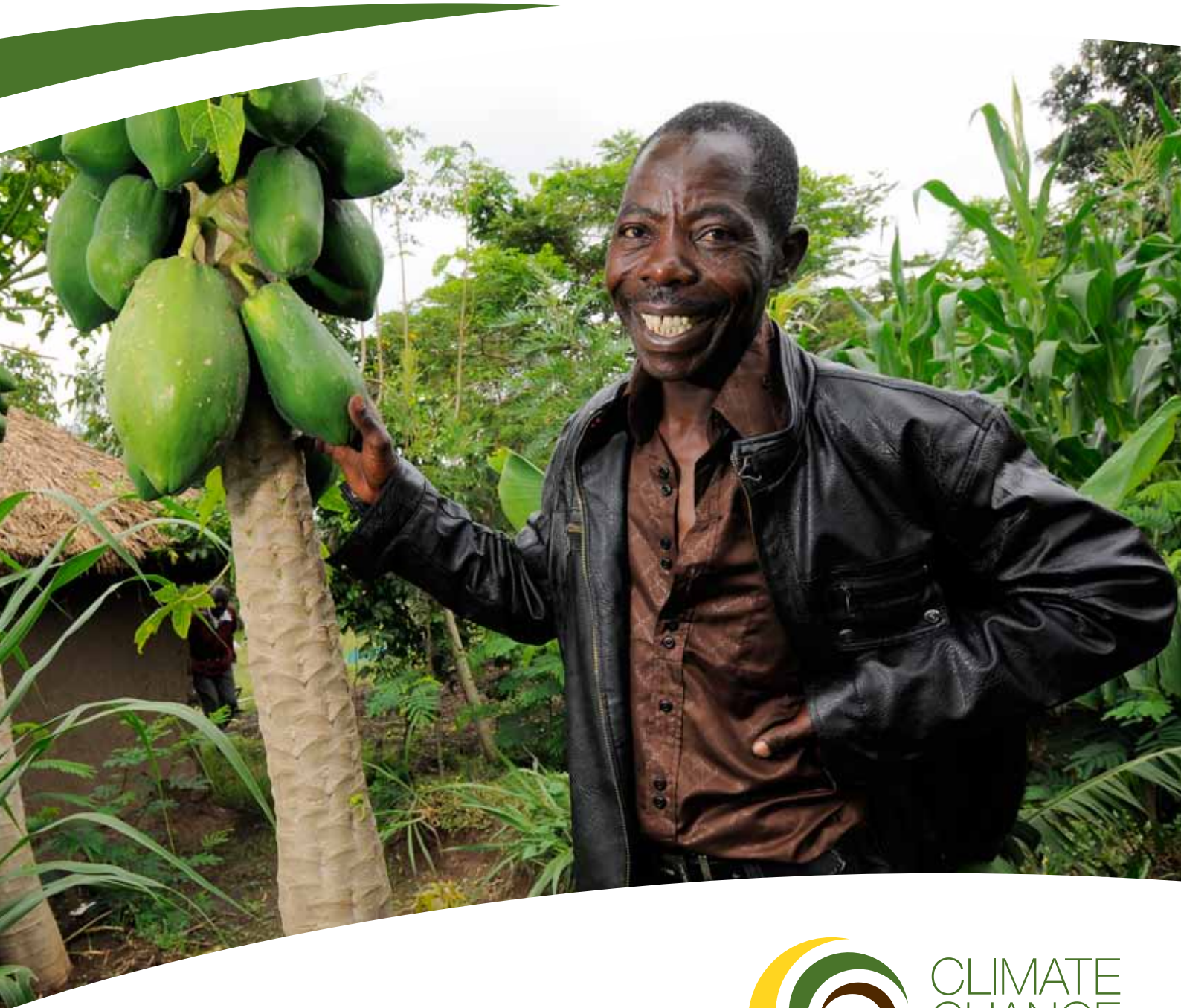


Mechanisms for agricultural climate change mitigation incentives for smallholders



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Corresponding Author

Tanja Havemann

Director
BeyondCarbon GmbH.
Titlisstrasse 35,
8032 Zurich, Switzerland
Email: tanja.havemann@beyondcarbon.ch

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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

Maurice, a farmer in Kenya, has sustainably intensified his small farm through agroforestry techniques.
Photo: N. Palmer (CIAT).

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Abbreviations & Acronyms

AD – Avoided Deforestation
ALM – Agricultural Land Management
A/R – Afforestation and reforestation
ARR – Afforestation, Reforestation and Re-vegetation
AFOLU – Agriculture, Forestry and Land Use
CCBA – Climate, Community and Biodiversity Alliance
CCBS – Climate, Community and Biodiversity Standard
CDM – Clean Development Mechanism
CER – Certified Emission Reduction
CFS – Carbon Fix Standard
CLIMBS – Philippine Coop Life Insurance and Mutual Benefit Services
CPA – CDM Programme Activity
EE – Energy Efficiency
FAO – Food and Agriculture Organization of the United Nations
FDI – Foreign Direct Investment
FOPEPRO – Fondo para los Pequeños Productores Rurales
GDP – Gross Domestic Product
GHG – Greenhouse Gas
HARITA – Horn of Africa Risk Transfer for Adaptation
IDB – Inter-American Development Bank
IFAD – International Fund for Agricultural Development
IFC – International Finance Corporation
IFM – Improved Forest Management
IFPRI – International Food Policy Research Institute
LAC – Latin American and Caribbean
LULUCF – Land Use, Land Use Change and Forestry
MFI – Micro Finance Institution
MRV – Measurement, Reporting and Verification
NAMA – Nationally Appropriate Mitigation Action
OPIC – Overseas Private Investment Corporation
PES – Payments for Ecosystem Services
PoA – Programme of Activities
PRC – Peatland Rewetting and Conservation
PPP – Public Private Partnership
RE – Renewable Energy
REDD – Reduced Emissions from Deforestation and forest Degradation
SEA – South East Asia
SSc – Small Scale
SME – Small and Medium sized Enterprise
SSA – sub-Saharan Africa
UNFCCC – United Nations Framework Convention on Climate Change
VCM – Voluntary Carbon Markets
VER – Voluntary Emission Reduction
VCS – Verified Carbon Standard
VCU – Verified Carbon Units
VSL – village savings and loans

Executive Summary

Smallholders have important roles to play in both the prevention of dangerous climate change by reducing net global Greenhouse Gas (GHG) emissions, and our global ability to adapt to climate change. However, smallholders have largely failed to benefit from international financial mechanisms established as a result of the United Nations Framework Convention on Climate Change (UNFCCC). We propose that this is due to the design of these mechanisms, which in their current formats are largely inaccessible to smallholder groups. The purpose of this paper, which draws on literature and interviews, is to examine finance and risk-related obstacles hindering smallholders from participating in current carbon finance mechanisms. It also suggests a framework for identifying how to prioritize and aggregate smallholders to achieve mitigation at scale.

In the Introduction, we provide our working definition of 'smallholder': *a household operating a small area of land (compared to the national average), that uses no, or limited hired labour.* We also briefly describe the complexity of assigning such a definition, illustrated by summarizing different smallholder characteristics in Asia, Latin America and the Caribbean and sub-Saharan Africa. In addition, the Introduction describes why smallholders are important in the context of climate change mitigation and adaptation: that they as aggregated groups manage large areas of land, relying heavily on it for survival, and that incentives linked to terrestrial mitigation can have significant social and economic benefits in addition to mitigation. A short overview of existing carbon finance schemes is also provided, which highlights the issue of scale (aggregation) in achieving meaningful results.

A brief section on aggregation follows the Introduction. First, the various forms of aggregation are described: horizontal aggregation occurs among actors on the same production level, and vertical aggregation occurs where there are increased links between different steps in the value chain. Aggregation may bring more economies of scale and group bargaining power, but may also contribute to locking smallholders into damaging agreements, resulting in low individual bargaining power for smallholders within the aggregating institution. Contract farming models are provided as examples of aggregation. Links between market exposure and aggregation are also briefly described, in that the types of markets that smallholders are engaged in affect aggregation opportunities and models.

The third section describes financing sources and delivery options for providing smallholders with GHG mitigation-related incentives. This section also describes risk

factors that smallholders are faced with. Eight potential sources of funding for smallholder activities, and delivery mechanisms for financial benefits are considered. These are: (1) self-financed, (2) community, family and friends, (3) local banks supported by the government, (4) microfinance Institutions, (5) private companies investing for production, (6) charities and development institutions, (7) private financial institutions, investing for profit, and (8) the local government budget. Each source is assessed on the basis of the type of capital provided, duration, requirements for provision and the current, as well as future potential for being a source and, or a mechanism for mitigation-related finance. Potential sources are: communities, family and friends (including remittances) and charities and development institutions. Potential mechanisms are: local banks, microfinance institutions, private companies, charities and development institutions and governments. Only charities and development institutions currently act as sources and mechanisms.

Section 3 also examines production-related, farmer, institutional, and governance risks faced by smallholders, and risk mitigation instruments. Climate change is likely to increase the risks that smallholders face, and to impact on their ability to generate quantifiable mitigation. Both informal and formal risk management strategies are described. Informal risk management strategies exist both at household and community levels. Formal risk management strategies include indemnity and index-based insurance. Examples are provided of a formal risk management scheme that involves smallholders, and the Philippine Coop Life Insurance and Mutual Benefit Services programme. It is clear that reducing the incidence and severity of adverse events may be an important co-benefit to smallholders participating in terrestrial mitigation programmes. Identifying overlapping components in mitigation and adaptation programmes involving smallholders (such as monitoring, reporting and verification systems and local weather information collection) warrants further investigation, particularly in the context of government-led mitigation programmes.

Section 4 compares smallholder versus carbon financier requirements and also provides a general framework for developing approaches for large-scale mitigation activities that include smallholders. This section contains a gap analysis (Table I) and also briefly examines some existing approaches being employed by carbon credit project standard developers in the voluntary carbon markets to encourage smallholder participation, for example, Plan Vivo and the Climate, Community and Biodiversity Alliance.

This section also presents an initial conceptual framework that could be used at the national or sub-national (rather than project) level for identifying which smallholders to work with, and approaches to develop appropriate incentive mechanisms. The steps can be summarized as: (1) Identify areas of highest physical potential for carbon storage or GHG emission reduction. This should also include an evaluation of the potential types of mitigation interventions, and be combined with a socio-economic assessment to determine who are the relevant stakeholders and a locally appropriate definition of 'smallholder'. (2) Examine local socio-economic conditions, focusing on resources that the smallholders have access to and with whom they currently interact. (3) Consider production that might be displaced by the GHG mitigation activity. Once this information has been collected and analyzed, evaluate which smallholders might be most effectively engaged in a GHG mitigation activity, and what a potential approach might be for engaging them. Note these steps are based on the assumption that GHG mitigation is the overarching aim of the programme. Also, thorough and on-going engagement with communities is required during the development of this and in the determination of a final programme. Developing, implementing and monitoring community engagement and buy-in is fundamental to success. Tools for carrying out a complementary bottom-up assessment are not covered in this paper; however we refer to existing tools that complement the conceptual framework described.

