

Towards Policies for Climate Change Mitigation: Incentives and benefits for smallholder farmers



CLIMATE
CHANGE
AGRICULTURE AND
FOOD SECURITY



Charlotte Streck, with contributions from
David Burns and Leticia Guimaraes

Corresponding Author

Charlotte Streck
 Climate Focus North America Inc.
 1025 Connecticut Ave NW, Suite 1102
 Washington, DC 20036, USA
 Email: c.streck@climatefocus.com

Acknowledgements

This report benefited greatly from comments received from and conversations held with an extensive group of practitioners, policy makers and experts. Special thanks go to Hasan Bolka, Alejandro Calvache, Maria Elfi Chaves Salamanca, Nora Ferm, Robert Gilbertson, Tanja Havemann, Lina Heron, Donna Lee, Mark Morage, Ilvia Patricia Niño, Christina Seeberg Elverfeldt, Seth Shames, Timm Tennigkeit and Lini Wollenberg.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of the Consortium of International Agricultural Research Centers (CGIAR) and the Earth System Science Partnership (ESSP). The program is supported by the European Union, the United States Agency for International Development (USAID), Canadian International Development Agency (CIDA), New Zealand Ministry of Foreign Affairs and Trade, the Danish International Development Agency (Danida), the UK Department for International Development (DFID), Irish Aid, and Instituto de Investigação Científica Tropical, Portugal (IICT) with technical support from the International Fund for Agricultural Development (IFAD).



Creative Commons License

This Report is licensed under a Creative Commons Attribution– NonCommercial–NoDerivs 3.0 Unported License.

This publication may be freely quoted and reproduced provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

© 2011 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
 ISSN1904-9005

Disclaimer

The views expressed in this report are those of the authors and not of the CGIAR, the ESSP or their funders. This report has been peer-reviewed.

Correct citation

Streck C, Burns D, and Guimaraes L. 2012. Incentives and benefits for climate change mitigation for smallholder farmers CCAFS Report no. 7. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

Contact information

CCAFS Coordinating Unit
 Faculty of Life Sciences, University of Copenhagen,
 Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark.
 Email: ccaafs@cgiar.org · Online: www.ccafs.cgiar.org

Front cover photo



Pic by Neil Palmer (CIAT). Himachal Pradesh, India.

Contents

Executive summary	5
1. Introduction	7
2. International climate finance options	8
2.1. Overview of climate finance	8
2.2. Delivery mechanisms	9
3. Policies to support smallholder investments in sustainable agricultural activities	12
4. Harnessing climate finance for the benefit of smallholders	16
4.1. Institutions	16
4.2. Policies and financial incentives	17
4.3. Measurement, reporting and verification	21
5. Conclusion	23
References	24
Annex I: Agricultural NAMA submissions	27
Annex II: Policy incentives to harness investments in smallholder farming systems	29
1. Establishing results-based incentives	29
1.1. Payments for environmental services	29
1.2. Carbon markets	29
2. Facilitating access to finance	30
3. Reducing or redistributing risk	30
4. Incentives for external (foreign and domestic) private investment	32
4.1. Publicprivate partnerships	32
4.2. Supply chain interventions	33
4.3. Labelling and certification	34

List of Tables

Table 1. Project-based carbon market mechanisms	9
Table 2. Comparing REDD+ and NAMA	10
Table 3. Barriers to the adoption of improved agricultural practices among smallholders	12
Table 4. Potential financial instruments to support smallholder sustainable agricultural practices	13
Table 5. Mitigation activities and financing mechanisms	18
Table 6. Types of PES schemes	19
Table 7. Illustrative MRV regimes for proposed NAMAs	21
Table 8. Climate finance opportunities benefiting smallholders	23
Table 9. Agricultural NAMA submissions to the UNFCCC (February 2011)	27
Table 10. Cases studies: climate risk mitigation instruments	31

List of Figures

Figure 1. Existing international public and private climate finance sources for agricultural mitigation.	11
---	----

List of Boxes

Box 1. Climate finance after Cancun and Durban	8
Box 2. NAMAs at a glance	10
Box 3. Regulatory readiness	17
Box 4. The Roundtable on Sustainable Palm Oil	18
Box 5. The Schokland Fund	19
Box 6. Climate risk insurance models in Ethiopia	20
Box 7. Project accounting: Kenya's sustainable agricultural land management methodology	22
Box 8. Case studies: Risk sharing and insurance mechanisms	31
Box 9. Agricultural growth corridors	33
Box 10. Examples of sustainable supply chain programmes	34
Box 11. The Sustainable Agriculture Network's climate module	35

Abbreviations & Acronyms

A/R afforestation/reforestation	NAMA Nationally Appropriate Mitigation Action
BAGC Beira Agricultural Growth Corridor	NGO non-governmental organisation
CCAFS CGIAR Research Programme on Climate Change, Agriculture and Food Security	OECD Organisation for Economic Co-operation and Development
CDM Clean Development Mechanism	OTC over-the-counter
CGIAR Consortium of International Agricultural Research Centers	PES payments for environmental services
CO₂e carbon dioxide equivalents	PoA Programme of Activities
COP Conference of the Parties to the UNFCCC	PPP publicprivate partnership
ENSO El Niño Southern Oscillation	REDD+ 'ReducedEmissions from Deforestation and forest Degradation, the role of forest conservation, sustainable management of forests and enhancement of forest carbon stocks'
EU ETS European Union Emission Trading System	RSPO Roundtable on Sustainable Palm Oil
FAO Food and Agriculture Organization of the United Nations	SAGCOT Southern Agricultural Growth Corridor of Tanzania
FDI foreign direct investment	SALM sustainable agricultural land management
GCF Green Climate Fund	SAN Sustainable Agriculture Network
GEF Global Environment Facility	STCP Sustainable Tree Crops Programme
GHG greenhouse gas	UNCTAD United Nations Conference on Trade and Development
Gt CO₂e Gigatonnes of carbon dioxide equivalents	UNFCCC United Nations Framework Convention on Climate Change
HARITA Horn of Africa Risk Transfer for Adaptation	USAID United States Agency for International Development
IBLI Index-based Livestock Insurance	USD US dollars
IFAD International Fund for Agricultural Development	WCF World Cocoa Foundation
IFPRI International Food Policy Research Institute	
IPCC Intergovernmental Panel on Climate Change	
MRV measurement, reporting and verification	
Mt million tons	

Executive Summary

For a long time, agriculture has been neglected by climate negotiators and policy makers in charge of defining national climate policies. This is changing, and the links between climate change and agriculture have become more obvious over the last years. Climate finance provides an opportunity to facilitate the adoption of agricultural practices that support climate mitigation and adaptation. This report presents a number of policies and interventions aimed at harnessing climate finance potential to support a transition to a more sustainable agriculture for the benefit of smallholder farmers.

However, agriculture differs from other sectors because of agriculture's role in producing food and meeting basic survival needs; its site-specific nature, which makes uniform strategies and solutions ineffective; the vulnerability of the sector to being affected directly by climate change; its adaptation needs and mitigation potential, mainly through sequestration; and, finally, its complex links to food security, trade, and broader land-use and forestry policies. When competing for climate finance, the agricultural sector is at a disadvantage compared with the industry and energy sectors.

It is therefore important that developing countries take advantage of the opportunity provided by fast-start climate finance to pilot, demonstrate and scale up sustainable mitigation and adaptation activities in the agricultural sector. For agriculture to be part of the solution to climate change, while continuing to contribute to development and food security, it needs to: (i) be eligible to receive resources from existing and future climate funds; (ii) have its specificities taken into account for effective allocation and use of resources; and (iii) allow rewards for agricultural producers who adopt sustainable practices that generate multiple benefits relating to climate change, development and food security.

The potential to sequester carbon in soils, enhance above-ground biomass and reduce non-carbon dioxide emissions creates an opportunity for the agricultural sector to benefit from mitigation finance. Smallholders can tap into this opportunity provided that adoption barriers can be successfully addressed. The most prohibitive barriers that prevent smallholders from accessing new technologies and practices often occur at the adoption stage: poorly functioning input and output markets; weak local institutions and infrastructure; inadequate extension systems; and a lack of credit and insurance markets. The first condition for the adoption of new agricultural practices is the prospect of a net benefit for the farmer. The second condition is that the farmer can overcome potential

financial, capacity and knowledge constraints to access such opportunities. The eventual benefits related to the adoption of new practices have to outweigh the costs associated with the removal of associated barriers, both for the farmers and for the policy makers in charge.

Lack of investment and credit count among the most important barriers to the uptake of new practices among smallholder farmers. While recognising that lack of finance is only one of several barriers impeding smallholder farmers from changing their practices, this report develops a number of proposals on how climate finance can support policies that seek to overcome investment barriers. Our evaluation of opportunities for climate finance opportunities is limited to an evaluation of mitigation finance. This is not to suggest that adaptation is not important; quite the contrary, it reflects only the (perceived or real) increased availability of mitigation finance and the possibility of leveraging those financing sources with private finance.

Finance for climate change mitigation can be delivered through public sector-backed grants, loans, guarantees or other instruments. Alternatively, it can come from private sources, either through carbon markets or climate-motivated investments. Finance sources include international, bilateral and multilateral funds that may be used to support improved, low-emission and climate-resilient agricultural practices. International climate finance instruments that include finance opportunities for agricultural mitigation are payments for 'nationally appropriate mitigation actions' by developing countries or incentives for 'reduced emissions from deforestation and forest degradation'. There are also a number of voluntary carbon market standards that include agriculture among their covered sectors. The clean development mechanism (CDM) under the Kyoto Protocol also covers a limited set of agricultural mitigation activities. However, opportunities are limited as the CDM excludes agricultural sequestration.

Policies that formulate financial incentives at the level of the individual farmer can be divided into: (i) output and results-based payments; (ii) direct access to loans or other financial products; (iii) risk-sharing mechanisms; and (iv) incentives for enhanced private investment. The various mechanisms differ between who bears the costs of the intervention (farmers, taxpayers, consumers, beneficiaries); the ability to target incentives; and administrative and transaction costs.

Examples of how climate finance can support payment for ecosystem services, carbon markets, supply chain support or measures that reduce investment risk and attract direct investment into the change of practices include the following:

- **Set up transition funds.** Funds to reimburse the costs of adopting climate change mitigation activities could address the lack of available credit, a major barrier preventing widespread implementation of sustainable agricultural practices by smallholders.
- **Pay for ecosystem services.** Where upfront finance is not needed, public support can be used to make payments for environmental services for sustainable agriculture activities. As much as is possible, finance could be made available through existing financial institutions.
- **Cover insurance and guarantee costs.** Climate finance can also help to reduce climate-related agricultural production risks with insurance strategies. Insurance schemes with low transaction costs encourage smallholders to increase production intensity because inputs are insured against failure.
- **Support capacity building and transaction costs.** Climate finance can support climate finance specific costs, such as the costs associated with the aggregation of smallholders, measurement, reporting and verification systems, or the training of extension systems, financial institutions or certification bodies. By covering such costs, governments can also lower the barriers for farmers to participate in carbon market or supply chain initiatives leveraging private sector finance.

While the longer-term work of creating a more sustainable, climate-resilient and low-emission agricultural sector will be

a multi-decade endeavour, developing countries can readily engage to support smallholders who invest in sustainable agricultural practices. Financial incentive programmes have to be consistent with readiness activities at the institutional and regulatory levels. Such activities include strengthening of institutions, increasing measurement capacities and assessing potential policies, but also putting in place domestic incentive systems for the implementation of improved agricultural practices and piloting such initiatives, which, if successful, could eventually be scaled up. Given the varied nature of farming systems across the world, effective incentive mechanisms must also be tailored to local realities and supported by a general set of enabling socioeconomic conditions.

Climate finance can be used to catalyse the transition to a more resilient agricultural sector that reduces greenhouse gas emissions and increases carbon sequestration. New sources of finance can be used to overcome common barriers to smallholders' investment in sustainable practices by making available new funds, disbursement mechanisms and partnerships, and by increasing the attention given to this issue. However, funds are limited and will not be available permanently. It is therefore essential to leverage other public and, even more importantly, private funds wherever possible. Options to involve the private sector include the design of loan and insurance schemes, public private partnerships and carbon markets.

1. Introduction

Until very recently, agriculture¹ has received comparatively little attention in the negotiations of the United Nations Framework Convention on Climate Change (UNFCCC) (Hailu 2011). The eligibility criteria of the Clean Development Mechanism of the Kyoto Protocol can serve as an indicator of the bias towards the energy and industry sectors. Up to now the agricultural sector has accounted for only 4% of the total registered CDM projects. However, this is about to change. Whether in the context of increasing climate resilience and food security, addressing drivers of deforestation or reducing agriculture-related emissions, there is strong pressure for considering the impacts climate change has on agriculture as well as the contribution agriculture makes to global warming (Nelson 2009).

The agricultural sector accounted for 1012% of all anthropogenic greenhouse gas (GHG) emissions in 2005 (5.16.1 Gt CO₂e) (Smith et al. 2007), and, in the tropics, agricultural expansion is the leading cause of land-use change. The sector's percentage of global GHG emissions increases to about 30% if indirect deforestation and supply chain emissions are included. In addition, GHG emissions from agriculture are expected to increase considerably over the next few years due to a combination of population growth and changing diets (Smith et al. 2007). The Intergovernmental Panel on Climate Change (IPCC) estimates that the global potential for GHG mitigation in agricultural production is 5.5 to 6 Gt CO₂e per year by 2030. While the reduction potential of methane and nitrous oxide emissions is significant, the largest potential for GHG emissions reductions in the agricultural sector lies in soil carbon sequestration (Smith et al. 2007).

There are extensive opportunities for increasing the adaptive capacity of farming systems while reducing GHG emissions or sequestering additional carbon. Many adaptation measures have positive impacts on mitigation, including: (i) conserving soil moisture; (ii) reducing soil degradation; (iii) reducing leaching of nitrogen and phosphorus; (iv) increasing the diversity of crop rotations; and (v) reducing temperature extremes through shade and shelter (Meridian Institute 2011). Practices that maximise benefits and minimise negative trade-offs across food security, development, climate change adaptation and mitigation are also referred to as 'climate-smart agriculture' (FAO 2010).

This report evaluates how governments can use climate finance to lift barriers for the adoption of sustainable

agricultural practices or the promotion of policies that alter the economic incentives for smallholder farmers. Enabling farmers to adopt new farming practices is challenging, as entrenched financial and institutional barriers often block the way to innovation and improvement (FAO 2008; Shiferaw et al. 2009). Climate finance may support policies that help to overcome investment barriers for the adoption of sustainable agricultural practices in smallholder agricultural systems. This report focuses on how to overcome these barriers, while recognising that financial constraints are only a subset of the barriers facing smallholders. Once such barriers have been removed, and provided that newly adopted practices result in increased yields or increased net income, smallholders are unlikely to switch back to older practices (Shiferaw et al. 2009). Mitigation benefits can therefore be considered robust, as the reversal risk is low. In conclusion, climate finance may support increased food security, climate mitigation and adaptation among smallholders in developing countries.

