenges, the Government of Nepal opted to include a private sector component in the country's strategic program that it endorsed together with the PPCR governing body in June 2011 (MoF 2013a). This component prioritized private sector engagement in the agriculture, housing, energy, and the finance sector, through three distinct projects that aim to:

- Promote climate-resilient agriculture;
- Strengthen vulnerable infrastructures by building the risk management capacity of private hydropower plant operators; and
- Overcome the technical and market barriers preventing private actors from playing a role in building climate-resilient houses for low-income communities.

The PPCR approved financing of about USD 9 million to these three projects (12% of the total USD 77 million assigned to the overall Nepalese PPCR program)[7]. Seventy three percent of these resources are in the form

5 The private sector is, for instance, the provider of about 90% of jobs in developing countries, accounts for 85% of all investments worldwide, and 62% of global climate finance flows in 2012 (IFC 2013a, Pauw and Scholz 2012, Buchner et al. 2013). The private sector is also an important investor in the most vulnerable countries (World Bank 2013a, World Bank 2012a).

6 Poshan (2010), based on data from the Department of Electricity Development, and NCF (2010) states that hydropower investments by the private sector in Nepal dwarfed government investments by a ratio of 4:1.

7 The initial volume of funds endorsed in June 2011 as per CIF (2011a) amounted to USD 86 million. The USD 77 million excludes USD 3.4 million related to MDBs' fee and programming budget and USD 14.4 million in concessional financing that, as a result of its decision of not borrowing money for non-revenue generating projects, the Government of Nepal decided not to borrow (December 2012); the USD 77 million includes the additional USD 5 million in grants allocated to the country by the PPCR governing body in November 2012 (CIF 2013i, CIF 2012c, CIF 2011a, ADB 2013a, MOF 2013a).

Box. 2 How does the PPCR engage the private sector?

The PPCR is piloting private sector involvement at different "entry points". Some of which feature in Nepal's pilot project.

Governance Structure

Private sector representatives are involved as:

- "Active observers" at the meeting of the PPCR governing body; this enables them to suggest agenda items, take the floor in deliberations, and submit their views to committee members (CIF 2011b);
- Participants at the regular Partnership Forums, and at the Private Sector Forum,[1] where they can provide input on strategic, technical, and performance matters.

Planning and design of programs and projects

Private actors are consulted through cross-sectoral workshops, market studies, and surveys (see e.g., PwC 2012, Poshan 2010) to obtain their input and feedback, and to raise their awareness about climate change risks and opportunities (CIF 2009a, CIF 2009b).

Implementation phase

The private sector can be engaged as an important partner in the implementation of projects. It can be a co-financier, a vehicle to deliver resilience, and/or a targeted beneficiary of PPCR interventions. In particular, the PPCR arrangements to support and engage the private sector in the implementation phase, include the following:

- The private and public sector arms of MDBs, via direct investments and technical assistance measures or, among others, public-private partnerships or initiatives aimed at strengthening the enabling environment;
- Dedicated financial instruments i.e., the possibility to deploy PPCR's funds through a range of instruments (e.g. grants, loans, and guarantees) – although some of these have only been used on a limited basis – with the aim of enabling MDBs to structure the financial package most suited to the project and the entity supported;[2]
- A target funding allocation – so called private sector 'set aside' – established in November 2012 with USD 70 million in concessional resources to be allocated through a competitive process[3] (CIF 2013c).

Through these arrangements, the PPCR aims to encourage engagement and incentivizes private actors' climate-resilient actions, addressing information, capacity and viability gaps.

1 The first CIF Private Sector Forum was held in Istanbul on November 2012 as part of the CIF Partnership Forum. This type of initiative is expected to be replicated. In October 2013, during the CIF regular meetings, the CIF Administrative Unit convened a dialogue dedicated to private sector involvement in strengthening climate resilience. See CIF web site for additional information.

2 For additional information on the financing instruments used under the CIF, see CIF 2013f and CIF 2012b.

3 The PPCR governing body established the private sector reserve to further stimulate private sector engagement, particularly in light of the limited number of projects with private sector participation in the PPCR portfolio – in the CIFs more generally (CIF 2013a, CIF 2013c, CIF 2013e and CIF 2011c). In November 2013, the PPCR governing body endorsed about USD 41 million in concessional loans to fund the development of 6 project concepts (CIF 2013h, CIF 2013g).

of concessional loans targeting viability gaps associated with investments in climate resilience (e.g. risks associated with investing in non-traditional agricultural practices). The remaining 27% are in grants, targeting capacity and knowledge shortcomings.

The climate-resilient agriculture project was the first of these three private sector-oriented projects, and the first within the PPCR portfolio, to gain private actors' interest and to move to implementation. It is also the most critical in Nepal given the importance of the agricultural sector for the country's economy.[8]

Three private agribusiness firms (Golchha Group, Sharda Group, and Probiotech – part of Nimbus Group) committed to help address key constraints to agricultural productivity by reducing the vulnerabilities of the farmers in their respective supply chains to climate risks. They have strong self-interest in doing so, as farmers' vulnerabilities and constraints affect yields and can in turn directly impact their businesses.

At the end of 2012, these agribusinesses signed a Memorandum of Understanding with IFC, which is in the process of finalizing the cooperation agreements that spell out the detailed terms, conditions, and specific responsibilities of each party. The project also attracted the interest of local commercial banks in partnering with IFC to expand lending to the agricultural sector. IFC aims in the short-term to sign an agreement with one bank only, and is currently negotiating the terms of its possible involvement. Other banks may be engaged at a later stage.

These projects are expected to mobilize a further USD 0.6 million in co-financing from IFC and other entities for technical assistance activities (CIF 2013a). Farmers and other value chain members are then expected to invest additional resources in climate-resilient measures, and banks to support their investments.

Timeline

Figure 1 presents key milestones in the development of the Nepalese strategic program and related projects, along with relevant national policies or initiatives. We highlight the duration of the consultation process undertaken to develop the program to identify areas for private sector engagement, and relevant private sector players.

The timeline illustrates that the private sector was engaged early in the process leading to the development of the country's strategic program, through extensive talks and diagnostic analysis. The process was supported by the establishment of a 15-member Technical Private Sector Working Group representing all the major sectors where contributions from the private sector had been foreseen.[9]

The studies carried out during the development of projects, were essential to understanding local issues associated with changing climate conditions, identifying possible impacts, and developing countermeasures to mitigate risks.

The consultation process, supported by evidence-based analysis along with efforts by other MDBs operating in the country, was central to improving the government's understanding of private sector involvement in the country's adaptation efforts (ADB 2013b). This, in turn, was **critical to its decision to allocate PPCR funds to private sector activities.** The government, ultimately responsible for the allocation of PPCR resources to projects, was initially reluctant to involve the private sector in the preparation of the PPCR program, and concerned about the use of its resources to support private actors' activities (CIF 2013g, IFC 2013b, ADB 2013b).

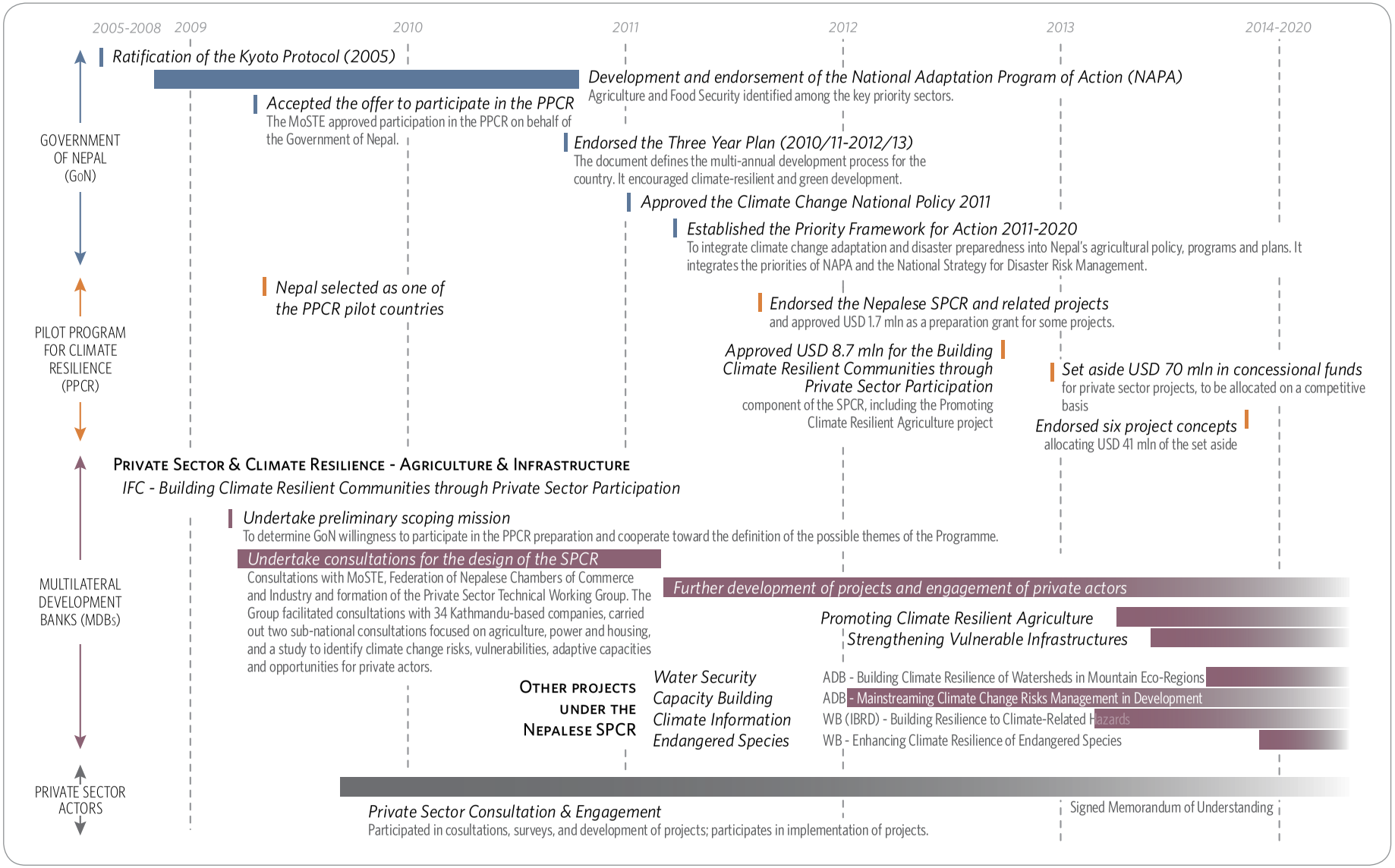
The consultation process was also fundamental to overcoming the reluctance of private actors to participate in a government-administered program, **and building their awareness and understanding of their vulnerability to climate-induced risks**, and the opportunities that may arise from changing climate conditions. The overall process also helped to elicit their interest and assess their capacity for utilizing PPCR resources and undertaking climate-resilient projects, thereby identifying possible partners (ADB 2013b, Poshan 2010).

Appendix A provides more details on the Nepalese SPCR and related projects.

8 With regard to the hydro and housing projects, in the first quarter of 2013, IFC identified hydropower companies that will invest in erosion resistant turbines with the support of PPCR concessional funding. The project in the housing sector – limited to a feasibility study and the development of housing and financing model – started in July/August 2013 (IFC 2013b) (See also Devex 2013 for additional information).

9 The working group – formed and led by the Federation of Nepalese Chambers of Commerce and Industry and facilitated by IFC – focused on the identification and formulation of priority sectors for private interventions, and led to the selection of the agriculture, infrastructure and finance sector. The Group carried out consultations with 34 local companies, sub-national consultations, and a scoping study on climate change vulnerabilities, risks, adaptive capacity and opportunities for private actors (ADB 2013b, ADB 2012, Poshan 2010).

Figure 1. Strategic adaptation program and projects timeline – key milestones.



SPCR projects are depicted from MDBs' approval through to their implementation phase. Although specifically mentioned with reference to one project only, capacity building measures are embedded in all projects.

Note: CPI elaboration based on IFC 2013b, ADB 2013b, ADB 2012a, UNFCC web site, CIF 2011a.

2.2 Promoting climate-resilient agriculture by engaging private sector companies – project overview

Nepal's PPCR agricultural sector project is relevant for the country because agriculture is a major economic sector: it accounts for 35% of its gross domestic product and employs 66% of the labor force (MoAD 2012a).

Climate change is expected to threaten Nepalese agricultural production, which is already challenged by the limited use of stress-resilient, quality seeds, poor farming practices, and high dependence on precipitations patterns. Projected climatic changes may exacerbate the already precarious food security of the country.[10]

The Nepalese PPCR agricultural project focuses on rice, maize, and sugarcane in five selected districts of the Terai region that a diagnostic study identified as **among the most vulnerable to changing climate conditions**, the most relevant for the country's food security and economy, and of the most interest to private sector actors (PwC 2012, IFPRI 2012).[11]

Specifically, **the project aims to strengthen the resilience of farmers growing rice, sugarcane, and maize to climate-induced risks**, by involving the following private actors:

- **Agribusinesses processing sugarcane, rice, and maize.** By building their technical skills and knowledge, the project will enable and incentivize the participating agribusinesses, Golchha Group, Sharda Group, and Probiotech-Nimbus Group, to transfer skills in improved agronomic practices to a target of 15,000 farmers in their supply chains over a four-year time frame (with a two-year pilot phase), and facilitate their access to stress-resilient seeds, irrigation technologies, and fertilizers.[12]
- **Local commercial banks**. By establishing risk-sharing mechanisms, providing advice on how to improve internal risk management systems, and helping them design dedicated financial products, the project aims to tackle banks' risk and capacity gaps. This, in turn, will enhance farmers' and agricultural supply chain members' access to finance and to financial products tailored to their needs.
- **Mobile phone and ICT operators**. The project plans to establish an SMS-based dissemination platform to deliver weather forecasts and advice on agronomic practices, as well as market information to farmers. This, in turn, should enable farmers to better respond to climate-related hazards thereby reducing or avoiding the associated agricultural losses.

As part of this project, **IFC is also facilitating the entry of an Indian irrigation technology provider** (Jain Irrigation) **to the Nepalese market with the aim of promoting access to**, and adoption of, **water-efficient irrigation technologies** such as solar pumps. This technology would be particularly well-suited to a country with chronic electricity shortage and primarily rain-fed agriculture. The company has already signed a Memorandum of Understanding with the Nepalese government and is developing an irrigation strategy for the country (IFC 2013b). It will use demonstration plots to showcase irrigation technologies.

The approach developed by IFC for this project is not totally new in the context of agricultural development (see e.g. IFC 2013b, IFC 2012a, IFC 2012b). Its key innovation is its strategy to involve various actors in the agricultural value chain and leverage their networks and respective incentives to tackle multiple barriers to

10 Joshi et al. (2012) highlights that Nepal is one of the most food insecure countries in Asia and that the growth rate of e.g. rice and maize yields is the lowest in South Asia.

11 Among the crops cultivated in the country, rice, maize, and sugarcane ranked the highest on a weighted average score - assessed through crop simulation models - evaluating changes in yields and productivity, their contribution to daily calorie intake, importance to the economy, level of interest among private players in undertaking support activities and ease of partnerships with growers, etc. (PwC 2012). Rice, in particular, accounts for nearly 55% of the total national cereal production, 67% of total cereal consumption, and is the principal staple food; about 34% of food expenditure is spent on rice, which supplies up to 40% per capita of the total calorie intake amount (UN WFP 2008, IRRI 2013, CIF 2011a and World Bank 2010). Over 70% of the agricultural land is rain-fed; Terai contributes about 56% of the country's annual cereal production (Regmi 2007).