Section 5 provides recommendations for various stakeholder groups:

Government agencies in developing countries:

Overlaps often exist between what is needed for agricultural and rural development, and for smallholders to engage in mitigation programmes: Governments could better internalize climate change mitigation and adaptation into their economic development, agricultural investment and growth plans. Emerging carbon finance mechanisms are increasingly targeted to governments and could be used to support programmes that are required for socio-economic development of smallholder groups as well as mitigation. Existing programmes that include smallholders could also use carbon finance mechanisms to leverage greater impact, e.g. payouts under Indonesia's Plantation Rehabilitation Programme could be made dependent on adoption of mitigation practices. Public private partnerships are also worth exploring: Governments could work with entities such as contract farming businesses, Micro Finance Institutions (MFIs) and local micro-insurance providers to develop and implement land and activity registers, credit agencies and data collection systems. This could go hand-in-hand with the development and implementation of "climate smart" codes of conduct

for contract farming and Foreign Direct Investments (FDI) related to land use investments. Governments could support the uptake of these through appropriate legislation.

Private finance institutions: Investors, insurers, financial institutions, MFIs:

There is currently little visibility on how profits can be made from low carbon investments in agriculture. Private financial institutions could work with governments to develop and implement GHG mitigation activities, e.g. they could be engaged in designing locally-appropriate products that combine risk management, adaptation, GHG mitigation and GHG Monitoring Reporting and Verification. However they are likely to require incentives and, or, support from governments, donors or multilaterals to do this. Private sector actors can carry out some activities unilaterally, e.g. climate screening of investments and operations. Businesses with supply chains in relevant areas may also wish to assess opportunities for setting up carbon insetting activities by building the costs of ecosystem services into supply chains (the Plan Vivo insetting approach).

Multilateral agencies, research agencies, donors and not for profit entities

This group plays important roles in supporting research and development of terrestrial carbon mitigation programmes. However, activities to engage private sector actors could be up-scaled. For example, multilateral and bilateral agencies are currently developing land investment principles, these could include requirements to assess and disclose GHG impacts, paving the way for rewarding low-carbon FDI and help host governments assess GHG emissions. To facilitate this, tools could be developed to help investors and companies understand and quantify the environmental impact of agricultural investments.

They also have important roles to play in supporting governments in appropriate service provision for institutions and processes. For example, they could support the provision of better agricultural extension services, which could include a GHG mitigation and adaptation component. Another activity that could be carried out is an assessment of government tenure and business registration arrangements and how they relate to smallholder mitigation activities. They could also conduct and make available market research on smallholder requirements related to mitigation (and adaptation) so that government institutions and potential investors can better develop appropriate products and services. They could work with governments to facilitate and help run competitions to demonstrate how GHG mitigation can be incorporated in agricultural development initiatives that include smallholders, for example in the African

Enterprise Challenge Fund (AECF). They could support standard setting and local certification agency capacities in developing countries, particularly where mitigation opportunities are highest. They can also provide the necessary upfront funding and human resources required to develop smallholder-relevant businesses with positive GHG-mitigation impacts, e.g. helping to facilitate or broker 'patient capital' and similar blended funding instruments to leverage greater (and better quality) commercial investment in agriculture that provides benefits to the climate and to smallholders.

Carbon finance and policy makers engaged in climate change activities

Policy makers focused on climate change should focus on the long-term viability and requirements of smallholders' business (assets, risks, financing) in designing and

implementing mitigation incentives. This requires a consideration of who would generate the mitigation and how they would benefit. They may wish to carefully consider and design co-benefit offerings with smallholders and other potential stakeholders such as private companies so that rewards are adequate and appropriate. Carbon financiers and policy makers may also wish to explore ways to reduce reporting or MRV costs and complexity of attaining mitigation benefits through collaborations with various types of organizations. Also, they should focus on promoting high quality projects through risk-mitigation instruments and standards. Good business practices should be employed, including transparency in agreements with smallholders and partner institutions. This includes facilitating mechanisms to increase GHG benefit transparency 'fairness'. Policy makers should promote liquidity and market certainty, if pursuing a market-based approach.

1. Introduction

Global interest in food security and climate change have received much attention over the past three years, particularly since the food price spikes of 2008 and extreme weather events, such as the 2011 drought in the Horn of Africa. Overlaps between food security, climate change mitigation and adaptation (resilience) in developing countries are only beginning to be explored. Smallholders have an important part to play in both the prevention of dangerous climate change (mitigation) and our global ability to adapt to it. Despite this they have largely failed to benefit from international financial mechanisms established by the United Nations Framework Convention on Climate Change (UNFCCC) to tackle dangerous climate change. We propose that this is due to the design of these mechanisms, which in their current format are largely inaccessible to smallholder groups.

The purpose of this paper, which draws on literature and interviews, is to examine finance and risk-related obstacles that hinder smallholders from participating in current carbon finance mechanisms that reward mitigation. It also suggests a framework to prioritize and aggregate smallholders to achieve mitigation at scale. We conclude this paper with a series of recommendations for stakeholder groups: policy makers in host and donor countries, financiers (both general and carbon-focused) and independent not-for-profit entities (research organizations and non-governmental organizations).

In the introduction (Section 1), we describe who smallholders are, how they influence, and are influenced by climate change and the current carbon finance mechanisms related to them. Following on from this in Section 2, we describe models for aggregating smallholders – an issue which must be addressed in order to achieve scale. Section 3 describes some of the financing sources and delivery options for providing smallholders with mitigation incentives. This section also describes risk factors facing smallholders. Section 4 compares smallholder requirements and those of carbon financiers and also provides a general framework for developing approaches for large-scale mitigation activities that include smallholders. Finally, Section 5, based on the previous analysis, proposes

a set of recommendations for potential supporters, including host governments, donors and private companies, to better include smallholders in mitigation efforts. The paper draws on examples from South America, Asia and sub-Saharan Africa.

1.1 Smallholders in context

Who are smallholders?

The definition of a ‘smallholder’ varies considerably within the literature. A definition relying only on area managed may ignore significant factors, including resource quality, production type, available institutional arrangements and access to services. Smallholders can be identified based on farm size (such as those operating less than two hectares [ha]), dependence on household labour, relative gross domestic product (GDP), resource access, and asset base (land, capital, skills, labour). This paper uses the term to refer to *a household operating a small area of land (compared to the national average) that uses no, or limited, hired labour* (IFOAM 2002; FAO 2004).

A smallholder's income sources may be diversified on and off-farm to a greater or lesser extent. This diversity is a product of, among others, market exposure, geographical location and infrastructure, government policies and local social norms. Smallholders may be linked into a variety of value chains that are domestic or international in their reach. Such links may have far reaching consequences in terms of access to resources. The following sections provide an overview of smallholders within each of the regions covered in this paper.

The Latin American and Caribbean (LAC) context

LAC smallholders are typically family farms, largely utilizing their own labour. Recent analysis suggests that there are about 15 million family farms in LAC (Berdegúe and Fuentabla, 2011), controlling approximately 400 million ha, which can be divided into three broad categories (Figure 1). Mexico has the greatest number of smallholders in the region (FAO 2010).

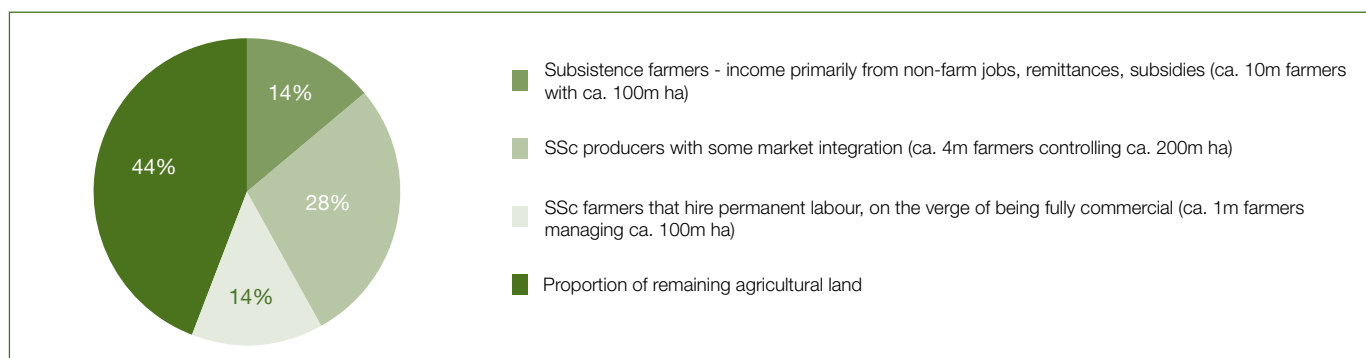


Figure 1: Smallholders in LAC (FAO 2009a).

Regional emissions from the Agriculture, Forestry and Land Use (AFOLU) sectors are significant, with an estimated 20.3% contributed by agricultural activities and 47.4% from forest-related activities (Gardi et al. 2010). The largest emitters in the region from the forestry sector are Brazil, Venezuela, Colombia and Peru. Small-scale agriculture and shifting cultivation are the largest direct drivers (Gardi et al. 2010). Brazil, Paraguay, Argentina and Jamaica have sizeable greenhouse gas (GHG) emissions from agriculture (UNEP/GRID-Arendal 2011).

Where smallholders in LAC have been able to engage in foreign markets, with high value and niche production such as organic coffee, fair trade markets for bananas, coffee, fresh fruit and vegetables, honey, fruit juice and sugar have, and will continue to be, important. LAC has at least two thirds of the world's certified producers.

The majority (80%-90%) of formal landowners in the region are men (Deer and Leon 2003). Smallholder women constitute the poorest population group in the region, and tend to have very limited access to markets. This is due in part to conflict, gender inequality, natural disasters, migration by men and structural adjustments (World Bank 2009).

The Asian Context

If the smallholder criterion of 2 ha is applied, this region has the greatest proportion of the world's smallholders (approximately 87%) (Thapa and Gaiha 2011). A summary of smallholder numbers in selected Asian countries is provided in Table 1. Smallholder land-holding size trends vary considerably. In

India, where the average farm size is declining, the number of marginal holdings (less than 1 ha) rose 3.6-fold from 1961 to 2003, and the proportion of India's farmland operated by farmers holding less than 1 ha rose from 7% to 22% (NSSO 2006; Zhou 2011). In China, 97.5% of farmers hold less than 2 ha and this proportion has been relatively stable (National Bureau of Statistics of China 2010). Market exposure and the route to market vary significantly. In China, for example, 92% of farmers sell their produce, and of these, 63.5% sell to doorstep traders (Zhou 2011).

The share of women farmers in Asia has remained nearly constant for the last 30 years (FAO 2011). In Eastern Asia, China has the highest proportion of women farmers (48%) and in Southern Asia, India has the highest proportion (over 30%) years (FAO 2011). Asian women are more likely to be employed in agriculture than in other sectors.

The sub-Saharan Africa (SSA) context

If the criterion of 2 ha is applied, about 80% of all farmers in SSA fall into this category. Estimates of smallholders in selected countries in the region are summarized in Table 2. The FAO predicts that the number of smallholders in the region will continue to increase until the year 2020 (Zhou 2011).