The emphasis of this report will be on harnessing mitigation finance for smallholder agriculture, reflecting the dichotomy of climate finance, which continues to separate mitigation from adaptation policy and finance. Mitigation finance is believed to be more easily accessible, in particular where mitigation benefits can be measured in tonnes of GHG emissions reduced or sequestered. However, the emphasis of this report is not to suggest that mitigation would take priority over adaptation measures. The best climate measures are those that combine mitigation and adaptation benefits while contributing to an increase in food security.

This report is structured as follows. Section 1 provides an overview of the main international climate finance mechanisms and sources. Section 2 describes some of the main barriers to the adoption of sustainable agricultural practices by smallholders. Section 3 describes what policies and instruments can be used to increase smallholder access to finance and investment. Section 4 investigates how climate finance can support the policies identified in the previous section to foster the implementation of sustainable agricultural practices by smallholders who could potentially benefit from climate finance. The conclusion of this report is that climate finance can be used as an instrument to overcome barriers to smallholders' adoption of sustainable agricultural practices by accessing new funds, designing new disbursement mechanisms, and forging new partnerships.

¹ The agricultural sector is an important source of export revenue for low-income developing countries. Agriculture is essential for rural development as it delivers food and nutrition, supports livelihoods, and generates jobs and income. According to the World Bank (2008), growth in the agricultural sector is believed to be twice as effective in alleviating poverty as growth in any other sector. It is estimated that there are over 525 million farms worldwide, and over 85% of these are believed to be smallholdings of less than 2 ha. In the developing world, smallholdings support over 2.5 billion people and are likely to populate the agricultural landscape for at least the next two to three decades (Nkem et al. 2007).

² As of November 2011, out of the 190 active approved methodologies, only 3 are for the agricultural sector while 67 are for the energy sector. CDM projects in the agricultural sector are only 4% of the total registered projects (n=3564), while energy projects represent almost 80% of that portfolio. For more information see: <http://cdm.unfccc.int/Projects/projsearch.html>. (Accessed on 9 January 2012)

³ In the process of developing their REDD+ strategies, 16 out of 20 developing countries have identified agriculture as the primary driver of deforestation and forest degradation (Kissinger 2011).

2. International climate finance options

Climate finance can be used to directly or indirectly support smallholder farmers. Direct support may come via international funds or investments that are disbursed to farmers, cooperatives or farmers' organisations. Such funds will often come as 'carbon finance', linked to the generation of certified tonnes of GHG emission reductions or removals. Certification and carbon accounting at the farm level have relatively high transaction costs. Where costs are prohibitive, indirect support of international climate finance in the form of creating enabling environments, supporting policies or public incentive schemes may be more appropriate. In these cases, the government will receive international climate finance and channel it via appropriate channels, policies and measures to create incentives for improved practices at the farm level.

The emerging nature of many climate finance instruments and mechanisms makes the understanding of the concrete opportunity challenging. Instruments include the sale of verified emission reductions to carbon markets, grant facilities, climate-specific loans and investment facilities. Purposes also vary and include the provision of project finance, technical assistance and capacity building.

2.1 Overview of climate finance

There are two channels through which the current international climate regime provides financing for mitigation activities in developing countries. Firstly, the Global Environment Facility (GEF), the biggest single independent international trust, serves as a financial mechanism for the UNFCCC and makes available direct

financial support for mitigation and adaptation projects in developing countries. Secondly, in addition to the administration of funds mandated by the UNFCCC, the Kyoto Protocol gave rise to a number of innovative market-based mechanisms (the CDM, Joint Implementation and International Emissions Trading) that opened the way to mitigation investments from the broader public as well as from the private sector.

Currently, climate negotiations are discussing the scaling-up of financial incentives for climate mitigation through the establishment of a Green Climate Fund (GCF) as well as new market mechanisms⁴. In addition to supporting adaptation measures and technology transfer, financing would flow to more ambitious 'nationally appropriate mitigation actions' (NAMAs) in developing countries and support the reduction of land use-related emissions.

The pledges for climate finance were formulated at the 15th session of the Conference of the Parties (COP) to the UNFCCC and were formalised a year later at the COP16 in Cancun⁵. These included a collective commitment by developed countries to provide USD 30 billion in 'new and additional' fast-start finance for developing countries between 2010 and 2012, 'with a balanced allocation between adaptation and mitigation', and to mobilise USD 100 billion a year by 2020 to address the mitigation and adaptation needs of developing countries. The delivery⁶ of international climate funding, the role of private versus public funding and funding criteria remain unclear. Box 1 summarises the climate finance arrangements as included in the Cancun Agreements.⁷ Taking into account the limited availability of public funds, the leveraging of private funds will be essential.

Box 1. Climate finance after Cancun and Durban

Fast-start finance:

- Pledge of 'new and additional' funds approaching USD 30 billion for the period 2010-2012.
- Balanced allocation between adaptation and mitigation.

Long-term finance:

- Pledge to mobilise USD100 billion per year by 2020.
- New and additional/predictable and adequate.

Sources:

- public/private;
- bilateral/multilateral;
- alternative sources.
- Balance allocation between mitigation and adaptation.
- Important role of the GCF.

Sources: *Decision 1/CP16, paragraphs 95 and 98, Decision 2/CP17 paragraphs 120 to 132.*

⁴ For more information see: www.iisd.ca/download/pdf/enb12521e.pdf. (Accessed on 9 January 2012) The GCF was formally launched at COP17 in Durban: Outcome of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Decision 2/CP17, Green Climate Fund report of the transitional committee. Decision 3/CP17.

⁵ *ibid*

⁶ Decision 1/CP16, paragraphs 95 and 98.

⁷ Decision 1/CP16.

2.2 Delivery mechanisms

Finance for climate change mitigation can be delivered through public sector-backed grants, loans, guarantees or other instruments. Alternatively, it can come from private sources through either carbon markets or climate-motivated investments.

Public funds: Public funds are managed by international or national agencies, either in donor or in recipient countries. In most cases, public funds will be made available to governments or government-authorized agencies. Where appropriate national organisations do not exist, mitigation finance funds can be managed through bilateral or multilateral development banks and donor agencies. Available instruments include: investment funds (domestic climate funds such as the Amazon Fund in Brazil, international multilateral funds such as the Climate Investment Funds hosted at the World Bank, and bilateral funds such as Germany's International Climate Initiative); guarantee facilities (such as the Pro-Climate Facility from the Nordic Development Fund); and grant support for capacity building or technical assistance (such as the World Bank's Policy and Human Resource Development grant from the Government of Japan). Funds often focus on supporting an enabling environment and cross-finance incentive mechanisms. Funds may also support market-based mechanisms by reducing transaction costs, creating enabling conditions and supporting pilot projects.

Market-based approaches: The future role of markets in financing mitigation action is still a matter of debate under the UNFCCC⁸. The Cancun Agreements decided to consider the establishment, at COP17, of new market

mechanisms to enhance the cost effectiveness of, and to promote, mitigation actions. The only existing regulated market mechanism that can support climate mitigation in the agricultural sector is the CDM. Although there is some discussion on expanding the scope of the CDM, opportunities for smallholders under this mechanism remain limited.

Recently, CDM Programme of Activities (PoAs) are a possible means of bundling CDM projects to realise large-scale emissions reductions, aggregating investments and reducing transaction costs. The PoAs support the inclusion of multiple and unlimited bundles of sub-projects over time. Adding projects to PoAs requires only a brief check by the validator as opposed to the lengthy CDM project approval cycle (Climate Focus 2011). If it were not for the limited number of available CDM methodologies for the agricultural sector, PoAs could create interesting financing opportunities for mitigation activities by smallholders.

In the voluntary carbon market, in contrast, offset standards explicitly encourage agricultural mitigation and promise lower transaction costs that are attractive for agricultural mitigation projects (De Pinto et al. 2010). The voluntary market is predominantly unregulated, encompassing all emission reduction credit transactions among entities operating outside of compliance GHG cap-and-trade systems. Agricultural activities accepted under voluntary standards include methane capture (2%), agricultural soil management (3%), and afforestation/reforestation (6%) or improved forest management (5%); these accounted for 21.3% of over-the-counter (OTC) trades in 2009 (about 9.4 million verified emission reductions). The eligibility of agricultural activities under different standards is reviewed in Table 1 below.

Table 1. Project-based carbon market mechanisms⁹

	Clean Development Mechanism (CDM)	CDM Programme of Activities (PoAs)	Voluntary carbon market
Mechanism	The CDM was authorised under the Kyoto Protocol to generate marketable certified emission reductions in developing countries, to meet GHG targets in developed countries.	CDM PoAs are a modality under the CDM to register an unlimited number of projects, and local, regional or national policies/standards as associated project activities, provided that approved baseline and monitoring methodologies are used.	The voluntary carbon market represents transactions in emission reduction credits by entities purchasing offsets outside a compliance GHG target. Independent standards typically certify credits traded OTC or through exchanges.
Agricultural practices	Manure management, agroforestry, afforestation/reforestation (A/R) and bioenergy.	Limited to CDM methodologies: for example, reducing nitrous oxide emissions or reducing methane.	Voluntary market mechanisms credit, inter alia, agroforestry, nitrogen, farm energy, crop, land use, livestock and soil management.
Barriers	<ul style="list-style-type: none"> Sequestration activities limited to A/R. EU Emission Trading System (EU ETS) excludes forest credits. 	<ul style="list-style-type: none"> Sequestration activities limited to A/R. EU ETS excludes forest credits. Lack of qualified aggregators and project managers. 	<ul style="list-style-type: none"> Low prices and variable credit quality. Small size of market (<1% compliance). Lack of standardisation.

⁸ For more information see: <http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf>. (Accessed on 9 January 2012)

⁹ For more information see www.unfccc.int and Peters-Stanley et al. 2011.

NAMAs and REDD+: In addition to existing climate finance mechanisms, there are two emerging concepts that link mitigation action in developing countries to funding from developed countries and that are relevant for the agricultural sector: nationally appropriate mitigation actions and 'reducing emissions from deforestation and forest degradation, the role of forest conservation, sustainable management of forests and enhancement of forest carbon stocks' (known as REDD+).

Box 2. NAMAs at a glance

- Conceived in Bali in 2007 (COP13); confirmed and elaborated in Cancun in 2010 (COP16).
- Voluntary mitigation actions by developing countries.
- Any government-sponsored and prioritised policy, programme or project that results in measurable GHG reductions can be a NAMA.
- Enabled in part by domestic investments and in part by international financial support.
- Performance basedthe stringency of MRV depends on the source of finance.
- A NAMA Registry will record information and facilitate the matching of action and support.
- Fast-start finance can support learning and the piloting and testing of NAMAs and any supporting MRV frameworks.

NAMAs are expected to follow a performance-based logic and be linked to real and measurable emission reductions. Where NAMAs are implemented with international support, they are subject to both national and international measurement, reporting and verification (MRV). Regardless of the eventual rules for applying international support to NAMAs, public sector finance alone will not be able to fully finance low-carbon development in developing countries.

Catalysing private sector resources for NAMAs will therefore be a priority for national governments as much as for international institutions.

By November 2011, 102 countries had submitted NAMAs to the UNFCCC ¹⁰. These submissions included pledges by all major developing country emitters, which, together with developed countries, represent 80% of global emissions. However, the country submissions vary greatly in their format and the detail of their content, and include anything from vague expressions of intent to lists of investment projects or national mitigation commitments(see Annex I for a list of agricultural NAMAs). Two countries (Papua New Guinea and Morocco) provide voluntary sector-wide agricultural mitigation targets, while other countries (for example Brazil) have submitted quantitative agricultural reduction targets for specific actions. The remaining countries tend to identify broad priorities for development of the agricultural sector or a short list of specific actions, including:

- crop residue management;
- cropland-related mitigation practices in specific areas;
- restoration of grasslands;
- fodder crop production;
- introduction of combined irrigation and fertilisation techniques to increase efficiency; and
- methane capture for livestock.

With regards to REDD+, the Cancun Agreements established a REDD+ framework that encourages developing countries to contribute to mitigation actions in the forest sector through forest-related activities. Agriculture, although not explicitly included in this decision, except through agroforestry, is expected to play a major role in countries' REDD+ strategies, which are required to address major drivers of deforestation. Table 2 summarises the main differences between the REDD+ and NAMA concept.

Table 2. Comparing REDD+ and NAMA

	REDD+	NAMAs
Mechanism	REDD+ is seen as an emerging, results-based mechanism that will provide incentives to developing countries to slow, halt and reverse deforestation.	NAMAs are voluntary commitments made by developing countries to reduce GHG emissions in various sectors. These are submitted to the UNFCCC and available for international climate financing according to terms of the Cancun and future UNFCCC agreements.
Agricultural practices	Terrestrial carbon activities that relate to forests, such as tree-based farming practices, agroforestry; and activities that reduce the effect agriculture has as driver of deforestation on forests.	Unrestricted: for example, sustainable land management and efficiency, livestock, soil and agricultural practices, cropland and livestock management, agroforestry, crop intensification and improvement.
Barriers	The establishment of national reference levels and accounting systems will take time. Benefit-sharing systems that include agricultural smallholders have still to emerge. The EU ETS does not accept forest-related crediting into its system.	Financing and implementation modalities remain undefined.

¹⁰ For more information see the UNEP Risø Centre's NAMA Pipeline Analysis and Database, 13 September 2011. (Available from <http://namapipeline.org/>) (Accessed on 9 January 2012)
Some of the submissions can be seen at: <http://unfccc.int/home/items/5265.php>. (Accessed on 9 January 2012)

While not all-inclusive, Figure 1 summarises primary sources of international climate finance that could currently support sustainable agricultural practices.