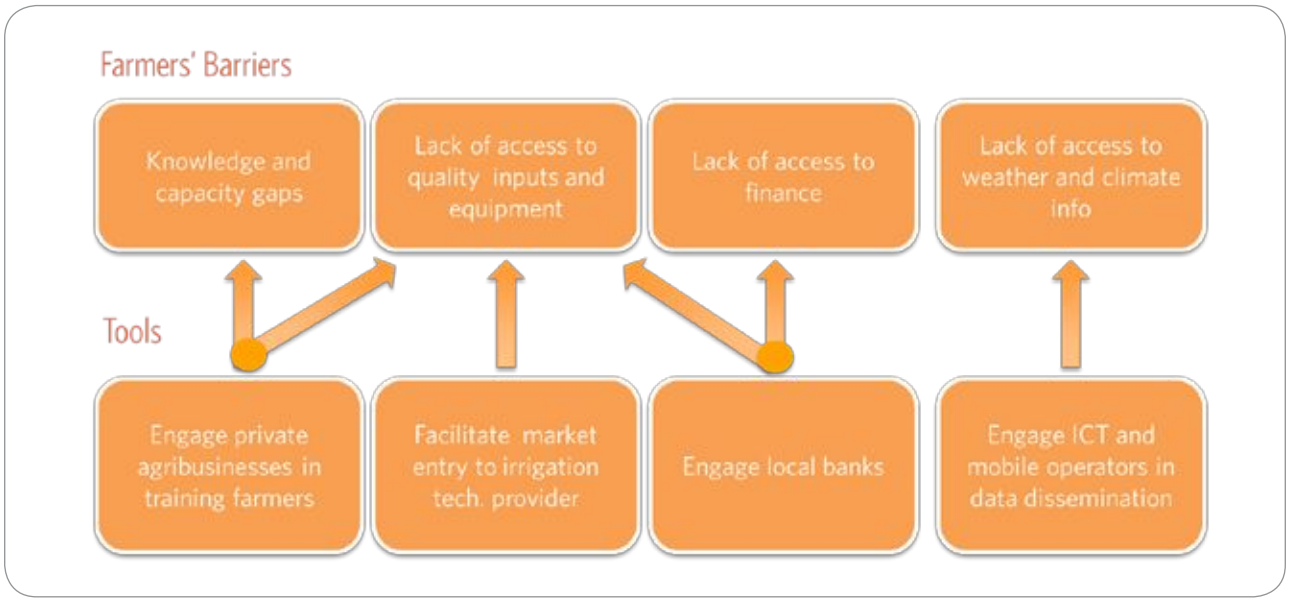
The study also conducted a value chain analysis and a survey with 453 farmer households including supply chain actors (seed suppliers, irrigation equipment suppliers/manufacturers, fertilizer dealers, feed suppliers and traders) to better understand the characteristics of farmers and key climate-induced hazards and constraints to enhanced agricultural productivity (PwC 2012)..

12 The project adopts a so called 'trainers of trainers' approach i.e. 15 experts will strengthen companies' technical teams as well as dealers and vets skills, and/or embed new expertise in these companies. In turn, trained staff will then provide training to lead farmers (from individuals to farmers' cooperatives), who are then expected to train other farmers through demonstration and replication of practices. The set-up of demonstration plots within these companies will serve as learning-by-doing grounds for the farmers trained under the project, but also for others in surrounding areas.

enhanced climate resilience (from agricultural inputs such as seeds to final outputs). Figure 2 shows the approach in a snapshot.

The long-term goal of the project is to build a sustainable business case for private actors to invest in climate-resilient agricultural practices beyond the project's life (IFC 2013c). The following sections focus on the engagement of agribusinesses, banks, and farmers, as mobile phone operators will only be involved at a later stage.[13]

Figure 2. Addressing key barriers to climate-resilient agriculture in Nepal.



Sources: CPI elaboration based on CIF 2011a, CIF 2012b, IFC 2013c, IFC 2013d.

13 The IFC plans to target mobile phone operators once the creation/upgrade of the country's hydro-meteorological observation/forecasting network and the creation of an ICT-based Agriculture Management Information System is completed. This is part of another PPCR project executed by the IBRD, and implemented by the Department of Hydrology and Meteorology, and the Ministry of Agriculture Development. Project closure is expected in 2018 (World Bank 2012b).

Table 1. Stakeholder descriptions and main roles

STAKEHOLDERS		DESCRIPTION	ROLE	FINANCING ROLE
Government of Nepal	Ministry of Science, Technology & Environment along with other ministries and agencies	PPCR focal point	Monitor, coordinate, and implement PPCR-related projects at the local level. Certifies seeds and undertakes research activities	Contributes in-kind resources, such as technical expertise, demonstration plots for showcasing irrigation methods, and develops policies and regulations.
Private actors	**Agribusinesses:** • Golchha Group (sugar division) • Sharda Group • Probiotech – Nimbus Group	Diversified conglomerates, among the largest in the country, with mills processing maize, rice and sugarcane. They each have from 1,500 to 20,000 farmers in supply chains.	Engaged to provide training to farmers They can act as loan intermediaries/ guarantor providing buy-back guarantees, and as input/technology dealers, thereby also developing new lines of business to provide e.g. irrigation equipment, seeds or other inputs to farmers as planned by IFC.	USD 0.3 million (USD 0.1 million each) in cash and in-kind contributions of staff time, equipment, facilities and demonstration plots*.
	Local Commercial Banks	They hold 77% of Nepal's total assets and liabilities and have about 1425 branches in the country, with a population of 95,000 per branch. Agriculture represents ≈3.7% of their total outstanding loans and advances (data as of July 2012).	Backed by a risk-sharing facility with IFC-PPCR and third-parties guarantee, they are expected to expand lending to the agricultural sector.	Expected to participate in a risk-sharing agreement with IFC, sharing risks for about USD 10 million of investments.
	Farmers	Farmers growing sugarcane, rice and maize on less than 1 ha of land, on average, and have a household income of around USD 1,500 a year. Farmers are also organized in cooperatives, particularly sugarcane growers. Women provide the majority of agricultural labor.	Are expected to participate in training activities and adopt / invest in improved agricultural practices.	Expected to invest own resources in climate adaptive inputs and technologies (not quantified); payment for training activities not required. Cooperatives will also be used to reach out to smallholder farmers.
International donors	**PPCR**	Multi-donor adaptation program within the Climate Investment Funds	Provides financial support	Provides about USD 2.1 million in grants and USD 3.6 million in concessional loans for this project.
	International Finance Cooperation (IFC)	Multilateral Development Bank, World Bank Group's private sector arm	Executing agency of the private sector component of the Nepalese PPCR program and co-financier Strengthens the capacity of agribusinesses, farmers and of local bank(s)	Expected to structure and provide up to USD 8 million for a risk-sharing facility.

Note: (*) The companies final contributions will be determined in the cooperation agreements, currently being finalized.

3. The costs and benefits of making agriculture climate-resilient for main stakeholders

Private actors' motivation for taking part in the project goes beyond short-term financial benefits. Their engagement is based on broader strategic objectives, such as building know-how on climate-adaptive practices, improving relationships with suppliers and customers, and gaining access to higher quality of crops.

By providing knowledge and covering start-up costs, the IFC-PPCR project aims to demonstrate the business case for climate-adaptive practices to the private actors involved, in order to keep them engaged beyond the project's life. This helps the Government of Nepal to improve the performance and climate resilience of agriculture, as one of the most important and vulnerable sectors of the country's economy.

This section aims to answer the following questions: what are the costs to public and private actors of building resilience in Nepal, and what potential benefits can motivate the different players to engage in the project? We first explore the costs and benefits to agribusinesses and banks, before going on to describe the potential benefits associated with the engagement of these actors to farmers and the Government of Nepal. Table 2 gives an overview of expected benefits per main stakeholders.

In this section we look at the key motivations agribusinesses, local commercial banks, farmers, and the government have for engaging in the project at the associated costs.

Table 2. Stakeholders' main expected benefits

		AGRIBUSINESSES	BANKS	FARMERS	GON	IFC/PPCR
NON-FINANCIAL & STRATEGIC BENEFITS	Knowledge of and capacity for improved agricultural practices	✓		✓	✓	
	Improved capacity to assess and manage agricultural lending risks		✓			
	Larger supplier/customer base		✓			
	Enhanced access to finance	✓		✓		
	Technology adoption	✓		✓	✓	✓
	Greater food security to climate-related risks			✓	✓	✓
	Learning on climate-resilient interventions				✓	✓
FINANCIAL RETURNS / BENEFITS	Increased income and revenues	✓	✓	✓		
	More climate-resilient agriculture, an important component of GDP				✓	
	Improved balance of payments				✓	
	Improved tax income				✓	

3.1 Agribusinesses

Low agricultural productivity incentivizes agribusinesses to participate in the project, as it constrains their business operations and ability to effectively respond to market demand. Without adaptation productivity will deteriorate further under changing climate conditions.

For an investment of about USD 0.1 million each in training activities, agribusinesses will benefit from more secure, better quality, and possibly greater crop supplies while developing know-how on how to make their business climate-resilient. The investment is projected to be recouped in around five years.

Both PPCR's coverage of costs and IFC's technical support reduce the risks associated with uncertain outcomes and are essential to encourage the agribusinesses' involvement in the project.

Agribusinesses have a strong incentive to engage in the IFC-PPCR project because farmers' poor farming practices, and vulnerabilities to climate-induced risks, directly impact the profitability and returns of their businesses. Insufficient supply of consistent quantity and quality of local rice, sugarcane, and maize crops, has already affected their businesses: some companies are running their plants below capacity (PwC 2012, Golchha 2013), while others have to procure supplies abroad at higher prices (Nimbus 2013a). The sugar processing agribusiness company, for instance, is running its plants at 75-80% of its capacity due to insufficient supply of sugarcane but also delays in national price fixing (Bhaghat 2010, Golchha 2013), resulting in foregone revenues of about USD 0.4-0.5 million per year (CPI's elaborations).[14] Sugaronline (2013) and dcnepalevent.com (2012) reported that some Nepalese sugar mills even had to temporarily close down operations due to insufficient sugarcane supply.[15]

Farmers' traditional cultivation practices, limited awareness of and use of modern seed varieties, reliance on rain-fed irrigation systems, lack of access to and improper usage of fertilizers, as well as lack of post-harvest storage facilities, have led to low yields and crop losses, both in terms of quality and quantity (PwC 2012, GoN 2011).

Changing climate conditions could result in even lower yields, causing plants to run even further below their potential capacity, and shutdowns to become more common. Current climate risks such as floods and droughts are projected to intensify and become more frequent. For instance, the winter drought experienced in 2008/2009 – the worst in the country's history – has already had detrimental effects on agribusinesses' facilities, and affected 5.9% of rice and 0.2% of maize production areas across the country.[16] In the Terai region, where the project is located, productivity is expected to shrink by 4-8% for sugarcane, 5-6% for rice, and 15%-16% for maize by 2030 (PwC 2012).

Agribusinesses' involvement in the project is expected to lead to both direct financial and more strategic benefits.

Financial benefits are expected to mainly stem from enhanced and more regular supply of crops and improvement in the quality of crops. They therefore depend mainly on the outcomes of farmers' training, adoption of improved farming practices, and the commercial viability of the proposed measures. They will also depend on market prices for crops.

Assuming that farmers increase their productivity by 20% (standard scenario), the participating sugarcane processing company – the agribusiness for which we elaborated a financial model[17] – **could expect to increase net revenues by at least USD 12,000 a year** once all targeted farmers are trained and take up improved practices (see Appendix D for assumptions).[18]

14 These calculation are based on the following assumptions: sugarcane crushing capacity of 3,000 tonnes per day, plant used at about 75-80% of their capacity (Golchha 2013), and running 150 days a year (Sugar Mill Association 2013); sugarcane purchases being responsible for 75% of overall sugar production costs; a net profit margin of 6% (see Appendix D), and prices of USD 54.4 per tonne of sugarcane (Ekantipur 2013, exchange rate from Oanda 2013).

15 It should be noted that in some cases this was not due to low production but disagreement on the price of sugarcane (see dcnepalevent.com 2012).

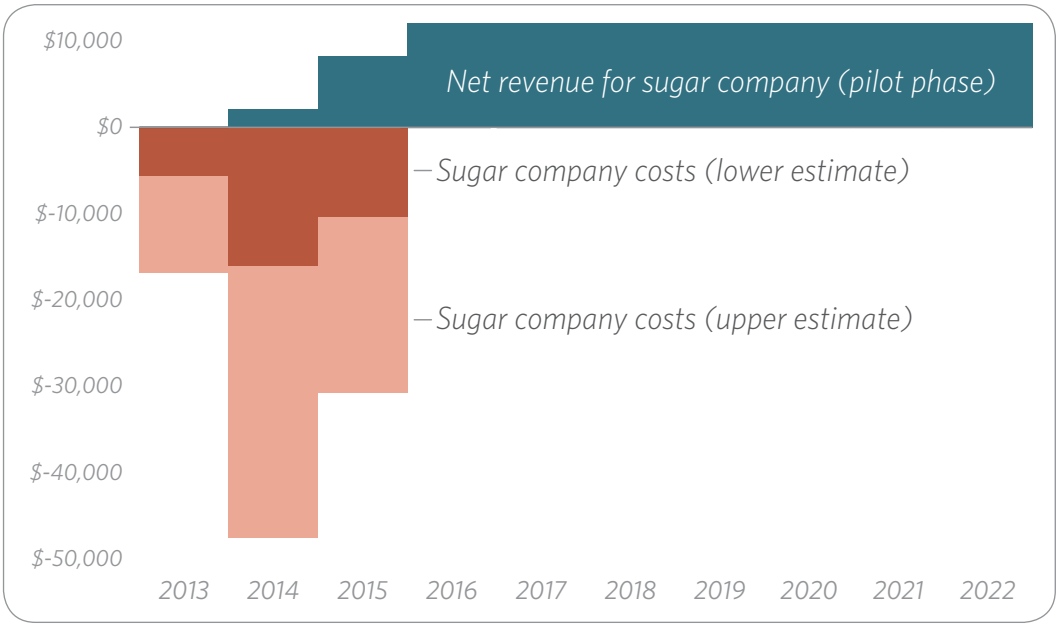
16 Calculated by dividing drought-affected area in 2009 (MoAD 2013) by harvested area in 2009 (FAO 2013).

17 The sugar processing company was chosen for the financial model because of two main reasons: it reaches most farmers out of the selected companies, and it has direct relationships to farmers, so there is less uncertainty in the calculations.

18 Under a 10% productivity increase scenario, net revenues could increase by around USD 6,000. Whatever the productivity increase achieved

These **benefit estimates are to be compared with costs in the order of USD 32,000** (lower estimate) **to USD 95,000** (higher estimate) for staff time, facilities, and demonstration plots (see Figure 3). Our estimates suggest that the sugar company's investment pays for itself in three to eight years under a productivity increase scenario of 20% (see Table 3).[19] Benefits may be different for rice and maize processing companies (see Box 3).