Most smallholders in this region have poor market access, and a decreasing resource base. It is estimated that only one third of smallholders in several parts of the region are net sellers of farm products (Staatz 2011)¹. A 2003 study (Jayne et al. 2003) of smallholders in Ethiopia, Kenya, Rwanda, Mozambique and

Table 1. Smallholders in Asia (FAO 2010)

Country	Number of smallholders
China	193m
India	93m
Indonesia	22m
Bangladesh	17m
Viet Nam	10m
Nepal	3.1m
Philippines	3.0m
Myanmar	1.9m
Thailand	1.9m

Table 2. Smallholders in SSA countries (FAO 2010)

Country	Number of smallholders
Ethiopia	9.4m
Nigeria	6.2m
D.R. Congo	4.3m
Tanzania	3.5m
Kenya	2.9m
Uganda	2.8m
Mozambique	2.6m

¹ Surveys conducted in Ethiopia, Kenya, Mali, Mozambique, Rwanda, Senegal, Somalia, United Republic of Tanzania, Zambia and Zimbabwe between the mid-1980s and 2002 found that in no country were more than half of the smallholders, net sellers of staples; the modal figure is closer to one third. In Ethiopia only 25% of smallholders were net sellers of either teff or maize, and only 25% were net sellers of maize in Mozambique. (Staatz 2011)

Zambia quantified the decline of average smallholder farm size. This same study also demonstrated that the proportion that off-farm income contributes to a smallholder's livelihood is negatively correlated with land size. However, in none of the five countries surveyed do households earn more than 50% of their total revenues from off-farm sources.

A large percentage of SSA smallholders are women. They are increasingly responsible for the farm as male urban migration is significant and growing (Livingston et al. 2011). In SSA women farmers make up 70% of agricultural labour. They provide 60%-80% of household food consumption labour, 90% of the work required to source water and fuel wood, 80% of labour required for food storage and transport, 100% of basic food processing, 90% of hoeing and weeding work, and 60% of harvesting and marketing services (World Bank 2009; FAO 2009b). Despite this, they often do not have equal rights to land and resources, and face poor access to credits, skill training, and new technologies (World Bank 2009, pg 175). The FAO 2009b states that in SSA women are responsible for selling and marketing traditional crops such as maize, sorghum, cassava, and leafy vegetables in local markets, while men tend to be more heavily involved in commercial production.

1.2 Smallholders and climate change

Smallholders, in aggregate, manage large areas of land
Globally, the agricultural sector accounts for 13.5% of GHG emissions, while land use, land use change and forestry (LULUCF) represent 17.4% of GHG emissions (IPCC 2007). To have a significant mitigation impact, an activity must have scale, in that it must take place over a large land area, and/or, have a high impact per unit of activity. Mitigation activities that smallholders could adopt are unlikely to generate significant volumes of mitigation per individual farm, hence aggregation is important. In many developing countries aggregated smallholders manage significant proportions of agricultural land and should therefore be part of the mitigation solution. The aggregation issue is considered in Section 2.

AFOLU mitigation practices that could be implemented by smallholders include (Seeberg-Elverfeldt and Tapio-Biström 2010): conservation agriculture, agroforestry and silvopastoral systems, improvement of land management systems (coffee, cocoa, forests, livestock), compost production, bio-energy, organic farming, afforestation and reforestation (A/R), and reduced emissions from deforestation and forest degradation (REDD).

Smallholders' vulnerability is impacted by the quality of their natural resource base

Smallholders inherently depend on the productivity of their land. However, they are often unable to practise sustainable land management due to a lack of resources and, or know-how. Therefore, conceptually they should be considered eligible for support to change their practices – making them

more productive whilst maintaining the intrinsic value. This also adds weight to the argument that more effort should go into designing appropriate mitigation schemes that consider smallholders, in particular their revenue and risk profiles. Therefore it is imperative that smallholders' revenues and risks must be considered in the design of appropriate national and local mitigation activity engagement schemes that engage them.

Socio-political context influences who participates in mitigation and adaptation activities

Women in smallholder households tend to focus on subsistence production and are largely the main producers of food, while men tend to focus on commercial crops (FAO 2006). Although globally women constitute a large share of the farming population, they often lag behind men in terms of access to land, labour, water, rural infrastructure, technology, credit, market-related information, training and advisory services. Tenure, for example, tends to be highly skewed towards men. To be effective, mitigation activities must consider local and national socio-political contexts.

Mitigation activities could benefit smallholders in a variety of ways

Although participating in the global effort to mitigate climate change might motivate a smallholder to take part in an activity, it is unlikely to be the primary driver. Where smallholders are recognized as land managers, for a mitigation activity to be of interest to smallholders, and for them to change their management practices, a net benefit must be demonstrated. This can take the form of revenue enhancement, and, or, risk reduction. Benefits linked to mitigation can be tangible or intangible. Examples of tangible benefits include: cash payments linked to carbon credits and subsidized or free inputs. Intangible benefits could include access to training programmes and institutional support (for example, through forming cooperatives and providing extension services) and increased tenure security. Land tenure uncertainty is often an obstacle to greater and longer-term smallholder investment in their land. A contractual relationship that demonstrates smallholders' land management rights within a mitigation project might therefore be a significant motivator.

Adaptation as a co-benefit to mitigation

AFOLU mitigation activities can increase local economic or environmental resilience. An improved ability to cope with local climatic changes (adaptation-dividend) can be a reduction to livelihood risks and income variability. As Box 1 illustrates, increased resilience (such as a reduction in risk) may in some cases be a greater motivator for smallholders to participate in a mitigation activity than generate new revenues.

1.3 Smallholders and carbon finance schemes

Overview

International acknowledgement of the adverse impact of GHG emissions has led to various governmental and

Box 1. Smallholders in mitigation and adaptation: Thailand case study (Srang-iam 2011)

A recent study conducted on several rural sites in Thailand considered (i) how local adaptation contributes to global climate change through reducing or removing emissions, and (ii) how the government's mitigation schemes have affected local livelihood by altering the vulnerability of farm households. Site-based interviews and assessment of the national policies and programmes highlighted the differences in concerns, the main concern of farmers being their ability to secure their livelihoods in the face of climatic uncertainty, while the government was to achieve net GHG reductions – these government interventions did not explicitly consider local resilience impacts. The study indicated that the most vulnerable farmers were the ones that were most likely to adopt high-GHG emitting farming practices. Farmers that were vulnerable were excluded from government mitigation programmes, such as tree planting schemes, due to lack of tenure documents. The author concludes: “national climate policies should prioritize the need of local farmers in adapting to climate change over the effectiveness in global emissions reduction. Such policies could aim at providing marginal farmers support for low carbon adaptation strategies.”

nongovernmental-driven schemes to promote mitigation activities, accompanied by financial incentives. In developing countries, these have been based largely on payments for performance and generating distinct units of mitigation (such as carbon credits) through implementing specific projects (project-based mechanisms). Initiatives that seek to have wider-scale impacts are being developed in response to outcomes at the Copenhagen and Cancun meetings of the UNFCCC. Countries are currently developing a variety of mitigation initiatives focusing on specific sectors, types of activities or regions (for example, Nationally Appropriate Mitigation Actions, NAMAs). These are described below and in detail in a complementary paper (Streck and Burns 2011).

Non-project based mitigation activities

These differ from project-based mechanisms in terms of:

- activity scalability, as the government designs, implements and manages the initiative;
- sources of funding;
- the output, which is not usually discrete units of mitigation (credits).

The value that developing country governments place on GHG mitigation from the agricultural sectors is reflected in their NAMA submissions: the majority of country plans submitted to the UNFCCC have included agricultural activities.

Multilateral and bilateral funding has been instrumental in supporting these initiatives, while the role of private sector capital in such schemes over the long term is likely to vary by country. For example, a government could introduce a reduced tax rate or subsidize loans to private companies for implementing specific GHG mitigation activities, or they could develop national MRV schemes and incentives that support the scaling-up of project-based approaches such as the Programme of Activities (PoA) approach.

Project-based mechanisms

Project activities carried out in a set area can lead to discrete

units of mitigation being generated. Volumes of mitigation units are determined using criteria and approaches are enshrined in various standards and their methodologies. These are summarized in Table 3. Note these only refer to smallholder-relevant GHG mitigation activities. Standards can be categorized by those generating credits for the regulated market, under the UNFCCC Kyoto Protocol CDM (clean development mechanism), and the voluntary carbon markets (VCMs). Credits developed under the CDM (known as Certified Emission Reductions – or CERs) can be traded on international exchanges and are relatively liquid. The prices of voluntary emission reductions (VERs) on the other hand tend, to be less liquid and less transparent.

Two standards have also been developed that do not result in GHG mitigation units, but rather are ‘overlays’ to ensure positive, social and environmental impacts: the Climate, Community and Biodiversity Standard (CCBS) and Social Carbon Methodology. CCBS was designed for use exclusively with land use projects. Social Carbon Methodology develops specific social benefit indicators based on project type and specific circumstances; indicators have been developed for A/R projects.

Project-based mechanisms: approaches to overcome the issue of scale

Most standards apply some form of category to project size, based on the total expected number of GHG mitigation units generated by a project. Small-scale (SSc) projects are usually allowed to take advantage of less onerous procedures. This is to level the playing field for smaller projects, which tend to have disproportionately high transaction costs, but also greater co-benefits. However, SSc projects remain in the minority for the more mainstream standards that do not have an emphasis on co-benefits (such as CDM and VCS).

Another approach designed to encourage aggregation and contain costs is the CDM PoA approach that allows distinct CPAs (CDM programme activities) that use the same project methodology and PoA project document to be aggregated.

PoA methodologies also provide the opportunity to convert carbon finance from one implemented CPA, to finance upfront costs of other CPAs. This is being trialed with small-scale energy projects in particular.

GHG mitigation benefits: the various project types have different economic profiles

There is a distinction to be made with regards to the timing and scale of costs and revenues of different project types, (see Table 4). Carbon credit investors are faced with a variety of projects to invest in, and will usually prioritize those that have the highest expected returns. Land use carbon credit projects have to date been largely uncompetitive in comparison to non-land use project opportunities.

Table 3. Overview of the most common international mitigation products relevant to smallholders in developing countries*

	Products	Activities generating product	Conditions for production	Unique characteristics of product
UNFCCC Kyoto Protocol - CDM	CERs**	A/R, bio-energy, waste management, EE	CDM methodology must be applied. Stakeholders must be informed of the project and their concerns addressed. Validation and verification of project. Credits must be registered in CDM registry. SSC methodologies and procedures are less onerous but must demonstrate engagement of low-income communities.	Can be used to meet Kyoto Protocol targets, relatively liquid.
Individual and corporate moral responsibility (voluntary offset initiatives)	VCUs generated under VCS	ARR, ALM, IFM, REDD, PRC, CDM project types	Same as above, standard has own methodologies, e.g. for land use projects outside CDM. CDM methodologies can be applied where appropriate. Registration possible in several voluntary registries.	Buffer to mitigate delivery risk.
	Plan Vivo certificates	A/R, agroforestry, forest restoration, AD, forest conservation	Same as above but Plan Vivo methodology applied – can be adapted to local conditions. Must be designed with local community. Strict benefit sharing requirements.	Unique ability to issue credits in advance. Focus on community engagement and benefits.
	Gold Standard VERs	RE and EE projects only.	Same procedure as above but specific Gold Standard methodologies exist. CDM methodologies can be applied where they exist. Sustainable development co-benefit focus in methodologies.	Used alone as VER or as “add-on” to CDM projects (CER).
	CFS-VER	New forests only (A/R)	Same procedure as above but uses own methodologies, including procedures to quantify sustainable development benefit.	Includes a buffer. Relatively simple methodology.
	VER+	CDM-eligible project types, all types of LULUCF including REDD if a buffer is applied.	Same procedure as above and CDM methodologies applicable. Other approaches used for projects where CDM methodology cannot be applied.	Captures projects that fall outside CDM, e.g. due to country status or timing.

Abbreviations: afforestation, reforestation and revegetation (ARR), agricultural land management (ALM), avoided deforestation (AD), carbon fix standard (CFS), energy efficiency (EE), improved forest management (IFM), peatland rewetting and conservation (PRC), renewable energy (RE), small scale (SSC), verified carbon units (VCUs)

* Note that region or country-specific initiatives e.g. the Chinese Panda Standard, are not included.