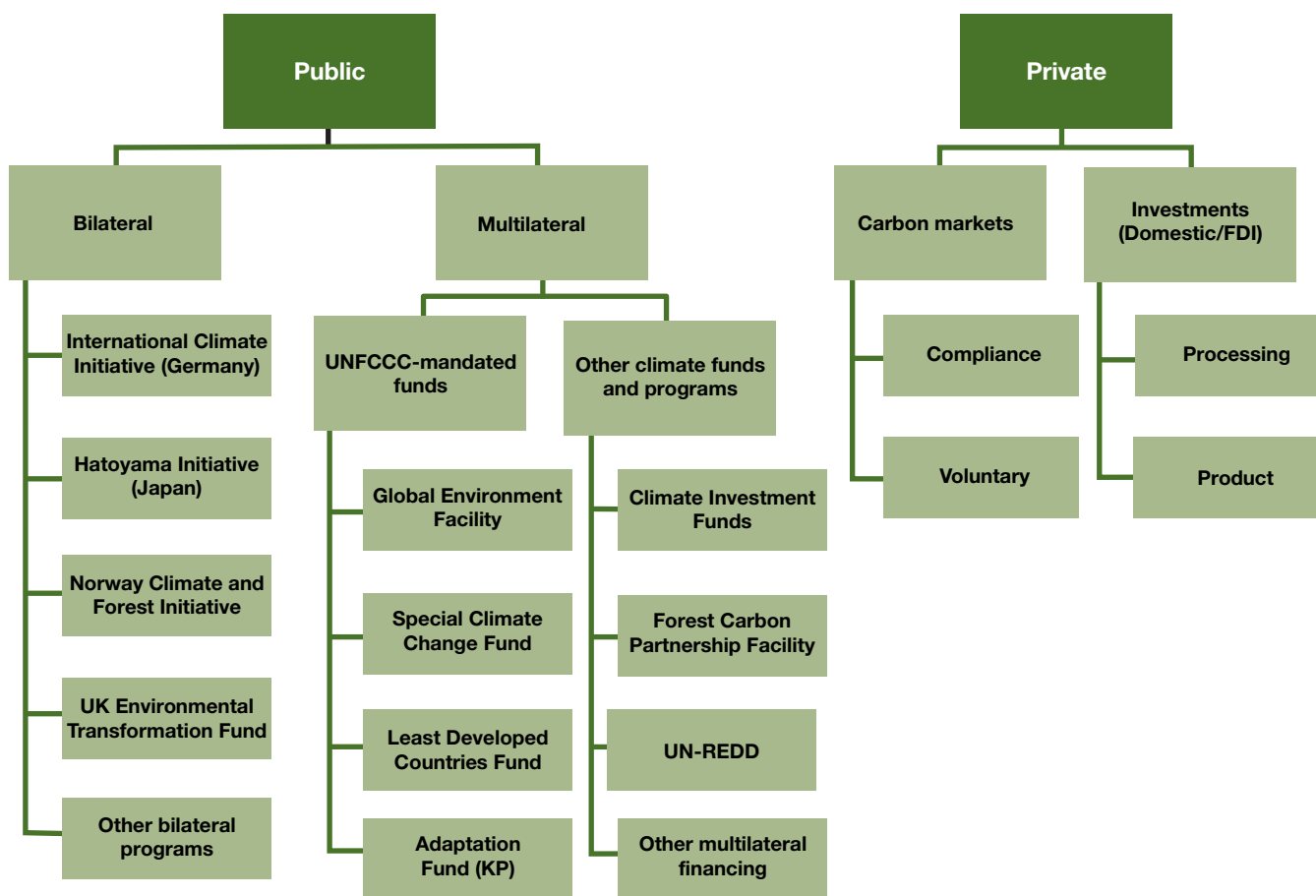


Figure 1. Existing international public and private climate finance sources for agricultural mitigation.

3. Policies to support smallholder investments in sustainable agricultural activities

Smallholders are a large and geographically dispersed group with heterogeneous interests (Birner and Resnick 2010). Each farm has its own specific suite of characteristics based on variations in resource endowment and family circumstances. Individual farms are organised not only to produce food, but also to meet other household goals. Smallholder activities and related income often consist of a range of interdependent gathering, production and post-harvest processes. Besides cropping and livestock keeping, household livelihoods can encompass fishing and agroforestry, as well as hunting and gathering activities (Dixon et al. 2001).

Sustainable agricultural practices can increase smallholders' resilience to climate change, improve their food security and contribute to the global goal of reducing GHG emissions. Nevertheless, changing common practices in smallholder systems is not an easy task. It requires smallholders to invest capital and labour in techniques that are often unfamiliar to them.

Impediments to the diffusion of new technologies and improved practices can occur at different stages, from inception to uptake of agricultural innovations by resource-poor smallholders. The most binding constraints often occur at the adoption stage: poorly functioning input and output markets, weak local institutions and infrastructure, or inadequate extension systems. The lack of credit and insurance markets also often prevents smallholders from accessing and using new technologies and practices (Lybbert and Sumner 2010). These barriers, summarised in Table 3, may be exacerbated by a lack of savings or liquid assets, especially when coupled with weak land tenure security.

Table 3. Barriers to the adoption of improved agricultural practices among smallholders

Investment barriers	Social/institutional barriers	Technological barriers
Lack of assets and savings.	Poorly functioning markets.	Lack of technical expertise.
No or little access to credit or extension services.	No or limited access to markets.	Existing resource degradation (for example soil or water).
No or little access to insurance.	Limited market information and understanding.	Lack of baseline data (for example on forest or soil carbon content).
Lack of infrastructure and equipment.	Weak land tenure security.	

The barriers to smallholders adopting new practices range from a lack of land titles and smallholders not recognising problems relating to natural resources, to the lack of capacity and capital to invest in, and to trust in, the long-term potential of sustainable land management practices (Garrity et al. 2006). Many smallholder farmers have no or limited access to credit as they do not have the means to prove that they have a sustainable source of income, and they do not hold a formal title to their lands that could be used as collateral.

Land tenure is one of the factors that contribute to or hinder the adoption of sustainable land management practices by smallholders. When land rights are well established, farmers have a clear incentive to manage their land in a sustainable and productive way (Antle and Diagana 2003). Insecure property rights diminish farmers' incentive to invest in the land they hold since they must bear the uncertainty of whether or not they will be able to recoup their investment (Quan and Dyer 2008; Omura 2008). But with the right institutions to ensure compensation for labour and other long-term investments on the land, different tenure systems can ensure access to land and stimulate investments in land improvement (Perez et al. 2007).

The lack of technical know-how and political support from local and national governments also add to these barriers. The diffusion of diverse technologies to smallholder farmers must take into account the more volatile and dynamic world of environmental and socioeconomic challenges. Crucial in helping smallholders is the integration of science-based and indigenous technology. Smallholders should be enabled to make informed choices according to their unique needs¹¹.

Given the varied nature of farming systems across the world, incentives for a change in practices must be tailored to local realities and supported by a general set of enabling socioeconomic conditions. Effective policies must identify the most important and relevant barriers and address them. Such policies may, among other things, clarify or create rights to land and water, or to the benefits from their use; provide access to markets; or strengthen institutional arrangements, such as credit services and extension systems. Policies could also enhance access to resources, increase productivity, or build local capacities for implementing sustainable management techniques.

¹¹ For more information see: www.ifad.org/events/agriculture/sessions/6/actors.htm. (Accessed on 9 January 2012)

Table 4 below provides a summary of policies that increase smallholder access to finance and investment. Lack of investment and credit are a significant barrier to the adoption of new practices among smallholder farmers. Farmers are often regarded as high-risk borrowers (Parker et al. 2008), and therefore ensuring that sufficient funds are available at affordable interest rates remains a major barrier. However, it is important to stress that the mere availability of finance may not be enough for risk-averse farmers, nor will it protect them in the event that new practices or technologies fail to increase yields or worse, decrease yields¹². Nevertheless, the focus of this report is on financial

incentives, which are divided into: (i) output and results-based payments; (ii) direct access to loans or other financial products; (iii) risk-sharing mechanisms; and (iv) incentives for enhanced private investment. The various mechanisms differ according to who bears the costs of the intervention (farmers, taxpayers, consumers, beneficiaries); the ability to target incentives; and administrative and transaction costs. This overview will inform the analysis of adequate climate finance instruments to support the scaling-up and tailoring of relevant policies that encourage adoption of improved agricultural practices. Annex II contains a more detailed description of the various policies.

Table 4. Potential financial instruments to support smallholder sustainable agricultural practices¹³

Instrument	Modalities	Advantages	Disadvantages	Application	Availability	Example
Results-based incentives						
Payments for services	Payments for conservation efforts, tree planting, improved agricultural management,	Increases financial attractiveness of alternative practices. Results-based.	Relies on local institutions and implementation and enforcement capacities.	Policies. Programmes.	Tested in a limited number of jurisdictions, mostly in Latin America.	Pro-poor Rewards for Environmental Services in Africa. ¹⁴
Payments for GHG emission reductions and removals	Market transactions for emission reduction credits. Monetisation of (future) emission reductions.	Increases financial attractiveness of projects that might not otherwise be feasible. Direct link to mitigation benefits.	Requires aggregation as well as costly monitoring and verification. Dependent on carbon price fluctuations. Advance payments are risky and difficult to obtain.	Programmes. Projects.	Current standards hold limited potential for smallholders due to high transaction costs.	World Bank BioCarbon Fund; Kenya Agricultural Carbon Finance Project ¹⁵ .

¹² For instance, in 2009, the FAO launched a 2-year programme through the European Union's Food Facility to provide fertiliser and improved seeds to approximately 200 farmers' associations. Many smallholders, who had little or no experience with application of chemical fertiliser, received subsidies to cover the costs of the fertiliser, but were still left to cover approximately 30% of the total cost. For many this was still a substantial economic burden and required borrowing. During the first year of the

project, a significant drought caused the fertiliser to burn plants, and those farmers without irrigation experienced production that was 2060% of an average year. Many farmers, who had exhausted their savings, were left with barely enough to survive (Laajaj and Da Fonseca Matias 2010).

¹³ Adapted from Climate Focus.2011.

¹⁴ For more information see: <http://presa.worldagroforestry.org/activities>.

¹⁵ Tennigkeit and Woelcke 2009.

Table 4 (cont.)

Instrument	Modalities	Advantages	Disadvantages	Application	Availability	Example
Direct financial incentives						
Debt	Preferential loans that subsidise particular inputs or practices.	Sources of financing for technology, labour and other investments.	Requires collateral and a revenue stream. Repayment risk. Difficult to find local lenders.	Programmes. Projects.	Limited availability for smallholders.	Global Climate Partnership Fund ¹⁶ . (The Fund is currently not supporting agricultural activities.) Los Andes Private Nature Reserve; USD 170 000 coffee harvest credit ¹⁷ .
	Microfinance loans to households.	Offers affordable financing to low-income clients. Often collateral-free.	Requires a local presence. High monitoring costs. Short pay-back periods.	Programmes. Projects.	Suitable (and available) for trade and market access.	Grameen Bank, Bangladesh; Spandana, India. Worldwide 5.4 million agricultural insurance policy holders ¹⁸ .
Grants	Financial support to projects that serve the public interest, often provided by governments or not-for-profit organisations.	Increases the financial attractiveness of projects that might otherwise not be economically feasible. Comes at no cost for smallholders.	Availability is limited and continuity is uncertain. Unlikely to cover the entire investment cost.	Programmes. Projects.	Limited availability and difficult to scale up.	GEF Small Grants Programme: Climate Change. ¹⁹ China's Grassland Ecology Conservation Reward and Subsidy System. ²⁰
Tariffs and taxes	Tax incentives to support policy objectives. Enhanced tax deductibility and tax rebates. Removal of taxes that create perverse incentives.	Steers investment into activities that would otherwise be economically unrewarding. Comes at no cost for smallholders.	Comparatively costly to set up. Relies on tax discipline and collection. Limited relevance for smallholders.	Policies.	Often only indirectly relevant for smallholders.	Renewable energy feed-in tariffs in Uganda for bagasse and biogas projects.

¹⁶ For more information see: <http://gcpf.lu>.

¹⁷ For more information see: www.conservation.org/sites/verdeventures/portfolio/north_central_america/pages/los_andes.aspx.

¹⁸ Dror et al 2011.

¹⁹ For more information see: <http://sgp.undp.org/index.cfm?module=projects&page=FocalArea&FocalAreaID=CC>. (Accessed on 9 January 2012)

²⁰ For more information see: <http://english.peopledaily.com.cn/90785/7564767.html>. (Accessed on 9 January 2012)

Table 4 (cont.)

Instrument	Modalities	Advantages	Disadvantages	Application	Availability	Example
Risk sharing (cont.)						
Insurance	Insurance against weather, political, crop and other risks.	Shifts investment and adoption risk away from smallholders.	Inappropriate use distorts markets. Excessive risk taking.	Policies Programmes.	Limited but increasing availability for smallholders.	Index-based livestock insurance in Mongolia ²¹ and Kenya ²² ; HARITA drought insurance in Ethiopia; Kilimo Salama input insurance in Kenya; ICICI Lombard weather insurance in Andhra Pradesh, India.
Loan guarantees	Mitigation of political or credit risks in public or private sector loans.	Effectively mobilises co-financing from external sources. Leverage potential for long-term debt finance for development.	Risk of principal loss for the issuer of the guarantee.	Policies Programmes.	Limited availability.	USAID Development Loan Agency, International Finance Corporation, Kreditanstalt für Wiederaufbau (KfW); agricultural input supply channels in Kenya, Malawi and Uganda by the Rockefeller Foundation. ²³
Incentives for foreign investment						
Public/private partnerships	Financial and policy support for targeted investments.	A flexible model accommodates multiple instruments. Proven in large-scale project investments and potential for programmes targeting smallholders.	Historically favoured larger investment projects. Risk of benefits accruing to larger private players rather than smallholders.	Policies Programmes.	Limited availability. Many still grant-financed.	Water efficient maize for Africa; Africa Enterprise Challenge Fund.

²¹ World Bank 2007

²² Lybbert and Sumner 2010.

²³ World Bank 2007, p. 153.

4. Harnessing climate finance for the benefit of smallholders

The potential for climate finance to initiate a move towards improved, sustainable agricultural practices is real, but agriculture competes with other sectors for limited public funds and market demand. When competing for climate finance, the complexity and diversity of the agricultural sector and its limited experience with carbon finance, and hence the limited availability of data and MRV systems, puts agriculture at a disadvantage compared with the industry and energy sectors. It is therefore important that developing countries take advantage of existing financial mechanisms to pilot, demonstrate and scale up mitigation (and adaptation) activities in the agricultural sector. In parallel, they may engage in readiness activities that include the improving of datasets, building MRV capacities, and developing more comprehensive national strategies. In this context, the REDD+ readiness process, in which over 40 developing countries have been engaged, may provide a platform for discussing a more integrated land-use strategy (a landscape approach) involving both the forest and agricultural sectors.

When considering applying climate finance to the agricultural sector, governments may start by defining policy goals, such as increasing climate resilience in the agricultural systems in a particular region or diversifying income sources among smallholders. The definition of the targeted outcome is followed by the identification of existing or new national policies and financial instruments that support this outcome and can be backed up or co-financed by international climate finance. The prioritised policies and measures should be aligned with the national development agenda. Stakeholder consultations would inform the appropriate policy choices. Policy makers should also evaluate the costs and benefits of suggested activities.

Policy makers could then identify the appropriate climate finance instruments to incentivise the adoption of sustainable agricultural practices by smallholders. Sectoral approaches, such as REDD+, mandate carbon accounting at the national level. Unless international schemes support the integration or 'nesting' of projects and programmes into the national accounting framework, incentives for emission reductions (such as payments) would accrue at the national level and then be distributed to local levels. The nesting of projects within national approaches allows non-state actors to directly account for emission reductions at the activity level.

In the following subsections, we will discuss how the policies and financial instruments described in the previous section could be linked to mitigation action by smallholders who potentially could benefit from climate finance. We will consider institutional requirements, appropriate incentives and finance mechanisms, and MRV systems.

