



Expanding Rural &
Agricultural Markets
Amid Climate Change

Lessons from
the 2015
Conference



April 2015

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DIAMOND



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PLATINUM



GOLD



SILVER



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Acronyms

CAD	Community Agro-Dealer
CAADP	Comprehensive Africa Agriculture Development Program
CSA	Climate-Smart agriculture
CMS	Coffee Management Services Ltd
CRS	Catholic Relief Services
DCA	Development Credit Authority
DiNER	Diversity in Nutrition and Enhanced Resilience
FAO	Food and Agriculture Organization of the United Nations
FBA	Farm Business Advisor
GALS	Gender Action Learning System
GDP	Gross Domestic Product
iDE	International Development Enterprises
IFC	International Finance Corporation
IOM	Investment Opportunity Map
IPPC	Inter-governmental Panel on Climate Change
MFI	Microfinance Institution
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
non-GMO	non-Genetically Modified Organisms
PALS	Participatory Action Learning System
PFI	Partner Financial Institution
PPP	Public-Private Partnership
REDD+	Reducing Emissions from Deforestation and Degradation+
SMiLEs	small, medium, including large enterprises
SME	Small and Medium Enterprise
USAID	United States Agency of International Development
USAID-FinGAP	USAID Financing Ghanaian Agriculture Project

Forward

Dear Fellow Nutcrackers,

In spite of the diversity of experience and perspectives of the almost 250 participants from 34 countries, *Cracking the Nut 2015* participants agreed that “climate change is the toughest nut to crack.” It is generally accepted that climate change will bring hotter temperatures, changing rainfall patterns, more frequent natural disasters and increased weather variability. The Intergovernmental Panel on Climate Change (IPCC) estimates that climate change impacts “could slow the growth of food production by 2 percent each decade for the rest of this century,” while “food demand will increase by 60 percent” by 2050.¹ For this reason, *Cracking the Nut 2015* focused on “Expanding Rural and Agricultural Markets Amid Climate Change.”

As the world is constantly evolving and adapting to changes in the environment, so are we. In 2014, AZMJ merged to form Connexus Corporation to increase our emphasis on designing and implementing sustainable market-driven solutions for private sector firms and social investors working in developing countries. While some argue that rural and agricultural development contribute to greenhouse gas emissions and other negative environmental impacts, we do not believe that we have to choose between people and the planet. At Connexus, we believe that there are sustainable ways to continue to feed and house the world’s growing population, while protecting the natural environment. *Cracking the Nut 2015* facilitated an important dialogue on the latest practices in climate-smart agriculture and how they can be scaled up. Presenters and participants openly shared experiences and lessons related to the increasing costs and risks associated with climate change, as well as the opportunities it creates. We are grateful to the many contributions made to this body of knowledge and we are confident that together we can create a sustainable and bio-diverse world, one that can protect and sustain all species, human, animal and plant.

Warm regards,



Anita Campion
President and CEO



¹ Christopher B. Field et al., “Summary for Policy Makers,” in *Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneva: IPCC Secretariat, 2014)

https://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1

Executive Summary

The learning event, *Cracking the Nut 2015: Expanding Rural and Agricultural Markets Amid Climate Change* took place March 2-3 in Lusaka, Zambia, and generated the following key lessons learned.

Strengthening Rural and Agricultural Infrastructure

To strengthen the enabling environment for rural and agricultural market development and for access to finance, the following infrastructure investments and innovations can make a significant difference.

- **National-level climate change assessments are needed, as well as land and water management plans.** Climate change vulnerability assessments can help governments prepare for the likely impacts of climate change in the future and adjust their rural and agricultural development plans accordingly.
- **Local community aggregators can help reduce transaction costs, build on local knowledge and provide demonstration plots to encourage uptake of new climate-smart technologies.** Large private sector firms, such as Cargill, can be attracted to invest in rural areas where aggregation models help to guarantee a community's ability to consistently respond to demand.
- **Geospatial mapping of current and potential crop production can facilitate investment in agricultural value chains and their supporting infrastructure.** In Ghana, USAID-FinGAP's partner financial institutions use geospatial mapping to identify clients and potential investments. The system allows them to view current and projected production volumes by district up to the year 2023. Projections can also be adjusted for climatic variations, such as a shortage of rainfall.
- **Shared value can be created by encouraging responsible farming, production and consumption throughout the value chain.** In Kenya, for example, Nestlé supported the "NESCAFÉ Plan" to promote a responsible coffee value chain from production to consumption. The plan introduced new climate-resistant coffee varieties and provided training on improved agronomic practices, including soil analysis.
- **Local seed production and distribution systems and security are needed to promote crop resilience and reduce vulnerability amid climate variations.** Unfortunately, seed systems are often dealt with as acute (short-term, crisis-driven) problems, when they are actually chronic (long-term and systemic). CRS has developed trade fairs for Diversity in Nutrition and Enhanced Resilience (DiNERS), which address longer-term systemic issues.

Expanding Financial Services to Rural Areas

Finance continues to be a barrier for rural and agricultural investment, which is considered even riskier when factoring in the negative impacts of climate change. The following lessons apply to expanding climate-smart access to finance.

- **To attract private investment to rural areas, governments should harmonize planning with commercial interests.** In Rwanda, government support for rural infrastructure and appropriate incentives has helped to attract significant "green investments" in rural areas, including US\$600 million by Erasmus International in agricultural-related investments.

- **Microinsurance can help to mitigate the negative impacts of natural disasters resulting from climate change.** Following Typhoon Haiyan in the Philippines, the microinsurance industry processed loss claims quickly and has since seen an increase in new policy owners, especially among those who did not have microloans in the past.
- **Education, access and experience instill appreciation on behalf of smallholders for weather index insurance products.** MicroEnsure found this to be helpful in designing its FarmerShield life and weather insurance product, in conjunction with NWK Agriservices, an agribusiness which operates a cotton out-grower program that engages 100,000 smallholder farmers.
- **Loan guarantees and other credit enhancement mechanisms can unlock private capital and allow for increased private sector investment in climate-smart agriculture.** By guaranteeing US\$4 million of Althelia Climate Fund's overall loan portfolio, the USAID Development Credit Authority (DCA) has helped Althelia to raise more capital and scale its loan portfolio to over US\$120 million.
- **Mobile technology can help agribusinesses and farmers respond to rapidly changing market dynamics and to access finance.** Innovations in mobile technology have helped farmers access much needed financing. At the same time, financial institutions have benefited from reduced risk and transaction costs by removing cash transactions from the field (thereby reducing the risk of theft and fraud).
- **Aligning the incentives of actors throughout the value chain can open up new pathways for financing that benefit all parties.** For example, TechnoServe works with cocoa buyers, input suppliers and farmer cooperatives to establish mutually beneficial relationships with microfinance institutions, which increases income up and down the value chain while reducing credit risks.

Improving Agricultural Production

Amid the adverse effects of climate change, keeping up with demand for higher quantity and quality of agricultural production will take commitment from all actors in global supply chains. This commitment will need appropriate technology, inputs and services to not only sustain, but boost production while improving soil health and farmer resiliency. Several lessons have been learned in providing a coordinated approach to improving agricultural production.

- **Private sector brands are recognizing the business case for protecting the environment.** Many businesses recognize that their supply chains are vulnerable if they rely on unsustainable production and practices. In addition, consumers are increasingly concerned about the treatment of small farmers and environmental protection.
- **Farm advisors are needed to link modern agro inputs and services to the first mile of supply chains.** Farm advisors are especially useful to link farmers in fragmented value chains to modern agro inputs and services, including from major companies, such as Syngenta and The Toro Company. For example, iDE has trained networks of farm business advisors in Zambia, who are paid commissions based on sales of inputs and equipment, while simultaneously facilitating access to finance.
- **Conservation agriculture is a necessary evolution to adapt to and thrive in changing climatic conditions.** To reverse the negative effects of climate change, we need to regenerate soils over time, using enhanced conservation agriculture techniques and rigorous soil monitoring systems.

- **Customizable agricultural production solutions, including effective water and soil management, are needed to fit the changing demands of climate change.** While there have been numerous technological advances to modernize agricultural production, many of these technologies are either too expensive or not adapted to the needs of small farmers in developing countries.

While conservation agriculture forms the basis for climate-smart agriculture, as Geoffrey Heinrich of CRS wisely stated, “We need to move toward *regenerative agriculture*.” In particular, we need to go further in the following areas:

- Using agro-forestry models to replenish soils and lost foliage coverage;
- Incentivizing smallholder behavior changes and climate-smart adaptations;
- Protecting and financing water resources;
- Encouraging private sector to buy into and invest in climate-smart agriculture; and
- Promote gender equality in rural and agricultural development and access to finance.

I. Introduction

The *Cracking the Nut 2015* conference focused on “Expanding Rural and Agricultural Markets amid Climate Change.” Neither the conference nor this publication spends time on documenting the realities of climate change, as this is already well documented. This conference focused on what we know from our work in rural and agricultural development, both scientifically and experientially, as well as the implications of climate change in the years to come. Leaders emphasized the need to not choose between people and planet, but to recognize and embrace our interdependence. (See Box 1 for definitions of terms used to discuss climate change.)