** Temporary CERs (tCERs) and long-term CERs (lCERs) are implicitly included, as a type of CER.

Table 4. Costs and benefits of project types relevant to smallholders

Project type	Cost elements	Benefit elements	Additional comments
Energy generation and efficiency projects e.g. improved cook stoves, solar cells	<ul style="list-style-type: none"> • Purchase, distribution and installation of equipment • Maintenance and replacement 	<ul style="list-style-type: none"> • Annual carbon credits • Cheaper energy or reduced energy cost 	High upfront costs, relatively quick returns. Precedent of financing e.g. by MFIs.
New forests (A/R)	<ul style="list-style-type: none"> • Land preparation • Seeds / seedlings • Planting • Maintenance • May be costs to secure land • May be infrastructure costs 	<ul style="list-style-type: none"> • Periodic carbon credits (usually at year 5 and once every 5 years) • Forest and non-forest product sources when plants mature) 	High upfront costs. Relatively long time for rewards (carbon and non-carbon). Initial volumes of benefit small.
Forest management and forest protection activities	<ul style="list-style-type: none"> • May be costs to secure land • Forest management • May be infrastructure costs 	<ul style="list-style-type: none"> • Periodic carbon credits (usually immediate and once every 5 years) • Possibility of generating immediate income depending on resource. 	High upfront costs. Shorter time than A/R for initial benefit but may be infrequent. Initial volumes of benefits may be large.
Non-forest land protection and rehabilitation	<ul style="list-style-type: none"> • Land preparation • Seeds / seedlings • Planting • Maintenance • May be costs to secure land • May be infrastructure costs 	<ul style="list-style-type: none"> • Productivity increases • Carbon benefits likely to be small per ha and very uncertain (relatively new methodology) 	Up front costs and time to receive non-carbon benefit may be relatively quick – carbon credits not likely to be most significant benefit.

Note that all projects incur similar carbon-related costs. Upfront, one-off carbon-related costs include: carbon credit project documentation development, validation, project registration. Ongoing carbon-related costs: monitoring reporting and verification (MRV), management of carbon credit project element, periodic verification of project, registry and issuance fees.

2. Challenges and opportunities of aggregation

Investments, including for mitigation, require a minimum scale to be financially profitable. Production capacity per smallholder, including for mitigation, is low, therefore aggregation is a necessity for activities involving smallholders. Aggregation requires commonalities, on the production and, or, outputs side. Regional differences, as described in the Introduction, may be a factor in determining possible aggregation models. An example of an aggregation commonality is the production of a particular marketable produce (such as Arabica coffee) and, or similar production conditions (such as operating under similar climatic and biophysical conditions).

How can smallholders be aggregated?

Smallholders can be aggregated in a variety of ways; the occurrence and appropriateness of different forms of aggregation is likely to vary considerably. Aggregation can facilitate integration – the linking of different participants within and amongst components of the value chain. Vertical integration refers to the control by a single entity of several steps in the production and, or distribution process. Horizontal integration refers to when different actors at the same level are linked; that is, it refers to one step in the production process.² Table 5 provides an overview of aggregation models.

Pros and cons of aggregation

There are both benefits and drawbacks associated with aggregation and integration: for example, there may be economies of scale and increased group bargaining power but smallholders may also be locked into damaging arrangements and have low individual bargaining power within the aggregating institution.

Contract farming as an example of aggregation

Opportunities may exist to incorporate mitigation activities into existing aggregation schemes, such as through existing contract farming programmes. Contract farming refers to “Agricultural production carried out according to a prior agreement in which the farmer commits to producing a given product in a given manner and the buyer commits to purchasing it- these contracts may be formal or informal (oral); the purchaser may provide ‘soft’ or ‘hard’ assistance (credit, inputs, training etc.); and the price may be fixed, set by a formula or unspecified” (Minot 2011). A mitigation activity could also drive aggregation.

Product type and production conditions are known to determine the suitability of aggregation. According to the International Food Policy Research Institute (IFPRI), contract farming makes most sense when it concerns high value crops, with large quality variations, that are perishable, have a high initial cost or input cost and the crop is difficult to grow, or new to the farmer. Also, it is more prevalent when the end consumers are willing to pay a premium (Minot 2011). The nature of the product that a mitigation activity can produce is described in the Introduction (Tables 3 and 4).

Market exposure and aggregation

Existing market exposure affects the ease with which smallholders can be involved in mitigation projects. Smallholders engaged in formalized contract farming schemes may already receive payments based on production performance. Theoretically, adding an additional production requirement and payment is possible. However, this requires an investment in terms of educating and incentivizing the aggregator to manage the GHG mitigation component in addition to their existing activities. The level of investment required for working with existing aggregators based on agricultural production, or developing new ones, is debatable. For example, smallholders already operating their farm more profitably may have a higher opportunity cost of land or labour and, under certain circumstances, may require higher incentives to participate in mitigation activities.³ Smallholders producing purely for subsistence may have little experience of contractual arrangements and little or no exposure to supporting services and infrastructure. Different types of smallholders are therefore likely to need different forms of incentives and support to implement GHG mitigation activities. Thus, consideration must be given to how to aggregate smallholders most effectively. For example, there may be lower individual payments required to incentivize subsistence smallholders but the institutional cost of engaging them may be higher.

² An example of vertical integration is the Shea quality value chain consultative processes in Ghana and Burkina Faso which lead to local standards being set that rewarded women for adopting processes that resulted in better quality (and higher value) produce.

³ For example, this was demonstrated by a study in Latin America (Haab et al. 2009)

Table 5. Smallholder farmer aggregation models (Havemann 2011)

Model	Sub-model	Description
<i>Driven by smallholders</i>		
Cooperatives and farmer controlled institutions (horizontal integration)	Associations, trusts, enterprises, cooperatives, farmer owned companies	Formalized groups of smallholders with legal standing. Many different structures exist depending on the institution's purpose e.g. marketing agency vs. producers' cooperative.
Contract farming (can be horizontal or vertical integration)	N/A	Smallholders group together to lease land to third party, e.g. a commercial farm manager.
<i>Driven by third party such as agribusiness or exporter</i>		
Contract farming (vertical integration)	Highly centralized	Institution that buys from a large number of smallholders and imposes demands on produce quantity and quality.
	Nucleus estate	Institution that buys through a centralized model, combined with a nucleus estate managed by the institution.
	Multipartite	Joint venture between a third party and a local entity representing smallholders and in a contractual relationship with them.
	Informal	Verbal purchase agreements, usually completed on a seasonal basis.
	Intermediary	Institution that has a contract with an intermediary who signs up individual smallholders.
Tenant farming or share cropping (vertical integration)	N/A	Contracting of smallholders to manage land owned or leased by third party.

3. Supporting smallholder production: financing and risk mitigation

The previous sections described how smallholders are relevant for mitigation, and the types of benefits they might receive from engaging in mitigation activities. This section considers sources and delivery mechanisms of financial incentives for mitigation and evaluates them in the context of smallholder requirements.

3.1 Assumptions about smallholder requirements

The evaluation presented here relies on the assumption that smallholders need awareness of, and access to, revenue enhancing and risk reducing benefits to have an interest, and to participate, in mitigation projects and programmes. As Table 6 summarizes, these needs may be tangible or intangible. We assume⁴ that smallholders currently have (IFOAM. 2002):

- low annual revenues that vary seasonally, and may fluctuate significantly depending on a variety of factors such as weather and off-farm employment opportunities;
- high household costs relative to revenues: a large proportion of household income is spent on food, water and energy;
- high vulnerability to events (risk factors) that impact on production, such as plant and animal diseases or a death in the family.

These factors will be re-visited in Section 4, where we assess how GHG mitigation incentive sources and delivery mechanisms could address them.

3.2 Characterization of financing types and sources

Financing for production, including production of GHG mitigation, can come from a variety of sources and take different forms such as grants, equity, loans, or a combination of these. Loans may be provided on a variety of terms and may recoup the principal plus interest, or as prepayment against

expected production. They can be domestic or foreign in origin. Production, including for mitigation units, requires both long and short-term financing. Short-term financing is usually debt, and used to cover short-term (less than one year) production costs and working capital. This may be tied to orders, such as from supermarkets demanding deliveries of particular quantities and qualities of produce. Mid and long-term financing is usually more senior, long-term debt and, or equity and is typically required to start a business or invest in capital expenditure. It is usually tied to business strategy (Diakit  2011).

Figure 2 illustrates domestic and foreign sources and delivery mechanisms. Foreign sources include bilateral or multilateral funds (channeled through overseas development assistance), various forms of private sector investment (including for the purpose of generating carbon credits) and philanthropy. It is usually difficult and expensive to identify and transact direct with smallholders due to lack of information, education and awareness, as well as poor rural infrastructure. Therefore, it is more common to reach smallholders through delivery institutions such as cooperatives or community based organizations.

3.3 Overview: financing production in smallholder systems

This section summarizes the type of capital that can be provided, requirements for its provision and an evaluation of it as a potential source and delivery mechanism of funding for GHG mitigation in smallholder agricultural systems. Figure 3 shows an evaluation of the types of capital provided by the sources 1-8 in Figure 2 above. Short summaries are given for sources 1-8. Note: smallholders may fall into multiple categories depending on products generated.

⁴ These assumptions are based on general characteristics of smallholders found in the literature. (IFOAM. 2002)

Table 6. Smallholders needs and how they can be met by GHG mitigation-linked benefits

Potential revenue enhancing and risk-reducing support to address need		
Primary benefits (direct)		
Smallholder assumptions	Tangible (Value is quantifiable)	Intangible (Value difficult to quantify)
Little, seasonal and insecure household revenue	<ul style="list-style-type: none"> • Payment for GHG mitigation units • Provide new income generating opportunities e.g. new produce, processing facilities, employment • Improved earnings through provision of quality and consistent extension service • Improved earnings by receiving more per unit of produce • Dividends / profit share from selling product associated with project 	<ul style="list-style-type: none"> • Clarification and improvement of tenure • Improved market access • Institutional development • Decreasing irregularity of smallholder incomes e.g. by introducing new, diverse income sources and providing access to storage • Agricultural training and techniques
High relative household and production costs	<ul style="list-style-type: none"> • Support to displace or reduce production costs e.g. inputs, energy • Support to displace or reduce living costs 	<ul style="list-style-type: none"> • Improvement of local facilities (healthcare / schools)
High vulnerability to events that impact on production	<ul style="list-style-type: none"> • Provide access to facilities that can extend the life of products e.g. processing and storage facilities • Provide access to formal production and family insurance 	<ul style="list-style-type: none"> • Access to savings opportunities • Improved information access (e.g. on weather) • Training on nutrition and health • Increased local resilience
Co-benefits (indirect)		
	<ul style="list-style-type: none"> • Training in financial literacy • Smallholder political representation • Gender awareness 	

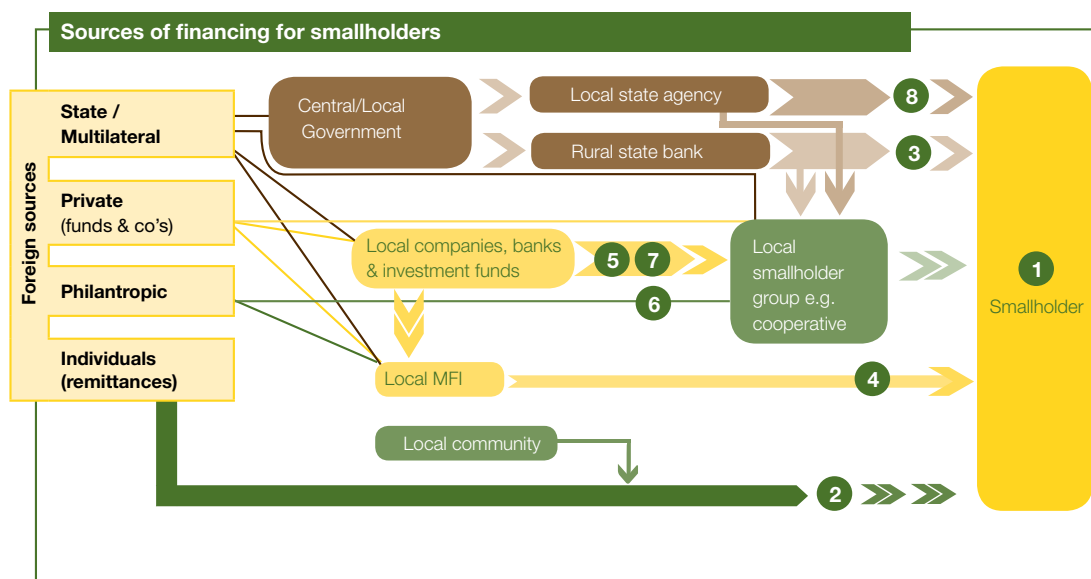


Figure 2. Characterization of finance sources and delivery mechanisms (The numbers in circles refer to Section 3.3 and Figure 3 below).