4.1. Institutions

Sustainable agriculture is a cross-cutting issue. Innovative institutional arrangements, making full use of existing structures at the national and international level, can contribute to improving coordination and integration capacity across institutions (for example through facilitating inter-ministerial dialogue; the creation of interdisciplinary communities of practice across relevant ministries, research institutes, planning units and farmers' unions; joint planning exercises; and multi-stakeholder consultation) (Meridian Institute 2011). Sustainable transformation of the agricultural sector will be costly, and the available financing (current and projected) will not meet the challenges faced by this sector (Wollenberg et al 2011). Coordination across different financial sources (both public and private) is essential to mobilise the scale of finance required to meet agricultural production and climate change challenges. Such coordination could involve blending climate financing for adaptation and mitigation with domestic resources or official development assistance to finance programmes to support climate-smart agriculture, where appropriate (Meridian Institute 2011).

To ensure coordinated management of agricultural policies, the governments of developing countries may consider appointing an institution, department or entity to coordinate the planning, implementation, MRV and finance matching of various policies, including those targeting adaptation and food security as well as mitigation. Such an institution could streamline access to climate finance, structure international financing proposals, manage oversight and verification for climate finance-related activities, and facilitate cooperative partnerships both domestically and internationally. This institution would work with various agencies to identify and develop climate-relevant actions, and submit formal funding requests to international donors or funds. The range of administrative and operational functions of the climate coordinating institution is summarised below:

- Assisting government ministries and state agencies to design and finance adaptation and mitigation strategies for the agricultural sector.
- Improving policy alignment and coordination capacity across relevant ministries and other entities, including for blending and leveraging financing from different sources to enable implementation of climate-smart agriculture.
- Developing metrics for measuring the performance (MRV) of such policies and programmes.
- Ensuring the performance of selected policies and programmes.

- Coordinating various national and international climate finance streams.
- Advising on and providing distribution of international finance domestically.
- Facilitating a feedback loop between national action and UNFCCC negotiations on agriculture and land use as well as on financial support mechanisms.

Where countries have national financial institutions that can directly access and serve as trustee and manager of international climate funds, such institutions would have to be involved in policy prioritisation, cost-benefit analysis and disbursement procedures. Such institutions need to ensure that there is accountability and transparency in the fund disbursement process. In the absence of such institutions, the government would have to establish the necessary relationships with international and bilateral agencies that administer climate finance.

The implementation of market-oriented and other policy incentives for direct investments into agriculture will depend on the availability of appropriate institutions and regulatory readiness (see Box 3). Readiness and capacity-building funds may help to set up the various policies, while international, results-based climate finance (such as REDD+ and NAMA finance) may (co-)finance the implementation costs, in particular for Payments for Environmental Services

(PES), loan or guarantee programmes.

Overarching national agricultural development policies, REDD+, NAMAs and other climate mitigation strategies that directly or indirectly impact on the agricultural sector must be aligned at the national level. To do that, countries need to invest in strengthening national institutions and extension systems, so that central and local staff are enabled to identify opportunities and direct them as needed. Reforming extension systems is essential to increase the efficiency of technical training for smallholders in sustainable agricultural practices. These systems need to be decentralised and modernised.

The private sector can collaborate by financing sustainable agricultural practices or by providing the technology and knowledge needed. This involvement may be driven, for instance, by the private sector's willingness to improve the sustainability of its product supply chain. Local private companies may also find this transition to a more sustainable agricultural sector a good business opportunity (for example by producing environmentally friendly agrochemicals to replace toxic pesticides). In this case it is important to build the capacity of these companies as well, so that they can meet sustainability standards in a cost-effective way.

Box 3. Regulatory readiness

- Formulating a national strategy on climate change and agriculture: Identifying promising agricultural practices, technologies and food system innovations, and policies that enable the adoption of climate-smart practices, including those that improve the efficiency and resilience of agricultural and food systems; formulating a strategy that improves policy alignment across different ministries and planning processes.
- Defining data and capacity needs: Closing knowledge and scientific gaps by designing capacity and technology support programmes.
- Establishing an institutional framework: Investing in institutional infrastructure that supports the adoption of new agricultural practices through extension, training, capacity building and the provision of inputs (such as seeds).
- Supporting land-use planning and tenure reform: Investing in land-use planning and tenure reform to support sustainable land management practices, enforcement, monitoring and improved governance.

4.2. Policies and financial incentives

Given existing funding limitations, it is important to tailor and target funding to where it can be most effective, while bearing in mind the multiple objectives the supported policy or measure is expected to fulfil. For instance, financial mechanisms capable of providing ex-ante funds to smallholders, such as transition cost subsidies, could be used to cover start-up transaction costs that might otherwise prevent poor smallholders from changing agricultural practices. However, to increase the effectiveness of the programme, ex-post payments through PES approaches could be prioritised where farmers can cover ex-ante costs themselves. In both cases, climate finance can also support climate finance-specific costs,

such as the costs associated with aggregation of farmers, MRV systems, or the training of extension systems, financial institutions or certification bodies.

Given that ex-ante funds are made available before performance can be measured or ensured, it is likely that they will come in the form of grants or loans from public climate funds. They can come from results-based or market payments if advance payments are considered or if financing institutions accept future payment streams as satisfactory collateral. The private sector can also make upfront payments available to, for example, farmers with whom they have a contract, as a form of investment in anticipated future benefits. This might include farmers in the supply chain of a carbon label product, or farmers involved in the establishment of a pilot carbon project in consideration of the sale of future carbon credits.

Table 5 illustrates the diverse potential financial arrangements that can fall under a climate finance supported programme. These arrangements describe how financial instruments (carbon offsets, risk-sharing instruments such as insurance or guarantees, and taxes or subsidies) to incentivise GHG mitigation or adaptation measures may be delivered and administered (performance or non-performance-based, government- or market-mediated transactions). The table illustrates a feasible array of such instruments and administrative arrangements.

International climate finance may be sought through either adaptation or mitigation finance, depending on the primary benefits of the proposed policy or measure. Ideally, climate-relevant interventions yield both mitigation and adaptation benefits. Adaptation benefits normally also go together with increased food security. Where various goals and benefits are combined, the blending of adaptation and mitigation funds may increase the available finance.

Table 5. Mitigation activities and financing mechanisms

		Payment distribution			
		Government programmes (extensions, cash payments)	Performance-based payments (direct market)	Performance-based payments (government-mediated)	Private investment
Financial instruments	PES	X		X	
	Carbon markets		X		X
	Guarantees and risk instruments	X			X
	Taxes and subsidies		X		X

Concrete examples of how climate finance can support PES, carbon markets, supply chain support or measures that reduce investment risk or attract direct investment into a change of practice include the following:

- **Transition funds can be set up and used to cover start-up certification costs:** The actual costs of

compliance with new carbon standards are not yet known; they will be influenced by choices of data sources, emission factors and system boundaries (Brenton et al. 2009). This uncertainty makes identifying suitable ways to lower costs for smallholders challenging. In partnership with local farmers' organisations and agricultural companies, governments may set up funds that cover the cost of certification through grants or concessional loans. Where premium payments reward certification and improved practices, smallholders could repay the investment received (or part of it), thereby replenishing the original funds so that they can continue to support new entrants. MRV of climate benefits would be linked to the number of certified farmers combined with area- or proxy-based accounting, depending on the farming system, the standard and the aggregation model.

Governments can also use funds to support the participation of smaller farmers in initiatives that seek to formulate sustainable production standards (such as the Roundtable on Sustainable Palm Oil (see Box 4) or the Round Table on Responsible Soy). Adoption of new standards is likely to require additional support and technical assistance.²⁶ Reducing transition costs (for example through the private sector paying for the cost of certification) and risks (such as the private sector insuring farmers against potential yield reductions as a result of participation) would facilitate the engagement of smallholder farmers. An industry- or government-financed fund to reimburse smallholders for the transaction costs could remove a major obstacle for adoption of improved practices in the agricultural sector while creating suitable MRV systems. Non-governmental organisations (NGOs) such as WWF²⁷ and others are investing in these initiatives. Driven by producers, roundtables promoting sustainable production standards can also steer investment to agricultural producers who use sustainable practices (see Boxes 4 and 5).

Box 4. The Roundtable on Sustainable Palm Oil

The Roundtable on Sustainable Palm Oil (RSPO) was formed in 2004 "to promot[e] the growth and use of sustainable oil palm products through credible global standards and engagement of stakeholders".²⁸ To achieve this goal, the RSPO developed 39 sustainability criteria across eight general principles related to environmental, social and legal concerns. Despite the inclusion of several environmental and social/development organisations among its members, the RSPO certification has been targeted by NGOs and the media for slow progress in creating a sustainable palm oil supply chain. Nevertheless, since 2004, RSPO membership has grown by over 500%. With the increasing demand for certified palm oil over the last few years, the RSPO continues to expand. Recently, the RSPO has attempted to bring the smallholder sector into sustainable production through the establishment of an escrow fund that will help to alleviate start-up costs. The RSPO is also actively recruiting new members in Africa and Latin America.

²⁶ For example, the Nature Conservancy recently helped the Adelbert Conservation Cooperative Society of Papua New Guinea receive Fair Trade certification for their cocoa, the first such certification in PNG. See: www.nature.org/ourinitiatives/regions/asiaandthepacific/papuanewguinea/explore/sweet-success.xml.

²⁷ See: http://wwf.panda.org/what_we_do/footprint/agriculture/.

²⁸ Article 3 of the RSPO By-laws: <http://www.rsपो.org/page/896>. (Accessed on 9 January 2012)

Box 5. The Schokland Fund²⁹

It is possible to rapidly deliver technical support and incentives to a large number of environmentally responsible farmers in key tropical forest nations, as demonstrated by the Schokland Fund. The Schokland Fund is an inter-roundtable initiative that provides support to small-scale farmers and farm workers in the palm oil, soy and sugarcane sectors, applying better farm management practices in order to add value to a certifiable and sustainable supply chain. During the last three years, the Fund has supported the certification of 80 000 smallholders worldwide and has benefited 250 000 workers. Farmers have added value to their product by supplying their certified palm oil, soybean or sugarcane to certified sustainable supply chains in an effective and efficient manner. Many of the pilot projects already under way through the Schokland Fund are also contributing to the reduction of emissions from deforestation. The Schokland Fund was set up with a contribution of 1 million euros from the Netherlands Ministry of Foreign Affairs and 2 million euros given by Oikocredit U.A.

- **Strategic early investments can help build smallholders' confidence and overcome market barriers:** Climate finance can also cover transaction costs, such as costs associated with aggregation of farmers, measurement and monitoring systems, or training of extension systems, financial institutions or certification bodies. By covering such costs, governments can also lower the barriers for smallholders to participate in carbon market or supply chain initiatives that leverage private sector finance.
- **Support of carbon and climate finance through results-based payment schemes:** Carbon markets may prove to be an effective source of finance for smallholders only in the long term. In the meantime, financial assistance in covering transaction costs (protocols, verification, feasibility studies, and so on), the strategic purchase of agricultural carbon credits and

the direct financing of strategic projects (when supported by the science) would help to support the development of viable agricultural carbon transaction models and build investor confidence (Climate Focus 2011).

Where upfront finance is not needed, public support can be used to make payments for environmental services for sustainable agriculture. Table 6 below includes potential PES goals, indicating whether they are product- or practice-driven, and relevant examples from existing schemes. Where possible, finance could be made available through existing institutions. Rural financial services or Community Development Funds may be appropriate distribution channels as they are demand-driven cost-sharing mechanisms that promote participatory community development.

Table 6. Types of PES schemes

Goal	Payments linked to improved product	Payments linked to improved practice
Increase carbon content of the system	<ul style="list-style-type: none"> • Payment linked to carbon content of soils. 	<ul style="list-style-type: none"> • Payments linked to particular practices: <ul style="list-style-type: none"> • agroforestry • conservation tillage • improved residue management
Reduce GHG emissions	<ul style="list-style-type: none"> • Payment linked to GHG reductions. 	<ul style="list-style-type: none"> • Improved cropland management. • Improved livestock management: <ul style="list-style-type: none"> • improved diet • reduced enteric fermentation • manure aerated before composting. • Precision application of inputs (fertiliser and pesticide).
Increase yields	<ul style="list-style-type: none"> • Payment linked to improved yields as an indicator of intensification. 	<ul style="list-style-type: none"> • Effective irrigation measures. • Nutrient management.
Reduce vulnerability	<ul style="list-style-type: none"> • Payment linked to soil carbon, biodiversity or watershed conservation. 	<ul style="list-style-type: none"> • Diversification of household activities.

²⁹ For more information see: <http://solidaridadnetwork.org/millenniumagreements>. (Accessed on 9 January 2012)

- Climate finance could help reduce climate-related agricultural production risks through insurance and guarantees:** Schemes that are available at low transaction costs will encourage smallholder farmers to increase production intensity because inputs are insured against failure. This will increase food security and farm income. A detailed analysis of existing schemes is required to understand the potential public leverage options and related risks. Currently, some input insurance systems successfully employ smart

mobile phone technology to address the challenge of reducing transaction costs. Weather index-based insurance mechanisms have also been tested successfully in a number of countries. The HARITA system in Ethiopia is addressing climate change by linking the weather index-based insurance with the Government's Food for Work programme, which is particularly useful for regions with frequent drought events (see Box 6).

Box 6. Climate risk insurance models in Ethiopia ³⁰

The HARITA climate resilience project

The Horn of Africa Risk Transfer for Adaptation (HARITA) is an innovative climate change resilience project launched by Oxfam America, Swiss Re, the Relief Society of Tigray, the International Research Institute for Climate and Society and Nyala Insurance, among others. Between November 2007 and December 2009, a pilot climate risk management package was designed for poor farmers in the village of Adi Ha consisting of a mix of risk reduction, drought insurance and credit. The approach consists of three main components:

- Risk reduction/minimising vulnerability:** Farmers participating in HARITA are learning how to use compost, which is critical for rebuilding soil nutrients and improving soil moisture retention. They are also building small-scale water harvesting structures and planting trees and grasses to promote soil and water conservation.
- Risk transfer/weather index insurance:** HARITA proposes to introduce micro-insurance to strengthen Ethiopia's Productive Safety Net Programme by addressing the non-chronic, 'unpredictable' needs not covered by the programme.
- Prudent risk taking/credit:** The project supports poor producers in making optimal production decisions even in the face of uncertainty, for the purposes of livelihood diversification, technology adoption and entrance into more profitable lines of business.

HARITA is also innovative in the sense that it allows very vulnerable farmers to pay their premiums in the form of risk-reducing labour, as a result of which farmers benefit through these risk-reduction measures even when there is no pay-out. In 2011, HARITA will scale up to serve 13 000 households.

Adaptations and Innovations for Ethiopia project

As part of the USAID-funded Index Insurance Innovation Initiative (R4), 10 index insurance pilot projects have or will be rolled out across Africa, Asia, and Latin America in a diverse range of agro-ecological, economic and social environments. Each programme is planned to have a direct impact on 5000 small-scale agricultural or pastoralist households, and will be designed to ensure local scale-up and dissemination.

One of the pilot projects that utilise climate change funds from USAID is the Index-based Livestock Insurance (IBLI): Adaptations and Innovations for Ethiopia project. The IBLI Ethiopia pilot is attempting to design and introduce new group-based and/or credit-linked products. Moreover, it will explicitly incorporate IPCC predictions of climate change and associated rangeland carbon effects to explore dynamic pricing and the potential for conditional insurance transfer programmes linking livestock insurance with individual behaviour to adapt to climate change. The index to determine pay-outs will be based on Normalized Difference Vegetation Index Satellite (NDVI) images, using vegetative cover as a proxy for drought.