In his Keynote address, Martin Bwalya, Head of the Programme Development Division with the New Partnership for Africa’s Development (NEPAD), explained that 60% of Africa’s population depends on agriculture and “agriculture is dependent on nature, so damaging nature damages livelihoods.” Mr. Bwalya argued that this conference was the right place and time to be talking about climate change, given that NEPAD’s Comprehensive Africa Agriculture Development Program (CAADP) had just completed its 10th anniversary. Indeed, the African Union Heads of State and Government Summit renewed their commitment to CAADP in January 2015 and launched the African Union Agenda 2063 with a goal of peace and prosperity for all peoples of Africa. And at the end of 2015, the world will reconvene in Paris to put in place the successor to the Kyoto Protocol, with climate change as the central issue. Mr. Bwalya highlighted the conference’s three sub-themes:

Theme 1: Strengthening Rural and Agricultural Infrastructure

Mr. Bwalya emphasized that it is a government’s responsibility to create an enabling environment for the development of rural and agricultural markets and that public financing is needed to catalyze development through infrastructure (water, roads, information and communication technologies, etc.) and to attract private sector investment. The United Nations estimates that US\$5-7 trillion dollars of investments are needed annually for critical infrastructure, especially in the developing world. Mr. Bwalya said that public-private partnerships must seek to balance profits for the private sector and investors with benefits for local communities in terms of human development.

Box 1.1: Climate Change Terms*

Adaptation: Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects.

Biodiversity: The total diversity of all organisms and ecosystems within an environment.

Climate change: refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.

Climate variability: refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events.

Extreme weather event: An event that is rare at a particular place and time of year

Mitigation: Technological change and substitution that reduce resource inputs and emissions per unit of output.

Resilience: The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Vulnerability: the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes.

**From the Synthesis Report Glossary of the IPCC Fourth Assessment Report, 2007.*

Theme 2: Expanding Financial Services to Rural Areas

Mr. Bwalya argued that rural communities need to increase employment opportunities, especially for youth and women, as Africa's rural areas are home to over 55% of the continent's population. In particular, policy changes are needed to move beyond the rhetoric of women's empowerment, toward real action to level the playing field and to facilitate women's access to financial services for rural and agricultural enterprise. Regarding finance for the environment, while some financial resources are flowing for clean energy initiatives, more funding is needed to support climate change adaptations and landscaping.

Theme 3: Improving Agricultural Production

Agriculture, forestry and land use changes cause approximately one third of global greenhouse gas emissions. To reduce this impact, a critical mass of farm households needs to convert to climate-smart agricultural practices. To encourage this change, the African Union Commission and Regional Economic Communities are collaborating with NEPAD on a number of initiatives to scale up climate-smart agriculture in Africa. For example, NEPAD has formed a Climate-Smart Agriculture (CSA) Alliance with a number of international non-governmental organizations (NGOs), including Catholic Relief Services (CRS) among others, who are committed to supporting climate-smart agriculture to spur economic growth and improve food security. These and other initiatives are needed to identify and scale climate-resistant crops that can tolerate conditions of extreme heat and salinity as well as drought and flooding.

II. Strengthening Rural and Agricultural Infrastructure

For this theme, a broad definition for rural and agricultural development infrastructure was used. For discussion purposes, during *Cracking the Nut 2015*, infrastructure included all the elements needed to create an enabling environment for rural and agricultural market development and access to finance. As a result, some of the lessons learned related to strengthening rural and agricultural infrastructure are geared toward governments and donors, while others focus on inputs and tools that can help private sector and development practitioners working to systematically strengthen rural and agricultural markets.

Lesson 1: National-level climate change assessments are needed, as well as land and water management plans

Participants largely agreed that their country has done some preparation in response to climate change, but that these responses are largely inadequate. Tetra Tech recently conducted a vulnerability assessment for USAID in Uganda, which highlighted the likely future impacts of climate change, including gradual increases in temperature and increased variability in weather patterns, more erratic rainfall and extreme weather events, such as flood and droughts. The assessment concluded that Arabica coffee will be the most impacted sector, because the specific growing conditions it requires will limit the places where it can be grown. The assessment also anticipates increased problems with pests and diseases for all crops and post-harvest handling difficulties for maize, an important staple crop. According to Doug Griffith, Chemonics' Chief of Party for the Feed the Future Uganda Enabling Environment for Agricultural Activity, "The climate change assessment is now being used as a tool to draw attention to public and private sector actors and to influence national climate change and other agricultural policies." Ideally, climate change concerns need to be embedded into national policies, especially related to land and water resource management.

Lesson 2: Local community aggregators can help reduce transaction costs, build on local knowledge and provide demonstration plots to encourage uptake of new climate-smart technologies

There is not a one size fits all model to providing agricultural inputs and new technology, but the package must be cost-effective and make sense for the local community. For example, USAID/Zambia's Production, Finance and Improved Technology Plus (PROFIT+) project is increasing smallholder revenues by working with private sector companies to offer holistic packages for climate-smart agriculture, including the appropriate combinations of inputs, technical assistance and access to finance (see Box 2.1).

Box 2.1: PROFIT+ Project Uses Community Aggregators to Link Private Firms to Smallholders

Based on its experiences in Ethiopia and Tanzania, ACDI/VOCA's strategy is to build long-term relationships with farmers through aggregation points that facilitate the flow of knowledge and inputs throughout its target value chains (oilseeds, maize and horticulture) in the Eastern province. Profit+ works to forge partnerships with large firms that have an interest in investing in smallholders, including large agribusiness wholesalers, processors and input suppliers.

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(...Box 2.1 continued)

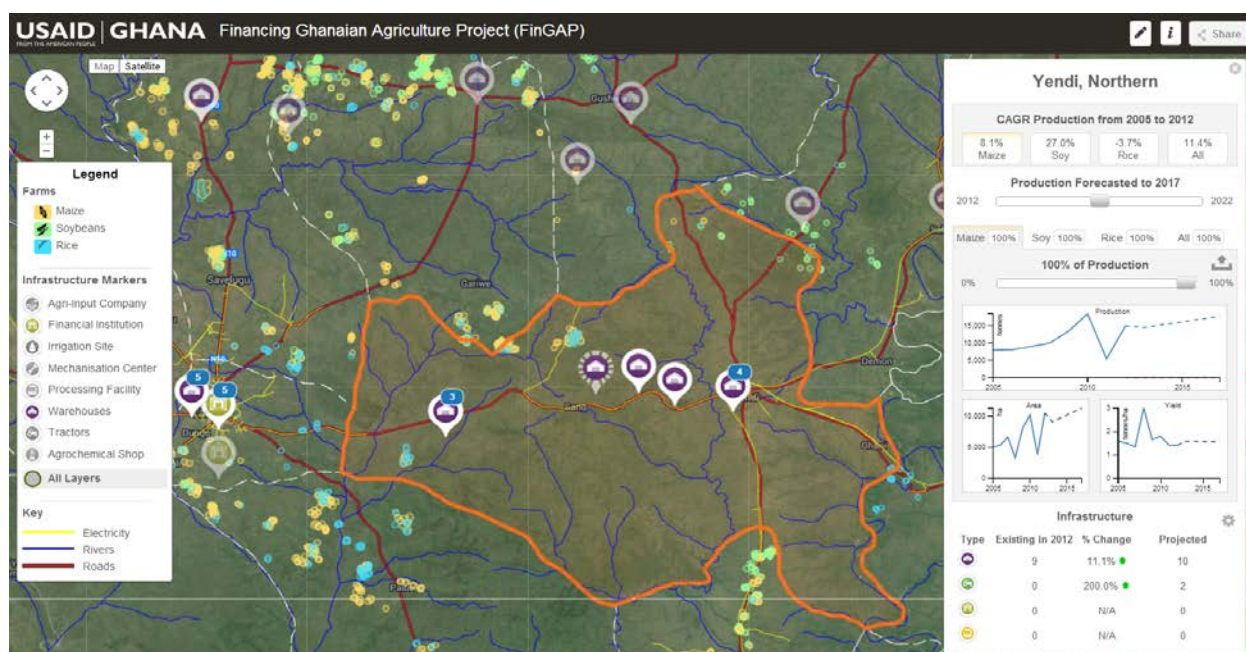
However, not all firms make good partners. It might not make sense to partner with a fertilizer distributor or pesticide deliverer, as they might only engage with the community once a year. Also, as Profit+ Chief of Party, Alex Pavlovic, explains, “Many retailers have expired chemicals for sale on their shelves” and have incentives more aligned with short-term sales rather than long-term relationship building. They look to work with partners who are committed to increasing smallholders’ production and income. Only with this level of commitment and frequent interaction with the community can a Community Agro-Dealer (CAD) be trusted to promote the use of new crops, hybrid seeds or technologies. One Profit+ partner, Jungle Beat, a peanut and processing company that sells peanut butter to South Africa, has worked effectively with the CAD network to distribute seeds to rural communities. To ensure an adequate source of quality peanuts, Jungle Beat does not offer the option to pay back in cash, but requires payment in groundnuts. By demonstrating that farmers can make 40% more money growing peanuts than maize, it is easy to convince farmers to diversify away from the traditional mono-crop, maize. Other aggregation models include franchise models for selling inputs, micro-consignment for drip irrigation and purchasing, processing or marketing groups, whose members work together to achieve economies of scale. Private sector partners benefit from working with Profit+, as it facilitates their entry into rural communities and working with smallholders. Emmanuel Mbewe from Cargill explains that they look for aggregation models that can help to guarantee a community’s ability to consistently respond to demand. To encourage private firms to work toward gender equality, the project uses a “Gender Clock,” which raises awareness of women’s schedules before suggesting behavior changes or setting regular meeting times to make sure they work for women, as well as men in the community.