Figure 3. Sugar processing company's costs and revenues under the pilot project (standard scenario with 20% production increase, in current USD)



Note: costs and revenues calculations assume project-related training to 567 farmers over 2 years and a 20% production increase. We assume that 340 trained sugarcane farmers adopt improved practices one year after the training, and that neither decay nor diffusion of farmers' knowledge will happen after the project. If farmers' knowledge were to decay, the revenues of the sugar company would decrease over time. If knowledge were to diffuse to other farmers, the revenues of the sugar company could increase further. To the extent possible, data are based on information based on project specifics (see Appendix D and E).

Table 3 below shows the effect of the PPCR grant contribution in reducing the payback period of companies' initial investment. The question remains open whether the project will demonstrate that benefits for agribusinesses outweigh costs during the project's lifetime, thereby incentivizing them to remain engaged, and scale up training activities (see Section 5).

Without IFC's know-how and about USD 1 million in PPCR grants to cover start-up costs, agribusinesses would not have engaged in training farmers in practices leading to climate resilience outcomes. PPCR cost coverage is needed because the project will not generate immediate, but rather future returns for these companies (see Figure 3). Moreover, the project helps to buy-down outcome risks associated with the non-traditional practices promoted under the project.

Agribusinesses' decision to take part in the project goes beyond pure financial metrics. Our interviews with one of the involved agribusinesses (Probiotech) and IFC indicate that **there are more strategic benefits that companies seem to value even more** (Nimbus 2013a, IFC 2013b and IFC 2013g).[20] These benefits include:

- **Increased know-how of training and climate-adaptive practices.** Before the project started, some companies did not train farmers at all (rice processing company), or the training did not lead to intended outcomes (sugarcane processing company), either because of their limited knowledge about improved and climate-adaptive practices, or because of deficiencies in their training methods. Training is a key tool to gain access to more and/or higher quality crops.
- **Monitoring and evaluation of the outcome of the training activities.** This standard approach of IFC-PPCR projects will enable the agribusinesses to better understand what works, what does not, and where.
- **Improved relations with farmers.** This is more relevant for the rice and maize-processing companies (see also Box 3) as the price of their

it is not likely to have a significant impact on the revenues of involved agribusinesses, which is for instance USD 5-10 million a year in case of the maize processor (Nimbus 2013b), and possibly higher in case of the sugar company (CPI elaborations).

19 It is worth noting that our estimates on costs, benefits, and pay-back are illustrative; agribusinesses may not calculate such financial benefits when considering their engagement in the project, but rather value the ancillary benefits associated with it such as improvement in crops quality (e.g. Nimbus 2013b).

20 These benefits also accrued to sugar company (DSCL) who was involved in a similar IFC project in India, as highlighted during an interview (DSCL 2013).

Table 3. Sugar company: impact of PPCR grants on the pay-back time of company's contribution.

PRODUCTIVITY INCREASE SCENARIOS	PAY-BACK TIME WITH PPCR COST-COVERAGE		EFFECT OF PPCR COST-COVERAGE ON PAY-BACK TIME*
	Upper contribution estimate (USD 0.1 million)	Lower contribution estimate (USD 0.03 million)	All estimates of sugar company contribution
10%	15.7 years	5.3 years	-27.6 years
20%	**7.9 years**	**2.6 years**	**-13.8 years**
30%	1.8 years	1.8 years	-9.2 years

Note: standard scenario in bold. (*) Assumes PPCR cost coverage of about USD 700,000 in the two-year pilot phase. This is 70% of the overall PPCR cost coverage over the four years and assumes that costs in the first 2 years of the project will be higher because of the development of training material and training experts in agribusinesses.

crops is not centrally regulated, and they do not have direct links to farmers, because they mainly procuring these crops through intermediaries. Improved relationships, in fact, may lead to reduction in margins paid to intermediaries. Moreover, farmers can also represent a potential customer base for agribusinesses selling seeds and fertilizers.

In addition, the opportunity to partner with IFC can motivate agribusinesses to get involved in the project because of two further benefits: First, IFC may invest in the involved companies and, second, it may partner and engage these companies in follow-up projects and initiatives. Both of these benefits occurred for the maize company, Probiotech, that cooperated with IFC in a poultry project from 2010 to 2013 (IFC 2012a) and, more recently, received an IFC equity investment proposal for about USD 1.9 million (see IFC 2013c).

Box 3. Differences between the sugarcane and the rice and maize value chains

The business case for the sugar company may be clearer than for rice and maize companies as the outcome risks of training farmers are lower in the sugarcane supply chain. Given the perishability of sugarcane and the high transport costs, sugarcane farmers are likely to sell their produce to sugar companies operating near them. For the rice and maize supply chains, which involve a higher number of intermediary buyers, the relations between the agribusinesses and farmers are not as close. Moreover, rice and maize are still cultivated more for subsistence rather than commercial reasons. Rice and maize companies will only benefit from the project if the capacity building activities can create direct relationships with farmers, thereby improving their loyalty and reducing/eliminating the market power of intermediaries and the risk farmers will divert part or most of their productivity gains to other possible customers.

3.2 Local commercial banks

The participation of local commercial banks in the project is designed to enhance their knowledge of and capacity for agricultural lending.

Risk-sharing arrangements with IFC-PPCR and through the involvement of agribusiness firms, give local banks the chance to experiment with lending to non-traditional agricultural practices and tap into the sector's potential for their portfolios.

However, it is too early to tell whether local commercial banks will fully engage and whether the project will be profitable for them.

Agricultural lending represents only about 3% of Nepalese commercial banks' total loan portfolios, and about 2% in the case of the bank that has shown most interest in partnering with IFC in the project (average 2010-2012; NRB 2012a, Ekantipur 2013a). Direct lending to farmers is limited (NRB 2012a) as it is considered too risky.

The Nepalese agricultural sector relies mostly on informal borrowing from saving and credit cooperatives, merchants, and relatives.[21] This kind of borrowing is favored by farmers because of their general lack of appropriate collateral for a bank loan, the limited reach of banks branch networks, poor transport infrastructure, and the transaction costs associated with borrowing from banks such as the relatively longer time frames banks require to issue a loan (Ferrari et al. 2006).

From the banks' perspective, limited lending to the sector can be explained by the existence of a number of barriers including:[22]

- The inadequate Capital Adequacy Ratio of several Nepalese banks[23] coupled with their poor risk management capabilities, hinders their capacity to float loans for a high risk sector like agriculture;
- High transaction costs of reaching farming households, dealing with relatively small loans that are linked to seasonal and uncertain cash flows, as well as difficulties in collecting loan repayments;
- Difficulties in assessing farmers' creditworthiness due to their lack of credit history;[24]
- A lack of adequate collateral as farmers' assets are often not suitable or sufficient to secure loans;[25]
- A lack of agricultural insurance coverage mechanisms that contributes to banks' skepticism over the safety of investments made in the sector.[26]

The prevalent subsistence nature of the Nepalese farming system (i.e. mainly intended for consumption rather than for sale) further reduces the attractiveness of the sector to banks.

Given these market conditions, there are four main

21 PwC (2012) suggests that Savings and Credit Cooperatives served about 68.4% of the households surveyed in 2011. Ferrari et al., (2006) in the 2006 Access to Financial Services Survey found that about 38% of Nepalese households had an outstanding loan exclusively from the informal sector; 16% from both the informal and formal sector, while 15% exclusively from the formal sector.

22 Sources: IFC 2013b, IFC 2013d, CIF 2012b, NRB 2012a, PwC 2012, Karki et al., 2010.

23 The Capital Adequacy Ratio (CAR) measures the amount of resources a bank has to hold in the form of stockholders' equity in relation to the amount of its risk weighted credit exposures. The NRB placed agricultural loans in the 100% risk weight category.

24 Generally, farmers do not have written records of past performances e.g. of input purchase, productivity, and crop sales hence, they are often unable to demonstrate the cash flow associated with their activities. Moreover, in the country there is low sharing of credit information. There is no operating registry to record liens on movable assets, which makes them practically unusable as collateral, and no public bureau dedicated to the sharing of credit information. There are some private ones which keep account of borrowers with loans greater than NPR 1 million (Ferrari et al. 2006).

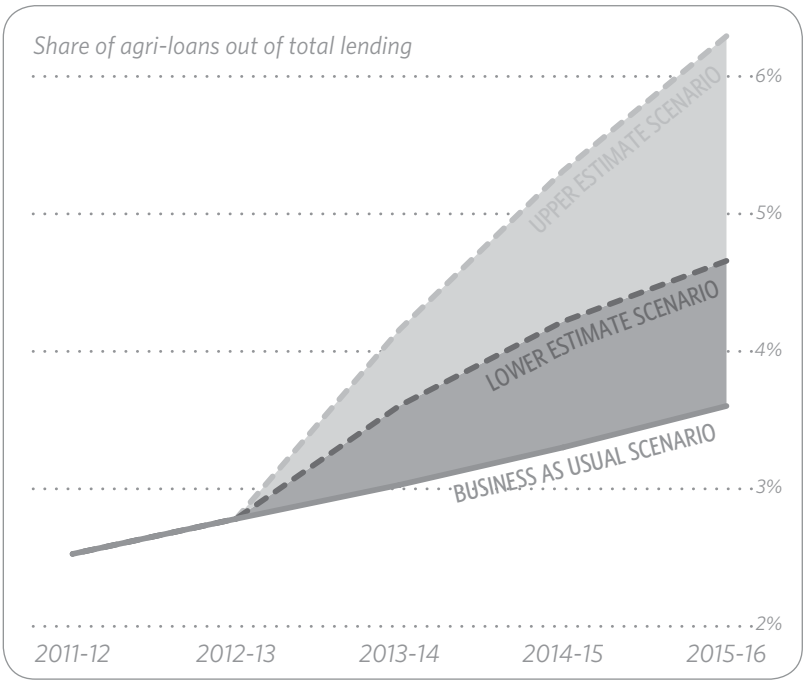
25 WB (2012) states that, on average, collateral can reach 260% of the loan value, and banks most commonly require personal assets. Therefore, farmers' assets might not be adequate or sufficient. The provision of collateral might be even more difficult for women, who undertake most of Nepal's agricultural work, since most of the land is held in the name of men, mostly working abroad (IRIN 2013).

26 Banks' poor investment decisions and inadequate analysis of market risks induced the liquidity crisis forcing several banks to fail in 2011 (Sapkota 2012, NRB 2012b, NRB 2011, NRB 2010).

incentives that can motivate banks to participate in the PPCR project:

- **Market potential of the sector:** The Nepalese agricultural sector has an estimated market potential of around USD 1.2 billion (NPR 105 billion), with an unmet credit demand of 36% (PwC 2012).[27] Considering the limited penetration of bank services (Ferrari et al. 2006), farmers and other value chain actors are an untapped market. The sector can also represent an opportunity for diversifying their portfolio.[28]
- **Compliance with regulation on agricultural lending:** The Nepalese Central Bank mandated commercial banks to enhance lending to productive sectors like agriculture to at least 10% of their total loan portfolio by mid-July 2014.[29] Agricultural loans, however, are ranked among the most risky due to their high likelihood of default, and this has implications for banks' Capital Adequacy Ratio.
- **Addressing Capital Adequacy Ratios** constraints which for several local banks are just above the mandatory regulatory requirement of 10%.[30] By partnering with IFC through the project's risk-sharing mechanism, these banks could increase their exposure to the agricultural sector without having to recapitalize.

Figure 4. Illustrative – Bank lending to the agricultural sector as a result of the risk-sharing facility: three estimated growth scenarios from 2011/2012 to 2015/2016.



Note: key assumptions include: Three years duration of the risk-sharing facility (as per IFC 2010); an annual disbursement rate of 30%, 60%, 90%; and that the facility will not be fully used due to the complexities associated with the financing of (and demand for) non-traditional agricultural practices. Repaid loans are not considered i.e. each dollar is lent only once over the duration of the facility. The business-as-usual (BAU) scenario applies a 22% compound annual growth rate (CAGR), calculated over the 2010-2012 agricultural lending portfolio (NRB 2013c). The lower estimate scenario assumes that PPCR loans will substitute old loans. The upper estimate scenario assumes that PPCR loans are additional to BAU loans. This is an illustrative graph, based on strong hypothesis. At the time of writing the risk-sharing facility was still under negotiation. There are several factors that could affect its leverage effect e.g., its uptake, the historical performance of banks' portfolio; the size of individual loans issued, their interest rate, and profitability expected. As a reference point. IFC is running another private sector-oriented PPCR project in Bangladesh, which aims to increase agri-lending to at least 2% of two banks' total portfolio (CIF 2013l).

- **Enhancing capacity to evaluate and manage the risks specific to lending to the agricultural sector**, and to develop tailored financial products. This can help banks to improve their profitability and performance.

At this stage of development of the project, IFC is still liaising with the interested banks.[31] It is too early to know whether the banks will engage and whether this will result in a profitable venture for them. Profitability will depend on the demand for the financial products developed within the project, borrowers' risk profiles, the interest rate applied, and the fee that the bank will have to pay for the risk-sharing facility under negotiation.

As the risk-sharing facility will only provide coverage

27 Figures refer to 2018. Previous estimates from the Nepalese Agriculture Development Strategy (2011 update) evaluated the investment potential in the sector at USD 223.4 million per annum (NPR 16.64 billion).

28 Banks' credit portfolio, at present, is concentrated on the manufacturing, trading, and real estate sectors. Banks may consider reducing their exposure to the real estate sector, for instance, which is currently subject to declining real estate prices (ICRA Nepal 2013, Sapkota 2012, NRB 2012).

29 The 10% mandate applies to lending to the agriculture and the hydropower sectors taken together. A separate regulation was also introduced in 2011 requiring banks to allocate 20% of their total loan portfolio to a broader range of productive sectors including agriculture and hydropower. To encourage implementation of these directives, the Central Bank will provide compliant banks with access to a refinancing facility for agricultural loans at 0% interest rate. Non-compliant institutions, in contrast, may be subject to fines. As of May 2013, there were no specific provisions in this regard. The Nepalese Bankers Association has requested that the Central Bank extend the deadline for compliance by about 3-4 years (NRB Directive 3/068, Kaphle and Sigdel 2013; NBA 2013, PwC 2012).

30 In 2012, the overall CAR of 16 out of 32 commercial banks operating in the country stood at 11.5% i.e., just above the mandatory regulatory requirement of 10%. In 2010 it was at 6.6% (Himalayan Times 2013, NRB 2012a).

31 We received the latest update on the deal in September 2013.

for loans financing the purchase of technologies and products that support the non-traditional agricultural practices disseminated via the training activities,[32] profitability will also depend on the additional risks associated with this kind of lending.

There could also be opportunity costs involved in increasing lending to agriculture for banks, such as lower lending to relatively more profitable and less risky sectors such as manufacturing (NRB 2012a).

Figure 4 illustrates the possible effects of a risk-sharing facility of about USD 20 million on the agricultural credit portfolio of the bank that showed most interest in the project.[33] Box 4 in Section 4 provides additional details on the facility.

32 The tentative list of criteria for investments eligible under the risk-sharing facility include e.g. water-efficient irrigation technologies, weather information platform, climate-resilient seeds, fertilizers, environmentally controlled sheds, products for pest and disease management, etc. (IFC 2013b).

33 For confidentiality reasons, we do not disclose the name of the bank.

3.3 Farmers

Farmers have a clear business case to participate in the project because by learning how to improve and strengthen the resilience of their farming practices they could benefit from higher income.

The involvement of agribusinesses as training providers can also facilitate their access to markets, inputs, technologies, and finance.