USAID has also issued a grant to the World Food Programme and Oxfam America to implement their R4 Resilience Initiative. Also in Ethiopia, the project seeks to strengthen smallholder food and income security through "a combination of improved resource management (risk reduction), microcredit ('smart' risk taking), risk transfer (insurance), and risk reserves (savings)" (Oxfam America and World Food Programme 2011). In this manner, risks of different magnitudes and timings can be addressed. The R4 Resilience Initiative builds on the HARITA model to test the approach on a larger scale, both within and outside Ethiopia, focusing on mechanisms that can be integrated into social protection systems, including productive safety nets. Should the initiative yield successful results, it can therefore be applied on a much larger scale by governments and international organisations.

²⁹ For more information see: <http://solidaridadnetwork.org/millenniumagreements>. (Accessed on 9 January 2012)

- International funds are limited and will not be available permanently. It is therefore essential to leverage other public and, even more importantly, private funds wherever possible:** Options to involve the private sector include the design of loan or insurance schemes, publicprivate partnerships (PPPs) and carbon markets. Such prioritisation can happen in parallel to international negotiations and the fine-tuning of rules on criteria for both MRV and funding. Countries can engage in demonstration activities while negotiations around the various climate finance mechanisms, NAMAs, REDD+ and corresponding MRV requirements continue. In the absence of international rules, funding will depend on a bilateral agreement between the host government and the developed country government contributing climate funds to support a particular activity. Programmes can also be implemented by NGOs or the private sector, preferably with government support and approval. Financing may also come from private national or international sources. In most cases financiers will be interested in carbon credits or in supply chain benefits. Fast-start and early climate finance allows the testing and learning of distribution mechanisms, MRV systems and benefit sharing, among other things, to be supported. Lessons learned will also inform international negotiations.

4.3. Measurement, reporting

MRV is the process under the UNFCCC to monitor climate actions, ensuring that they are real and additional (in terms of emission reductions and other metrics). For developing countries, MRV may quickly become a condition for accessing scaled-up and performance-based international climate finance. Among other things, MRV aims to: (i) assess the effectiveness of mitigation actions; (ii) provide international recognition of each country's actions; (iii) identify and share best practice in order to improve implementation; and (iv) provide feedback on policy implementation (Bakker and Würtenberger 2010).

The Cancun Agreements refer to two broad types of MRV in developing countries: (i) internationally supported mitigation actions subject to domestic as well as international MRV; and (ii) unilateral actions funded domestically and subject only to domestic MRV. The nature of MRV will depend on the stated objectives of the particular policy or measure and the national circumstances of the proponent country (see Table 7 for examples of proposed NAMAs). This will almost certainly involve milestones and performance-based metrics, which may or may not be linked to measured emission reductions. Where countries lack the ability to account for emission reductions, results-based financing frameworks may be linked to proxies for emission reductions (Meridian Institute 2011).

Table 7. Illustrative MRV regimes for proposed NAMAs

NAMA	Country	MRV
Restoration and sustainable management of grazing land	Brazil, Jordan, Mongolia	GHG-based accounting, stratification and monitoring of degraded lands and activity proxies (Tier II).
No-till agriculture	Ghana, Brazil, Sierra Leone	Area monitoring of land under no-till and/or conservation farming, per hectare.
Capacity building for policy makers and farmers regarding mitigation measures	Macedonia, Republic of Congo	Indicators in connection with climate change training programmes(e.g. individuals receiving training, adoption post-training and/or policy changes).

International climate finance can be used to support countries that have a demonstrated commitment to establish a system to monitor agricultural emissions, along with policies and measures to reduce agricultural emissions. Financial support could be provided for an agricultural readiness process, strengthening of existing agricultural monitoring and evaluation capacity. This would ultimately lead to national agricultural GHG monitoring systems, including national reference emission levels and related capacity-building support. Financing could be linked to milestones related to the MRV system development and reporting accuracy. Performance-based payments for emission reductions achieved would provide incentives not only to set up monitoring systems but also to adopt agricultural mitigation activities. The fast-start financing committed under the Cancun Agreements could provide suitable financing pathways such as NAMAs or bilateral initiatives. Any agricultural climate investment programme

would need to be developed, tailoring different climate financing mechanisms to tackle specific investment barriers and risks.

The results-based nature of mitigation finance requires the monitoring of emission reductions and sequestration benefits. Various MRV systems require different levels of accuracy. The most accurate systems allow for the measurement of carbon benefits on a per tonne basis and generate 'compliance-grade' or 'market-ready' carbon benefits. Since market-based instruments require more stringent MRV, policy makers (most likely in cooperation with international partners) will also have to decide which activities would qualify to access market-based finance, and, if they do qualify, whether carbon accounting would happen at the project (voluntary carbon market), policy or sectoral (NAMA) level. For most agricultural projects (exceptions exist in livestock and waste management) undertaken by smallholders, MRV for compliance-grade

carbon will be costly. Data are missing and, even where they exist, they are highly aggregated. While MRV methods and data improve, benefits may be measured through proxies. While such measurements will not yield compliance-grade carbon benefits, they may suffice to link funding to mitigation results.

In the UNFCCC system, agricultural emissions are accounted for and reported as part of national inventories and national communications to the UNFCCC. In some cases, enhanced support for programmes to support the

adoption of agricultural mitigation practices has been accounted for within the context of programme accounting systems that may be linked to national GHG inventories. Actions supported through the CDM and voluntary carbon markets apply project-based accounting approaches in the agricultural sector (see Box 7 for an example). There are also programmatic and project-based accounting approaches that have been developed as part of sub-national (pre-)compliance markets and voluntary market-based mechanisms (Meridian Institute 2011).

Box 7. Project accounting: Kenya's sustainable agricultural land management methodology

Kenya's land management methodology, which was approved by the verified carbon standard in December 2011, involves estimating and monitoring GHG emissions relating to the adoption of sustainable agricultural land management (SALM) practices in agricultural landscapes. In this methodology, SALM is defined as any practice that increases the carbon stocks on the land. Examples of SALM are (but are not limited to) manure management, use of cover crops, returning composted crop residuals to the field, and the introduction of trees into the landscape. The methodology is to monitor project activities and use soil carbon models to estimate carbon sequestration rates. An activity baseline and monitoring survey tool was developed to monitor the adoption and maintenance of SALM practices and their impact on crop yield, which is a main driver of soil carbon sequestration. This methodology is based on the Kenya Agriculture Carbon Project, which was developed in partnership with the Vi Agroforestry Programme, the Government of Kenya and the World Bank.

5. Conclusion

Climate finance brings a new momentum for the support of sustainable agricultural practices in developing countries. With new and additional funds and disbursement mechanisms available, policy makers have a greater incentive to work on policies that support smallholder farmers and to lift the barriers to the adoption of sustainable practices by these individuals. Furthermore, climate finance may also lead to new partnerships between public and private entities to support activities

that mitigate climate change while also increasing the resilience of smallholding systems and food security.

Table 8 below synthesises some of the policies that can both be supported by climate finance and benefit smallholder farmers. Developing countries could assess what the main local barriers to the adoption of sustainable practices by local smallholders are and use these mechanisms to address these challenges.

Table 8. Climate finance opportunities benefiting smallholders

Policy	Financing Source	Financing Mechanism	MRV
PES	Domestic budget.	Results- or activity-based disbursements. Expansion of current programmes in countries that already have initiatives to incentivise investments in environmentally sound practices (for example the Mexican PES programme for hydrological services).	Results- or activity-based MRV (change in practice; compliance with desired behaviour; measurement of outcomes).
	International climate finance; public sector.	Support from performance-based international finance for NAMAs (if there is a direct mitigation benefit); REDD+ (if there is a link to avoided emissions from deforestation or enhancement of forest carbon stocks); adaptation (if there is an adaptation or food security benefit).	For NAMA and REDD+, carbon baseline has to be established and MRV has to assess carbon fluxes.
Carbon markets	Private resources; national markets; voluntary.	Direct payments to beneficiaries by carbon market buyers or aggregators. Direct payments to beneficiaries.	Based on existing voluntary carbon standards. Approved MRV protocols based on compliance or voluntary carbon standards.
	Private resources; international markets; regulated and	Support from buyers who want to invest in corporate sustainability or who have a compliance target.	
Loans	Domestic budgets.	Disbursements to smallholders via intermediaries. Provision of concessional loans from the government to smallholder farmers who implement sustainable agricultural practices (ABC in Brazil; Low-Carbon Agriculture Plan).	MRV can be linked to the terms that regulate the debt service. MRV can also be a condition or covenant to the loan.
	International loans.	Disbursement via government agencies or private intermediaries (e.g. local banks).	The MRV system depends on the funded activity.
Grants	Domestic budgets.	Disbursements to farmers or intermediaries. Grants covering the transition to sustainable and low-carbon activities. Support for the development of local capacity to get ready for a shift in agricultural practices.	No carbon accounting. Initiatives have to go through a due diligence process in order to receive the investments and, once the investment is in place, periodic site visits ensure that the project is following the minimum criteria established.
	International grants.	Support for extension services, public services or private activities that create an enabling environment.	
Fiscal incentives	National budgets.	Taxes and tariffs. Removal of taxes that favour activities with a high carbon footprint. Tax breaks for low-carbon mitigation activities. Potential for national government subsidies for farms and products that use sustainable agricultural practices with the aim of reducing sector emissions.	MRV is unlikely to be linked to carbon. Activity-based accounting and eventual capturing of carbon benefits in national carbon accounting (in sectoral mechanisms such as REDD+).
Insurance or guarantees	Public budgets (national or international).	Provision of guarantees or insurance against loss of harvest related to the changed practices. Guarantees that allow access to finance.	MRV at the level of the beneficiary of the insurance or guarantee, as a condition to access the risk mitigation tool. Where private initiatives are cross-financed and supported with public carbon finance, MRV of carbon benefits will be a requirement.
	Private resources.		
PPPs in supply chains	Public and private resources.	Transition cost subsidies from private or public partners.	Lifecycle analysis. MRV of carbon through the use of simplified carbon accounting methods.

References

- Antle JM, Diagana B. 2003. Creating incentives for the adoption of sustainable agricultural practices in developing countries: the role of carbon sequestration. *American Journal of Agricultural Economics* 85(5): 11781184.
- Bakker C, Würtenberger L. 2010. Nationally appropriate mitigation actions (NAMAs) and measurement, reporting and verification (MRV). Policy Brief, Technical Assistance to the Ghanaian National Climate Change Policy Framework. November 2010. (Available from www.ecn.nl/docs/library/report/2011/o11018.pdf) (Accessed 9 January 2012).
- Barnett BJ, Black JR, Hu Y, Skees JR. 2005. Is area yield insurance competitive with farm yield insurance? *Journal of Agricultural and Resource Economics* 30(2): 285301.
- Birner R, Resnick D. 2010. The political economy of policies for smallholder agriculture. *World Development* 38(10): 14421452.
- Brenton P, Edwards-Jones G, Jensen MF. 2009. Carbon Labelling and Low-income Country Exports: A Review of the Development Issues, *Development Policy Review* 27(3): 243267.
- Carter MR, Galarza F, Boucher S. 2007. Underwriting area-based yield insurance to crowd-in credit supply and demand. Working Paper No. 07-003. Davis: Department of Agricultural and Resource Economics, University of California.
- Clay J. 2009. Balancing the budget: demand exceeds the Earth's supply. In: WWF. Annual Report 2009. Washington: WWF. p 1619. (Available from www.worldwildlife.org/who/financialinfo/2009AR/WWFBinaryitem17387.pdf) (Accessed 9 January 2012).
- Climate Focus et al. 2011. Carbon market and climate finance for agriculture in developing countries. Amsterdam: Climate Focus. (Available from www.climatefocus.com/documents/title_carbon_market_and_climate_finance_for_agriculture_in_developing_countries) (Accessed 9 January 2012).
- Climate Focus. 2011. The handbook for programme of activities: practical guidance to successful implementation. Amsterdam: Climate Focus. (Available from www.climatefocus.com/documents/files/the_handbook_for_programmes_of_activities_practical_guidance_to_successful_implementation.pdf) (Accessed 9 January 2012).
- De Pinto A, Magalhaes M, Ringler M. 2010. Potential of carbon markets for small farmers: a literature review. International Food Policy Research Institute (IFPRI) Discussion Paper 01004. IFPRI, Washington, DC. (Available from www.ifpri.org/sites/default/files/publications/ifpridp01004.pdf) (Accessed 9 January 2012).
- Dixon J, Gulliver A, Gibbon D, Hall M, eds. 2001. Farming systems and poverty: improving farmers' livelihoods in a changing world. Washington, DC: FAO and the World Bank. (Available from www.fao.org/DOCREP/003/Y1860E/y1860e13.htm) (Accessed 9 January 2012).
- Dror I, Jenkins K, Motegi K, Siltanen J. 2011. A Landscape Study of Micro Insurance Education. New Delhi: Micro Insurance Academy. (Available from www.microinsurancecentre.org/resources/documents/doc_download/822-a-landscape-study-of-micro-insurance-education-.html) (Accessed 9 January 2012).
- The Economist. 2010. Security for shillings (insuring crops with a mobile phone). Article published 11 March 2010. (Available from www.economist.com/node/15663856) (Accessed 9 January 2012).
- [FAO] Food and Agriculture Organization of the United Nations. 2008. Climate change adaptation and mitigation in the food and agriculture sector: technical background document from the expert consultation held on 5 to 7 March 2008. Rome: FAO.
- [FAO] Food and Agriculture Organization of the United Nations. 2010. "Climate Smart" Agriculture, Policies, Practises and Financing for Food Security, Adaptation and Mitigation. Prepared for The Hague Conference on Agriculture, Food Security and Climate Change. Rome: FAO.
- Garrity D, Okono A, Grayson M, Parrott S, eds. 2006. World agroforestry into the future. Nairobi: World Agroforestry Centre. (Available from www.worldagroforestrycentre.org/downloads/publications/PDFs/b14409.pdf) (Accessed 9 January 2012).
- Guyana Chronicle. 2011. Agriculture has firm place in future of countrysays President Jagdeo. Article published on 18 August 2011. (Available from www.guyanachronicleonline.com/site/index.php?option=com_content&view=article&id=31800:agriculture-has-firm-place-in-future-of-country-says-president-jagdeo&catid=4:top-story&Itemid=8) (Accessed 9 January 2012).
- Hailu M. 2011. Agriculture in climate change negotiations. Spore No. 155, October- November 2011. (Available from <http://spore.cta.int>) (Accessed 9 January 2012).
- Hamilton K et al. 2010. Building bridges: state of the voluntary carbon markets 2010. Washington, DC: Ecosystem Marketplace; New York: Bloomberg New Energy Finance.
- Hebebrand C. 2011. Leveraging private sector investment in developing country agrifood systems. Policy Paper Series. Chicago: Chicago Council on Global Affairs. (Available from www.thechicagocouncil.org/UserFiles/File/GlobalAgDevelopment/Report/CCGA%20GADI%20Private%20Sector%20Policy%20Paper%20FINAL%20VERSION.pdf) (Accessed 9 January 2012).