Lesson 3: Geospatial mapping of current and potential crop production can facilitate investment in agricultural value chains and their supporting infrastructure

In many developing countries, rural and agricultural development is hindered by a lack of supporting infrastructure. Often agribusinesses complain that they have no funds to support infrastructural investments, while lenders/investors claim there is a lack of “bankable” agricultural projects. As USAID/Washington Senior Advisor, Lawrence Camp, explains, modernizing agricultural value chains requires long-term investments, yet the risk and transaction costs associated with researching investments in rural areas can be a deterrent to lenders and investors.

USAID’s Financing Ghanaian Agriculture Project (USAID-FinGAP), managed by CARANA Corporation, has designed a number of tools to bridge this disconnect that hinders agricultural finance, especially for its target value chains (soy, maize and rice) in northern Ghana (see Box 2.2).

One of the tools developed by USAID-FinGAP is the Investment Opportunity Map (IOM). This investment mapping software application, developed with the support of Nautilytics, allows prospective investors to forecast *when and where* infrastructural investments will be needed based on agricultural production projections and detailed descriptions of on-the-ground capacity (see Figure 1).

Figure 1: USAID-FinGAP Investment Opportunity Map

The Investment Opportunity Map brings together geo-spatial data and production forecasts to spur future agricultural investment. As a web-based application, the IOM is accessible even in low bandwidth regions. The system maps the location and capacity of a broad range of value chain actors, including commercial farms, input companies, business advisory services, irrigation, mechanization centers, processing facilities, warehouses, tractors, haulage stations and financial institutions. These data are furnished principally by the local government, universities, and by USAID implementing partners. Users can make different production and investment predictions by region, value chain and investment type. The system allows users to predict agricultural production volumes by district up to the year 2023. Projections can also be adjusted for climatic variations, such as a shortage of rainfall. Harnessing crowd-sourced data allows the system to be continuously updated. For example, after visiting a warehouse, a user can send a message to the administrator with an update about its condition and functional capacity. This allows the tool to be updated in real-time with spatially-relevant data. As Dominic Ansah of Connexus Corporation explains, USAID-FinGAP's partner financial institutions (PFIs) can use this mapping tool to identify clients and potential investments in specific value chains, and to assess potential competition.

Box 2.2: USAID-FinGAP's Approach to Facilitating Finance for Value Chains and Infrastructure

In just 1.5 years, the USAID-FinGAP project has facilitated over US\$10.5 million of finance and investment to a wide range of actors in the soy, maize and rice value chains, including loans for machinery and equipment, infrastructure and processing upgrades in northern Ghana. The project addresses both the supply and demand challenges that hinder improved access to private finance among agribusinesses. On the demand side, USAID-FinGAP uses a facilitation approach to expand access to finance to agribusiness actors, by enticing local business advisory service providers to serve agricultural small, medium and large enterprises by packaging loans and investments for these actors in ways that address the concerns of the partner financial institutions (PFIs).

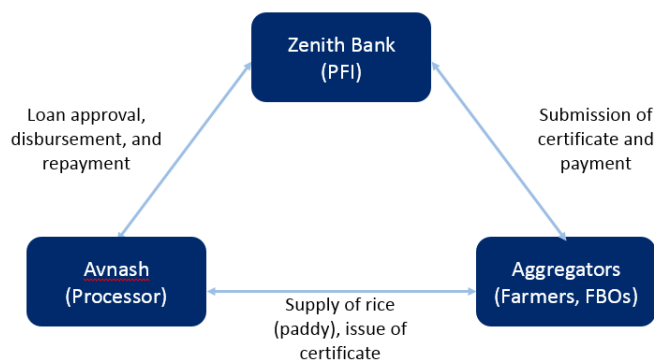
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(...Box 2.2 continued)

On the supply side, USAID-FinGAP uses “smart subsidies” to stimulate expanded finance to Ghanaian agriculture: challenge grants worth US\$1.3 million were recently awarded to 14 PFIs that will leverage the release of US\$31.4 million in new, private capital to Ghana’s agribusiness actors over the course of one year. USAID-FinGAP, through its subcontractor, Connexus Corporation, also provides technical assistance and training to PFIs in the areas of agricultural value chain finance, risk management, and agricultural finance product design, and portfolio monitoring and management.

Also key to USAID-FinGAP’s approach is demand-driven technical assistance to PFIs to increase their willingness and ability to lend to agribusinesses. With technical assistance from Connexus, USAID-FinGAP recently helped Zenith Bank design its first agricultural loan product. As highlighted in Figure 2, a tripartite financing model was developed whereby Zenith bank provides a line of credit to address farmers’ short-term cash flow needs, while securing supply of rice to the processor, Avnash. After receiving the rice, Avnash reimburses Zenith directly, reducing risks for all value chain actors while strengthening their competitive edge. This tripartite financing model can also be used to support the expansion of rice storage facilities as the value chain expands over time.

Figure 2: Tripartite Financing Model



Lesson 4: Shared value can be created by encouraging responsible farming, production and consumption throughout the value chain

Private firms are increasingly investing in agricultural value chains, not only to ensure access to sufficient quality and quantity of supply, but also to demonstrate their commitment to climate-smart agriculture and fair treatment of smallholders. In Kenya, for example, Nestlé supported the “NESCAFÉ Plan” to promote a responsible coffee value chain from production to consumption. Box 2.3 demonstrates how private sector investments can be used to increase production and revenues, while protecting the natural environment.

Box 2.3: Coffee Management Services Improves Quality and Sustainability of Coffee in East Africa

An agribusiness service provider, Coffee Management Services Ltd (CMS) offers farm management services to the coffee industry in East Africa, which is one of the most negatively impacted agricultural value chains by climate change. A recent assessment in Kenya found that as temperatures increase as a result of climate change, coffee farmers will need to move to higher altitudes and make other adjustments to avoid the extinction of Kenya's coffee production by 2050. Under the NESCAFÉ Plan, CMS worked with nine cooperatives, representing 23,000 active farmers, to improve their agronomic practices through its extension services and trainings. In addition, CMS hired six agronomists, set up 27 demo plots and nine seedling nurseries, supplied 238,593 seedlings and developed 745 lead promoter farmers to disseminate training and best practice information. Nestlé guarantees a premium price if its coffee standards are met, which include 4C verification (common code for coffee community). By introducing new climate-resistant coffee varieties and improved practices (e.g. soil analysis), CMS helped to increase production from 4.8 million kg to 14.1 million kg and premium grade coffee increased from 18,000 to 30,000 bags over three years. In addition to increasing coffee production and revenues, the NESCAFÉ Plan helped to reduce the use of chemical fertilizer, improved soil conservation and expanded shade tree coverage.

Lesson 5: Local seed systems and security are needed to promote crop resilience and reduce vulnerability amid climate variations

Agricultural assistance often seeks to accelerate farmers' recovery from crises, such as drought and flooding. Often this assistance is in the form of emergency seed aid distributed by NGOs, governments, and international agencies. Emergency seed interventions are widespread with the FAO alone reporting spending of US\$358 million on emergency operations in 2007, of which US\$93 million was directly tied to seed distribution. Unfortunately, seed system problems are often treated as acute (short-term, crisis-driven) when the problem is actually chronic (long-term, systemic issue). For instance, Ethiopia has received seed aid at least 35+ years in a row (supposedly in response to drought) when the real problems are more systemic and longer-term. Such fluctuations are likely to continue with global warming and climate change. However, more refined analysis is needed.

Seed system security assessments look at the function of all seed channels, if seed is available, if farmers' are able to access it and if the quality meets producer and consumer preferences. Note that different seed channels might be affected differently by stresses—so in the case of war in Rwanda, for example, private sector input supply (for potatoes) broke down while local markets provided ample amounts of bean. Louise Sperling of Catholic Relief Services (CRS) noted that it is important to avoid stereotypes: a production shortfall (like during a drought) does not necessarily equal a seed shortage. Also, the intervention needs to be tailored to the goal of seed system support. Different approaches are needed depending on whether the goal is to link relief to development efforts, to expand commercial offerings of seeds, or to increase food variety and improve nutrition.

CRS has found the use of seed fairs and vouchers to be very helpful to address problems of farmer access in the short-term. For more chronic stress, especially tied to under and malnutrition, CRS has developed a new and more refined response, called fairs for Diversity in Nutrition and Enhanced Resilience (DiNERS), as described in Box 2.4. Ultimately CRS and partners are looking to strengthen all the seed systems farmers use (formal and informal), on a more sustainable basis. Concrete suggestions for making the formal sector more responsive to smallholder farmers included:

1. Encourage agro-dealers to expand to more rural areas;
2. Expand type of outlets – mom and pop stores can be as important as large commercial retail outlets;
3. Package for the very poor in small packets. For example, a cow pea distributor was having difficulty selling seeds at a seed fair until they repackaged into smaller packets for farmers to try;
4. Invest in transfer of information and feedback, especially as related to new crops and breeding; and
5. Invest in storage facilities, to ensure that seeds maintain their quality and do not mature too quickly.