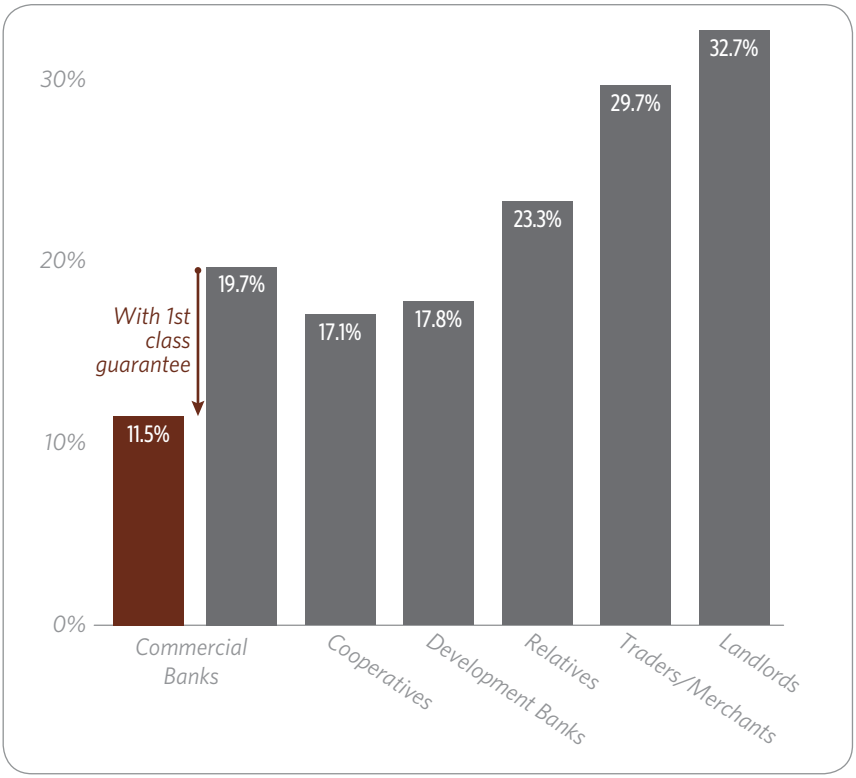
The project set a target objective of increasing trained farmers' productivity and incomes by 20% through practices that also increase their resilience to climate impacts. Similar projects suggest that this goal is achievable (see Appendix E).[34]

The engagement of agribusiness firms as training providers has the potential to generate benefits to farmers beyond improving their knowledge of agricultural practices.

As agribusinesses and farmers are linked through the supply chain, farmers may benefit from (enhanced) access to:

- **More secure markets for their supplies**, as companies may promote contract-farming arrangements, or offer purchase guarantees on crops produced under training interventions with the aim of ensuring the loyalty of trained farmers;
- **Technologies otherwise not easily accessible** (also new ones) through, for instance, agribusinesses' purchasing equipment and renting it to farmers);
- **Finance**, as companies may improve farmers' creditworthiness and attractiveness to banks through purchase guarantees and the intermediation of loans (see Box 4).

Figure 5. – Level of interest rates demanded by various lenders in the agricultural sector.



Notes: The rate applied for loans with a first class bank guarantee from a rated bank are not specific to agricultural lending, and refer to the average made available by the institution that showed most interest to partner with IFC in the project, which is among those with the highest portfolio in the sector (IFC 2013b). To provide another example, also other banks operating in the country for which we have data, e.g. Kumari Bank, apply a slightly lower interest rate, 11% on average (Kumari Bank web site). For guarantees from non-rated banks, rates range between 12 -15%. The Central Bank (NRB 2012) reports that the lending rates applied for loans from commercial banks in the agricultural sector in 2011 ranged from 9.5-13%. The other data depicted were retrieved from the PwC (2012) survey; For traders and merchants we depicted the average rate applied by the two.

The involvement of banks under the PPCR framework, and with PPCR and IFC backing through the risk-sharing facility, is another key part of tackling farmers' credit constraints while promoting the financing of practices aimed to increase resilience in agricultural production systems. The involvement of commercial banks could also help to:

- Lead to more affordable terms and conditions for loans, at rates lower than those prevailing on the market, as suggested by the rates offered by banks with a guarantee from a rated financial institution (see Figure 5); this could help to shift farmers away from informal lending sources that typically loan at higher rates.[35]

34 According to CIF (2011a) and CIMMYT (2010), for instance, improved varieties of seeds alone would result in a 20-30% increase in yields.

35 Karki et al. (2010) suggests that financial resources obtained by farmers

- Enable access to a higher volume of credits and services than other entities are able to offer.[36]
- Promote farm diversification, which can help to increase farmers' adaptive capacity.

Under the project, farmers will not be asked to pay for the training activities, but will be incentivized to invest in improved and climate-resilient farming practices. These should translate into benefits that will more than repay investment costs of climate-adaptive products.

via e.g. merchants and traders under the commitment of selling a predetermined amount of their produce at a rate irrespective of prevailing market prices, are mainly used to satisfy consumption rather than productive purposes.

36 NRB (2013b), IFC (2013) and Ferrari et al. (2006) suggest that the amount of loans typically provided by e.g. micro-finance institutions is not sufficient to match many on-farm investments, or the needs of other bigger actors in the agricultural value chain. Moreover, micro-finance services currently remain inadequate in the country due to structural issues such as technical capacity, and governance weaknesses.

3.4 The Government of Nepal

Agriculture is one of the key economic sectors in Nepal, and mostly driven by private actors whose daily decision making and behavior can lock-in the country's vulnerability for a long-time. Therefore, involving the private sector is critical for the Government of Nepal to improve the performance of the sector and its resilience.

The government's decision to allocate a portion of PPCR resources to address capacity and financial gaps in the private sector can help strengthen and improve this sector's performance, a cornerstone of any move from subsistence to commercial agriculture.

Agriculture is the mainstay of the Nepalese economy, accounting for around 37% of its gross domestic product and 66% of its labor force (MoAD 2012). Analysis made prior and during the PPCR program preparation (see CIF 2011a, GoN 2010a) highlighted the challenges posed by changing climate conditions to the country's agricultural outputs. Droughts like the one Nepal experienced in 2008-09, for instance, destroyed crops across the country, more than halving yields in some districts and putting food security at risk.

Increasing the climate resilience of the agricultural sector is therefore critical for the country's economy and the wellbeing of its citizens.

The Government of Nepal has made numerous efforts to promote agricultural-led growth, aiming to move from subsistence to commercial farming systems, but past programs have not yet led to intended results (e.g. Samriddhi 2011, World Bank 2011).[37]

In the target districts, the IFC-PPCR project can help to strengthen the agricultural performance and improve food security, by providing:

- **Know-how**, for preventing and managing climate-related losses through improved practices leading to increased productivity and food security. If effective, practices demonstrated during the project may also generate positive spill-over effects through replication. The project can also contribute to overcoming the bottlenecks in existing capacity building activities supported by the government, which are suffering from lack of staff, funding and effectiveness, and whose trainers have limited expertise in climate change (IRIN 2013, FAO 2010);[38]
- **Acces to new and/or improved technologies**, such as solar-powered irrigation pumps from Jain Irrigation, the Indian company with whom IFC is liaising to facilitate its entry in the Nepalese market and, in agreement with the government is developing the national irrigation strategy for the country;
- **Stronger value chains for** the key crops targeted by the program, and **associated players**, which may imply more secure provision of taxes, employment opportunities, as well as an improvement in the balance of trade thanks to reduced imports;[39]
- **A more supportive financial system** capable of satisfying the need of the sectors, to favor private business growth and enable the shift to commercial farms.[40]

37 Increasing the productivity of the agriculture sector is a key priority for the GoN, which plans to double spending (currently 8% of the budget, MoF 2013b), and increase public lending in the sector (Himalayan Times 2012).

38 Gafspfund (2010) highlights that the training service delivery system does not meet farmers' demand; the level of coverage of the training system is about 15% of agricultural households nationwide. IRIN (2013) reports that one public technician is responsible for training an average of 1,500 farmers when in developed countries it is 400 farmers on average. Moreover, to receive advisory services, farmers have to reach public district centres which are often far away or not easily reachable because of inadequate transport infrastructure. In the 2012/2013 budget, around USD 0.6 million (NPR 57 million) was allocated to agricultural training (MoF 2013a).

39 The private sector currently (2012/13) contributes 19% of the Government's overall tax income, and this represents taxes on corporate profits only (MoF 2013c). 2010 official imports of sugar, rice and maize amounted to USD 75 million (or almost 0.5% of GDP, see World Bank 2013a) and actual costs are higher as these crops are also illegally imported from India (Goletti et al. 2012). In 2010, the agricultural trade balance was USD 350 million in deficit. The government has set a target of 50% reduction over the short-term (5 years) (MoAD 2013b).

40 Private banks piloting of new practices may then be taken up by public banks, which in the past decade have had negative capital adequacy ratios and high non-performing loans (NRB 2012a; Ferrari et al. 2006);

The benefits for the government can be particularly high compared to similar projects implemented by NGOs or government entities. If the project provides successful outcomes, agribusinesses may see enough benefits to continue training with lower or no without public backing after the project period. NGOs, in contrast, would need additional financial support to continue the training further. Moreover, strengthening the performances of Nepalese-based companies can help to stimulate domestic industry and, therefore, local development.

Table 4. From inputs to final desired outcomes (project targets)

INPUT	OUTPUT	INTERIM OUTCOME	EXPECTED FINAL OUTCOME
Public capital: • ≈USD 2.1 million in PPCR grant resources for capacity building activities • ≈USD 10 million in guarantees for a risk-sharing facility with at least one bank **Private resources:** • ≈USD 0.3 million in cash and in-kind contributions from agribusinesses • ≈USD 10 million from the target bank for the risk-sharing facility. Additional resources will be invested to cover the cost of the facility and projects	• Development of crop-specific training modules and methods to deliver climate resilience • 15 trainers instructed on climate resilience, embedded in companies' technical teams • Development of financing products and risk management training to the staff of the partnering bank(s)	• Enhancement of at least 1,700 farmers' knowledge of climate-resilient, higher yielding farming practices • Enhanced availability of improved stress-resilient and high-yielding seed varieties and improved technologies • Banks sustain the adoption of improved practices through the promotion of tailored financial products	**Agribusinesses:** • Enhanced capacity and expertise on how to increase crops productivity and train farmers • Improved value chain relationships • More secure supply of rice, maize, and sugarcane, of higher quality; higher operational efficiency and profitability **Banks:** • Improved risk-management practices and ability to satisfy agricultural market needs **Farmers:** • Improved ability to cope with climate-related risks • Improved value chain relationships • 20% higher yields and income[1] **Government of Nepal:** • Climate-resilient agricultural sector and enhanced food security • Stronger and more resilient private sector • Increased revenues from taxes • Reduction of trade deficit • New employment opportunities

1 A control or comparison group of farmers will be monitored to establish a credible baseline (IFC 2013b, IFC 2013e).

4. Risk allocation in the project

Private companies in Nepal are unlikely to invest in or borrow for improved agricultural practices unless the public sector reduces the risks associated with these investments.

The project's knowledge building, financial assistance, and risk-sharing arrangements can mitigate many of the risks, but several outcome risks still remain, particularly, uncertainties about farmers' investment in and adoption of improved agricultural practices.

To evaluate the risk profile of the Nepalese IFC-PPCR project, we apply a risk management framework and assess inherent risks. We identify and assess the risks faced by key project stakeholders, analyze and present the strategies used to mitigate the most important risks that could cause the project to fail and, lastly, outline the final risk allocation implications for the major stakeholders.

4.1 Risk identification and assessment

To capture all significant sources of risk, we categorize risks according to the three main phases of the project:

- **Development risks** cover all the risks incurred before the project begins implementation, including the identification of suitable private partners and their engagement in relevant climate-resilient measures;
- **Operation risks** cover risks related to implementing and running the project, such as the inadequacy of the training measures and/or of their delivery method;
- **Outcome risks** cover the risks of not achieving the public policy objectives. For the PPCR, these risks include failure to deliver the intended climate resilience and food security objectives, and to demonstrate that private sector involvement in building resilience is achievable.

Next, identified risks are classified according to their probability of occurrence, or frequency (from very low to very high), and their potential impact on the project's objectives (again from very low to very high).

LOW-RISK EVENTS

Risk events with low probability of occurrence and low to medium impact:

We did not identify any low risk events, considering the novelty of the topic of adaptation for the private sector, the uncertainties associated with planning adaptation measures in a country where the lack of reliable climate data is the norm, as well as the lack of evidence about the effectiveness of private engagement in meeting adaptation goals.

MODERATE RISK EVENTS

Risk events with moderate probability of occurrence, and medium to high impact:

- **Changes in the Nepalese government's support to the PPCR program and projects**,[41] or changes in policies and regulation favorable to the project such as the mandate for increasing the agricultural sector's share in banks' loan portfolios. These risks are shared among the PPCR, IFC, and the government itself, given that it is the ultimate beneficiary and has overall responsibility for the program.
- **Commodity prices risk:** all actors operating in the agricultural sector face some level of revenue volatility given the nature of the market. Associated risks are borne by private actors, who are used to facing price uncertainties.
- **Failure to deliver timely weather forecasts and agronomic information to farmers**, which are critical to prevent climate-induced losses and fully enable farmers to implement improved agricultural practices over time.[42] IFC bears the risk, but shares it with the World Bank (IBRD) and, ultimately, the Government of Nepal.

41 This is exemplified by the decision to not borrowing money to invest on non-revenue generating projects such as certain adaptation interventions that the government made in December 2012. This had repercussions for some projects within the country's program, which were endorsed more than a year before. The IFC-PPCR project was not affected because in this case PPCR money do not fell into the government sovereignty, but rather IFC, who is responsible for their repayment (CIF 2013i, ADB 2013a).

42 It is worth noting that even if good weather data is provided, farmers may not be able to interpret it and make appropriate decisions.

Under the PPCR framework, the World Bank is responsible for the creation and upgrade of the country's hydro-meteorological network, and the government is responsible for the country's overall adaptation program. Failure to set up an effective weather information network could affect IFC's ability to engage mobile phone operators and/or to deliver effective training measures.

HIGH-RISK EVENTS

Risk events with a very high impact whatever their probability of occurrence or medium-impact events with a high probability of occurrence.

- **Failure to engage the private sector in the country's climate-resilient development program**. There are several challenges that could have hampered IFC-PPCR's ability to involve private actors in the project, including: Nepal's complex terrain as a post-conflict Least Developed Country; private actors' limited understanding of climate-related risks and opportunities; and the government's limited understanding of the private sector's role in building climate resilience.

  This risk, along with the risk of engaging unsuitable partners, would undermine the reputation of IFC and the overall credibility of the PPCR, and make it more difficult for it to fulfill its mandate. It would also likely result in partial losses of the donors' money used to develop the project.

- **Failing to remove barriers to finance**, such as the inability to structure risk-sharing mechanisms sufficiently attractive to local banks to effectively unlock their resources for lending to climate-relevant measures; or the inability of the planned training measures to stimulate demand for finance, thereby generating a deal flow. The lack of data and information at the farm level, the lack of borrower credit history, and banks' limited involvement in agricultural lending, coupled with the risk-sharing facility's loan criteria (see Box 4), makes this a highly probable risk. IFC and the PPCR bear the reputational and financial risks.

- **Inability to set up and deliver effective training measures** due to the lack of skilled human resources to develop training activities relevant for coping with climate variability and change over time, or an inadequate delivery model.[43] Some types of training methods (e.g. written material), may not be effective in promoting farmers' adoption of new practices and inputs if they do not take their literacy levels and cultural attitudes into account[44] (see e.g., IFC 2013g, Ganesh 2006, Hamal and Anderson 1982, DSCL 2013). Failing to obtain farmers' interest and participation in training activities could affect the project's final outcomes. IFC and the PPCR assume these risks and share them with the agribusinesses given their direct involvement and contributions.