- Hellmuth ME, Osgood DE, Hess U, Moorhead A, Bhojwani H, eds. 2009. Index insurance and climate risk: climate risk: prospects for development and disaster management. *Climate and Society* No. 2. New York: International Research Institute for Climate and Society (IRI), Columbia University. (Available from http://portal.iri.columbia.edu/portal/server.pt/gateway/PTARGS_0_5024_4201_0_0_18/Climate%20and%20Society%20Issue%20Number%202.pdf) (Accessed 9 January 2012).
- HighQuest Partners. 2010. World investment report: transnational corporations, agricultural production and development. New York: HighQuest Partners.
- Jabbar MA, Ehui SK, Von Kaufmann R. 2002. Supply and demand for livestock credit in Sub-Saharan Africa: lessons for designing new credit schemes. *World Development* 30(6): 10291042.
- Jack BK, Kousky C, Sims KRE. 2008. Designing payments for ecosystem services: lessons from previous experience with incentive-based mechanisms. *Proceedings of the National Academy of Sciences of the United States of America* 105(28): 94659470.
- Kaiteur News. 2011. Farmers urged to practice climate smart agriculture. Article published on 18 August 2011. (Available from www.kaiteurnewsonline.com/2011/08/18/farmers-urged-to-practice-%E2%80%98climate-smart%E2%80%99-agriculture/) (Accessed 9 January 2012).
- Kissinger G. 2011. Linking forests and food production in the REDD+ context. CCAFS Working Paper No. 1. Copenhagen: CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. (Available from www.ccafs.cgiar.org/) (Accessed 9 January 2012).
- Kloppinger-Todd R, Sharma M (eds). 2010. Innovations in rural and agricultural finance: 2020 Focus 18. Washington, DC: International Food Policy Research Institute and The World Bank. (Available from <http://dx.doi.org/10.2499/0896296687>) (Accessed 9 January 2012).
- Laajaj R, Da Fonseca Matias A. 2010. Subsidies and the consequences of drought: a field report. BASIS Brief, July 2010. BASIS Research Program on Poverty, Inequality and Development, University of Wisconsin-Madison. (Available from <http://www.basis.wisc.edu/live/amabrief10-04.pdf>) (Accessed 9 January 2012).
- Laurance WF, Koh LP, Butler R, Sodhi NS, Bradshaw CJA, Neidel JD, Consonji H, Vega JM. 2009. Improving the performance of the Roundtable on Sustainable Palm Oil for nature conservation. *Conservation Biology* 24(2): 377381.
- Lybbert T, Sumner D. 2010. Agricultural technologies for climate change mitigation and adaption in developing countries: policy options for innovation and technology diffusion: ICTSD-IPC platform on climate change, agriculture and trade. Issue Brief Number 6. Geneva: International Centre for Trade and Sustainable Development; Washington, DC: International Food and Agricultural Trade Policy Council.
- Meridian Institute. 2011. Agriculture and climate change: scoping report. Washington, DC: Meridian Institute. (Available from www.climate-agriculture.org/) (Accessed 9 January 2012).
- Nelson C (ed). 2009. Agriculture and climate change: An agenda for negotiation in Copenhagen. 2020 Focus Brief no. 16. Washington, DC: International Food Policy Research Institute (IFPRI). (Available from www.ifpri.org/publication/agriculture-and-climate-change) (Accessed 9 January 2012).
- Nkem J, Santoso H, Murdiyarto D, Brockhaus M, Kanninen M. 2007. Using tropical forest ecosystem goods and services for planning climate change adaptation with implications for food security and poverty reduction. *Journal of SAT Agricultural Research*. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). (Available from www.icrisat.org/journal/SpecialProject/sp17.pdf) (Accessed on 4 November 2011)
- Omura M. 2008. Property rights and natural resource management incentives: do transferability and formality matter? *American Journal of Agricultural Economics* 90(4): 11431155.
- Oxfam America. 2010. Horn of Africa Risk transfer for adaptation: HARITA project report: November 2007-December 2009. Boston: Oxfam America.
- Pagiola S. 2008. Payments for environmental services in Costa Rica. *Ecological Economics* 65(4): 712724.
- Parker C, Cranford M. 2010. The little biodiversity finance book: a guide to proactive investment in natural capital (PINC). Oxford: Global Canopy Programme. (Available from www.globalcanopy.org/sites/default/files/LBFB_EN%20.pdf) (Accessed 9 January 2012).
- Parker S, Pasaribu S, DeMelenae S. 2008. A rapid assessment of microcredit schemes available to smallholder farmers and fishermen. Helping Indonesia to Grow. Jakarta: USAID and AMARTA. (Available from www.amarta.net/amarta/ConsultancyReport/EN/AMARTA%20Value%20Chain%20Assessment%20Microedit.pdf) (Accessed 9 January 2012).
- Perez C, Roncoli C, Neely C, Steiner JL. 2007. Can carbon sequestration markets benefit low-income producers in semi-arid Africa? Potentials and challenges. *Agricultural Systems* 94(1): 212.
- Peters-Stanley M, Hamilton K, Marcello T, Sjardin M. 2011. Back to the Future: State of the Voluntary Carbon Markets 2011. Washington DC and New York: Ecosystem Marketplace/Forest Trends, Bloomberg New Energy Finance. (Available from www.forest-trends.org/publication_details.php?publicationID=2828) (Accessed 9 January 2012).

- Quan J and Dyer N. 2008. Climate change and land tenure: the implications of climate change for land tenure and land policy. Land Tenure Working Paper 2. Rome: UN Food and Agriculture Organization. (Available from <ftp://ftp.fao.org/docrep/fao/011/aj332e/aj332e00.pdf>) (Accessed 9 January 2012).
- Schmidhuber J, Bruinsma J, Boedeker G. 2009. Capital requirements for agriculture in developing countries to 2050. Rome: UN Food and Agriculture Organization, Economic and Social Development Department. (Available from <ftp://ftp.fao.org/docrep/fao/012/ak974e/ak974e00.pdf>) (Accessed 9 January 2012).
- Shiferaw BA, Okello J, Reddy RV. 2009. Adoption and adaptation of natural resource management innovations in smallholder agriculture: reflections on key lessons and best practices. *Environment, Development and Sustainability* 11(2009): 601619.
- Skees JR, Collier B. 2010. New approaches for index insurance: ENSO insurance in Peru. Brief 11. In: Kloeppinger-Todd R, Sharma M, eds. *Innovations in rural and agriculture finance. 2020 Vision for Food, Agriculture and the Environment. Focus 18.* Washington, DC: International Food Policy Research Institute and The World Bank. (Available from <http://content.yudu.com/Library/A1ohrn/InnovationsinRuralan/resources/24.htm>) (Accessed 9 January 2012).
- Smith P, Martino D, Cai Z, Gwary D, Janzen H, Kumar P, McCarl B, Ogle S, O'Mara F, Rice C, Scholes B, Sirotenko O, Howden M, McAllister T, Pan G, Romanenkov V, Schneider U, Towprayoon S, Wattenbach M. 2007. Agriculture. In: Metz B, Davidson OR, Bosch PR, Dave R, Meyer LA, eds. *Climate change 2007: mitigation of climate change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007.* Published for the Intergovernmental Panel on Climate Change (IPCC). Cambridge: Cambridge University Press. (Available from www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg3_report_mitigation_of_climate_change.htm) (Accessed 9 January 2012).
- Stringfellow R, Coulter J, Lucey T, McKone C, Hussain A. 1997. Improving the access of smallholders to agricultural services in Sub-Saharan Africa: farmer cooperation and the role of the donor community. *Natural Resources Perspectives*, Number 20, June 1997. London: Overseas Development Institute.
- Swinnen JFM, Maertens M. 2007. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agricultural Economics* 37(s1): 89102.
- Tennigkeit T, Woelcke J. 2009. BioCarbon Fund: agricultural land management carbon projects. Presentation at ARD week 2009. (Available from http://siteresources.worldbank.org/INTARD/Resources/335807-1236361651968/Timm_RWsideevent.pdf) (Accessed 9 January 2012).
- Teoh CH. 2010. Key sustainability issues in the palm oil sector. Washington, DC: The World Bank. (Available from http://siteresources.worldbank.org/INTINDONESIA/Resources/226271-1170911056314/Discussion.Paper_palmoil.pdf) (Accessed 9 January 2012).
- [UNFCCC] United Nations Framework Convention on Climate Change. 2008. Challenges and opportunities for mitigation in the agricultural sector. Technical Paper. FCCC/TP/2008/8. Bonn: UNFCCC. (Available from <http://unfccc.int/resource/docs/2008/tp/08.pdf>) (Accessed 9 January 2012).
- [USAID] United States Agency for International Development. 2009. Credit Guarantees: Promoting Private Investment in Development. (Available from http://www.usaid.gov/our_work/economic_growth_and_trade/development_credit/YIR_2010.pdf) (Accessed 9 January 2012).
- Wenner MD. 2010. Credit risk management in financing agriculture. Brief 10. In: Kloeppinger-Todd R, Sharma M, eds. *Innovations in rural and agriculture finance. 2020 Vision for Food, Agriculture and the Environment. Focus 18.* Washington, DC: International Food Policy Research Institute and The World Bank. (Available from www.ifpri.org/sites/default/files/publications/focus18.pdf) (Accessed 9 January 2012).
- Wollenberg E, Campbell BM, Holmgren P, Seymour F, Sibanda L, and von Braun J. 2011. Climate Change, Agriculture and Food Security. 2011. Actions needed to halt deforestation and promote climate-smart agriculture. CCAFS Policy Brief 4. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. (Available from www.ccafs.cgiar.org) (Accessed 9 January 2012).
- World Bank. 2007. World development report 2008: agriculture for development. Washington, DC: The International Bank for Reconstruction and Development and The World Bank.
- World Bank. 2008. Growth and poverty reduction in agriculture's three worlds. World Development Report 2008. Washington, DC: The World Bank. (Available from http://siteresources.worldbank.org/INTWDR2008/Resources/2795087-1192112387976/WDR08_02_ch01.pdf) (Accessed 9 January 2012).
- Wunder S. 2007. The efficiency of payments for environmental services in tropical conservation. *Conservation Biology* 21(1): 4858.

Annex I: Agricultural NAMA submissions

NAMAs represent voluntary GHG emission reduction goals by developing countries that are to be realised through technology transfer and financial support from developed countries. These initiatives will likely form the basis for future projects and programmes as fast-start and adaptation financing flows to developing countries. NAMA submissions by developing countries relevant to agriculture are summarised in the table below.

Table 9. Agricultural NAMA submissions to the UNFCCC (February 2011)

Country	Mode	Activity	Implementation
Brazil	GHG cuts and sinks	Cropland and livestock management	Integrated croplivestock system (range of estimated reduction: 1822 MtCO ₂ e in 2020). No-till farming (range of estimated reduction: 1620 MtCO ₂ e in 2020). Implementation of agroforestry practices and systems on 261 840 km ² of agricultural land for livelihood improvement and carbon sequestration.
Central African Republic	N/A	Land and livestock management	Increase of forage seeds and their popularisation in the following regions: Ouham, OuhamPende and NanaMambere.
	GHG sinks	Crop intensification and improvement	Intensification of the production of improved agricultural seeds with farmers.
Chad Republic	GHG sinks	Crop intensification and improvement	Increase of forage seeds and their popularisation with farmers. Manufacturing of compost and fertiliser.
Republic of Congo	Capacity and sinks	Crop improvement and extension	Choosing and popularising of agricultural species better adapted to climate change. Capacity building with farmers, with improved techniques and crops better adjusted to global warming.
Eritrea	GHG sinks	Sustainable land management	Implementation of projects and programmes to enhance soil carbon stocks in agricultural soils.
	N/A	Sustainable land planning	Development and elaboration of appropriate and integrated plans that support both adaptation and mitigation actions for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas in Eritrea affected by drought and desertification, as well as floods.
Ethiopia	GHG cuts and sinks	Cropland management and agroforestry	Application of compost on 8000 km ² of agricultural land in rural local communities for increased carbon retention by the soil. Implementation of agroforestry practices and systems on 261 840 km ² of agricultural land for livelihood improvement and carbon sequestration.
Gabon	GHG sinks	Agroforestry	Mention of agroforestry as an action domain: "with proper funding, 100 000 ha are targeted and with application of diverse international mechanisms, 1 900 000 ha are targeted."
Ghana	GHG cuts and sinks	Sustainable land management	Uncontrolled burning (promotion of spot and zero burning practices); improved land preparation (promotion of minimum tillage); incentivisation of the use of biofuels for mechanised agriculture; use of nitrogen-based fertilisers (promotion of the use of organic fertilisers and the integrated use of plant nutrients).
	GHG cuts	Crop switching	Predominant cultivation of rice in lowlands; promotion of high-yielding upland rice cultivation.
	GHG cuts and sinks	Post-harvest practices	Burning of crop residues (promotion of the recycling of crop residues).
	GHG cuts and sinks		High post-harvest losses (improving storage facilities and promotion of the use of post-harvest technologies).

Country	Mode	Activity	Implementation
Ivory Coast	N/A	N/A	"Durable development of agricultural operations."
Jordan	GHG cuts and sinks	Cropland and livestock management	Growth of perennial forages in Badia region; introduction of best management practices in irrigated farming fertilisation applications.
	GHG cuts	Methane capture	Use of methane emitted from livestock, chicken farming and slaughter houses.
Macedonia	GHG cuts	Enabling conditions for GHG emission reduction	(1) Completion of institutional and legal reforms in the irrigation sector; (2) increasing institutional and individual capacity for applying international funds; (3) development of systems to apply "good agricultural practices"; (4) financial incentives for mitigation technologies.
		Mitigation technologies	(1) Installation of methane recovery and flaring systems at selected farms; (2) research support programme for the development of new mitigation technologies and transfer of existing ones; (3) introduction of practices that use the agriculture potential for renewable energy and carbon sequestration; (4) programmatic CDM projects.
	Capacity	Carbon finance capacity building	National and local training and capacity strengthening for: (1) training for CDM potential in agriculture; (2) training for preparation of CDM documentation.
		Mitigation technologies and capacity building	(1) Training of farmers/decision makers in GHG mitigation issues (upgrade to current curricula and syllabuses); (2) training of farmers for adopting new technologies; (3) familiarisation of the public and institutions with the problems of climate mitigation.
Madagascar	N/A	Crop improvement and fertilisation	(1) Increase in forage seeds and their popularisation; (2) intensification of the production of enhanced agricultural seeds; (3) manufacture of compost and fertilisers in accordance with the quality levels applicable to rural environments in agricultural investment zones.
Mauretania	N/A	Efficiency	Policies with regard to agriculture: (1) promotion of public transportation; (2) utilisation of butane gas as a replacement for the use of wood products; (3) use of energy-efficient lamps.
Mongolia	GHG sinks	Livestock management	Limit to the increase in the total number of livestock by increasing the productivity of each type of animal, especially cattle.
Morocco	GHG cuts and sinks	Cropland management	Increase in the efficiency of agricultural land.
Papua New Guinea	GHG cuts	N/A	High-level policy objectives for GHG reductions in agricultural sector of 1527 MtCO ₂ e/year relative to business-as-usual projections of 3158 MtCO ₂ e/year by 2030 (estimates in 2010 of 2538 MtCO ₂ e/year).
Peru	GHG cuts and sinks	Livestock, soil and agricultural practices	Ministry of Agriculture coordination of NAMAs implemented for GHG mitigation: (1) livestock management; (2) agricultural residue management; (3) soil and agricultural system improvement.
Sierra Leone	GHG sinks	Sustainable land management and agroforestry	Introduction of conservation farming and promotion of the use of other sustainable agricultural practices, e.g. agroforestry.
	GHG cuts	Bioenergy	Development of agricultural waste incineration programmes for energy production.
Togo	GHG cuts	Efficiency	(1) Reduction in energy consumption by use of common transportation; (2) use of gas as a replacement for fuel; (3) replacing of non-energy-efficient lamps with energy-efficient ones.
Tunisia	GHG cuts and sinks	Sustainable land management and efficiency	(1) Expansion of 'biological farming' to 500 000 ha by 2014; (2) upgrade of farms to 'international standards' and promotion of water-saving irrigation on = 200 000 ha compared with 120 000 ha in 2009; (3) support for brackish water desalination of treated wastewater for agricultural using recycling and efficient technologies.