For practical guidance and strategic input on designing seed-related interventions, see the CRS and partner website at <http://seedsystem.org>.

Box 2.4: CRS Seed Fairs Increase Availability and Access to Diverse Seed Supply in Zambia

On its USAID/Zambia Mawa Project, CRS piloted 11 DiNER seed fairs, providing access to improved seeds to 4,223 households in 11 sites. CRS began this initiative with a seed system security assessment, which found that 95% of seeds were for maize, cotton and groundnuts, and concluded that there was a need to promote diversity of crops and varieties to improve nutrition. By offering households US\$40 vouchers to purchase seeds at the DiNER seed fairs, CRS invited local and commercial agro-dealers to sell a broad variety of crops and seeds, while offering seed nutrition education sessions on the side. In 14 days in September 2014, these 11 fairs reported US\$190,322 of seeds sold, of which US\$21,642 was through cash purchases. CRS was pleased with these results, but more importantly, an analysis of the data collected found that a wider diversity of seeds was supplied and purchased than previously had been available. While half of the seed purchases were for maize (which the government buys), the other half was very diverse, including many varieties of vegetables that could be used to improve food security. Interestingly, the data showed that men were more likely to prioritize cash crops while women prioritized home consumption needs. The main drivers of the seed purchases were for “income offset” and “novelty.” The seed fairs also helped to raise awareness of the role of government seed control and certification, as government inspectors were there to ensure transparency of which seeds were certified and which were not. Often the inspectors required seed sellers to re-sort their seeds to improve the quality of seeds they were offering. To make more seeds available, however, seed certification bottlenecks need to be addressed.

III. Expanding Financial Services to Rural Areas

Access to adequate financial resources to protect and amplify commercial investments is a critical issue for any business. However, many small businesses around the world, especially smallholder farmers in rural areas, lack this necessary capability. This is a result of the elevated risks (both perceived and real) and the high costs of serving rural farmers and other agricultural enterprises. As Greg Snyders of Dalberg pointed out, increasing demand for food, compounded by unstable production as a result of a changing climate, creates an increasing need to integrate the estimated 450 million smallholder farmers globally into agricultural value chains. This section focuses on several strategies that development partners and financial institutions are implementing to overcome the challenges associated with expanding access to finance for rural areas.

Lesson 6: To attract private investment to rural areas, governments should harmonize planning with commercial interests

At the recent Rio+20 “Earth Summit” in 2012, government leaders around the world agreed that future economic development must be tied to investments in a green economy. While government climate change-related policies can sometimes scare off private investors, in Rwanda, government support for rural infrastructure and appropriate incentives has helped to attract significant “green investments” in rural areas, including US\$600 million by Erasmus International in agricultural-related investments (see Box 3.1).

Box 3.1: Erasmus International’s Green Investments in Rwanda

Based on its successful approach to increase food production and fisheries through US\$1.5 million of investment in Macedonia, Erasmus International is now adapting its approach to supporting rural and agricultural development in Rwanda, in close coordination with the Government of Rwanda. Erasmus has a long-term approach to investment, which includes partnering with local firms to expand their debt and equity investments, the returns for which remain in the target country. Through this unique approach, Erasmus is investing US\$15 million in an organic fertilizer factory, US\$110 million in a solar farm and US\$295 million in solar-powered irrigation. Erasmus is also investing in “Green-Smart Villages” that will demonstrate their ability to contribute to food, water and energy self-sufficiency through the reduction of wood-fuel consumption and the use of biogas and other technologies. These villages will harvest rainwater and increase yields and income, using organic fertilizer from biogas sludge bi-products and climate-smart agricultural practices.

As Innocent Rutamu of Erasmus International explained, “Whenever possible, nations should not choose between the environment and prosperity.” He argues that large investments in agriculture, if done sensibly, can “provide incentives for sustainable management of water, livestock, forests and fisheries.” The Rwandan government gives priority for its infrastructural investments to areas where private investment is committed, improving rural roads, energy grids and water supply. The Government of Rwanda has offered tax incentives, export support and technical input to encourage private investors to invest in different sectors that expand markets, revenues and competitiveness. For example, preferential tariffs for investment in strategic export crops, such as coffee, tea, pyrethrum and horticulture, have encouraged private investment in processing plants. These processors not only provide a market for Rwandan agricultural products, but also add value within the supply chain and make the end products more competitive. Thanks to significant investments in private coffee washing and processing plants Rwandan specialty coffee is now in high demand and commands a price premium.

Lesson 7: Microinsurance can help to mitigate the negative impacts of natural disasters resulting from climate change

As a risk-financing instrument, microinsurance can play an important role in disaster risk management. When Typhoon Haiyan hit the Philippines with some of the highest wind speeds ever recorded on land (313 km/hour), the microinsurance industry was able to demonstrate just how important it can be in helping low income communities recover from damages, which totaled approximately US\$1.8 billion. The devastation caused by Typhoon Haiyan was predominantly a result of the “storm surge” that followed, which was responsible for the majority of destruction to property and loss of lives.

It wasn't only the relatively high penetration of microinsurance that helped to mitigate the negative impacts on the poor, but also how the government and private sector responded swiftly to ensure insurance claims were paid (see Box 3.2). As Manoj Paney of the MicroInsurance Network explains, “Claims are the moment of truth for insurance.” Following Typhoon Haiyan, 111,000 out of 126,363 claims were paid; almost all of which were calamity claims, covering property damages. With the average claim payout of only US\$108 and the majority of the insurance had been provided as a product bundled with microfinance, a total of US\$12 million of microinsurance was paid out.

Box 3.2: Swift Response to Typhoon Haiyan Mitigates Negative Impacts in the Philippines

A study by the MicroInsurance Network, *Aiding the disaster recovery process: the effectiveness of microinsurance service providers' response to Typhoon Haiyan*, highlights the important role that the Philippine government regulators and private insurance providers played in facilitating the flow of funds to the most impacted areas, resulting in 60% of all claims paid within four months of Typhoon Haiyan. The Philippines has the highest microinsurance coverage ratio in Asia, with 19.95 million lives covered. This high coverage was due in part to government regulators actively promoting the expansion of the microinsurance industry by integrating microinsurance into the microfinance regulatory framework, reducing capital requirements from 125 million pesos to 5 million pesos and educating clients about microinsurance (with funding from GIZ). They also relaxed licensing requirements for microinsurance agents and allowed for faster claims settlement. When Typhoon Haiyan hit, it was logistically challenging to reach affected areas, both client and insurance company records were lost and banks closed, which limited access to cash at a time people were desperately in need of clean water, food and shelter. The regulators moved quickly to coordinate efforts by creating claims action centers where one could go to process a claim regardless of insurance company or type. Protocol was relaxed, for example, instead of requiring a death certificate from a doctor, names listed on the government casualty list were sufficient. In addition, regulators allowed for some in-kind payments for temporary shelter and food, in lieu of cash. And insurers were allowed to use satellite data for rapid mass evaluation of the eight regions impacted by the Typhoon. The insurance companies also relaxed protocol, allowing a moratorium of up to 90 days to make back payments owed on insurance premiums. Many insurance companies facilitated rapid claims payment, including cash transfers through cell phones. By being so responsive at a time of crisis, the microinsurance industry has since seen an increase in new policy owners, especially among those who did not have microloans in the past, and should be even better prepared to respond to the next natural disaster.

Lesson 8: Education, access and experience instill appreciation on behalf of smallholders for weather index insurance products

In an era of rapid climate change, the need for mechanisms for small farmers to guard against weather-related catastrophes remains an important development challenge. Insurance products can be part of the answer to this challenge. In Zambia, MicroEnsure's pilot of weather index insurance (see Box 3.3), in partnership with NWK Agriservices, Musika and the Financial Sector Deepening Zambia (FSDZ) Project, has found that there are three key ingredients to introducing microinsurance products:

1. **Education** – Consumers need to be educated on the benefits of insurance, as well as on how the products work. Preliminary results from MicroEnsure's rollout show that consumer education needs to be continual; one time education sessions are not sufficient;
2. **Access** – Bundling insurance products with sales contracts is one way to improve access for smallholder farmers and to build a loyal supplier base;
3. **Experience** – The demonstration effect is very strong with new insurance products, and FSDZ and Musika noticed a direct correlation between areas where payouts were made and subsequent uptake and demand for additional products.

Box 3.3: MicroEnsure's Entrance into Zambia's Rural Microinsurance Market

In 2014, MicroEnsure established itself in Zambia with a catalytic grant from Musika. One of the first products MicroEnsure designed was the FarmerShield life and weather insurance product in conjunction with NWK Agriservices, an agribusiness which operates a cotton out-grower program that engages 100,000 smallholder farmers and has diversified into input distribution and commodity storage and trading. Faced with problems of farmer loyalty and side-selling, NWK partnered with MicroEnsure to offer weather index and life insurance to its farmers. The companies planned to build weather stations across Zambia to record weather events, but faced with high construction and operation costs, they decided to use satellite imaging to monitor regional weather. Prior to its first season of operation in 2013-14, 6,610 farmers signed up for weather index insurance, covering 7,600 hectares.