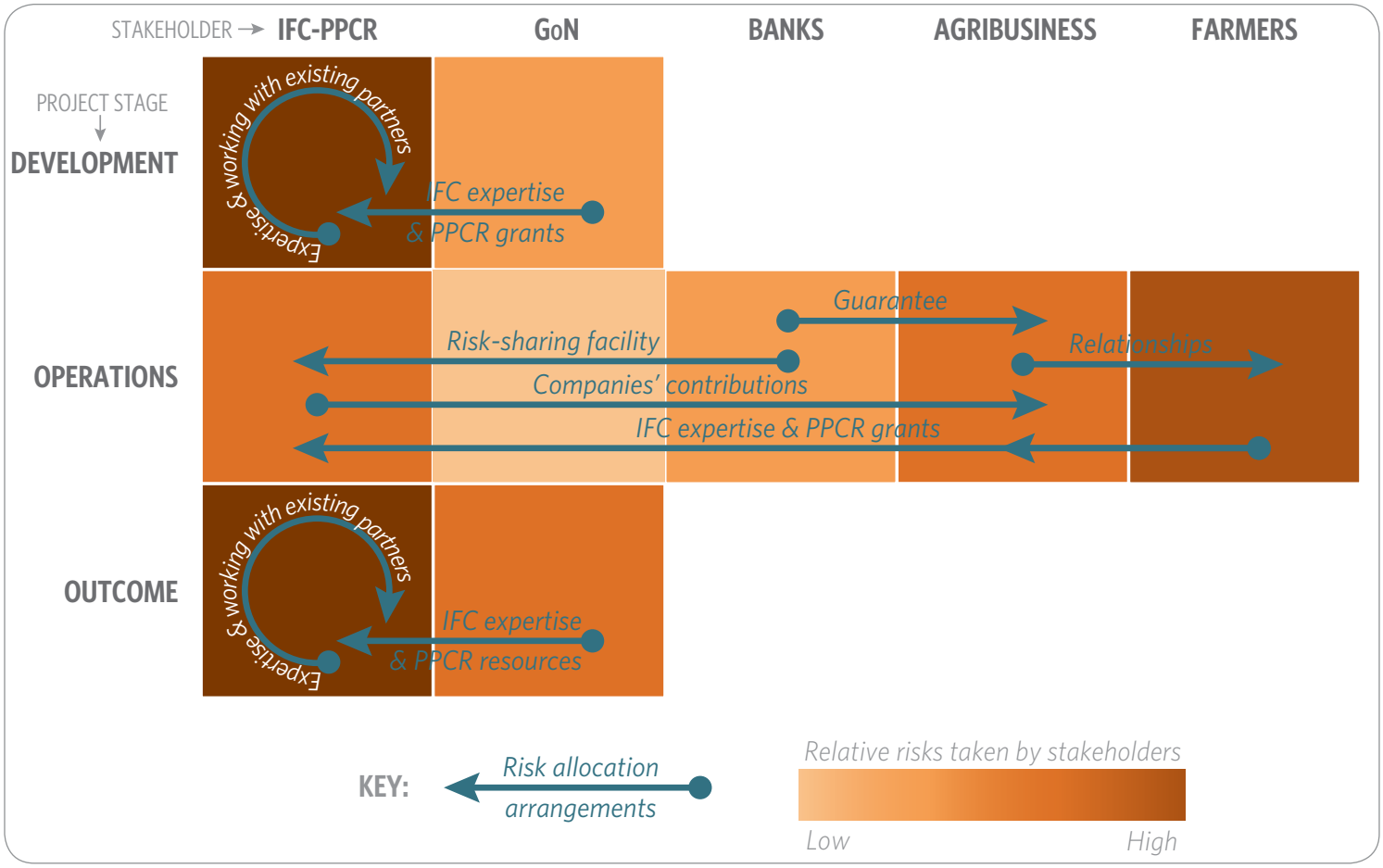
  IFC also bears the risk that the agronomic practices proposed during the training activities will not remain relevant as climate varies and changes over time, and the risk of working with companies not familiar with the provision of training measures, and/or without direct relationships with farmers at the beginning of the project (e.g., the rice case). These factors also increase outcome risks for the companies involved.

43 Developing training tools tailored to farmers' climate resilience needs is still a relatively novel practice for IFC's staff, partnering organizations, and consultants. Agricultural inputs and technologies suitable to face the challenges posed by climate change might not yet be locally available and/or easily importable.

44 Nepalese farmers have demonstrated slow and weak adoption rates. Studies have found that only 5% to 10% of farmers are willing to take the risk of changing practices which may result in income risks. This is generally related to price and yield uncertainties and can vary greatly among farmers based on farm size, percentage of land ownership, farmer's age, level of education, etc. (e.g. IFC 2013b, Kafle and Shah 2012, Paudel and Matsuoka 2008).

4.2 Risk management strategies and allocation framework

Figure 6. San Giorgio Group IFC-PPCR project dynamic risk matrix



Note: Risks are categorized according to their potential 'magnitude' multiplied by the 'likelihood of risk': from 'very high' in dark red, to 'high' in orange, 'moderate' in light orange and 'low' in yellow. Given the early stage of this project, we acknowledge the subjectivity of the weighting system.

The dynamic risk matrix (Figure 6) above illustrates two aspects: **risk allocation** - where identified risk events originate and sit at project initiation (described in section 4.1); and **risk response** - how risks are managed and/or shifted among project stakeholders through the use of risk transfer mechanisms (described here).

There is evidence to suggest that the project's risks and uncertainties are allocated to the stakeholders most suited to manage them. Nevertheless, if the project fails to deliver its intended objectives, the most vulnerable group of actors, farmers, will remain exposed to climate impacts.

Stakeholders' 'know-how' and the relationships between involved parties play an important role in the project risk allocation, and ultimately in its likelihood of success.

Regulation-related risks

The following arrangements can mitigate or help to avoid this type of risk:

- The stable presence of IFC and of the other implementing agencies in the country;
- Ongoing dialogue through the coordination mechanisms under development within the PPCR for the implementation of the program (WB 2013).

The regular PPCR Pilot Countries' meetings can create an additional platform for dialogue and may help to hedge this risk. Positive peer pressure from other PPCR countries also plays a role in motivating the Nepalese government to support the PPCR process and deliver results.

Private sector engagement-related risks

In Nepal, the PPCR framework and IFC hedged these risks through:

- **An intense consultation phase** supported by the establishment of a Technical Private Sector Working Group and analytical studies (e.g. IFC 2013b, ADB 2012a, Poshan 2010, PwC 2012).
- **IFC's previous experience** in projects applying similar approaches, that is working with and through agribusinesses to train farmers (see e.g. IFC 2012b; IFC 2013g, IFC 2013h), and in promoting the use of stress-tolerant seeds such as in Bangladesh (see e.g. IFC 2013i).
- **IFC's existing relationships with some of the private partners involved in the project** such as Probiotech, the maize processing company, which has trained poultry farmers, and some local banks such as the Himalayan Bank (Himalayanbank.com; IFC 2012a; IFC.org).
- **IFC's screening, appraisal tools, and standards**, to ensure the integrity, credibility and suitability of selected partners.

Access to finance-related risks

IFC can mitigate part of these risks by leveraging its:

- **Expertise in operating with financial institutions in developing countries**, and in structuring risk-sharing facilities in the agricultural sector (e.g. IFC 2010).
- **Relationships with some local banks.** IFC, for instance, has been collaborating with the Himalayan Bank since 2007, already entering into a guarantee facility agreement (Himalayanbank.com). According to IFC (2013b), this is one of the private banks with the most significant agribusiness portfolio.

Moreover, PPCR resources cover part of the risk, as planned to provide the first loss coverage in the risk-sharing facility under discussion.

Finally, agribusinesses can mitigate part of the finance-related risks when acting as loan intermediaries and guarantors, or guarantee buy-back of agricultural products (see Box 4 for details).

Training-related risks

IFC bears part of these risks and can mitigate them by:

- **Previous experience in the development and provision of training to and through value chain actors**,[45] and in sourcing experts;
- **Knowledge of crop-specific vulnerabilities and barriers to enhanced productivity** developed during the preparation phase of the project, which can support the development of relevant training measures;
- **Adoption of a phased training approach, including follow-up training activities and close monitoring** through an external evaluator, which can allow for adjustments to farmers' behavior or climatic changes (IFC 2013d).
- **Technical backstopping** by establishing relationships with expert partners.[46]

Agribusinesses also bear training-related risks, as they invest their own resources without a guaranteed return. For instance, they bear the risk that trained farmers will sell their produce to other companies (a high risk in the rice and maize supply chains), that they will not adopt improved agricultural practices (e.g. because the farmers remain unconvinced, or the practices are not affordable or cost-effective), or that delays in price fixation – determined at the national level – will delay farmers supplies, possibly resulting in crop decay (a high risk in the sugarcane supply chain). These risks remain substantial but can be mitigated with the establishment of closer relationships with farmers, enabled by the training activities, buy-back agreements for farmers' produce, and indirect financing arrangements.

Farmers also bear part of the risks because the adoption of new but ineffective farming practices could put their sources of income or livelihood at risk.

The effectiveness of the training measures will be critical to ensure companies' and farmers' engagement in the long-term, thereby ensuring the sustainability and scalability of the project. They will also be critical to demonstrate that delivering adaptation via private actors can work.

45 IFC has been cooperating with Probiotech, the maize processing company operating in the country's animal feed industry to strengthen the technical skills of Nepalese poultry farmers (IFC 2012a).

46 These organizations include the International Centre for Integrated Mountain Development, a regional intergovernmental learning and knowledge sharing center, and the International Rice Research Center, a research and training organization.

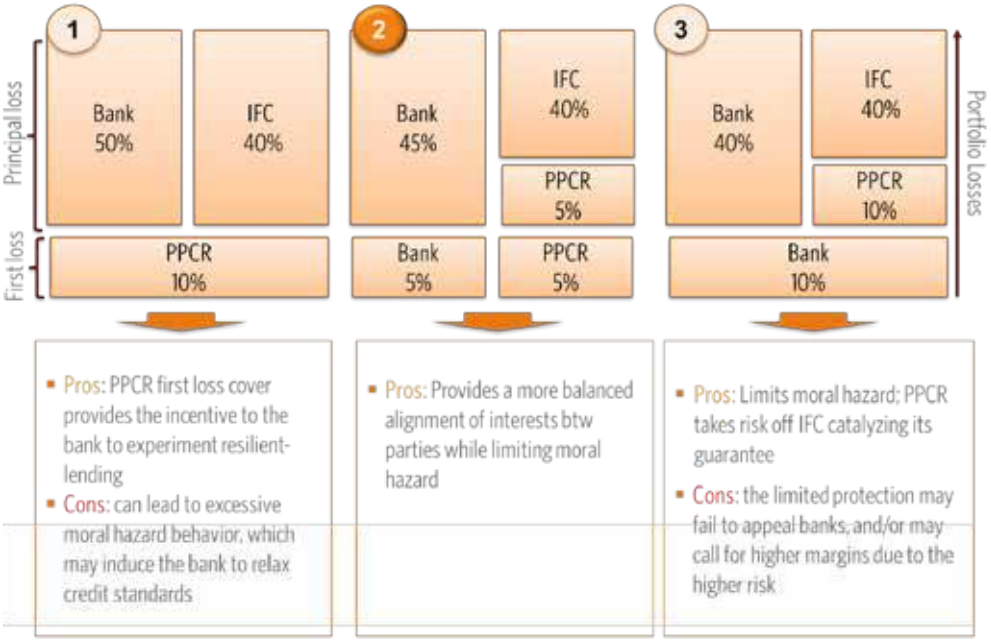
Box 4. Addressing the risks of lending for climate resilience

IFC is working on a USD 20 million risk-sharing facility to transfer 50% of the risks associated with a portfolio of eligible 'climate-resilient loans' from a local commercial bank to IFC and the PPCR. The deal is still under negotiation and the set of criteria specifying the assets eligible to be covered under the facility still to be agreed (September 2013).[1] IFC plans to close the deal with one bank before scaling it up to other institutions.

The facility is planned to take the form of an unfunded partial credit guarantee, shared pari passu with the partnering bank. Its structure, terms, and conditions, are critical to induce the bank to experiment with climate-relevant lending to the agricultural sector, while avoiding moral hazard behavior. The pricing of such a facility, which is linked to the profitability of lending, is another critical element as it can tip the balance in terms of demand and utilization of the facility itself (IEG 2009, Mignucci et al. 2013). Narrow margins, in fact, would reduce the motivation of the bank to renounce part of them to pay for the facility. The pricing to be agreed by parties will depend on the riskiness of the underlying loan portfolio, IFC's costs of funds, and expected losses.

There are various options for allocating first and principal loss, depending on the specific needs of the partnering institutions and the nature of the assets to be covered by the facility (IFC.org). As illustrated in Figure 7, each approach implies different risk-sharing/pricing trade-offs.

Figure 7. Three different and possible options for the risk-sharing facility



Option 2 – where the first loss is evenly shared between the PPCR and the prospect bank – would ensure a balanced alignment of interests between parties, while limiting the moral hazard risk that the partnering bank would relax its credit standards at the expense of IFC.

The use of PPCR's funds to cover part of the first and principal loss tranche has the following effects:

- Removing some of the risks from IFC, which might have not been willing to engage in this venture without third party backup;

1 In addition to the selection criteria, IFC and the client bank will also agree on the servicing procedures for defaulted assets. The disbursement of IFC funds are made if the criteria are met at the time of the call on the Risk Sharing Facility (IFC 2009).

- Encouraging the bank to kick-start climate-relevant agricultural lending.
- Lowering the price of the facility as compared to the level IFC would have set it otherwise.

IFC's direct involvement and partial cover of the principal loss – to be used after the exhaustion of the first loss – enables the local commercial bank to share the risks with an entity relatively more suited to manage them. This could lead the partnering bank to reduce the interest rates applied for loans, to the advantage of farmers' (see Figure 5 in Section 3).

How the involvement of value chain actors can reduce risks for banks

The involvement of agribusinesses can contribute to further buy down credit risks and reduce the transaction costs of lending to farmers, thereby facilitating financing throughout the value chain.

Agribusinesses, in fact, can act as vehicles to disperse and collect back the loans through value chain financing, and/or enhance farmers' creditworthiness via purchase guarantees on the crops supplied by farmers.

The relationships between agribusinesses and farmers can facilitate credit screening, monitoring, and enforcement. Farmers' willingness to maintain good relationships with their direct buyers make them less likely to default on loans, as it would possibly result in them needing to find another buyer.

These arrangements, which are not new in developing countries, differ according to the characteristics of the supply chains (see also Box 3);

- **In the sugarcane supply chain**, where farmers and the processing company have direct interactions, **lending could occur through agribusinesses**, which can be liable for farmers' debt and loans repayment.
- **In the rice and maize supply chains**, the looser relationship between companies and farmers may induce banks to **lend to farmers' cooperatives on the basis of farmers group guarantees**. Interviews with the company involved in the maize chain (Probiotech 2013) suggest that the company will be willing to provide a buy-back guarantee to farmers, as a way to ensure access to their products (see also e4nepal.com).