Annex II: Policy incentives to harness investments in smallholder farming systems

1. Establishing results-based incentives

Incentive regulation provides a targeted group with the motivation to change behaviour to achieve a predefined goal. Mechanisms that seek to induce behaviour change may rely on market-based incentives. In many industrial countries, financial incentives in the agricultural sector are linked to prices and amount to substantial subsidies (World Bank 2007). Smallholders in developing countries rarely have access to subsidies in the form of offtake agreements or price guarantees (World Bank 2007). Instead, policies or programmes directed towards smallholders in developing countries are increasingly designed to support a particular service or product. There is also an increasing body of experience in programmes that provide support to smallholders for maintaining or changing a practice that is aligned with a public good. Such payments are often ex-post or results-based and can support ecosystem or environmental services in general, or emission reductions in particular.

1.1. Payments for environmental services

Policies that establish payments for environmental services (PES) compensate individuals or communities for undertaking actions that maintain or increase the provision of an environmental good, such as water purification, flood mitigation, biodiversity protection or carbon sequestration (Jack et al. 2008). PES programmes seek to internalise external effects and align the individual and social benefits of relevant activities. The state or other beneficiaries of environmental services make payments to local landholders for adopting practices that secure the continued function of those services through ecosystem conservation and/or restoration (Wunder 2007).

For smallholders, payments could target the continued adoption of changed practices or be linked to increased soil carbon or efficiency gains. In countries as diverse as Costa Rica, Mexico, Vietnam and China, PES schemes are integrated into public policies where the government pays on behalf of service users or in defence of a national or international environmental good. Sometimes public payments are cross-financed through contributions from selected industries or other beneficiaries of the environmental services (Wunder 2007).

However, PES systems are not without their challenges. They depend on the availability of strong institutions able to

monitor compliance and process payments. High transaction costs are another challenge in implementing PES systems in the context of smallholder farming. Triggering the adoption of sustainable practices and monitoring compliance are often costly, and the anticipated environmental benefit at the farm level is low. Aggregation is essential, but often not easy to organise. Other problems relate to the risk that payments may go first or primarily to those who are likely to change their behaviour anyway (De Pinto et al. 2010). PES policies may also be undermined by existing subsidy programmes or tax regimes designed to encourage resource use that is counter to the ecosystem service goals of the policy.

The design of PES programmes can be improved with better baseline data that allow for comparison of different land-use practices and measurement of overall progress. An understanding of opportunity costs allows policy makers to calculate the price that needs to be paid to steer behaviour towards more sustainable activities. PES makes little sense where opportunity costs are too high (Wunder 2007). It is also important to recognise that these costs are likely to have a temporal component. For instance, if the objective is to promote agroforestry practices, one needs to recognise that most benefits are not received by the farmer during the first year. In order to ensure that the smallholders continue to be committed to the PES programme in the long run, they need to be given enough financial incentives and support in meeting basic subsistence in the short term.

How payments are made will also affect the outcome of PES programmes targeting smallholders. When payments are direct and made in cash, keeping those payments small but frequent (to mimic regular income flows) will probably best ensure continued participation; if large, upfront sums are distributed, leverage for participation may be lost (Wunder 2007). Moreover, shorter, renewable contracts are better able to account for changing opportunity costs (De Pinto et al. 2010).

1.2. Carbon markets

Carbon markets rely on a specific type of PES that links payments to GHG emissions or removals. Carbon markets have proved to be able to mobilise significant amounts of funding, where transaction costs are manageable and demand for carbon credits is robust and sustained. The advantage of carbon markets is that they directly link payments to carbon benefits, establishing a direct measure of mitigation success. Carbon markets are most effective under favourable conditions for private investment, including:

- a policy framework to ensure market demand;
- assurance of public support for enabling conditions, such as land tenure enforcement and agricultural extension services;
- approved and feasible methodologies for measuring agricultural carbon;
- a track record in selecting and managing projects at reasonable MRV and transaction costs; and
- a cost-effective aggregation mechanism at the national or regional scale.

However, accurately measuring carbon stock changes may be costly, in particular in agricultural systems. In addition, the carbon benefit at the farm level for smallholders may not justify the transaction costs related to carbon measurement and accounting. Barriers to carbon transactions in the agricultural sector in developing countries include:

- low GHG mitigation and removal potential at the farm level, and the need for aggregation at the landscape level;
- the expense, complexity and uncertainty of establishing new market infrastructure;
- the fear that carbon markets would expose countries and farmers to excessive delays, lack of liquidity, transaction costs and downside risks or detract from policies that promote more efficient agricultural practices;
- limited focus on productivity and smallholder benefits by current carbon standards;
- lack of protocols for MRV and high costs of establishing baseline emissions; and
- high initial risks and low initial returns, given early project costs and slow accumulation of carbon over years or decades.

In some instances, where direct measurements are too costly, proxies for GHG benefits can potentially be defined and lower carbon transaction costs. If emissions from croplands are of primary concern, crop residues and manure can serve as valuable proxies for GHG emissions. For example, a new methodology was developed to account for emission reductions from the application of sustainable agricultural land management in Kenya for a World Bank BioCarbon Fund project³⁴ and is also currently under review for adoption by the Verified Carbon Standard³⁵. The project uses look-up tables, which are based, in part, on the amount of crop residue and manure left on fields (Tennigkeit and Woelcke 2009). However, it is uncertain to what extent this project can be scaled up and lead to sustained smallholder benefits on a larger scale.

2. Facilitating access to finance

Public finance can also be used to lower investment costs and improve access to credit. Credit or guarantee schemes can facilitate the acquisition of new technologies, cover increased labour costs, or provide smallholder farmers with credit and capital to make the investments needed to adopt improved agricultural practices. This is particularly relevant

³⁴ See: <http://wbcarbonfinance.org/Router.cfm?Page=BioCF&FID=9708&ItemID=9708&ft=Projects&ProjID=58099> for a project description.

³⁵ See: <http://v-c-s.org/methodologies/adoption-sustainable-agricultural-land-management-salm> for a project description.

when PES or other results-based payment schemes would fail because farmers do not have the financial resources to make ex-ante investment to implement new practices and improved farming techniques that could be rewarded with ex-post payments.

Increasing the levels of finance available to microcredit schemes or providing an influx of low-interest loans to bring down high commercial interest rates may help increase the availability and affordability of credit for smallholders (Jabbar et al. 2002). In addition, providing inventory finance to credit-worthy community suppliers instead of directly to smallholders may be a viable alternative in some situations, such as when equitable secondary distribution can be ensured. Finally, poor disbursement procedures can be addressed through better oversight of governments and by smallholder farmers organising voluntary savings and credit groups). In turn, such groups can be linked to banks and credible lending organisations, input suppliers and markets (Stringfellow et al. 1997).

3. Reducing or redistributing risk

For governments with the funds and capacity to do so, directly providing smallholders with needed inputs, training and extension services may be the easiest option, though costly. For instance, Guyana recently announced the second phase of its Grow More Food campaign, which focuses on increasing food production in Guyana by distributing fertilisers, seeds, planting materials and livestock to farmers and farmers' groups across the country (Kaieteur News 2011).

Facilitating access to finance while simultaneously reducing risk through insurance, for example may encourage participation and uptake of improved agricultural practices. Risk is generally a function of the vulnerability of farmers to hazards or detrimental changes farmers confront. Risks can relate to political changes, adverse fluctuations in input costs or commodity prices, supply chain or infrastructure difficulties, weather or climate change. Given their general vulnerability, smallholders may be hesitant to adopt new agricultural techniques because they are novel and perceived as risky especially if they involve high upfront investment or transaction costs.

One of the many brakes on agriculture in developing countries is smallholders' inability or unwillingness to invest in better seed and fertiliser. Many use poor-quality seed from previous harvests. Insurance can address this situation. However, insurance has to be simple, affordable and relevant to smallholder farmers. Most available insurances are either crop-based or area-based (also known as index-based). In the former, a farmer's crops are insured against failure due to a variety of natural sources (drought, fire, flood, pests, and so on) (Barnett et al. 2005). In the latter, pay-outs are based on the average yield of all producers in a region, irrespective of whether or not they purchase insurance (Carter et al. 2007). Insurance holders

receive a pay-out when the average yield falls below some critical value. In weather index-based insurance schemes (a subset of area- or yield-based schemes), predictors of

average yields such as rainfall or temperature are measured instead of realised average yields (Carter et al. 2007). See Box 8 and Table 10 for examples for insurance models

Box 8. Case studies: Risk sharing and insurance mechanisms

Safe Farming: Kilimo Salama input insurance

Kilimo Salama, meaning 'safe farming' in the Kiswahili language, is a crop insurance policy set up by UAP Insurance of Kenya, Safaricom and the Syngenta Foundation. Farmers pay an extra 5% to insure a bag of seed, fertiliser or herbicide against crop failure. MEA Fertilisers and Syngenta East Africa, two agribusinesses hoping to benefit from higher sales of their products, match the farmers' investment to meet the full 10% cost of the insurance premium. Local agents register an insurance policy with UAP by using a camera-phone to scan a bar code on each bag sold. A text message confirming the policy is then sent to the farmer's handset. Farmers are registered at their nearest weather station, which transmits data over the mobile network. If weather conditions deteriorate, a panel of experts uses an index system to determine whether crops will no longer be viable. At that point pay-outs are made directly to the handsets of farmers in the affected areas using Safaricom's M-PESA mobile money service. With no field surveys, no paperwork and no middlemen, transaction costs are minimal. The scheme is designed to be self-financing. Clear terms should help Kilimo Salama overcome farmers' distrust of previous insurance schemes, as should word of mouth. The trial scheme was hit by one of the worst droughts in decades, triggering compensation payments of 80% of farmers'

investments. The average amount of insured seed in the area has now risen from 2 kg per farmer to 4 kg.

El Niño Southern Oscillation (ENSO) insurance in Peru

The 1998 ENSO event greatly impacted Peru's agricultural sector, with associated reverberations through the rest of the economy. ENSO insurance has become a means to pay for consequential losses and extra costs linked to extreme flooding events. The insurance uses the monthly sea surface temperatures for the ENSO region, and pay-outs are based on the average of November and December temperatures. Three different contracts are available with three different thresholds for where payments begin. Indemnity payments are made in early January, when flooding begins (flooding continues into April). Since the indemnity payments are made before the worst flooding, educational efforts have been under way to help people in target markets understand how to use the extra cash to mitigate the impending crisis. Farmers' associations in remote regions have already expressed interest in using the funds to clear drainage systems that are likely to become blocked and flood. Currently, smallholders are not eligible for the insurance, which is only being offered to highly exposed risk aggregators however, demand is likely to drive its expansion. Nevertheless, it represents a novel approach to weather index-based insurance.

Insurance schemes are not without risk, however. Risks may vary with the type of insurance scheme (see Table 10). For instance, weather-index schemes have been slowed by a lack of high-quality weather data and inadequate distribution of weather stations (Wenner 2010). Area-based yield insurance also requires reliable long-term statistical

information (Carter et al. 2007). Additionally, if growing conditions are poor for prolonged periods (due to drought, for example), insurance may be ineffective if lenders cannot absorb the risk exposure of a large number of borrowers who may be unable to pay off loans after a major natural disaster (Skees and Collier 2010).

Table 10. Cases studies: climate risk mitigation instruments

	Example	Description	Results	Risks
Loan guarantees	CLUSA Mozambique	Between 1995 and 2005, USD 11.5 million in USAID funding helped farmers better organise market products to local traders.	USD 5.1 million has been leveraged from other sources (partially in the form of matching grants). Farmers gained greater market access. The programme has been copied by other donors.	<ul style="list-style-type: none"> • Primary risk loss of creditor capital. • Requires strong domestic financial institutions. • Potentially high transaction costs. • May not serve the most destitute farmers.
	AGRA's Innovative Financing Initiative	USD 17 million in loan guarantees to reduce risks of lending to smallholders.	USD 160 million has been leveraged in loans from commercial banks in Kenya, Uganda, Tanzania, Ghana and Mozambique.	
Insurance products	Kilimo Salama (Safe Farming) micro-insurance scheme in Kenya (see also Box 8)	Farmers pay an extra 5% to insure seed, fertiliser, herbicide, etc. against crop failure; agribusinesses match the investment to meet the insurance premium. Index used to determine whether crops fail due to weather conditions.	The average amount of seed insured in the area has risen from 2 kg per farmer to 4 kg. A trial of 200 farmers hit by drought triggered compensation payments of 80% of farmers' investments.	<ul style="list-style-type: none"> • Incentive to neglect crops to gain higher pay-outs (traditional risk) but only in non-index systems. • Weather data may not be available (need 30+ years). • Farmers may be unable to afford insurance.
	Horn of Africa Risk Transfer for Adaptation (HARITA)	Farmers work extra days for payments to earn an insurance certificate protecting against rainfall deficit.	This approach multiplies the value of [donor] money by paying the insurance premium through labour for risk reduction measures.	

Guarantees or insurance to intermediaries or financial institutions can enable extension of a broader suite of financial products to farmers and cooperatives. Rather than addressing smallholder risk, loan guarantees can allow lenders to take on additional risk through an outside agent that has agreed to cover an established percentage of the claim. One example is USAID's Development Credit Authority, which pays up to 50% of a claim in the event of a realised loss, enabling partner financial institutions to take on riskier loans made to smallholders (USAID 2009). The programme has been successful within the agricultural sector, leveraging USD 28 for every dollar spent on average (USAID 2009). Currently, however, loan guarantees are typically only being used to support post-harvest practices.