	Type of capital	Requirements	Potential
1	Smallholder – self-financed E LT ST	T	X
2	Community, family & friends (incl. remittances) D E LT ST	T	S M
3	Local banks associated with government D LT ST	T A C IN FL TR	S M
4	Microfinance Institutions (MFIs) D ST	IN C TR	S M
5	Private company investing for production P LT ST	T A IN TR	S M
6	Charities and Development Institutions G D E LT ST	A	S M
7	Private financial institutions, investing for profit E D LT ST	T A IN FL TR	S M
8	Government budget (national / regional) G LT	T IN	S M

LEGEND

Type of capital

- Equity
- Debit
- Pre-payment
- Grant
- Long term (>1 year)
- Short term (<1 year)
- Can do LT but unusual

Requirements

- Tenure required
- Tenure highly beneficial
- Infrastructure e.g. phone cover
- Aggregation a condition
- Financial literacy
- Collateral required
- Track Record required

Potential to finance GHG mitigation

- None
- High opportunity as a source
- Mid-low opportunity as a source
- High opportunity as a mechanism
- Mid-low opportunity as a mechanism

Figure 3. Evaluation of financing sources for incentivizing GHG mitigation in smallholder agricultural systems.

1 *Self-financed and controlled*

This situation, where the smallholder is entirely self-financed, can be considered the 'default'. This group includes wealthier smallholders, as well as highly disadvantaged subsistence farmers with no access to third party financing. The smallholder must have built reserves, as well as confidence that the investment will be successful. They may also be encouraged to pursue this strategy as a result of cultural norms (such as investing in livestock as a form of savings), and, or where there are few other opportunities for safely storing extra resources; for example, where assets cannot be converted into cash and there are no local savings facilities. The size of the available investment is likely to be small and affected by personal circumstances. Tenure arrangements may be an important consideration in terms of the type and duration of investment. Smallholders are not likely to invest solely for the purpose of GHG mitigation.

2 *Informal and semi-formal sources: friends, family and informal lenders*

This involves informal financial support from members of the community, such as remittances from friends or family and village savings and loans associations (which we consider semi-formal). Currently, the majority of financing for smallholder agricultural production is domestic (local communities, friends and family and remittances). Investments through individuals or organizations familiar with, and to, the smallholder may provide distinct benefits in terms of channeling support for mitigation activities, in that they may be more familiar with the type of financial and non-financial support required, and there may be more community pressure to succeed. Additionally, because the funding often relies on trust, there may be no requirement for collateral, or for aggregation. Box 2 provides an example of a Ugandan entrepreneur who used personal funding to build a successful business engaging smallholders.

Drawbacks of this type of funding to the smallholder:

- risk of community discontent if targets are not met;
- funding may favour certain groups based on social norms rather than potential and performance (nepotism, gender discrimination);
- funding sizes are usually small and scaling-up may be an issue;
- repayment demands may be affected by personal circumstances;
- terms may not be clear and enforceable;
- informal sources (loan sharks) may charge very high interest rates.

The potential scale of funding is large. For example recent estimates from the African Development Bank show that migrant remittances to Africa will be USD 22 billion in 2011 and USD 24 billion in 2012 (African Economic Outlook 2011). However, aggregating domestic sources and remittances may be difficult. Tapping into remittances and encouraging diaspora investment in agriculture is of increasing interest. For example, IFAD and the US State Department recently launched the 'Diaspora Investment in Agriculture' initiative.⁶ Effectively tapping into this source relies on local banking institutions, often with the support of local and foreign governments, donors and multilateral agencies. For example, governments might need to offer a tax reduction to investors in a remittance bond to encourage participation. In contrast, the example provided in Box 2 illustrates a potential mechanism for delivery of this source of funding. However, it is difficult to assess how many similar opportunities there are. Therefore, although this is a large potential source it is likely a poor mechanism.

Box 2. Sunshine Foods in Uganda: building a successful business with smallholders⁵

In 2007, the founder of Sunshine Foods decided to set up a chili growing and export business in Uganda. The area she targeted, in northeast Uganda is dominated by smallholders. She initially looked for extension and other farmer networks to work with, but did not find any adequate partners, so she decided to invest her own money in recruiting and training extension workers. She also provided inputs to the farmers – due to the lack of collateral she had to do this purely on a trust basis. In the early stages of the project she went to the local bank; however she was denied funding for the farmers due to lack of collateral that could be registered and lack of a track record (they demanded min. 3 year financial statements). Her strategy is to buy from groups, to ensure strict quality criteria, to ensure that smallholders understand the conditions, yet that they are supported in growing this new crop. Initially the farmers were very sceptical about adopting a new crop, and they were unsure of demand (price, volumes, stability, and so on). Four years since starting her business, she is getting a return on her initial investment, her products occupy a majority of the market and she is planning similar grassroots agribusinesses in the region.

⁵ Sources: Interview with Pamela Anyoti Peronaci and (New Agriculturalist 2011).

⁶ This initiative will assist and encourage investments by migrants in business opportunities that enhance food security, generate economic opportunity and foster job growth in rural areas. More information can be found at: <http://www.ifad.org/media/press/2011/35.htm>

3 *Domestic and government supported banks (excluding private banks and microfinance institutions (MFIs))*

This refers to banks that provide project and personal finance products and services and are supported by local government, such as dedicated agricultural banks. The ability of these institutions to offer products and services to rural smallholders depends on a variety of factors, including the local policy framework and domestic savings rates. They can be the executor of government policies, for example on subsidized lending rates for agriculture, but are typically restricted by local infrastructure and transaction size. Their financing policies may be affected by cultural biases, including discrimination against women borrowers.⁷ Financing policies that are supported by governments are also affected by the quality of government management.

Given other competing opportunities, local banks are, by themselves, unlikely to be a large source of investment. That is, unless the local government provides incentives and support for them to do so, or they participate in a donor-supported programme. Additionally, financing project-based initiatives, for example by accepting smallholder-produced agricultural carbon credits as collateral, is an unlikely avenue for such institutions. The reasons for this are that:

- projects borrow to finance production, such as against delivery of a future product. The inability to deliver the future product is probably a result of a failure to produce, which reduces the likelihood of carbon revenues. In other words, the risk of production is related to the value of the collateral.
- smallholder mitigation activities tend to produce VERs. The value of a VER is set through negotiation so it may be difficult to assign a value to the contract. Credits are also not liquid, meaning that the bank may impose a very high discount on the value of the credit as a collateral, making it inefficient and typically insufficient.

In summary, local banks are by themselves, unlikely to be a significant source of finance. However, if the banks have a good rural distribution network, they may be a potential mechanism.

4 *Microfinance institutions*

MFIs are institutions that provide small loans, over relatively short periods (usually between six and twelve months). Their strategies to overcome transaction costs are to lend small amounts to many individuals, to rely on community pressure to encourage repayment, to favour lending to women who tend to have higher repayment rates, and to favour clients who have a good track record and collateral. Funds are usually business, rather than consumption related, and targeted to the poor.

There is much geographic variation in how MFIs operate. In Latin America, for example, MFIs tend to work with individuals; in South East Asia there has been a greater focus on village savings and loans (VSL) models. Prevalence of MFIs, particularly in rural areas is facilitated by infrastructure such as roads and mobile phone networks. In some places they are more prevalent than the local banks. Most MFIs source part of their funding, directly or indirectly, from multilateral development agencies. This is illustrated by the example of FOPEPRO in Box 3.

MFIs have the ability to finance fast-yielding production. Smallholder agricultural mitigation project activities are likely to take more than one year from inception to significant yield output. In addition, MFIs base their business on return on principal plus interest, not monetization of products such as carbon credits. So although their mechanism may in many cases be well suited to reach smallholders, they are unlikely to be a relevant source.

Box 3. A new MFI in Latin America: Fondo para los Pequeños Productores Rurales en América Latina (FOPEPRO)⁸

This social investment fund, which is supported by the IDB and two private social investment companies “aims to promote the economic development of small farmers by providing loans for the production, processing and marketing of staple food crops (maize, beans etc.) and high value non-traditional exports such as cocoa, coffee, bananas, sesame, vegetable crops and dairy products across most countries in Central and South America... [it] will provide loans to three types of borrowers: smallholder organizations, rural MFIs, and processing and marketing small and medium sized enterprises (SMEs) which are part of the agricultural producer value chain. Loans will finance working capital, medium term investment loans and subordinated loans with a maximum tenor of five years.”(IDB 2011)

⁷ “In Cameroon, for example, although a woman is now legally allowed to start a business without her husband’s consent, a husband may still formally object to his wife’s exercise of a trade or profession if he judges it not in the interest of their marriage or children. In Swaziland, women are not allowed to register property and they need a male guardian’s consent to open a bank account or start a business.” From <http://www.guardian.co.uk/global-development/poverty-matters/2011/jun/14/africa-women-entrepreneurs-overlooked>

⁸ IDB, “FOPEPRO”. More information can be found at: http://acerola-management.com/en/fo_vision_en and <http://www.sidi.fr/fopepro.php>

5 *Private companies investing for production (including carbon credit developers)*

Private companies that source their products from smallholders often have an incentive to support production. *The main forms of this value chain finance are: "(1) Provision of credit, savings, guarantees or insurance to or among value chain actors, (2) Strategic alliances through financing extended by a combination of value chain actors and financial institutions, (3) Tools/services to manage price, production or marketing risks."* (Devlin and Kormawa 2011)

Relationships between producers and off-takers are fundamentally underpinned by trust and track record, and may not always be enshrined in a formal contract. Support is usually short term, and based on seasonal production. However, there may be longer-term arrangements for tree crops, but this is likely to be in the form of non-cash support, such as provision of infrastructure.

To receive this type of support, smallholders will usually have to demonstrate that they can deliver minimum quality and quantity of produce at a given time – this requires infrastructure. Support is usually limited to smallholders with produce destined for international markets, or, in the case of larger developing economies, urban centres. Prices are often tied to international commodity markets, which may not reflect local economic circumstances. In some cases, the bargaining power of smallholders may be limited, which can put them at risk of abusive contracting practices, and dependency on a large off-taker may restrict a smallholder's long-term opportunities.