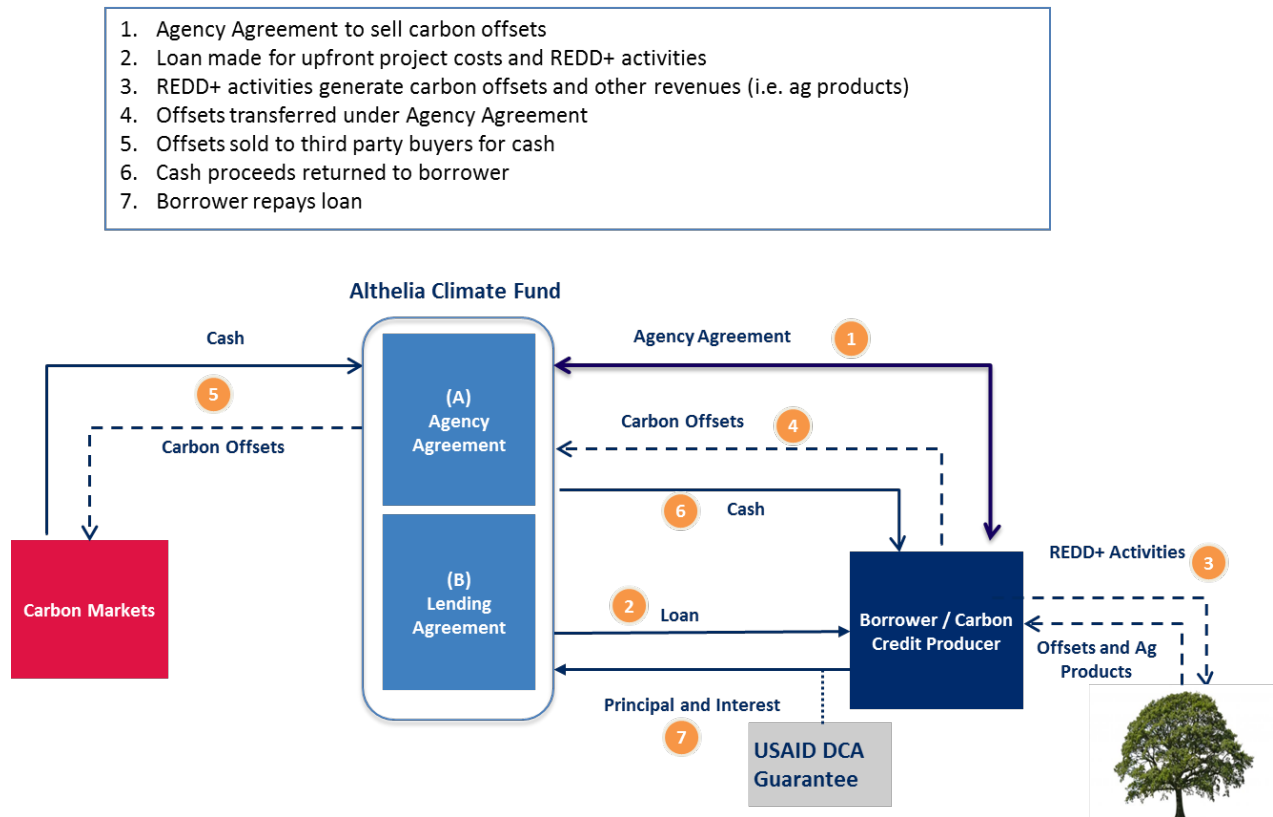
This particular weather index product was designed so that benefit payouts were modeled on the impact of various climatic events, such as drought or floods, on cotton yields. Data was collected at a local level and benefits were automatically paid out if the weather event crossed the predetermined level of severity. As an illustration, if total rainfall for a region in a certain season fell below MicroEnsure's predetermined level of what would be considered a drought, then payments were distributed to farmers to compensate for their statistical losses.

In 2014, weather events occurred triggering US\$42,000 of pay-outs, thus demonstrating the value of the product in its first season. Furthermore, the FarmerShield life insurance product covered a total of 25,165 farmers' lives with a gross written premium of US\$5,536. The net loss ratio for this product was 48%, which is a positive outcome for a life microinsurance product and attracted even further demand from farmers to cover additional lives in their households. As a result of this coverage, farmers valued both the weather index and life insurance products and they appreciated both the direct (e.g. claim pay-outs) and indirect (e.g. integration into the value chain) benefits of the insurance products. NWK has noticed a positive impact on its business with increased deliveries and reduced side-selling (pending final conclusions of this pilot study), and the products are expected to be sustainable and profitable for the insurers and reinsurers. From this initial product with NWK Agriservices, MicroEnsure is diversifying its product offerings to rural Zambians, which is vital for the development of rural Zambian financial markets.

Lesson 9: Loan guarantees and other credit enhancement mechanisms can unlock private capital and allow for increased private sector investment in climate-smart agriculture

To catalyze large amounts of private investment into projects that yield high social, environmental and economic returns, USAID’s Development Credit Authority (DCA) guarantees are being used by Althelia Climate Fund, a Luxembourg-based impact investment fund, to raise more capital and scale its lending. By guaranteeing US\$4 million of Althelia’s overall loan portfolio, the DCA has been able to help Althelia raise more capital and scale its lending to a total of over US\$120 million. Althelia selects investments in developing countries based on their adherence to Reducing Emissions from Deforestation and Forest Degradation (REDD+) principles, investing in conservation projects that simultaneously provide alternative livelihoods to local residents (see Box 3.4 for an illustration). The income generated from these alternative activities, in addition to the revenue from the sale of certified carbon offsets, is used to pay back the loans to Althelia. To reduce the risk to private investors, the DCA attached its guarantee to Althelia’s portfolio of loans, as seen in step seven in Figure 3 below, covering up to 50% of the losses of any individual non-performing loan. By stepping in and reducing the total potential losses, the DCA guarantee effectively reduces the risk on behalf of each individual investor, and makes the investment portfolio more attractive overall.

Figure 3: USAID DCA Guarantee to Althelia Climate Fund



Box 3.4: Althelia Invests US\$6.5 million in Tambopata REDD+ and Agroforestry Project in Peru

Alongside US\$6.4 million from grants and co-financiers, Althelia invested US\$6.5 million in the Tambopata REDD+ and Agroforestry Project in Peru. The goal of this project is to protect standing forest and to restore degraded lands through agroforestry for cocoa production purposes. Tambopata National Park represents 570,000 hectares (ha) of tropical forest with some of the most biologically diverse fauna and flora in the Amazon. It currently loses in excess of 2,000 ha of pristine forest every year due to a progression of illegal timber and unmanaged slash and burn agriculture. The Association for Research and Integral Investment (AIDER), a well-established, local non-governmental organization, has been awarded a 20 year conservation concession from the government to implement a conservation and economic development plan achieving: direct protection of the core conservation area of 570,000 ha; and, the implementation of 4,000 ha of certified cocoa to redirect the deforestation trend and provide alternate livelihoods for 10,000 community members. Furthermore, the investment is projected to reduce CO₂ greenhouse gas emissions by 4,000,000 metric tonnes through avoided deforestation through 2020. The US\$12.9 million initial investment in capital expenditures and operating costs is projected to yield a total of US\$50 million in revenues over the life of the project.

Lesson 10: Mobile technology can help agribusinesses and farmers respond to rapidly changing market dynamics and to access finance

As mobile technology continues to penetrate rural communities, agricultural value chain actors can benefit from the increased transparency and information flows that mobile telephones and the internet have created. Innovations in mobile technology have helped farmers to access much needed information and financing, and financial institutions have benefited from reduced risk and transaction costs since these innovations remove cash transactions from the field (thereby reducing the risk of theft and fraud) and increase communication and transparency between the institution and the client. Realizing the benefits of mobile technology and the importance of finding the right partners and channels that connect financial services with value chain partners, leading development organizations – including TechnoServe, Grameen Foundation and Opportunity International – are piloting and scaling new mobile technology platforms (see Box 3.5).

Box 3.5: Innovations in Mobile Technology Expand Rural Access to Finance

Innovative Mobile and Agricultural Finance Solutions. TechnoServe is working in a public-private partnership with Vodafone and USAID in Kenya, Tanzania and Mozambique to allow agribusinesses to engage more effectively with their smallholder suppliers. “Connected Farmer” is a cloud-based agriculture application that harnesses the M-Pesa platform to allow real-time, digital transactions with 8,400 registered farmers. Transactions that were previously cash-based and tracked via paper can be moved onto the platform, allowing all loan payments to be completed with M-Pesa, and all transactions to be tracked digitally. It removes cash from the field and greatly increases the transparency and visibility for management into field operations via real-time reports. So far, US\$132,000 has been disbursed to farmers via M-Pesa, facilitating the growth of mobile finance. The platform allows for easier management of farmer data, which enables better business analytics. The resulting increase in communications with farmers via one-way and two-way SMS messages builds farmer capacity and increases loyalty.