5. Can the project be sustained, scaled up, and replicated?

If the project performs as planned, agribusinesses will see the benefits of continuing to train farmers beyond the project's life, ensuring the sustainability of the intervention.

Scaling-up among new actors or crops in Nepal and replication in other countries is feasible but challenging. To be successful, interventions will have to be adapted to local socio-economic circumstances, and the climate vulnerabilities of the targeted actors.

In-depth studies can help to identify opportunities and gaps, while dedicated funding mechanisms for climate-resilient projects can create the space for valuable experiments. Both can raise awareness and knowledge among private and public actors vulnerable to changing climate conditions. The success of the IFC-PPCR project will not only depend on its effectiveness in convincing businesses of the short-term benefits of climate-resilience, but also on its contribution to making climate resilience a long-term business concern for the private sector actors involved. Ongoing training of farmers, and farmers' investments in and adoption of climate-adaptive practices will be essential to ensure the project has lasting impacts, and to scale-up results.

This section discusses whether the agribusinesses engaged in the project are likely to train farmers in climate-adaptive agricultural practices beyond the project's life. To draw early insights for replicability, it also looks beyond the Nepalese case, to understand how the PPCR has been performing to date in other pilot countries.

5.1 Sustainability: the long-term business case for building climate resilience

The overarching objective of the project is to build the business case for the agribusinesses involved to train farmers in climate-resilient agricultural practices beyond the life of the project. The results achieved and demonstrated by the project during the two-year pilot phase will play a big role in determining whether or not this will happen. IFC and agribusinesses will assess the cost and benefits of the training activities, and decide whether to continue.

At the end of the project's pilot phase, agribusinesses may see more benefits than costs in training additional farmers. This may occur because of one or a combination of the following reasons:

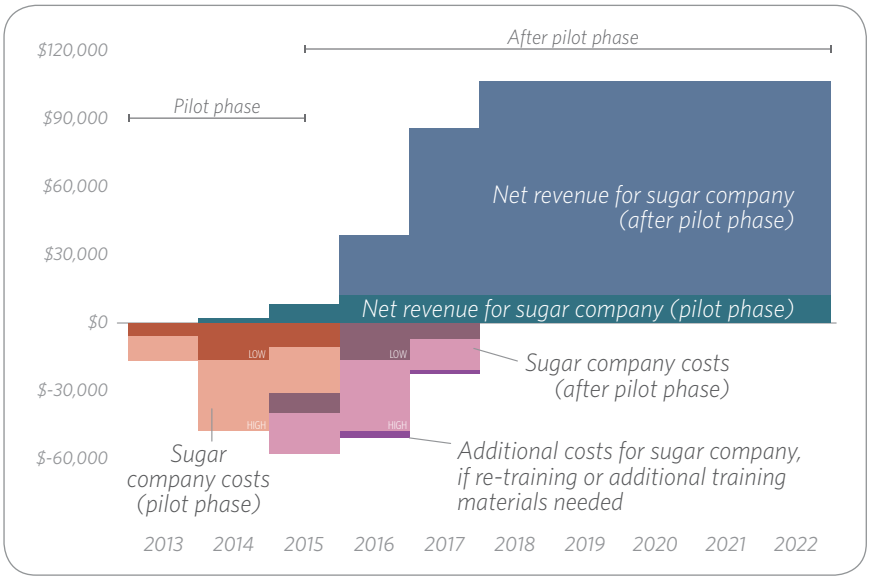
- **Start-up costs cease:** The agribusinesses will not have to cover the initial investment paid with the support of PPCR funds to create training materials. These are "sunk costs" that should not occur after the pilot period (or may just require slight adjustments).
- **Learning-effect during the project:** Learning-by-doing can improve the effectiveness of training farmers in improved agricultural practices, and generate efficiency gains. The approaches piloted during the project will have been tested, their reliability proved or shortcomings highlighted, and they will have been adjusted to maximize results.
- **Increased awareness of benefits:** During the project intervention, agribusinesses may become more aware of the benefits associated with addressing farmers' capacity gaps and vulnerabilities. This is particularly true in the case of the rice company, which was not previously engaged in any training activities. The sugarcane and the maize processing companies, which are already engaged in training activities – the latter with farmers growing broilers (IFC 2012a) – may become aware of the additional benefits of training farmers using the approach and practices promoted by IFC under the project, and the benefits of climate-adaptive seeds and irrigation technologies.

To illustrate the potential long-term business case, Figure 8 considers the case of the sugarcane-processing company to show the costs and benefits of extending training to 4,400 additional farmers in the two years after the pilot phase (mid-2015 to mid-2017). In a standard scenario, training of additional farmers will pay back in only two to seven months, as more farmers will be trained per year.[47]

47 This assumes that the training costs and the associated increase in farmers' productivity are the same as in the 20% standard scenario in the pilot phase of the project. See Appendix D and E for more information and

Assuming the projects generate learning and result in efficiency gains, the benefits to companies may be even higher, and the payback period for their investment shorter. Additional gains can be generated by the demonstration effect of the project; farmers not involved in the training may replicate practices adopted successfully by "lead farmers".

Figure 8. Sugar company's costs and revenues (in current USD) – pilot phase and beyond



Notes: Projections assume that 4,400 additional farmers are trained after the pilot phase, of which 2.700 are assumed to adopt improved practices and increase their productivity by 20% (standard scenario).

Public financial support will likely still be needed to continue farmers' training after the pilot phase, but can be gradually phased out. In our standard scenario, after the end of the pilot period, the project still covers part of the training costs. PPCR funds and IFC support may be required for delivering additional training to reach an increasing numbers of farmers or to invest in content or tools,[48] or because productivity increases are lower than expected. However, IFC plans to decrease the cost coverage over time, and this may be feasible, according to our financial calculations for the sugarcane processing company: even if the company had to pay for all IFC-PPCR costs in the two years after the pilot phase, the investment should still pay back in a relatively short time (0.8-1.2 years). It is worth noting that **in other IFC agricultural projects** (not targeting climate resilience), **IFC was able to reduce or even phase out the financial support provided, and agribusinesses remained engaged beyond the initial intervention**. This was, for instance, the case for a project in India, where a sugarcane processor, DCM Shriram Consolidated Limited (DCSL), decided to scale-up training from 2,000 to 12,000 farmers under the project, and is even planning to reach 50,000 in a next phase (DSCL 2013). From an initial coverage of 50% of the project's costs, public, and NGO subsidies were reduced to 40-45% in the follow up project (IFC 2013b).[49]

Furthermore, in the case of Probiotech – the maize processing company currently involved in the PPCR project – cost reductions of about 5 NPR per kilogram of broilers produced during a previous IFC project (IFC 2012a) led to significant improvement in its business performance. This motivated Probiotech to scale up the model to 2,000-4,000 additional broiler-growing farmers, and to replicate it with maize farmers under the PPCR.

Success in past IFC projects, however, may be related to a combination of technical assistance and investments into companies: IFC invested in DCSL and it is currently in the process of acquiring an equity share of Probiotech. IFC's follow-up investment might be a salient element for agribusinesses to remain engaged beyond the project's life. As the World Bank's Independent Evaluation Group highlighted (IEG 2011), IFC has achieved superior outcomes when combining technical assistance projects with investment in agribusiness partners. In contrast, it also highlights that results have been inferior when IFC has not followed up with investment, due to the lack of a partner company with the financial and technical capacity to support the type of interventions learned during the project's life.

5.2 Is private engagement in climate resilience scalable and replicable?

Close monitoring and post-project evaluation of the Nepalese IFC-PPCR project will be essential to understanding what worked and what did not. It would contribute to the creation of a knowledge base for shaping future interventions aimed at engaging the private sector in climate resilience initiatives, including their scale-up and replication in other contexts.[50]

details on assumptions.

48 In the case of an IFC project with the Indian sugar company DSCL the extension of training involved additional program development costs for the use of GPS and tablets to further improve training (DSCL 2013).

49 Discussions with DSCL suggests that IFC is still covering 50% of the follow-up costs, but this is mainly due to additional investments in GPS systems and tablets; IFC costs would decrease if the same approach as in the initial phase were used (DSCL 2013).

50 For a relevant discussion on the topic see also Biagini and Miller, 2013.

If the IFC-PPCR project in Nepal proves to be successful, its model could be scaled-up to reach out to more farmers, both through the agribusinesses involved in the project – which have around 22,000-36,000 farmers in total in their supply chains[51] – and **by engaging more agribusinesses processing the same crops or others in the country**. For instance, IFC has already identified at least two other companies (one processing rice and the other sugarcane) that could be involved in the project (IFC 2013b and IFC 2013d).

Furthermore, peers can gain knowledge from and imitate farmers or other entities trained during the project. For example, farmers' cooperatives can share knowledge with or be imitated by smallholders, generating positive spill-over effects.

However, **there are some challenges to scaling up the project in Nepal**. Examples include:

- Climate change affects crops in different ways, and constraints to enhanced productivity are crop-specific. Therefore, scale up is more likely to require public support if new crops are targeted, as new approaches tailored to these crops would be needed;
- Private players might be less interested in investing in subsistence crops than in commercial and cash crops like sugarcane.
- Agribusinesses that operate in supply chains with a number of intermediary off-takers typically have weaker relationships with farmers and therefore fewer incentives to train farmers who could sell to different buyers ("side-selling").

The project approach can be replicated in other countries. The project itself is a good example for this, as it already replicates an existing model used by IFC in agriculture development that builds farmers' capacity through agribusiness firms, thereby harnessing the links and incentives of actors within the value chain. Interviews with IFC staff suggest that this project incorporates lessons learned through previous experience in conventional projects, and that the lessons learned so far during the development of the Nepalese intervention have already been shared with other PPCR countries, such as Bangladesh (IFC 2013b).

Nonetheless, replicating private sector engagement in other countries may face context-specific barriers as experiences in some other PPCR pilot countries have shown (see Box 5). These include:

- Unfavorable investment climates and underdeveloped private sectors;
- Limited government awareness of the potential role of the private sector in climate-resilient development and reluctance to share climate finance aid with private actors;
- Short-term time horizon for investment return of many private sector players.

5.3 Addressing barriers to scaling up and replicating private sector engagement in climate resilience

Challenges and delays experienced in some PPCR private sector projects call for enhanced efforts to create conducive frameworks, as well as the generation and diffusion of knowledge about climate risks and potential opportunities. Identifying "game changers" is a complex task that requires time, experimentation, and flexibility.

Based on early insights from the PPCR and MDBs' experience, the following strategies may help to address the barriers for fostering and scaling-up private actors' involvement

- **Carry out in-depth market studies** to identify business opportunities, market needs, and viability gaps as well as ways to improve enabling environments. They are also needed to identify where private action makes business sense and to design effective public interventions. MDBs have undertaken a number of these studies to develop projects for funding by the PPCR or by other mechanisms (see CIF 2013a for e.g. Niger; EBRD and IFC 2013). These studies and analyses, developed through direct interviews with and/or in cooperation with private actors, represent an important tool to promote awareness, share knowledge, identify business models, and possibly pave the way for future interventions. They can also help to educate and prepare governments to harness the local private sector's potential for adaptation by identifying, for instance, opportunities for partnerships and collaboration.
- **Create dedicated private sector funding mechanisms** such as the "private sector set aside" established by the PPCR governing body in November 2012 for allocating a

51 Data from NPC-WFP-NDRI (2010), PwC (2012), CEAPRED (2013b), Golchha (2013), FAO (2013), and Nimbus (2013a).

predetermined volume of resources on a competitive basis.[52] This mechanism can provide opportunities to experiment while avoiding giving recipient governments the feeling that the use of funds for private-oriented projects results in a loss to the public sector, a perspective often expressed by government representatives participating in CIF projects (CIF 2011c).

- **Provide both low-cost loans and grants to fill viability and capacity gaps** therefore enabling private actors to play an active role in climate resilience. Grant resources are critical for generating the demand for investments in adaptation measures by financing technical assistance measures. Concessional loans can help to incentivize these investments by buying down the additional costs and risks associated to non-traditional practices.
- **Pilot and test private sector adaptation approaches in Middle Income Countries**. Given the relative novelty of the topic for the private sector, testing approaches in countries with more developed private sectors where projects are likely to face relatively fewer barriers could help to generate the experience and track record needed to ensure the uptake of best practices and successful models in Least Developed Countries.

52 Under the private sector set aside the PPCR governing body recently (November 2013) endorsed USD 41 million in concessional loan resources, out of the USD 70 million competitive set aside, for six private sector-oriented project concepts submitted by PPCR pilot countries through the AfDB, EBRD and IDB (CIF 2013g and CIF 2013h).

Box 5. Learning from the early experience developed across PPCR pilot countries.

CIF (2013a) and interviews with IFC (2013b) highlight that piloting approaches to private sector engagement in Least Developed Countries (LDCs) is a challenging undertaking.

- **Unfavorable business climates and underdeveloped private sectors can limit the opportunities for engagement**. IFC experience in Mozambique has demonstrated that policy and regulatory barriers such as land tenure restrictions, and weak infrastructures, can make it hard to find viable investment opportunities. Identifying suitable private sector partners for investments or for channeling PPCR funds can also be difficult. In LDCs, it may be that few private companies meet IFC's social and environmental standards, or have the characteristics needed to ensure reach and scale, as experienced in Zambia and Bangladesh for instance.[1]
- **Limited awareness of the role of the private sector in climate-resilient development at the private and public levels can create obstacles.** Insufficient public-private cooperation, as shown in Bangladesh, can bring further difficulties. Private actors' knowledge gaps about the risk that may arise from changing weather patterns and exposure of their businesses to climate impacts can make it difficult to raise their interest (IFC 2013b).
- **Governments' reluctance to share PPCR funds with private entities**.[2] This is due to their tendency to prioritize public sector projects, difficulties in visualizing the role and relevance of private players in strengthening countries' resilience, as well as unfamiliarity with private sector funding projects, which go beyond standard practices.
- **Lack of data, information, and technical skills can hinder the ability of private actors to evaluate climate-risks, or develop products or services that could help to mitigate climate-related impacts** This was the case both in Niger and Zambia where two PPCR projects that aimed to develop weather index-based insurance products for the agricultural sector, have been constrained by, among other things, insufficient long-term weather data and poor financial skillsets (CIF 2013a).
- **Uncertainties about the possible returns on climate-resilient investments and/or mismatch with investors' time horizons**. Proving the business case can be difficult or lengthy given the limited evidence on the short-term benefits stemming from adaptation investment and the complexities in evaluating successful outcomes. Moreover, as for instance noted in Zambia, returns can be attractive on paper, but proposed measures may face significant implementation risks. Finally, the benefits of climate resilience generally manifest over longer time frames, while private actors are often only interested in investments that pay back within a few years. IFC's experience within the PPCR suggests within 5 years (IFC 2013b) so there is a mismatch between the potential returns and investors' time horizons.

Sources: CIF 2013a, IFC 2013b, EBRD and IFC 2013, RAI 2013, ECIAfrica/DAI 2012.

1 In Bangladesh, where the PPCR project focuses on low-lying areas (polders), identifying and working with suitable business partners has proved challenging. The number of financial institutions that could be engaged to channel PPCR funds to farmers is small, as highly risk-averse local banks rarely have branches in these areas. This can limit the opportunities of identifying adequate partners, can enhance implementation risks, and/or limit the likelihood of success of the project (IFC 2013b).

2 Governments' reluctance can be particularly high in sectors where public intervention has been significant, and where it is unclear how best to involve private players. In Bangladesh, for instance, limited government support to private sector activities has created barriers to private investment, deterring the involvement of private actors in the development of seed varieties (Rai 2013).