Pre-financing of CERs or VERs by carbon credit project developers and funds is a form of financing for production. The conditions under which projects can generate carbon credits are described in the Introduction. Carbon credit

projects tend to have high transaction costs, usually favour countries that already host such projects and have clear national rules about ownership of carbon and a history of tenure enforcement. Sequestration-based projects tend to take longer to generate significant volumes, and uncertainties exist about quantifying carbon storage and sequestration in soils. Due to the small volumes produced per smallholder, aggregation is a necessity. However, these types of activities could provide significant co-benefits and enhance existing agriculture or forestry projects that involve smallholders, such as out-grower schemes for logs. Box 4 below, illustrates some specific challenges to value chain financing in Bolivia – many of these are also relevant for any type of production, including mitigation.

Due to the restrictions on agricultural and smallholder carbon credit projects described in the Introduction, and uncertainties surrounding the future of carbon markets, this is not, at the moment, likely to be a significant source. Currently, bilateral and multilateral donors and charities have a more significant role in financing these types of projects. However, if global regulations change, or if appropriate local regulations are enacted, the private sector could be a significant source of financing. Private companies that already engage smallholders could provide an interesting mechanism to reach them.

6 *Charities and development institutions*

This encompasses a wide range of financial support such as debt, equity, grants, loan guarantees, risk insurance, and non-financial support (training, materials etc.). Note that development institutions also provide direct budget support to developing country governments. However, as these funds flow through the local government, this is covered in the following section.

Box 4. Twelve challenges to value chain finance for Bolivia's farmers (Schiff and Stallard 2009)

Challenges are summarized as: (1) Systemic risk such as weather and crop failure. (2) Market risk generated by cyclical and seasonal price fluctuations. (3) Credit risk including lack of collateral and incomplete support services. (4) Investment returns are limited and slow in Bolivia, where rural capital revolves slowly with one or two crops per year. (5) Low investments and assets which provide limited collateral options. (6) Geographic dispersion makes economies of scale difficult to achieve. (7) Inadequate infrastructure capacity including communications, roads, social services, all of which increase the cost of lending. (8) Technical capacity and training is lacking: limiting adaptation to new technologies, productivity and competitiveness. (9) Social exclusion inhibits integration into financial markets and reduces market efficiency. (10) Institutional capacity, including management and technical capacity of organizations in rural Bolivia is lacking and results in few new products being piloted to meet farmer and small business need. (11) Political and social interference such as forgiving loans, withholding savings, capping interest rates, and subsidies create a potential risk for financial intermediaries. (12) Regulatory risks include excessive requirements and, or lack of enforcement of regulations, hindering the viability of business and financial operations in rural areas.

Analysis carried out in 2010 by the Corporate Leadership Coalition for Smallholder Farmer Livelihoods identified some key trends in development assistance for smallholders in the agriculture sectors (Pfitzer et al. 2010):

- smallholder focused aid accounted for just 2.2% of the combined aid budgets of 29 donors, representing USD 12 billion in funding;
- Africa receives proportionally more funding for smallholders compared to other regions, followed by Asia and the Americas;
- the majority of funding is for “*direct assistance to smallholders on training and, or providing them with inputs to improve their yields and incomes*” (Pfitzer et al. 2010, p9), followed closely by access to markets and finance for smallholders, and finally, for improving their infrastructure and operating environment.

In addition to providing financial and technical support, these institutions, and particularly the multilateral and donor agencies, can play an important role in structuring new products that increase and improve investments in rural areas. For example, multilateral agencies can structure remittance bonds, ‘green growth bonds’⁹, development bonds and securitization bonds (USAID 2003). Multilateral agencies can also provide risk reduction facilities, such as guarantees or political risk insurance. For example, Terra Carbon LLC recently signed an agreement with the US Overseas Private Investment Corporation (OPIC) which provides them with a political risk insurance for a REDD project in SEA¹⁰. Note that these types of products require scale, and therefore aggregation is necessary.

Charities can play an important role at a local level – both in terms of financial and non-financial support. For example, they can establish community-based organizations that can develop into formally aggregated institutions. Additionally, they can support these aggregated institutions to interact with the private sector, as illustrated by the example in Box 5. Many charities have taken the lead in developing terrestrial carbon mitigation projects, particularly as the carbon markets have been too uncertain, or profits look too small to interest purely profit-driven companies. Charities aim to demonstrate that their

work has had an impact; thus, to access this type of funding a smallholder has to partner with a local institution, which may be an issue when quality partner organizations do not exist.

Although this may be a potentially significant source of funding, there are questions to be raised about financial sustainability. If not properly designed, this form of support can lead to aid dependency and local market distortions. Programmes may also be misaligned when compared to smallholders’ needs. This source should be considered a short to medium-term financing opportunity. As a mechanism for delivery, this may be a good way of engaging smallholders, but this option should be pursued only in the short to medium term for a particular smallholder group.

7 Private financial institutions investing for profit

This encompasses institutions such as foreign banks operating in the country, and investment funds. Note, they are not investing to gain a tangible product as such, but to get a return in the form of capital. They tend to have the same restrictions as local banks associated with the government (No.3 above), but also have access to capital from developed country markets that could be put to use. They are typically generalists, and considering the range of investment alternatives they face, are not likely to be a significant source. Additionally, their reach may be equal or less than that of local banks, so they are similarly unlikely to be a good distribution mechanism.

8 Government budget (national or regional)

How the government is organized and operates, including the level of decentralization and devolution impacts on the connections between smallholders, smallholder groups and state. Indirect support is provided to smallholders by investments in infrastructure, decisions on price controls, taxes and subsidies. Government bodies may engage directly with smallholders through agriculture and non-agriculture facilities such as rural health-care and education facilities. They may also provide support through rural agricultural extension services and improved seed distribution programmes. In addition they may interact with smallholder farmers groups, such as cooperatives.

Box 5. An example of business-NGO partnerships to facilitate smallholder trade (Oxfam 2009)

Aj Ticonel is a Latin American company that works with a local NGO to facilitate smallholder production. The company first informs OPCION, the NGO, on volumes and quality standards required according to orders received from their clients. OPCION draws up a production schedule with each producer group to develop detailed plans for sowing and production. Technicians associated with OPCION work with the producers to meet the demand. The produce is delivered to group-owned collection points. A significant equity share of Aj Ticonel belongs to the smallholders. This business model is suitable for higher-value produce.

⁹ The World Bank, for example, have launched a number of green bonds, see: <http://treasury.worldbank.org/cmd/htm/WorldBankGreenBonds.html>

¹⁰ <http://www.businesswire.com/news/home/20110630005407/en/Terra-Global-Capital-Signs-Groundbreaking-OPIC-REDD>

Support is usually in the form of services, or subsidized access to goods or services. For the purpose of this paper, we classify these as grants. Support flows through government policies, which typically takes some time to put in place and to dismantle. It can therefore be classified as a long-term facility. To access these, smallholders may have to prove that they have a 'right' (hence tenure might be necessary) and may have to be in an accessible location (access to infrastructure).

Developing country governments are unlikely to provide large budgets on their own for GHG mitigation activities, particularly if they perceive more pressing development issues. Historical responsibility for GHG emissions also lies with developed countries and there is a strong feeling they should shoulder most of the cost. Hence, donors and multilateral agencies often provide budget support for government programmes and initiatives. However, as people's wellbeing becomes increasingly affected by climate change, developing country governments also have a responsibility to pursue actions that protect them. In addition, there can be win-wins between agricultural resilience and GHG mitigation activities. In summary, government agencies are unlikely to be a significant source of finance, at least in the short to medium term. However, they can be a mechanism for creating awareness of, and distributing benefits linked to GHG mitigation.

3.4 Risks and risk management

It is important to consider the role of risks to smallholders: climate change is likely to increase the risks that smallholders face, and to impact on their ability to generate GHG mitigation. Reducing the incidence and severity of adverse events may be an important co-benefit to smallholders participating in GHG mitigation programmes. Smallholders' risks can be broadly divided into three categories: production risks, farmer risks and institutional and governance risks. Note that the issue of risks is also covered in a complementary paper (Streck and Burns 2011).

3.4.1 Risks faced by smallholders

Production risks

Production risks refer to natural factors (weather, pests, diseases) and market factors (price of seeds, fertilizers, pesticides and food price volatility). Smallholders tend to have low resource endowments, especially land and capital assets, so production risks tend to have a significant impact when manifested (Moschini and Hennessy 2001). Limited access to financial instruments reduces the capacity of smallholders to invest in production and revenue enhancing instruments, such as improved inputs and access to storage facilities. In

turn, uncertainties in farm and household incomes may further limit access to production credit because of increased (or perceived) loan default risks.

Farmer risks

Farmer risks occur from ill health, lack of skills and social standing. Illness represents a major risk amongst smallholder farmers because it can reduce production and increase household costs. Death is another considerable shock that also removes a contribution to income and the household economy, and may impose the large unexpected cost of a funeral.

Institutional and governance risks

Institutional and governance risks refer to those posed by interacting with financial institutions, the government (regulatory environment) and conflict. Poor governance may affect the capacity of people to access and maintain assets, services and utilities. It may also lead to increased transaction costs associated with investments.

3.4.2 Risk management

Risk management instruments can reduce the cost, unpredictability or severity of risks to the smallholder. They can be classified as informal or formal risk management mechanisms, as summarized in Table 7 (AFRACA 2009).

3.4.3 Risk mitigation at household level

Farmers in developing countries tend to have little access to formal risk management solutions, and usually rely on informal coping mechanisms. These include: enterprise diversification, altered production techniques, reallocation of labour, high discount rates on new practices, maintaining reserves of non-interest-earning assets that are sold in the event of a shock, reducing household consumption and, or investment such as educating children, especially girls. Each of these strategies may provide short-term relief but in the longer term may contribute to increased household poverty and vulnerability.

Buffer stocks accumulation (money, land, livestock and other assets) is also a common risk mitigation strategy. Livestock particularly represents an important component of household risk mitigation, as animal products can be sold throughout the year (IFAD 2010a). They are also relatively easy to sell but are vulnerable to the effects of climate change (IFAD 2010b).

3.4.4 Risk sharing at the community level

Community-level savings and credit associations help farmers to mitigate risks by developing a pool of savings and a local source of borrowing. Examples include: extended families, cooperative labour arrangements, group sharing of the costs

and benefits of livestock herding, and a jointly owned storage and processing infrastructure. However, as IFAD 2010 states, many of these strategies fail when risks affect a large number of members at once.

3.4.5 Formal risk management instruments

Insurance can be divided into indemnity-based insurance (traditional insurance), index-based insurance and micro-insurance. Insurance penetration in general remains very low in developing countries. For example, Latin America, Asia and sub-Saharan Africa together accounted for only 21% of the world insurance premium total in 2008 (Wenner 2010).

Indemnity-based insurance

Traditional insurance, or indemnity-based insurance, reimburses a client the estimated financial loss resulting from a shortfall, or loss in yield at the time of harvest. The cover

can be either multi-peril crop insurance or single peril crop insurance. Traditional insurance is usually reinsured, in that the local insurance company transfers all or part of the risk to a reinsurer. In this way, insurer and reinsurer share premiums and risks, thereby making the premiums more affordable. Agricultural indemnity based instruments protect against livelihood and asset losses generated from catastrophic events and can concurrently improve access to finance, as risks are transferred from farmers to third parties. Boxes 6 and 7 provide examples of two innovative insurance products that are being trialed in Ethiopia.