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(...Box 3.5 continued)

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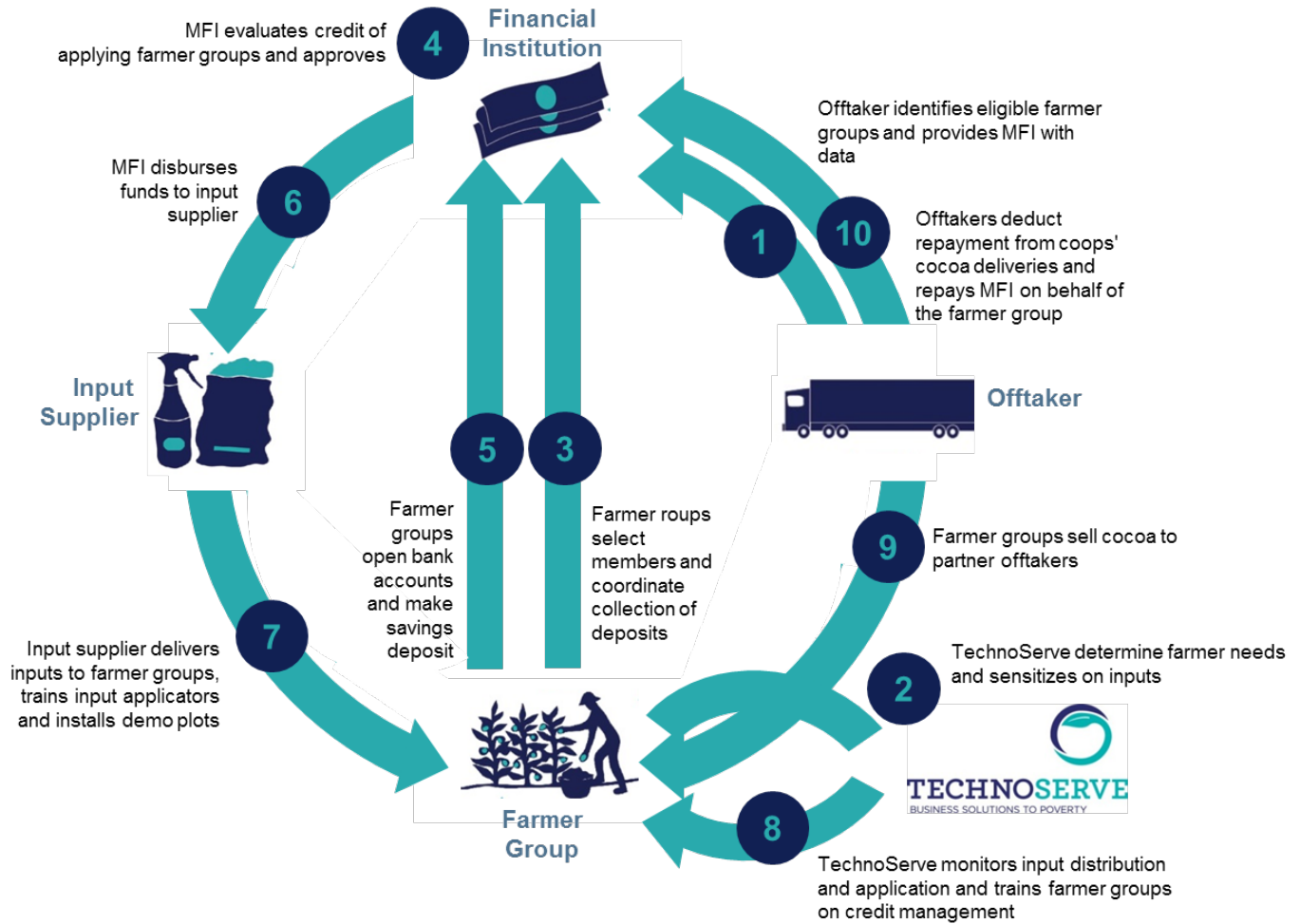
eWarehouse. The Grameen Foundation has been using mobile technology to reduce costs for access to markets via an “eWarehouse” in Kenya. This digital platform is designed for unorganized farmers to have increased access to a digital warehouse receipts system. Farmers are able to produce a crop and store it at their farm. Using the eWarehouse platform, farmers are able to have two-way communication with banks to share quantities and qualities of stored goods. Banks can then provide short-term (i.e. 2 months) loans for up to 50% of the prevailing market prices of the goods stored. Buyers are also allowed to access the system and can see how much and where goods are stored. When goods are purchased, the eWarehouse platform pays the bank, then the farmers. Grameen built the technology platform, which increased transparency and reduced costs of extension services and monitoring.

Mobile Money and Branchless Banking. Opportunity International (OI) firmly believes that mobile money and branchless banking technologies offer the biggest potential in terms of sustainability for the bank and the farmer. Currently, OI is utilizing a tablet- and mobile-based application called Mobile Enterprise OpenSky to prospect, finance and monitor smallholders receiving financing from their financial institutions outside of bank branches. By using these technologies, OI is able to help reduce the reliance of these rural areas on physical paper money and increase the flow of cheaper and quicker digital transactions. Mobile money allows for bulk payments to farmers—not just during production cycles, but during the marketing phase as well.

Lesson 11: Aligning the incentives of actors throughout the value chain can open up new pathways for financing that benefit all parties

TechnoServe is working with cocoa farmers in West Africa to implement a creative financing mechanism that leverages existing relationships in the cocoa value chain. Jessica Antista of TechnoServe explains, “We’ve established that there is a strong market opportunity here. Inputs seem to be the strongest lever and we need to provide credit to access these inputs.” TechnoServe works with cocoa buyers, input suppliers and farmer cooperatives to establish tripartite relationships with microfinance institutions (MFIs). By using existing relationships between farmer cooperatives and buyers, TechnoServe can lessen the risks MFIs face when working with the agricultural sector, as seen in Figure 4.

Figure 4: TechnoServe Tripartite Financing Model



TechnoServe has realized a 100% repayment rate by cooperatives in Côte d’Ivoire and a 97% repayment rate in Ghana over the four year period they have used this mechanism. However, one of the biggest barriers to scaling is the general lack of organization on behalf of most farmers – only 20% of cocoa farmers in Côte d’Ivoire belong to cooperatives. Another barrier to scaling is the difficulty farmers face in setting aside adequate savings with a local MFI. (Farmers are required to deposit 10-15% of the value of the loan, averaging between US\$200 and US\$250, before the loan is disbursed.) As mobile technology platforms become more prevalent in West Africa, TechnoServe sees an opportunity for quicker scaling of this method across the region.

IV. Improving Agricultural Production

Improving agricultural production amid climate change will require commitment from all the actors in the supply chain in order to deliver the technologies, inputs and services needed to increase sustainable production, improve soil quality and increase farmer resiliency. To achieve these objectives, lead firms will need to develop innovative partnerships and delivery models and transform the way their supply chains operate based on best practices in conservation. According to the FAO's definition, *conservation agriculture* is “an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment.”² While conservation agriculture forms the basis for climate-smart agricultural production, as Geoffrey Heinrich of CRS wisely stated, “We need to move toward *regenerative agriculture*,” which implies returning soil, water, forests and wetlands to a healthy, balanced state.

Lesson 12: Private sector brands are recognizing the business case for protecting the environment

What started as a fringe, pro-environment strategy by brands such as Ben & Jerry's and Green Mountain Coffee, environmentally sound business is becoming mainstream as more consumers seek to purchase from companies that pursue a triple bottom line incorporating economic, social and environmental benefits. More recently, many businesses are recognizing that their supply chains are vulnerable if they rely on unsustainable production and practices. In addition, consumers are concerned about the treatment of small farmers and environmental protection. Thus, businesses see the importance of improving sustainability of supply chains to grow their businesses and maintaining quality production to retain their markets. To achieve this, private sector companies are partnering with a wide range of stakeholders including governments, donors and development organizations to ensure that sustainable and climate-smart practices are applied all along the supply chain, including at the source with smallholder farmers (see Box 4.1 for an example from Syngenta).

Box 4.1: Syngenta Partners for Good “Climate-Smart” Growth

Globally, Syngenta is implementing a program called the “Good Growth Plan” in which the main objective is to improve productivity by 20% without using more land, water or inputs by 2020. The three pillars are: 1) Technology, 2) Skilled workforce and 3) Technology transfer through extension.

The Good Growth Plan is broken down into six key commitments:

1. Make crops more efficient;
2. Rescue more farm land;
3. Empower smallholders;
4. Help biodiversity flourish;
5. Help people stay safe; and
6. Look after every worker.

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² <http://www.fao.org/ag/ca/1a.html>

(...Box 4.1 continued)

In Zambia, Syngenta has developed distribution models to reduce the distance to inputs for small-scale farmers and to facilitate the transfer of technologies to increase productivity. Syngenta has partnered with key stakeholders and has established ten regional depots from which distributors access these technologies at wholesale prices. It also offers inputs and technical assistance on agronomic practices to farmers through Community Agro-Dealers (CAD) in communities where there are no stockists and agro-dealers. Syngenta trains these distributors on finance, safe use of products and agronomy to ensure that community agro-dealers and farmers get the maximum benefits from the inputs they sell and can grow their businesses. This is one way of shortening the distances to access improved technologies for enhanced productivity. This also ensures that farmers have access to better technologies and inputs.