6. Conclusion

Private sector engagement in building countries' climate-resilience is critical to "climate-proof" key sectors of countries' economies and thereby secure climate-resilient development. The decisions and behaviour of this major engine of economic growth will determine whether Least Developed Countries (LDCs) move out of poverty in a resilient manner.

The agricultural sector in Nepal is highly vulnerable to the impacts of changing climate conditions. **The private sector takes most of the investment decisions in the Nepalese agricultural sector and could provide tools and services to smooth the path to adaptation.** Its successful involvement can stimulate replication and scale up of best practices, products, and technologies.

Recognizing their potential, the PPCR – a multilateral mechanism channeling international climate finance resources – is piloting ways to engage private actors in climate-resilient measures aligned with countries' adaptation priorities and strategies.

The IFC-PPCR project in the Nepalese agricultural sector shows that private actors have economic interests to embed climate resilience considerations in their business practices. For agribusinesses, the exposure of the farmers that supply them to weather events, and the constraints on these farmers' productivity, can affect their ability to satisfy market demand and remain profitable over time, thereby incentivizing them to strengthen farmers' capabilities and resilience. Farmers also have strong incentives to participate in the IFC-PPCR project in order to learn how to avoid climate-induced losses, and how to increase their income through improved yields and better quality production.

The early experience gained the PPCR in Nepal, also provides **insights on the barriers that prevent private action (knowledge, capacity, and risk gaps), and highlights the following key interventions to address them**:

- **Consult and involve both local private and public actors early in the process of** developing countries' adaptation programs and projects**, with the backing of evidence-based analyses**. This is essential to increase recipient governments' awareness of the potential of private actors in building resilience, to educate private actors about climate-related risks and possible opportunities, and to identify business models enabling their participation.
- **Tailor knowledge and capacity building measures to create private delivery models for adaptation interventions**. This lays the foundation for long-lasting results, maximizing the potential outcomes from each dollar of public finance invested. The project provision of know-how to agribusinesses is key to enable them to train farmers operating in their supply chains in improved agronomic practices.
- **Create innovative financing mechanisms to get local financial institutions on board**. Local banks are critical to fully enable private actors to invest in resilience; capacity building measures are then essential to create demand for investment and generate a deal flow.

The Nepalese experience also shows that the level of public support in private-sector oriented projects has to be limited to avoid market distortions and to ensure that public resources are spent effectively. In the Nepalese case, agribusinesses and banks are asked to contribute to the project – increasingly as they get results and gain experience - in order to limit the risk of moral hazard behavior. Still, grant funding is an essential component to build their knowledge and capacity, and incentivize them to engage in ventures with uncertain outcomes.

Further experimentation and analysis is needed to replicate and scale-up efforts.

It is too early to fully assess the effectiveness of the PPCR in involving private actors in building countries' resilience, and the likelihood of success of the interventions developed by IFC in Nepal. Nevertheless, the early insights drawn from this case study, from the experience of the MDBs in other PPCR pilot countries and beyond, as well as interactions with experts, may provide decision makers with a better understanding of the challenges faced on-the-ground, but also of promising strategies that can address them.

Finding "game changers" is a complex undertaking that requires time, experimentation and flexibility. In addition to the approaches used in Nepal, the following can be further explored:

- **Dedicated private sector funding windows**, with competitive allocation, to provide further opportunities to experiment, while addressing the reluctance of some governments to share international climate finance with the private sector.

- **Further testing of pilot approaches for private sector engagement in adaptation in Middle Income Countries** to generate learning and identify best practice that could then be transferred to LDCs.

As PPCR projects focused on private sector engagement in climate resilience advance into the implementation phase, additional analysis of these projects, but also of others beyond the PPCR, can provide further insights to fully understand shortcomings and how to best scale-up and replicate successful interventions. Effective private involvement can help countries to speed up the transition toward climate-resilient development.

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8. Acronyms

ADB	Asian Development Bank
AfDB	African Development Bank
CAGR	Compound Annual Growth Rate
EBRD	European Bank for Reconstruction and Development
GoN	Government of Nepal
IADB	Inter-American Development Bank
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
LDC	Least Developed Countries
MDBs	Multilateral Development Banks
MoAD	Ministry of Agriculture
MoSTE	Ministry of Science, Technology and Environment
MoU	Memorandum of Understanding
NAPA	National Adaptation Program of Action
NPR	Nepalese Rupees
PPCR	Pilot Program for Climate Resilience
SPCR	Strategic Program for Climate Resilience
USD	United States Dollars
WB	World Bank

Appendix A. Details on the Strategic Program of Climate Resilience in Nepal (SPCR)

The Nepalese Strategic Program for Climate Resilience (SPCR) endorsed in June 2011 outlines a set of measures aimed to tackle key priority risks challenging the country's climate-resilient development.

Table 5 shows the main climate-related risks and affected sectors, and the type of interventions supported with PPCR funds, and implemented by the Asian Development Bank, and the World Bank Group (IBRD and IFC) in cooperation with the Nepalese government (CIF 2011a).[1] Figure 9 shows the related financing.

The identification of the country's adaptation priorities and the development of interventions to address them resulted from an extensive participatory process[2] that lasted about 21 months (May 2009-February 2011) and involved consultations with a variety of stakeholders – from government agencies and civil society representatives, to development partners, the private sector, and technical experts.

Table 5. Nepal's main risks, adaptation needs, and PPCR measures[3]

CLIMATE-RELATED RISKS	AREA OF INTERVENTION	SPCR MEASURES TO BUILD RESILIENCE
Temperature increase Erratic rainfall and changes in monson patterns	Agriculture and food security	Address key constraints to agricultural productivity and reduce the vulnerability of farmers and of private companies' operations
Changes in hydrological cycles	Water security	Watershed management and planning
Increased frequency of extreme weather events	Climate-induced disasters	Creation/upgrade of hydro-meteorological observatory and forecasting systems
	Urban settlements and infratstructures	"Climate proof" selected vulnerable infrastructure, housing, and hydropower plants
Shifting of ecological belts and vegetation	Ecosystem health	Enhance capacity, knowledge, and incentives to protect endangered species
All of the above	Country's institutional and policy framework Public and private actors' capacity in managing climate-related risks Access to finance	All areas: strenghten the country's institutional and policy framework and public and private actors' capacity to manage climate-related risks; enhance access to finance.

Source: CIF (2011a), GoN (2010a), Poshan (2010).

1 This includes e.g., the Department of Soil Conservation and Watershed Management, Department of Hydrology and Meteorology, and the Ministry of Science, Technology and Environment.

2 The process, which built on the National Adaptation Program for Action (NAPA) that began a few months ahead of the PPCR, was supported by studies assessing climate change risks, adaptive capacity, and resilience at national, district, and community levels (CIF 2011a).

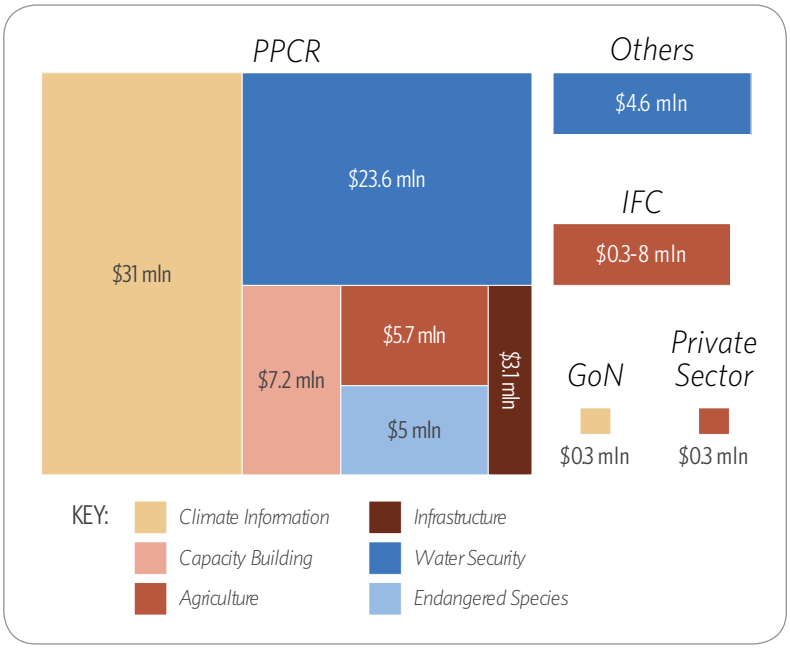
3 Nepal's SPCR has five components: (i) building climate resilience of watersheds in mountain eco-systems, (ii) building resilience to climate-related hazards (iii) mainstreaming climate change risk management in development, (iv) building climate-resilient communities through private sector participation, and (iv) enhancing the climate resilience of endangered species CIF (2011a).

To identify opportunities for the engagement of private actors aligned with the country's adaptation priorities, during the preparatory consultation phase IFC worked with the Government of Nepal, the Federation of Chambers of Commerce and Industries, private sector players, and the other MDBs involved in the country's program (CIF 2011a, Poshan 2010). The process was also supported by the establishment of a 15-member Technical Private Sector Working Group, representing all the major sectors where contributions from the private sector had been foreseen.[4]

Moreover, IFC led a scoping assessment to identify local companies' vulnerabilities, adaptive capacity, and potentials in undertaking climate-resilient projects (CIF 2011a, Poshan 2010). The study also helped to identify the needs of the farming communities, financing requirements and identify implementation partners and modalities.

The Technical Working Group focused on the identification and formulation of priority private sector investments, and led to the selection of the projects in the agriculture, infrastructure, and finance sector (ADB 2013b, ADB 2012a, Poshan 2010). The discussions also highlighted that the private sector could have contributed in a broader number of sectors, including, for instance, the tourism and non-timber forest products sectors.

Figure 9. Investments by entity, financing type, and SPCR program components



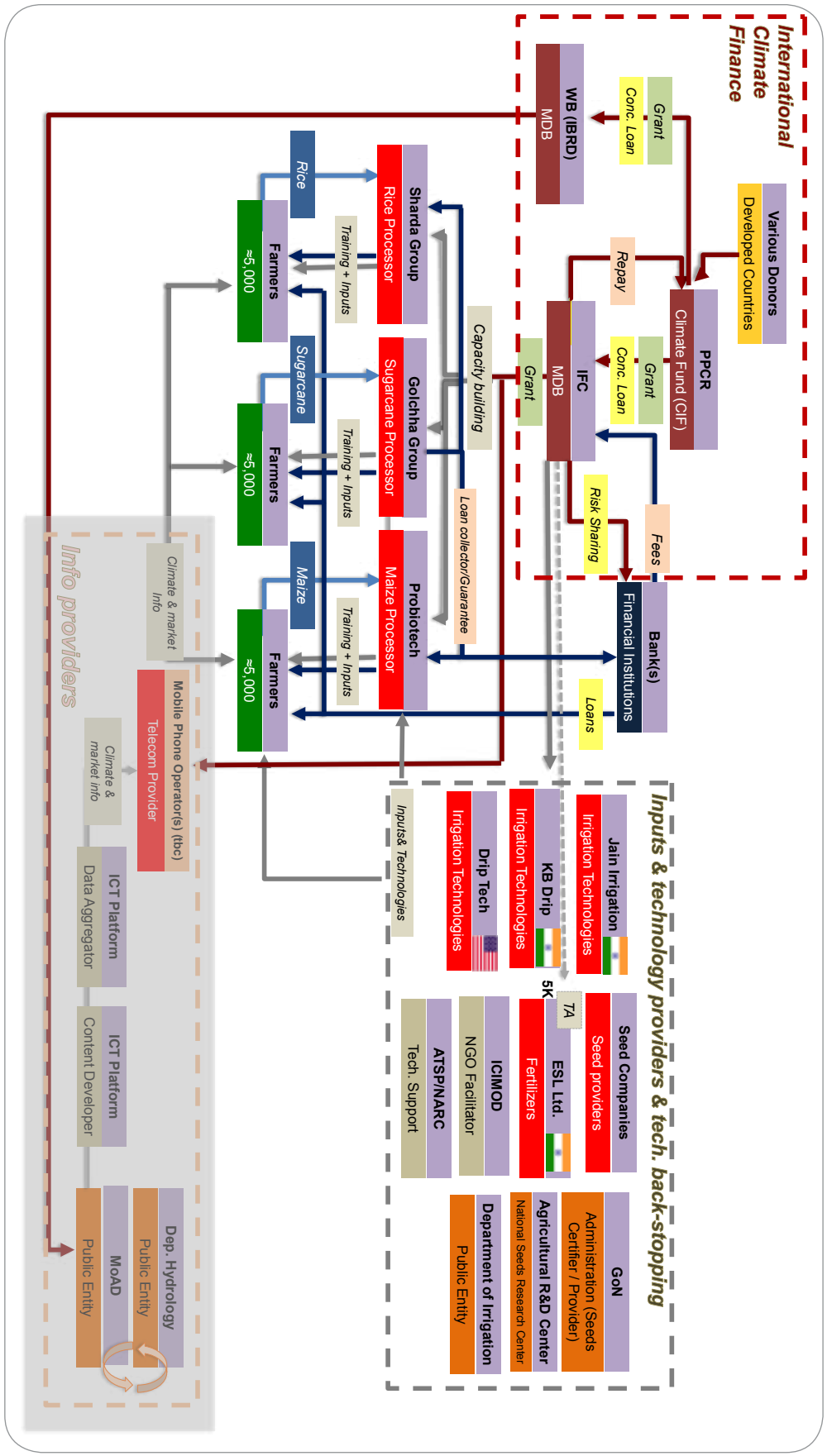
Note: PPCR contributions exclude MDBs projects preparation and supervision services and projects preparation grants for USD 2.8 million and USD 1.2 million respectively. They also exclude funding of USD 0.2 million for the preparation of the SPCR. PPCR financing for the private sector component of the SPCR (agriculture and infrastructure), and for the climate information one, includes financing in the form of concessional and near-zero loans for USD 6.6 million and USD 15 million respectively. "Others" refers to the Nordic Development Fund. IFC's contributions range from USD 0.3 million, as reported in CIF (2013a), to around USD 8 million as suggested by IFC (2013b) as a provision for the risk-sharing facility. Source: CIF (2013a), IFC (2013b), CIF web site (Country plans and projects), MDBs' projects web sites.

The overall set of measures included in the country's PPCR program can also help to create more favorable conditions for the private sector to contribute to climate-resilient development and generate business opportunities that can help to manage climate-related risks: the upgrade of the country's hydro-meteorological network, for instance, can enable farmers to access weather forecast data and, possibly, the development of insurance products that can help them recover from climate-induced disasters.

4 The Private Sector Working Group – formed and led by the Federation of Nepalese Chambers of Commerce and Industry with IFC facilitation and consultant support – was added to complement the six sectoral working groups developed under the NAPA process to guide the development of concrete interventions in key vulnerable sectors.

Appendix B. PPCR Nepal stakeholder map

Figure 10. Key project stakeholders



Note: Displayed technology providers are the ones identified during the project preparation - actual stakeholders may vary during implementation of the project; the dotted arrow refers to a planned investment of about USD 5,000 to cover technical assistance measures aimed to increase the availability of fertilizers - Source: CPI elaboration based on IFC (2013b), IFC (2013d), IFC (2013e) and IFC (2013f).