Index-based insurance

Index-based insurance pays out based on the value of an index rather than actual losses measured at field level. Examples of indexes are rainfall, temperature, humidity, crop yield and river levels. Payouts occur when the index (such as rainfall) is below a total agreed value over a certain period (insurance against drought related crop loss). Such schemes do not require farm level assessments.

Table 7. Overview of risk management instruments

Informal risk management	
Farm household level (Risk mitigation)	<ul style="list-style-type: none"> • Savings • Buffer stocks • Enterprise diversification • Low risk, low return crop • Production techniques • Sale of assets • Reallocation of labour • Reduced consumption
Community level (Risk sharing)	<ul style="list-style-type: none"> • Food crop sharing • Common property resource management • Social reciprocity • Household size, social networks • Rotating savings/credit • Sale of assets • Transfers from mutual support networks
Formal risk management	
Market-based (Risk sharing and transfer)	<ul style="list-style-type: none"> • Contract marketing • Financial hedging tools • Traditional insurance • Weather-index insurance • Micro-insurance • Contingency funds for disaster relief • Savings • Credit

Box 6. Nyala Insurance in Ethiopia (Meherette 2009)

Nyala Insurance S.C., for example, is an Ethiopian insurance company, that provides multi-peril crop insurance that insures farmers from natural and human factors affecting production yield. Payout is made to all farmers who suffered a shortfall of the pre-agreed long-term average yield. However, farmers must produce crops for sale, and be in areas with relatively good infrastructure to access this type of insurance. Indemnity based insurance usually involves (expensive) farm level assessments, is costly to administer and more suitable to large farms or cooperatives.

Box 7. HARITA project in Ethiopia (Meherette 2009)

The Horn of Africa Risk Transfer for Adaptation (HARITA) project in Ethiopia is a relatively new mechanism that addresses the needs of smallholders through an unusual mix of risk reduction, drought insurance, and credit. The project adopts an innovative, holistic approach to risk management and integrates risk transfer (such as insurance) with risk reduction (such as improved agricultural practices and conservation activities) and prudent risk-taking (such as credit). It aims to increase climate resilience amongst farmers and improve access to micro-insurance.

Index versus indemnity-based insurance

The main advantage of index-based insurance is a lower transaction cost compared with indemnity insurance. This makes it more appetizing for private sector insurers in developing countries and more affordable. Index-based insurance can either be sold at the micro level (such as to smallholders) or at the meso level (to cooperatives). However, index-insurance does not come without shortfalls. The robustness of index assessment depends on the availability and reliability of quality data, often lacking in developing countries, and it is vulnerable to basis risks (when insurance payouts do not match actual losses). Contract design is particularly important in order to avoid basis risks (Hellmuth et al. 2009).

Micro-insurance schemes

Micro-insurance is usually targeted at low-income farmers in developing countries with limited access to traditional insurance. Micro-insurance aggregates multiple individual smallholders or smallholder groups into larger groups where risks can be pooled. A wide variety of risks can be covered, such as life, health and asset insurance. It is typically provided to low-income individuals in combination with microfinance loans. Note that these products tend to be pooled at several levels for reinsurance purposes; for example at village level, regional level and then reinsured at national level.

One example is the Munich Re and GTZ partnership in the Philippines, implemented in partnership with the Philippine Coop Life Insurance and Mutual Benefit Services (CLIMBS). This product is designed to protect the loan portfolios of

cooperatives against losses from extreme weather events.

Extreme events pose serious risks to microfinance institutions like cooperatives, obliging them to impose high interest rates on loans. In order to guarantee liquidity to the cooperatives in case of, for example, typhoons (measured in terms of extreme wind speed and rainfall), this micro-insurance product provides quick payouts through CLIMBS (Munich RE 2010).

Overlaps between micro-insurance and GHG mitigation

Another point to note is that micro-insurance schemes often have MRV related requirements to track local conditions, and they typically require smallholders to adopt certain practices to minimize risks. For example, the Syngenta Foundation is building weather stations in Kenya in order to be able to deliver micro-insurance. This could be an interesting overlap with GHG MRV mitigation requirements.

A number of insurance and reinsurance companies are developing micro-insurance products. Many of the large reinsurance institutions also have underwriting facilities for carbon credit projects. However, there has to date been no consideration of the overlap between mitigation and adaptation (risk reduction). For instance, it could be conceivable that there are some overlaps in land management and MRV requirements of agricultural insurance and reinsurance programmes and GHG mitigation programmes.

4. Engaging smallholders in GHG mitigation

Based on the variety of smallholder groups, challenges of achieving scale through aggregation, and the financing and risk-related barriers that smallholders face, how can GHG mitigation-related instruments be designed in a way to encourage greater participation and to help scale-up terrestrial carbon mitigation opportunities? This section takes a step towards responding to this question, first by examining the gaps between smallholder and carbon financier/project developer needs, and second by proposing a conceptual framework for developing a strategy to identify and aggregate smallholders.

4.1 Smallholder needs versus requirements for mitigation activities

Designing GHG mitigation incentives for smallholders

Smallholders require a blend of financing and risk mitigation instruments. Access to these will depend among others, on assets, track record, participation in local institutions including aggregators, and infrastructure. Payments for GHG mitigation could be a way to increase the adoption of improved land management practices by smallholders. Engagement of smallholders in GHG mitigation activities, and particularly in the project-based mechanisms, has been hampered by the uncertainty and timing of benefits, upfront costs (financial and non-financial) and the size of potential returns¹¹. There may be grounds for re-engineering incentives, particularly within the regulated markets and in national approaches (such as NAMAs) so that they are better aligned with smallholder requirements. However, if this is to be effective, incentives must fit local smallholder requirements.

Table 8 summarizes some of the gaps between smallholder needs and requirements for providing benefits tied to GHG mitigation. As the evolution of the global, national, regional and voluntary GHG mitigation measures continues, possibilities are emerging for shaping GHG mitigation incentives so that, where appropriate, they can better include smallholders.

Motives of the supporters of mitigation initiatives, such as governments or private investors, are also an important consideration and result in the prioritization of units of mitigation versus rural development or biodiversity. Where GHG

mitigation is the driving motive, to get the biggest 'bang' for the GHG mitigation 'buck', efforts should be targeted towards the largest, most cost effective GHG mitigation opportunities. Section 4.2, which considers an initial framework for identifying and including smallholders in mitigation, is predicated on the primary motive of the need for delivering GHG mitigation at scale.

Approaches by Voluntary Carbon Market standards to better include smallholders

Barriers facing smallholders regarding their involvement in GHG mitigation activities have been noted by a number of voluntary carbon standards: The Climate, Community and Biodiversity Alliance (CCBA), responsible for the CCBS recognizes that investors often avoid projects that involve smallholders because of complexities and costs associated with aggregation. CCBA is examining possibilities to make CCBS more accessible for smallholder projects and to build a robust framework for doing so without additional complexity¹². Plan Vivo is working towards introducing mitigation into supply chains ('carbon insetting'). This means that resilience is built into supply chains by investing in payments for ecosystem services (PES). This can be done either through an existing Plan Vivo project that offers ecosystem services crucial to the supply of agricultural commodities relevant for the business, or by developing a new programme within a business's supply chains, to support communities living in and around areas where ecosystem services are at risk¹³. It is also important to note that the issue of maximizing GHG mitigation per dollar invested may be less relevant in the case of the voluntary markets, where co-benefits may be as important, or more important than the actual quantities of GHG mitigation.

4.2 Identifying and incentivizing smallholders to participate in mitigation activities

Figure 4 provides an initial conceptual framework for identifying which smallholders to work with, and suggestions for approaches to creating incentive mechanisms. The outlined approach should be led by the national or provincial government, rather than the private sector; however, it can create the basis for designing a market-based instrument or a framework to house a market-based instrument.

¹¹ Although Plan Vivo does allow for earlier crediting, the relatively low value of, and demand for, credits vs. the upfront costs are an issue.

¹² Interview with Joanna Durbin, CCBA.

¹³ Increasing supply chain security through the Plan Vivo System: A tried and tested Payments for Ecosystem Services model, Plan Vivo Foundation. www.planvivo.org

Table 8. Gap analysis of smallholder needs versus requirements for GHG mitigation benefits ('carbon finance')

Smallholder needs	Carbon finance needs	Gap causes
Access to aggregating institutions (voice, horizontal coordination)	Access to large number of project participants (scale)	High upfront costs of aggregating and building institutions.
Access to markets – information about opportunities (ICT, news, training) and infrastructure (roads, shops, banks), mechanization	Access to and communication with potential project participants	High upfront cost of identifying smallholders and making them aware of opportunities.
Tenure security to justify increased investment	Ensuring that participants own and can transfer carbon (if project based)	Tenure may be unclear, expensive to register, clarify user vs. owner rights (important gender component).
Access to long term finance (equity/ long term debt) to invest in livelihood improvements	Access to equity/long-term debt to invest in project/programme	Dearth of long-term finance available to smallholders. Investors unwilling to finance risky AFOLU projects with long-term lock-in periods – compounded by carbon price and demand uncertainty
Access to short term finance related to improved production	Register and track record of smallholders, access to short-term debt	Lack of access to institutions and services, e.g. poor rural banking infrastructure, credit agencies, little registered collateral, track record information, no, or poor quality, credit registries.
Access to formal micro-insurance	Diversified portfolio and/or VCS or similar instruments to manage risk	Weather data and infrastructure, aggregation of smallholders a requirement, understanding of contracts, and training.
Information to manage risks and opportunities. Government institutions including access and governance.	Data on GHG mitigation potential and effect of trends (e.g. for reference levels), including management and control of leakage	Lack of data and information systems, e.g. no consistent environmental data, such as national, international MRV systems. Ability of government to control extensification, develop and implement (and enforce) sound and consistent policies.
Improved land use management practices that are appropriate to them	Methodologies for quantifying mitigation impact	Poor or limited profitability of agricultural projects vs. other carbon credit projects; lack of good, consistent data, methodologies.
Certainty of incentive/support in order to change land use management	Demand for mitigation units (credits/other performance based units)	Regulatory uncertainty, market transparency and complexity, carbon credit liquidity
Reliability of counterpart e.g. carbon credit project developer, government	Reliability of participants	Poor or non-existent contract enforcement, limited financial literacy, information and training, as well as proper incentives and risk management.
Preference for cash, short term returns (high discount rates), value of co-benefits, support required upfront	Price per unit of mitigation, timing of payment for mitigation, payment against performance	Carbon finance mechanism is payment for performance based, regulatory uncertainty; current status of carbon market (liquidity, demand, prices), value of 'co-benefits' to farmer and suitability of intervention.

As the basis for providing these incentives impacts on atmospheric GHGs, it is important to first identify areas of highest physical potential for carbon storage or GHG emission reduction (Stage 1, Figure 4). Tools and methods already exist for identifying these areas. They should also include an evaluation of the potential types of mitigation interventions, such as A/R RE and should be combined with a socio-economic assessment to determine who are the relevant stakeholders and who needs to implement activities, including identifying who constitutes a smallholder.

When relevant smallholder groups have been identified, a closer examination of their socio-economic characteristics is required. Note that Stage 2 in Figure 4 takes a simplistic approach, and in reality, smallholders may produce both for production and to meet household needs. The purpose of following this approach is to understand what resources smallholders may be able to access (following on from Figure 3) and with whom they currently interact. For example smallholders producing for export are probably more likely to be part of, or have access to, an aggregating institution. The difference between these and subsistence farmers who have minimal market exposure is who the potential supporters of the smallholder mitigation activity are, and the type of support required by smallholders to engage them in mitigation activities.