In line with this trend, Tropical Forest Alliance 2020 is a growing global partnership of over 40 government, business, and civil society partners committed to reducing commodity-driven tropical deforestation by the year 2020. To maximize effectiveness and deliver tangible results, Tropical Forest Alliance 2020 focuses on the following measurable actions:

- Protect tropical forests, with particular focus on South East Asia, Central and West Africa, and Central and South America;
- Target four key commodity value chains (palm oil, soy, paper and beef); and
- Prioritize actions that have the greatest potential to deliver results at scale.

Achieving the goal of Tropical Forest Alliance 2020 will require concerted efforts between “a broad set of stakeholders,” according to Dr. Lexine Hansen of USAID/Washington. As population and demand for food increases, “forest land may become more profitable if converted into agricultural land, thus reducing the natural capital, carbon, and biodiversity values of the original forest,” which, Dr. Hansen argues needs to be factored into project planning. In Zambia, Deuteronomy Kasaro, of the Inter-Ministerial Climate Change Secretariat, is charged with implementing the national strategy to reduce deforestation and forest degradation. Mr. Kasaro echoed the importance of providing incentives to smallholders to improve productivity without cutting down forests to expand agricultural lands.

There has long been a call for more public-private collaboration in developing sustainable, traceable and resilient supply from agricultural supply chains. Ben & Jerry’s, supported by CRS, offers a good example of this type of collaboration in action. For many years, CRS has been a leader in providing farmer support services. They have leveraged their extensive network of service providers to deliver targeted support to farmers to meet the quality standards demanded by Ben & Jerry’s for the ingredients that go into their high-end ice cream. In line with Ben & Jerry’s “value sourcing” strategy, CRS has used this collaboration as an opportunity to push forward short and long-term farmer development strategies (see box 4.2).

Box 4.2: Ben & Jerry's Brand Loyalty Starts with a Strong Commitment to Climate-Smart Agriculture

Ben & Jerry's has built strong brand loyalty for its specialty ice creams through its long history of "value sourcing," which includes responsibly-sourced packaging and purchasing ingredients from farmers that practice sustainable agriculture. Ben & Jerry's focuses on developing loyal, long-term relationships and partnerships, based on a solid understanding of farmer profiles and their ability to meet requirements of quality and scale. Last year, side selling in Uganda left Ben & Jerry's scrambling to source high quality vanilla that matched its traditional flavor. As a result, Ben & Jerry's is looking to level the playing field by incentivizing farmers to stay loyal, reinforced by a new commitment to only buy fair trade and non-GMO ingredients. Ben & Jerry's commits to a minimum price in advance and pays a fair trade premium (usually 15% of market price) to farmers without allowing mark-ups to be passed on to the end consumers. Ben & Jerry's also helps farmer households to receive health insurance and funds for schooling. As Ben & Jerry's expands in Africa, it is looking to build additional long-term relationships to source vanilla and cocoa, two of its primary ingredients.

Lesson 13: Farm advisors are needed to link modern agro inputs and services to the first mile of supply chains

Extension services are an effective method for reaching farmers with the necessary technical assistance and inputs for improved agricultural production. Modern supply chains are demanding a new level of production capacity with the potential to transform a subsistence farming operation into a market-driven agribusiness. Delivering these modern agro inputs and services requires a market-based approach to reaching farmers at the first mile of supply chains. To meet this challenge, networks of service providers need to deliver a variety of inputs and services up and down the supply chain, motivated by sales and commissions paid through increasing the quality, quantity and the reliability of agricultural production. Reliability of agricultural production is not only important to meeting the demands of consumers, it is also an indicator of the overall health of a farming sector and its ability to sustain the shocks of external factors, such as climate change.

For example, International Development Enterprises (iDE) has developed a market-based approach to delivering modern inputs and services to the first mile of agricultural supply chains through networks of Farm Business Advisors (FBAs). FBAs are paid commissions, driven by sales of inputs and equipment, as well as the facilitation of finance. FBAs also provide advice to farmers, helping to improve their success as a farmer, making them a more reliable driver of future commissions for the FBA. What is innovative about the FBA approach is the commissions are paid 100% by the input and service providers to drive sales. This system works when there is a profit motive working throughout the system including the end users, i.e. farmers. The iDE FBA system works exceptionally well in fragmented supply chains, which have traditionally been the hardest to reach with modern inputs and services. Major companies, such as Syngenta and Toro Company, are now using FBA networks to sell their products to the farmers in the first mile of agricultural production (see Box 4.3 on the Toro Company).

Box 4.3: The Toro Company Targets Smallholder Markets for Micro-Drip Irrigation

Eduardo Mendías explained that historically, Toro Micro-irrigation, a division of The Toro Company, has been a supplier to large commercial farmers, but realized that even some smallholders were benefiting from its Micro-irrigation technologies. In fact, Toro found that smallholders can reduce their use of water by one third and their labor to one fifth with its drip irrigation systems, when compared to traditional hand watering. So, it partnered with iDE and applied for a USAID-funded “Partnering for Innovation” grant to develop smallholder drip irrigation kits that would be better designed to meet smallholder needs, including technical assistance to ensure smallholders received the maximum benefits and would become repeat customers. Toro found that technical assistance and farmer support were important for ensuring success and that when supported, villages and townships will get behind the technology, highlighting its value to others through demo plots and volume purchases. According to Mr. Mendías, the Toro Company is now looking to “to leverage other innovations made at the top of the pyramid to work more effectively at the bottom of the pyramid” and now sees the value of the smallholder market.

Lesson 14: Conservation agriculture is a necessary evolution to adapt to and thrive in changing climatic conditions

Small farmers need to adapt to the effects of a changing climate to sustain their livelihoods. However, to reverse the negative effects of both climate change and bad agricultural practices requires regenerating soils and ground cover, using enhanced conservation agriculture techniques and rigorous soil monitoring systems coupled with a market proposition that can help farmers absorb the associated costs. Development practitioners including NCBA/CLUSA and Concern Worldwide (see Boxes 4.4 and 4.5) have extensive networks of farm advisors developing and extending the use of conservation agriculture techniques to smallholders in developing countries.

Once identified, the appropriate conservation practices need to be disseminated within the unique ecological, social, cultural, economic and political contexts of the target population’s environment.

Box 4.4: NCBA/CLUSA’s Zero Risk Conservation Agriculture Program in Senegal

Supported by USAID/Senegal, NCBA/CLUSA has developed a set of easily implemented farming techniques that have proven to boost yields while improving soil health, maintaining moisture, lowering costs and improving production quality. This can all be done without financing, but requires more discipline, knowledge and work than is demanded by traditional farming practices. Given no need for financing, the risk is essentially zero as long as proper tillage, compost and inputs are applied using the correct conservation agriculture techniques. Once learned, the productivity sells itself allowing the knowledge to flow from farmer to farmer ahead of more formalized systems and techniques than those that require financing. The key component is the delivery of the inputs and tillage services, a system developed by NCBA/CLUSA to function as a viable business through commissions on input sales. Initial results have provided for up to 400% increases in maize productivity, while increasing soil health.

Solutions that use resources already available on the farm such as mulching with organic materials, micro dosing of organic inputs, and proper tillage techniques can increase productivity without increasing the cost of farming.

Box 4.5: Understanding Farming Households in order to Develop a Lens for Implementing Conservation Agriculture Programs

As part of the Accenture-supported “Skills to Succeed” program, Concern Worldwide has provided a tailored response to the needs of smallholders in Malawi with bio-mass transfers and in Zambia with micro-dosing of organic inputs. Concern Worldwide uses a grassroots approach to assess and implement solutions based on conservation agriculture principles of minimum tillage, crop rotation and water retention, in addition to specialized solutions for local conditions. Benefits to farmers include: better distribution of labor demand, efficient use of inputs, reduced soil erosion and build-up of organic soil matter. Concern Worldwide helps to ensure the adoption of these enhanced farming techniques by recognizing the various and dynamic ecology of contexts (e.g., ecological contexts, such as erratic rainfall or economic contexts, such as the preponderance of maize in agricultural markets), in which farming households exist and how they work to influence farmer decision making. Barrier analysis can then be used to fine-tune approaches allowing first movers to provide the needed proof for wider uptake.

Lesson 15: Customizable agricultural production solutions, including effective water and soil management, are needed to fit the changing demands of climate change

To expand production in the last half century, the Green Revolution called for widespread use of irrigation, hybrid seeds, synthetic fertilizers, pesticides and enhanced farm management techniques. Though highly successful in terms of increasing yield, the approach has not proven sustainable in terms of soil health, erosion control and coping with depleting water resources. Since the Green Revolution, numerous technological advances have modernized agricultural production providing further boosts to yields while balancing the need for sustainable production. Though available in most developed countries, these advances have proven either too expensive or overly specialized for small farmers in developing countries to benefit. GRM International has developed a combination of technologies that have proven capable in boosting yields while maximizing water and soil resources in some of the most inhospitable agricultural environments in the world (see Box 4.6 on desert farming). The fact that these techniques were able to significantly increase yields in a desert climate shows the potential for less extreme environments. To replicate this success, the development community needs to develop and market solution packages that are customizable in order to match the changing soil, climate and economic realities of smallholders in developing countries.