Appendix C. PPCR private sector-oriented projects in the PPCR portfolio

Eleven out of 66 projects and programs in the PPCR portfolio – amounting to about USD 72 million out of USD 983 million in PPCR funding (USD 25 million of which received PPCR funding approval by the PPCR Sub-Committee) – target private sector involvement, mainly in the agriculture, infrastructure (energy and housing), and financial sectors (CIF 2013a). 71% of these resources are provided as loans at concessional terms, while the remaining are grants. Interventions range from building capacity in climate-adaptive practices, and facilitating and/or strengthening market linkages between different actors in agricultural value chains, to expanding access to finance and to risk mitigation tools such as weather index-based insurance products or weather forecast information to farmers (see Table 6).

The table below presents an overview of the various private sector projects in the PPCR portfolio, and their status as of August 2013.

Most recently, PPCR pilot countries through the public and private sector arms of the MDBs (AfDB, EBRD, IADB and the World Bank) submitted 11 private sector-oriented project concepts to be funded with the USD 70 million in concessional funds set aside in November 2012 to finance projects aimed to engage private actors in activities with climate-resilient outcomes.

At the beginning of November 2013, the PPCR governing body endorsed USD 40.85 million in concessional loan resources for advancing the development of six of these project concepts, for interventions ranging from the infrastructure to the agriculture and forestry sectors in Haiti, Jamaica, Mozambique, Saint Lucia, and Tajikistan. See CIF (2013g) and Table 7 for further details.

A second call for project concepts, for the competitive allocation of the remaining USD 30 million in concessional funds, is to be organized with revised procedures (see CIF web site). The experience developed through the first round highlighted a number of areas for improvement: from the scoring criteria for projects selection, to the need for enhanced advertisement of the funding opportunity, and for grant resources to support the creation of enabling environments.

Table 6.- Private sector projects by country and type of intervention

COUNTRY	MDB	PROJECT TITLE	PROJECT MAIN OBJECTIVES	FINANCING (USD MILLION)		CO-FINANCING (USD MILLION	STATUS
				GRANTS	LOANS		
BANGLADESH	IFC	Promoting climate-resilient agriculture and food security	Pilot climate adaptive agricultural practices, products and technologies by: • Engaging agribusiness companies through capacity development, to train farmers, strengthening farm-to-market linkages • Engaging banks via technical assistance to facilitate access to finance	3.1	10		• Endorsed in November 2010 • USD 3.1 million in PPCR grants approved in August 2013 to support the advisory component of the project. • The submission for approval of the investment component – supported with USD10 million in loans – is expected 12-18 months after the commencement of the advisory component.
NEPAL		Public and private sector collaboration to enhance food security through promoting climate-resilient agriculture	Pilot climate-adaptive agricultural practices, products and technologies to enhance farmers' climate resilience and agricutural productivity by: • Engaging and developing the capacity of private agribusiness companies and other relevant private actors to train farmers • Involving local banks in the provision of climate-resilient agri-lending • Creating a commercial mobile phone platform for the dissemination of climate and market information and agro-practice suggestions to farmers through the engagement of relevant public and private partners	2.1* (+ 0.3 project preparation grant)	3.6*	IFC: 8.3* Others: 0.3*	• Endorsed in June 2011 • Advisory project approved in January 2013 and under implementation • Investment component under appraisal with potential clients • The potential for creating a commercial mobile phone platform will be explored once the hydro-meteorological network and the agri-management information system will be up and running

Table 6.- Private sector projects by country and type of intervention (continued)

COUNTRY	MDB	PROJECT TITLE	PROJECT MAIN OBJECTIVES	FINANCING (USD MILLION)		CO-FINANCING (USD MILLION	STATUS
				GRANTS	LOANS		
MOZAMBIQUE		Developing climate resilience in the agricultural and peri-urban water sectors through provision of credit lines from Mozambican banks	• Engage local banks in the provision of credit lines for climate-resilient investment in the agriculture and peri-urban water sectors	0.2^	5.4	IFC: 5	• Endorsed in June 2011 • Market study of potential for climate-resilient credit lines completed • IFC is liaising with banks and microfinance institutions to evaluate their business plans for the development of these credit lines. IFC may discuss a possible update of its program under the SPCR if by 31 December 2013 no viable business plans are developed
		Developing community climate resilience through private sector engagement in forest management, sustainable timber harvesting, and/or eco-tourism	• Engage private agribusiness in natural resource management activities such as sustainable harvesting measures and in watershed management • Encourage private sector tourism companies to adapt through adaptation needs assessment.	0.3^	5.2	IFC: 5 Private actors: 14	• Endorsed in June 2011 • Market study to identify potential investment completed • IFC is engaging with the private sector companies that expressed interest to developing business plans for investment where potential interventions have been identified. IFC may discuss a possible update of its program under the SPCR if by 31 December 2013 no viable investment projects have emerged.
	IFC	Improvement of climate forecasting systems and operationalization of early warning systems	• Develop a commercial mobile phone platform to enable the dissemination of climate and weather information to agricultural producers and other stakeholders	0.5	1.5		• Endorsed in November 2010 • Market study completed • IFC is currently liaising with a local mobile communication company to develop this platform
NIGER		Sustainable management and control of water resources	• Enhance agricultural productivity and irrigation-fed agriculture through the engagement of relevant private actors in improved/resilient irrigation techniques, and piloting of stress-resistant seeds	0.5	2.5		• Endorsed in November 2010 • IFC is currently liaising with irrigation companies and exploring investment opportunities
		Private sector investment to build climate resilience in Niger's agricultural sector	• Develop a weather index-based insurance product for the agricultural sector, in support of farmers	1.0	6.0		• Endorsed in November 2010 • Market and feasibility study completed • As a result of the analysis undertaken, IFC does not foresee short-term investment opportunities in this area, and is exploring the possibility of re-allocating funds endorsed to this component to the other two.

Table 6.- Private sector projects by country and type of intervention (continued)

COUNTRY	MDB	PROJECT TITLE	PROJECT MAIN OBJECTIVES	FINANCING (USD MILLION) GRANTS	FINANCING (USD MILLION) LOANS	CO-FINANCING (USD MILLION	STATUS
INFRASTRUCTURE (ENERGY AND HOUSING)							
BANGLADESH	IFC	Feasibility study for a pilot program of climate-resilient housing in the coastal region	• Build market understanding on low-cost storm and cyclone-proof housing, assessing the potential and establishing the housing and finance needs and affordability • Develop and pilot a business model for the private sector, engaging housing development companies and financiers interested in entering into this market	0.4			• Endorsed in November 2010 • PPCR funding approved in August 2013
NEPAL	IFC	Climate proofing vulnerable private infrastructure (hydropower) Feasibility study for low cost climate-resilient housing	• Enhance the climate risk management capacity of private hydropower operators by promoting the adoption of climate-resilient measures (e.g., landslide protection and technology upgrades) and facilitating access to finance at affordable terms • Build market understanding to assess those technical and financial barriers that prevent the private sector from playing a role in building climate-resilient housing	0.1	3*		• Endorsed in June 2011 • IFC identified the hydropower companies that will invest in erosion-resistant turbines. • The feasibility study started in July/August 2013
TAJIKISTAN	EBRD	Enhancing the climate resilience of the energy sector	• Pilot the integration of climate change risk analysis and resilience measures into hydropower investments • Pave the way to subsequent private sector investments by demonstrating the investment model for climate-resilient upgrades of hydropower plants	11.0		EBRD: 47.6	• Endorsed in November 2010 • Feasibility studies completed • PPCR funding approved in August 2013

Note: (*) Values as per IFC (2013b) and CIF (2013a). At the time of writing we did not have sufficient information on the IFC contribution of about USD 0.3 million stated in CIF (2013a). We associated it to the agricultural project, assuming the financing of additional capacity building measures for the financial sector.
Note: (*) Expected / projected. (^) Include project preparation grant for 0.425.
The EBRD project in Tajikistan has the character of both a private and public sector project. EBRD counterpart, the state energy company Barki Tojik, is mainly government-owned, but operates on quasi-commercial lines and also has non-government minority shareholders. Sources: CIF 2013a; CIF web site (see country plans and projects); EBRD 2013.

Table7. Projects endorsed for funding under the competitive set-aside.

COUNTRY	MULTILATERAL DEVELOPMENT BANK	PROJECT TITLE	PROJECT OBJECTIVE	PPCR FUNDING IN LOANS (USD MILLION)
Tajikistan	EBRD	Enhancing the climate resilience of the energy sector	Strengthen the country's enabling environment and institutional capacities, and upgrade a major hydropower plant with climate-resilient technologies, demonstrating the investment model	10
Tajikistan	EBRD	Small business climate resilience financing facility	Facilitate access to finance at affordable rates for energy and water-efficient technologies to enhance the resilience of enterprises and households. The facility seeks to engage local finance institutions as vehicles for channeling target credit lines.	5
Mozambique	AfDB	Lurio Green Resources Forestry Project	Support the development of forest plantations of small and medium holder out-grower. The project seeks to promote the management of natural resources and the increase of farmers' incomes.	11
Jamaica	IDB	Financing water adaptation in Jamaica's new urban housing sector	Support private housing developers and construction companies to deliver water-secure and climate-resilient housing	5.75
Saint Lucia	IDB	Supporting climate-resilient investments in the agricultural sector	Support the private sector – from farmers to processing companies – to adopt climate resilient technologies and practices through the provision of loans The project seeks to enhance awareness of the relevance of climate resilience practices, support the production of high-value, climate-resilient agricultural products, and enhance the country's food security.	6.1
Haiti	IDB	Support for the building of a climate-resilient sorghum supply chain	Promote climate-resilient post-harvesting measures among farmers by strengthening the linkages between a local company and farmers operating in its supply chain.	3

Sources: CIF 2013h; CIF web site.

Appendix D. Model inputs/assumptions for sugarcane farmers training

INPUT	DESCRIPTION	SOURCE
Sugar mill crushing capacity	3000 tonnes of sugarcane per day, for each of two mills	Golchha (2013)
Operating time of sugar mills	150 days per year	Derived from Sugaronline (2013), Sugar Mill Association (2013)
Capacity factor of sugar mills	75-80% (Golchha 2013) (80% is also the ratio of the 120 days per year sugar mills in Nepal are actually running (MoAD 2013) divided by the 150 days the Nepalese Sugar Mill Association assumes the sugar mills can run)	Golchha (2013) MoAD (2013)
Procurement of sugarcane as a share of total operating costs	75% This is the average observed in a number of Pakistan sugar mills, and here used as a proxy	Fatima (2011), Mirpurkhas (2012), Mehran (2012)
Net profit margin of sugar mills / producers	6%, median derived from analyzing yearly net profit rates for the years 2008-2012 for three sugar mills in Pakistan and eight sugarcane producers in India.	Fatima (2011), Mirpurkhas (2012), Mehran (2012), Moneycontrol.com (2013)
Sugarcane price 2013	54.4 USD per tonne, calculated by multiplying 481 Nepalese rupees per quintal, including VAT (Ekantipur 2013) with 100 and an exchange rate of 0.0113 USD per Nepalese rupee, average of 1st June 2012- 1st June 2013 (Oanda 2013)	Ekantipur (2013), Oanda (2013)
Productivity increase	Standard scenario: 20% improvement, project goal Lower scenario: 10% improvement, lower-end of achievements as reported by the literature and implementing organizations (see Appendix E) Upper scenario: 30% improvement, optimistic scenario, considering that the 52-56% achievement in a similar sugarcane project in India (DSCL) may be too optimistic in this case as the project does not only target productivity but also climate resilience.	IFC (2013d). See Appendix E for past achievements Based on IFC (2013g)
PPRC grant for farmer's training	USD 1 million over 4 years. We assume that 70% will be spent in the pilot phase (first 2 years), as start-up costs for e.g. hiring experts and developing training tools will mainly occur in the first years.	IFC (2013b) IFC (2013c)
Net revenue	Assumed to be additional revenues from sugar production due to farmer's training multiplied by the net profit margin. This assumes that the net profit margin overall does not change when the company produces additional sugar, which can be justified as, in general, sugar mills spend only around 2.5% of their income on fixed plants costs (incl. operation and maintenance), while the rest (particularly 70-80% sugarcane procurement costs) can be assumed to be variable.	Fatima (2011) Mirpurkhas (2012), Mehran (2012) for the cost break-down of sugar mills operating in Pakistan used as a proxy.

Farmers	Trained in first 4 years: 15,000, equally split between maize, rice and sugarcane. "Adopters" increasing their production: 9000 equally split between the three crops	IFC (2013b) IFC (2013d) IFC (2013f)
Farmers trained per year	Targeted farmers trained per year, project goal Year 1 (pilot phase): 600 farmers (4%) Year 2 (pilot phase) 1100 farmers (7%) Year 3 (2nd phase): 8100 farmers (50%) Year 4 (2nd phase) 4800 farmers (39%)	IFC (2013f)
Time lag between training and effects on productivity	1 year, resulting from original goal to reach all farmers by 2016, and productivity goal in 2017	Based on IFC (2013f) goals
Baseline production of sugarcane	46.5 t sugarcane per ha, average over the two targeted districts (Sarlahi, Morang) close to planned sugar mills, from years 2006/2007 to 2011/2012.	MoAD (2012) CEAPRED (2013)
Average farm size	0.83 hectare per farmer	NPC-WFP-NDRI (2010)
Future production changes in the baseline	No change. This assumes that future productivity increases are approximately balanced out by losses due to climate change, which are projected to be 4-8% in case of sugarcane in Nepal by 2030.	World Bank (2013a), PwC (2012) for changes in crops productivity
% of additional production supplied to training sugar company	100%. This is likely because there is only one mill per district, and transporting sugarcane is very expensive, given the substantial weight of sugarcane (sugar only weighs around 10% of the raw material, see Fatima, 2011, Mirpurkhas 2012, Mehran 2012) and the low quality of roads in rural Nepal (World Bank 2009). No sugarcane has been exported from Nepal to India in the last 10 years (FAO 2013), even when the border to India is very close for most sugarcane production areas.	Based on, Fatima (2011), Mirpurkhas (2012), Mehran (2012), World Bank (2009), FAO (2013) IFC (2013b) PwC (2012) Nimbus (21013a)
In-kind and cash contribution of / costs for agribusiness companies	Lower estimate: USD 32,000, assuming, two additional employees over 2 years with a wage of USD 8,000 per year. Does not include costs related to facilities and demonstration plots. Trainers employed are assumed to be paid by IFC. Higher estimate: USD 95,000, recent IFC (2013b) estimation for 2-year pilot period	Wage and number of employees: Nimbus (2013b); Duration of the project: IFC (2012b, 2013d)
Annual inflation (USD)	All calculations were conducted with constant 2013 USD. For transformation to 2013 USD, annual inflation of 2.3% assumed (average of years 2003-2012), using data from OECD (2013).	OECD (2013)

Appendix E. Outcome of training measures: literature review

COUNTRY	PROJECT DEVELOPER	PRODUCT	MEASURE FOR OUTCOME	OBSERVED INCREASE	SOURCE
Nepal	ADB	Maize / rice (irrigation)	Agricultural production	12-13% overall	ADB (2012b)
Nepal	Various	Crops in general	Households income	16% overall	Dillon et al. (2011)
Uganda	Various	Crops in general	Agricultural production	13-19% overall	Pender et al. (2004)
Nepal	IFC	Poultry	Feed-conversion rate	20% overall	Nimbus (2013)
India	IFC	Sugarcane	Agricultural production	52-56% overall (compared to control group)	Derived from IFC (2013g)
Kenya	World Bank	Crops in general	Agricultural production	3% to 7% per year (target)	World Bank (2013b)