4. Incentives for external (foreign and domestic) private investment

Agriculture attracts billions of dollars in new private investment. The private sector contributes about two-thirds of global investment and financial flows, both through local investments and through foreign direct investment (FDI). A 2010 survey conducted for the Organisation for Economic Co-operation and Development (OECD) estimated about USD 14 billion of private capital has been committed to farmland and agricultural infrastructure investment globally among more than 50 firms active in this area. UN statistics show that FDI in global agricultural production tripled between 1990 and 2007 to USD 3 billion annually from less than USD 1 billion (HighQuest Partners 2010).

Smallholder farmers hardly benefit from these investment flows. They are often the sole investors into their operations. However, public policies can stimulate outside investments into agricultural production that benefit smallholders, such as financial concessions, including tax incentives, co-financing of critical infrastructure and training and capacity-building programmes, as well as funds to help with environmental and social impact assessments (Hebebrand 2011). Governments in developing countries may start by analysing the role of external investment into domestic farming systems and developing a strategy to encourage investments that benefit smallholders and are in

line with the public policy objective of the country.

4.1. Public private partnerships

Public private partnerships (PPPs) can encourage sustainable investments through sharing risks and rewards, providing loans and credit, or providing needed training. PPPs are based on agreements between a public agency and one or several companies to share skills and finance in delivering a service for the general public. They are also a tool to encourage the private sector to undertake an activity that it would not do otherwise, because of either high risk or low returns on investment. Public agencies in the agricultural sector generally see PPPs as a means to attract investment, while private entities often benefit from a reduced investment risk. Farmers benefit through training, higher quality seeds or access to capital.

While there is clear benefit to enhancing dialogue between private sector companies and governments around shared needs, goals and objectives, it is important that each party identifies what it can bring to the table for a given geographic scale. For instance, a local government may not have the necessary financial resources to extend credit to smallholders, while a private sector company may not have sufficient contacts or standing in a community to build capacity. In this case, the company could provide the finances for credit, while the government could work with the company to build capacity.

Coordinated efforts focused around a particular region can leverage significant and scaled-up investment. Projects that guide large-scale public and private investments towards specific regions and areas of high agricultural potential are currently being developed (Hebebrand 2011). Two pilot growth corridor investments that have undergone multiple feasibility studies and investment plans since 2010 the Beira Agricultural Growth Corridor in Mozambique and the Southern Agricultural Corridor of Tanzania include smallholders in their target group and are calling for several billion dollars of private and public investment, involving many large transnational corporations, small- and medium-sized businesses, multilateral institutions, NGOs/universities and government agencies (see Box 9).

³⁶ The most recent FAO estimates are that about 30% of the total agricultural investments come from the public sector, while private investment accounts for 70% (Schmidhuber et al. 2009).

³⁷ Since not all investments may actually benefit smallholders, national interests or supported global goods, the FAO, IFAD, UNCTAD and the World Bank are collaborating with governments to develop an international code of conduct for responsible agricultural investment (Hebebrand 2011).

Box 9. Agricultural growth corridors³⁸

The investment blueprint for the Beira Agricultural Growth Corridor (BAGC) was launched in 2010. The Beira corridor is the gateway to South East Africa, linking inland areas of Zambia, Malawi, Zimbabwe and Mozambique by road and rail networks to shipping facilities at the Indian Ocean at Beira. The project aims to boost agricultural productivity in Mozambique and the wider region through significant investments in agriculture-supporting infrastructure, particularly irrigation. The blueprint aims to increase farmer revenue to more than USD 1 billion per year through vastly improved fields, lower operating costs, and better access to domestic and global markets. The BAGC report shows that USD 250 million of long-term capital could induce private investment in Mozambique of more than USD 1 billion, while creating more than 350 000 new jobs over a 20-year period. This would benefit more than 200 000 smallholder households, many of which would gain access to affordable irrigation.

The investment blueprint for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) was launched in January 2011, and aims to harness the agricultural potential of Tanzania through links to the port of Dar es Salaam, and to the neighbouring countries of Malawi, Zambia and the Democratic Republic of Congo. The project calls for the development of six clusters of profitable small-, medium- and large-scale farms and associated agribusinesses, centred in areas of particularly high agricultural potential. Among other objectives, the SAGCOT blueprint seeks to commercialise smallholder production by incentivising stronger connections between smallholders and commercial agribusiness. To accomplish this, the blueprint calls for 'hub and outgrower' schemes, in which smallholders in the vicinity of large-scale farms will be allowed to access inputs, extension services, value-adding facilities and markets. The blueprint aims to convert tens of thousands of smallholders into commercial farmers with access to irrigation and weather insurance, while lifting more than 2 million people permanently out of poverty by 2030.

Governments can also support smallholder farmers in negotiating contracts with private traders, retailers or agribusinesses. If appropriately structured, contract farming³⁹ can reduce the transaction costs and risks of smallholders, while simultaneously providing greater access to financial capital, technology and extension services (World Bank 2007). The public sector can also help smallholders ensure that contracts are designed fairly, and educate farmers on their rights and obligations (World Bank 2007). In many countries the government remains involved in the agricultural supply chain through shares in privatised food-processing companies, through state-owned banks and government credit schemes, and by providing extension services (Swinnen and Maertens 2007).

4.2. Supply chain interventions

Sustainable, secure and efficient supply chains can benefit both smallholder farmers and multinational corporations. The investments that corporations make to improve their supply chain by either helping suppliers or changing the companies' practices on the ground are likely to pay off by ensuring future, productive supplies of needed

commodities. Such actions can also help companies stay ahead of legislation and take advantage of a growing market of environmentally conscious consumers. In this process, companies need to form alliances, among themselves and with NGOs, research organisations and local communities (see PPPs above).

WWF estimates that about 200 global companies control 50% of the international trade of the 15 most significant commodities traded worldwide. If these companies commit to make their supply chains more sustainable they can lead a change in behaviour that is faster than any change that could potentially be led by end consumers. If these key companies change, others are likely to follow, contributing to make 40-50% of the global commodities market more sustainable (Clay 2009). To increase impact and ensure effective participation by smallholders, large companies may actively assist farmers in achieving standards through training, auditing of their suppliers (see Box 10) and monitoring progress. Throughout the process, both stakeholders and consumers need to be informed, as transparency is crucial for success.

³⁸ Adapted from: Hebebrand C. 2011. Leveraging private sector investment in developing country agrifood systems. Policy Paper Series. Chicago: Chicago Council on Global Affairs. (Available from www.thechicagocouncil.org/UserFiles/File/GlobalAgDevelopment/Report/CCGA%20GADI%20Private%20Sector%20Policy%20Paper%20FINAL%20VERSION.pdf) (Accessed on 9 January 2012)

³⁹ The FAO defines contract farming as agricultural production carried out according to an agreement between a buyer and farmers which establishes conditions for the production and marketing of a farm product or products. Typically, the farmer agrees to provide agreed quantities of a specific agricultural product. These should meet the quality standards of the purchaser and be supplied at the time determined by the purchaser. In turn, the buyer commits to purchase the product and, in some cases, to support production through, for example, the supply of farm inputs, land preparation and the provision of technical advice.

Box 10. Examples of sustainable supply chain programs

Walmart's sustainability programme⁴⁰ was launched in 2005 with the goal of being supplied with 100% renewable energy, creating zero waste, and selling products that sustain people and the environment. As the largest retailer in the world, the company has significant influence over its suppliers, which is used to achieve its sustainability goals. Walmart has created its own sustainability index, to create a more transparent supply chain, accelerate the adoption of best practice by its suppliers (over 100 000 globally) and provide customers with information about its products. In 2010 the company released its global sustainable agriculture goals, which by the end of 2015 are meant to help small- and medium-sized farmers expand their businesses, get more income for their products and reduce the environmental impact of farming. They also intend to sustainably source key agricultural products, including palm oil (estimated GHG reduction of 5 Mt by 2015) and cattle, in part through the establishment of country-specific commitments. For instance, Walmart Brazil will share its knowledge on sourcing beef that does not contribute to Amazon deforestation with other Walmart markets. In developing its sustainable agriculture goals, Walmart consulted with a number of suppliers, universities and NGOs.

As part of Campbell Soup Company's sustainable agriculture goals,⁴¹ the company aims to reduce water usage by 20% and energy by 30% per pound for their top ingredient grown by 2020. This is done through supporting increased integrated pest management and decreased fertiliser use. On the latter, the company has partnered with universities on projects targeting nitrogen usage. In pilot tomato studies, they found that it is possible to reduce nitrogen by 25-45% without impacting

negatively on yields. Such a reduction has mitigation benefits, but also frees up capital to smallholders, who need to purchase less fertiliser. After the success of pilot plots, the company is now running trials with selected farmers on their own farms. To reduce the risk to participating farmers, Campbell's will cover the cost of any decreases in yield due to participation.

Mars Inc. participates in the Sustainable Tree Crops Programme (STCP), a PPP between the cocoa and chocolate industry and government supporters. This programme, which is operating in West Africa, has successfully promoted farmers' organisations and cooperatives, leading to improvements designed to help farmers achieve better prices for their cocoa. Through its Farmer Field Schools programme, the STCP also helps farmers achieve increased yields by improving farming techniques. In addition, Mars is a member of the World Cocoa Foundation (WCF), a global organisation of cocoa and chocolate companies, processors, traders and others who are dedicated to improving the conditions of cocoa farmers and the communities in which they live. WCF programmes raise farmer income, encourage responsible, sustainable cocoa farming and help strengthen cocoa farming communities. Members provide financial contributions as well as technical expertise and guidance to partners in West Africa and other programme locations. Mars, in partnership with USAID and WCF, has also invested in research and the distribution of tree seedlings to enable farmers in Ghana to grow disease-resistant high-yield cocoa trees. The programme offers farmers a chance to attend field schools to learn about improved cultivation of cocoa and marketing practices. Training and financial stability of the farmers ensures continuous and quality supply for Mars.⁴²

4.3. Labelling and certification

Labelling and certification systems can support farmers to implement sustainable practices. Certification systems are rapidly gaining public and private support. Already, several agricultural certification organisations promoting sustainable or socially conscious agriculture have become well established, including Rainforest Alliance and UTZ Certified, while Fair Trade has become well known for coffee and cacao certifications. Globally, certified agricultural and forest products account for over USD 42 billion of retail sales and it is estimated they could reach USD 210 billion by 2020. Certification could generate new finance of around USD 10.5 billion

annually if farmers were appropriately compensated for implementing more sustainable practices (Parker and Cranford 2010).

To date, few labelling or certification schemes have explicitly incorporated climate standards. However, new standards such as the Sustainable Agriculture Network's (SAN) climate module are emerging (see Box 11). The SAN standard formulates criteria for mitigation and adaptation to climate change that aim to make farmers more aware of the impacts of climate change and to promote the adoption of good agricultural practices that reduce GHG emissions, increase carbon sequestration and enhance the capacity of farms to adapt to climate change.

⁴⁰ For more information see: <http://walmartstores.com/pressroom/news/10376.aspx>. (Accessed on 9 January 2012)

⁴¹ For more information see: www.campbellsoupcompany.com/csr/planet_agriculture.asp. (Accessed on 9 January 2012)

⁴² For more information see: www.mars.com/korea/en/commitments/sustainability/cocoa-sustainability.aspx; <http://www.afrik-news.com/article18594.html>. (Accessed on 9 January 2012)

⁴³ The supermarket Tesco in the United Kingdom is one exception, while France has new legislation under development that would make carbon labelling mandatory for a range of products. The International Organization for Standardization (ISO) is also planning to release an international carbon footprint standard (ISO 14067) at the end of 2011 (Meridian Institute 2011; Brenton et al. 2009).

Box 11. The Sustainable Agriculture Network's climate module

In February 2011, the Rainforest Alliance and the SAN unveiled the new climate module. The new module, based on 15 mitigation and adaptation criteria, reinforces the sustainable practices that are already required of Rainforest Alliance certified farms and highlights those activities that have demonstrated the greatest climate change mitigation and adaptation benefits. The SAN worked to draft criteria that are rigorous, accessible and easy to implement for farmers in tropical countries, and that will result in substantial long-term climate benefits. Under the module's standards, farmers conduct baseline and emission calculations so that they can see the mitigation benefits of their efforts. Moreover, the procedures are simple so that smallholders are not excluded by technical or onerous requirements. While the standard is not stringent enough to meet voluntary carbon standards, they are far more accessible to farmers, which in turn can mean participation at a greater scale.

Certification schemes have also raised concerns relating to equity and cost of compliance for developing countries confronted with a multiplicity of standards.⁴⁴ While certification provides significant benefits for farmers where premiums are paid for certified products, requirements for certification are not without risk for poor suppliers from developing countries, which often lack the resources and capacity to apply new processes and standards. Thus far, the ability to attain price premiums or achieve rapid

adoption among such schemes has been mixed. Moreover, given the range of barriers facing smallholders in developing countries, including lack of market access, farmers are unlikely to adopt additional, burdensome criteria without some assurances as to their profitability. Future schemes will need to balance the need for accurate and useful data with the need to be simple, transparent and involve sufficiently low transaction costs to include small countries and producers.⁴⁵

⁴⁴ Meridian Institute. 2011. Agriculture and climate change, scoping report. Washington, DC: Meridian Institute.

⁴⁵ [ICTSD] International Centre for Trade and Sustainable Development. Submission on information and view relating to modalities for the operationalization of the work programme and a possible forum on response measures. Geneva: ICTSD. (Available from <http://unfccc.int/resource/docs/2011/smsn/ngo/286.pdf>) (Accessed on 9 January 2012)

Climate finance provides an opportunity to facilitate the adoption of agricultural practices that support climate mitigation and adaptation. This report evaluates how governments can use climate finance to lift barriers for the adoption of sustainable agricultural practices or the promotion of policies that alter the economic incentives for smallholder farmers. Currently, the agricultural sector is at a disadvantage when competing for climate finance, compared with the industry and energy sectors. This report develops a number of proposals on how climate finance can support policies that seek to overcome investment barriers.

Examples of how climate finance can measures that reduce investment risk and attract direct investment into the change of practices include:

- Set up transition funds. Funds to reimburse the costs of adopting climate change mitigation activities could address the lack of available credit, a major barrier preventing widespread implementation of sustainable agricultural practices by smallholders.
- Pay for ecosystem services. Where upfront finance is not needed, public support can be used to make payments for environmental services for sustainable agriculture activities. As much as is possible, finance could be made available through existing financial institutions.
- Cover insurance and guarantee costs. Climate finance can also help to reduce climate-related agricultural production risks with insurance strategies. Insurance schemes with low transaction costs encourage smallholders to increase production intensity because inputs are insured against failure.
- Support capacity building and transaction costs. Climate finance can support climate finance specific costs, such as the costs associated with the aggregation of smallholders, measurement, reporting and verification systems, or the training of extension systems, financial institutions or certification bodies. By covering such costs, governments can also lower the barriers for farmers to participate in carbon market or supply chain initiatives leveraging private sector finance.

Research supported by



With technical assistance from



In partnership with



The University of Vermont



CLIMATE FOCUS



Towards Policies for Climate Change Mitigation: Incentives and benefits for smallholder farmers