Box 4.6: GRM International Develops Tools, Technologies and Practices for Desert Farming

To diversify its economy and provide food security for its population, The United Arab Emirate of Abu Dhabi contracted GRM International to help modernize its agricultural sector. Using rigorous studies of the soil, GRM helped to prescribe a mix of tools, technologies and management practices to boost both the productivity and profitability of desert farming in the region. Some of the most successful interventions included:

- introducing a minimum guarantee price (MGP) and crop planning system to improve the crop marketing function and protect farmers from price variability,
- mainstreaming the use of advanced drip irrigation and hydroponic farming techniques,
- providing updated crop guides to farmers, and
- providing access to advanced natural resource management techniques based on updated and reliable data.

As a package, the solutions implemented by GRM for this project would not all be affordable for smallholders in most developing countries, however GRM International also offers a customizable set of solutions that can be applied to diverse circumstances in countries around the world.

V. Cross-Sectoral Issues and Moving Forward

This year's conference brought a few, important cross-cutting themes to the foreground. These include the importance of incorporating women and youth into rural and agricultural development activities (including access to finance) and the need to better manage and protect earth's natural resources. Rural and agricultural markets should not be expanded amid climate change without at least considering the effects (good or bad) that this expansion will have on the natural environment and communities as a whole.

Women and Youth

Women and youth are among the most vulnerable to the effects of climate change; it impacts not only their livelihoods, but also, shelter and housing, food security, access to water and susceptibility to disease. Furthermore, pre-existing gender gaps and unequal access to resources are only exacerbated by climate change. The Inter-governmental Panel on Climate Change identifies gender as one of the socio-economic factors that influences “the capacity to adapt to changing environmental and economic conditions.”³

Moving forward, policies and programs need to take into account gender and youth, specifically considering the effects they will have on such populations through analysis, segregated data and mainstreaming. Furthermore, research shows that women and youth can be positive agents in adapting and mitigating climate change when given equal access to information, training and resources. In the case of Coffee Management Services in Kenya, a key lesson learned was that **one cannot rely on knowledge passing across genders, so both genders need to participate in training and capacity building activities**. Box 5.1 highlights the case of the Bukonzo Joint Cooperative Union in Uganda where training and capacity building is being provided across genders and youth, leading to increased production and higher quality yields of coffee, one of the value chains most negatively impacted by climate change.

Box 5.1: Incorporating Women and Youth into the Coffee Value Chain

Gender inequality and the lack of full participation by women in decision-making and financial planning for family businesses are key contributors to poverty in rural Uganda. In 2004, the Bukonzo Joint Cooperative Union – a community of several cooperatives in Western Uganda – began to integrate a participatory framework of value chain development called the Participatory Action Learning System (PALS) to incentivize women's contributions in the cooperative and in the community which was later changed to GALS (Gender Action Learning System). The GALS approach is a structured community-led empowerment methodology aimed at constructive economic, social and political transformation. By using pictograms for all sessions, illiterate group members feel more comfortable participating and sharing in the growth of the cooperative. By educating all its members on the production processes and by incorporating a wider range of women into the management structure using the GALS framework, the cooperative has grown substantially over the past 14 years – producing about 300 tons of coffee in 2014, up from 13 tons in 2005.

(continued on next page...)

³ Intergovernmental Panel on Climate Change, ‘Climate Change 2007: Synthesis Report’, Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland.

(...Box 5.1 continued)

Today, the cooperative has over 5,000 farmers, is certified Fair Trade and Organic, and has been receiving exceptional coffee cupping scores. As a result, the cooperative has been able to specialize in the processing and sales of high-quality Arabica coffee. The cooperative is now expanding its GALS methodology to address gender inequalities among the youth in the community, and has been training neighboring cooperatives on successful implementation of the framework as well. In keeping with its founding principles, the Bukonzo Joint Cooperative Union is now planning to deliver significantly greater profits to its members by centralizing all aspects of post-harvest production in a state-of-the-art facility at its headquarters in Kyarumba.

Natural Resource Management

As the climate around us continues to change, putting greater pressure on ecosystems and resources upon which many people's livelihoods depend, sustainable stewardship of our planet's resources has become increasingly critical. There is a need to go beyond baseline environmental impact studies certifying that a program will not damage the environment, and proactively incorporate environmental management and protection elements into programs and policies. Rural and agricultural growth programs can actively contribute to responsible environmental management, which is necessary to help adapt to and mitigate the negative effects of climate change on local ecosystems, while also supporting income generation and sustainable livelihoods.

One such example is the Reducing Emissions from Deforestation and Degradation (REDD+) program. Deforestation, which claims 13 million hectares of forest each year (an area larger than Malawi), and forest degradation account for nearly 20% of global greenhouse gas emissions, which is more than the entire global transportation sector and second only to the energy sector. The UN REDD program aims to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. The "REDD+" program goes a step further beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.⁴ The program supports partner countries across Latin America and the Caribbean, Africa and Asia-Pacific in a variety of ways including the Tambopata project with USAID DCA and Althelia Climate Fund in Peru (see Box 3.4) which helps local communities earn carbon credits and income while simultaneously protecting their forests.

What's Next Moving Forward?

We have come a long way in identifying the many ways that climate change will impact rural and agricultural development in the future. Even the top Beijing weather scientist, Zheng Guogang, now admits that the world's largest emitter of greenhouse gases, China, faces a huge impact from climate change, including "ecological degradation."⁵ We have a long way to go, however, to mitigate the negative impacts of climate change through our efforts related to developing rural and agricultural markets and access to finance. Based on the findings and lessons learned from *Cracking the Nut 2015*, more attention is needed in the following areas:

⁴ <http://www.un-redd.org/AboutREDD/tabid/102614/Default.aspx>

⁵ National Public Radio blog, March 23, 2015. <http://www.npr.org/blogs/thetwo-way/2015/03/22/394658945/top-beijing-scientist-china-faces-huge-impact-from-climate-change>.

Using agro-forestry models for regeneration. Given increasing demand to use land for agriculture and food production, additional emphasis should be placed on promoting production through climate-sensitive agro-forestry. As carbon emissions continue to increase, it is not sufficient to simply protect existing lands and forests. To reverse the effects of greenhouse gases on the environment, the planting of commercial and indigenous trees on farm lands needs to be increased, possibly with public and private incentives to do so.

Incentivizing smallholder behavior changes and climate-smart adaptations. The private sector has demonstrated an increased commitment to work with smallholders to meet their production needs and specifications, which increasingly include climate-smart approaches. Donor and government support could reinforce these efforts through public-private partnerships. It is especially important that governments from developed countries acknowledge their responsibilities as the largest contributors to the greenhouse gases and not expect developing country governments and low income farmers to shoulder the burden of repairing environmental degradation.

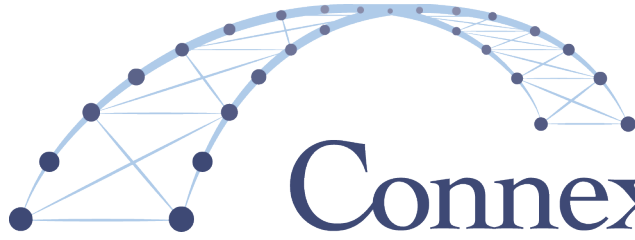
Protecting and financing water resources. All life is dependent on access to clean water, which is becoming an increasingly scarce natural resource. As resources become scarce, costs increase and tension rise to protect them. There is an increasing need for public and private sector coordination to map out how water supply and demand will change over time to make sure commercial priorities are balanced with the needs of the poor. Municipal finance will be needed to support the expansion of access to clean water and sanitation services, especially in countries with rapidly growing populations. There will be a need for careful coordination and international mediation between states that face mutual dependence on particular sources of water for agricultural irrigation, such as the Niger River.

Encouraging private sector to buy into and invest in climate-smart agriculture. While there have been businesses, such as Ben & Jerrys, that have made environmental protection part of their business strategy, more private firms need to move beyond rhetoric, toward implementation of climate-smart principles in all their production and buyer relationships. As consumers are becoming more conscious of their role in protecting the environment and are demanding proof of fair treatment for small farmers and investments in clean energy technologies and sustainable land management, there are clear long-term strategic advantages to demonstrating a commitment to climate-smart agriculture, and real reputation risks associated with being a slow “adapter.”

Promoting gender equality in rural and agricultural development & access to finance. As more than half of agricultural producers are women, we need to be more proactive about serving the needs of rural women. Too often development projects apply a “one size fits all” approach to service delivery and accept low participation rates from women. Given that women are 50% of the population and very important in ensuring the health and nutrition of children, they should benefit from at least 50% of our initiatives in expanding rural and agricultural markets and access to finance. As this publication emphasizes, we must consider the multiple demands on women’s time and schedule and organize meetings and trainings that do not conflict with other common responsibilities, such as cooking and childcare.

Perhaps a quote from the Dalai Lama best emphasizes why we need to go further to mitigate the negative impacts of climate change:

“Because past environmental destruction was the result of ignorance, we can easily forgive it. Today, we are better informed. Therefore, it’s essential that we make an ethical examination of what we have inherited, what we are responsible for, and what we will pass on to coming generations. Ours is clearly a pivotal generation.”



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