Stage 3 considers production that might be displaced by the GHG mitigation activity; that is the opportunity cost of land, labour and other production resources that might be utilized in a GHG mitigation activity. This is likely to reflect current production patterns, such as the space available on smallholder farms to grow trees that could have grown crops. In cases where smallholders were not producing previously (due to lack of capacity, lack of land access and so on), there may be no activity displacement. Obviously the opportunity cost depends not only on the current production patterns but also on the type of GHG mitigation interventions identified in Step 1. Following on from this, it is possible to then consider which smallholders might be most effectively engaged in a GHG mitigation activity, and what a potential approach might be for involving them.

This third stage needs to be considered in the context of funding sources available, and the basis on which it is provided. For example, funds may have a clear GHG mitigation mandate, or may be targeted to address food security or private profit. Linked to this is the type and timing of desired results such as the periodic delivery of a carbon credit or emission reduction against a national baseline, or a seasonal profit based on agricultural operations. A payment for performance approach, for example, might be better suited to smallholders who already have some transaction experience.

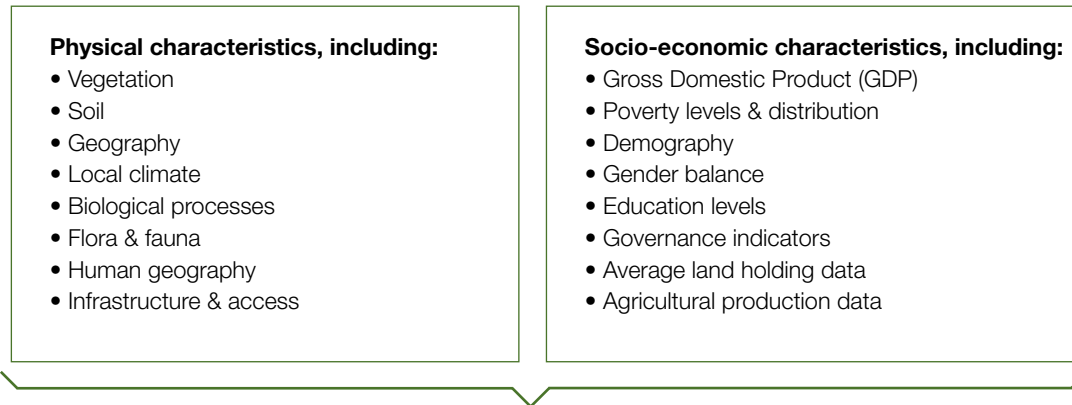
The size, type and timing of investments to achieve GHG mitigation will also vary according to the mitigation activity and the type of smallholder. Studies on PES in Latin America, for example, found that the poorest rural households, who depend heavily on subsistence farming, accepted lower conservation payments than smallholders who were more diversified and sold into markets (Haab et al. 2009). Obviously, at this initial stage, thorough engagement with communities is necessary, together with an assessment of their interest in participating. Developing, implementing and monitoring community engagement and buy-in is fundamental to success. A number of tools exist which can help local governments and communities understand carbon finance and incorporate this type of finance into community projects.¹⁴

Some lessons from cooperatives are relevant for GHG mitigation projects: focus on motivated farmers; seek out good businesses (and business opportunities); provide professional services; conduct market and client research prior to initiating the project; concentrate on creating market links with a range of service providers rather than trying to provide all services alone; and work with existing private sector players to improve quality, competitiveness and the scope of services offered to members (Reiquam undated).

Finally, this paper has focused on the issue of distributing benefits. Consideration also should be given to being able to 'collect production' - in this case, gather robust estimates of emission reduction or sequestration. The required accuracy of these estimates again ties into the sources and conditions of funding. However, the GHG mitigation potential of smallholders within the agricultural sector is likely to be compared with opportunities in other sectors. It is also likely that a combination of approaches will be implemented, within different countries and sectors. To be more attractive to a greater range of potential funders, stakeholders should properly consider how different groups and mechanisms could work in tandem to streamline procedures, reduce transaction costs and leverage greater investment from a wider range of potential funders.

¹⁴ For example, the IIED Community Development Carbon Finance Toolkit. Available from: <http://www.iied.org/sustainable-markets/key-issues/environmental-economics/community-development-carbon-finance-toolkit>

1 Evaluate the mitigation opportunity: mitigation volumes, timing, duration, likelihood



- ✓ Identify areas with the biggest physical mitigation potential
- ✓ Identify smallholders, develop appropriate characterization framework

2 Evaluate local smallholders for inclusion in mitigation activities based on exposure

NB: In diverse systems, focus on maximum value product

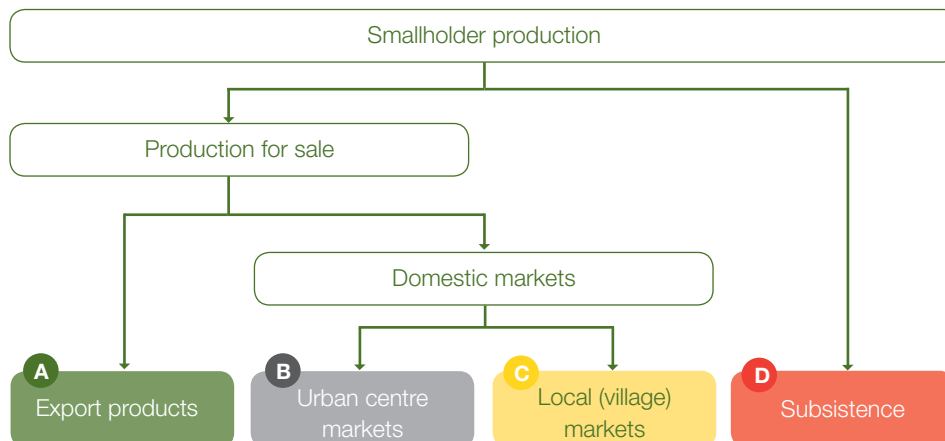


Figure 4. (Stages 1 & 2): Framework for identifying smallholders to include in GHG mitigation activities based on provincial / district or national approaches, driven by a need for mitigation at scale.

3 Initiate design and implementation of appropriate engagement & incentive schemes

Examine the nature and scale of opportunity costs:

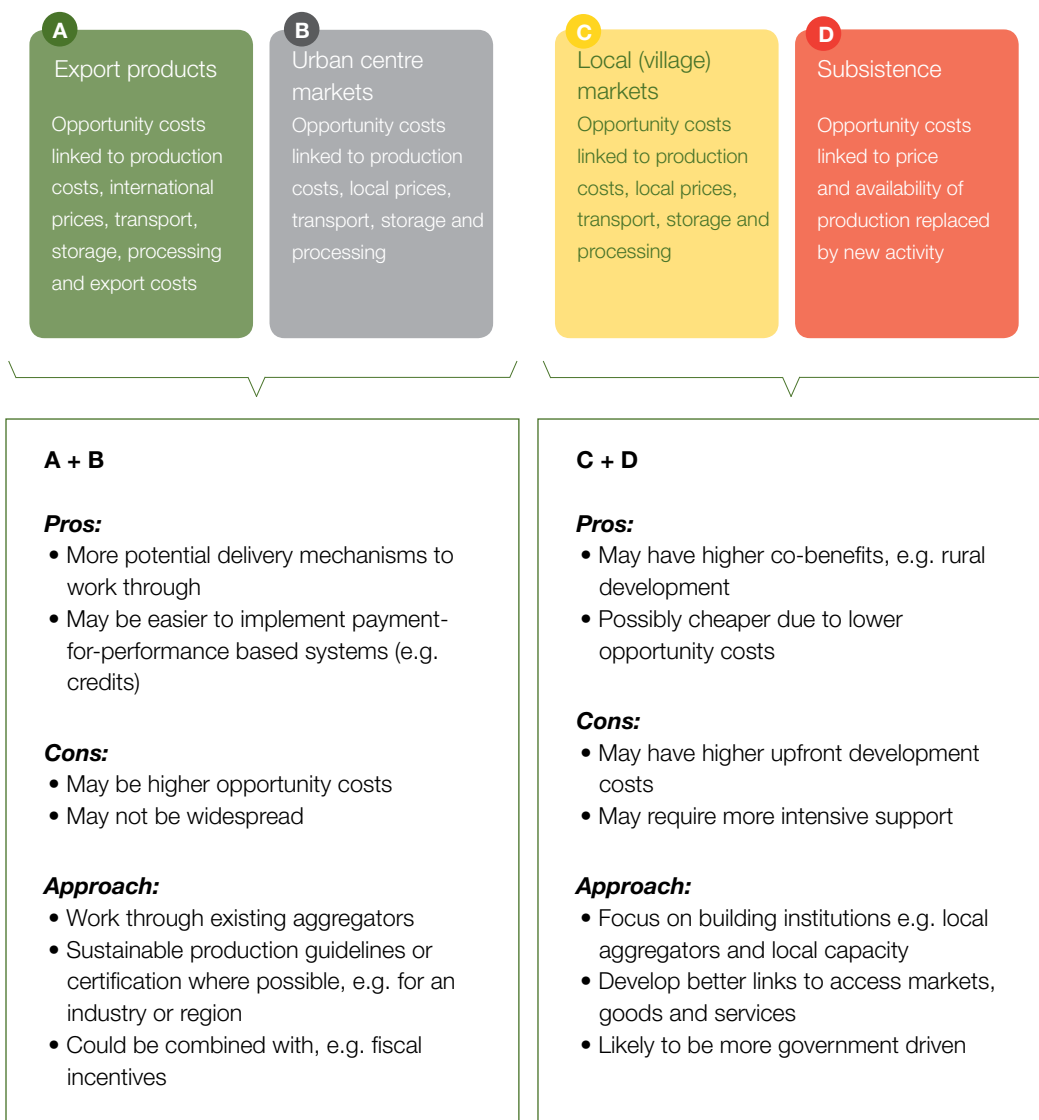


Figure 4. (Stage 3): Framework for identifying smallholders to include in GHG mitigation activities based on provincial / district or national approaches, driven by a need for mitigation at scale.

5. Recommendations for various stakeholder groups

The following section provides a number of high-level recommendations for various international stakeholder groups that have been mentioned in this paper.

5.1 Government agencies in developing countries

Integration of climate change policies in development

Government agencies may wish to consider GHG mitigation and adaptation in their economic development, agricultural investment and growth plans. Overlaps often exist between what is needed for agricultural and rural development, and for smallholders to engage in GHG mitigation programmes. For example, local infrastructure that can indirectly support mitigation activities such as information technology, storage and processing facilities, and weather stations are required for both types of activities. Both agricultural development and GHG mitigation programmes also require significant investments in awareness creation and training (extension services). Governments can play an important role in identifying and providing these win-win opportunities.

Examples of potential integration of climate change policies

Programmes intended to improve productivity of smallholders could include a GHG mitigation element. Payouts under Indonesia's Plantation Rehabilitation Programme, for example, could be made dependent on the adoption of certain mitigation practices, and GHG MRV and GHG minimization (or even offset) requirements could be a condition for companies to participate in the various African growth corridor programmes. One existing example that could be promoted in the context of GHG mitigation is the Zambian Farmers' Association No Tillage programme. Benefits provided in return could be financial or non-financial (such as extended tenure arrangements, or access to machinery).

Formation of partnerships

Public private partnerships (PPPs) also seem worth exploring. Governments could work with private sector entities such as MFIs, contract farming businesses, and local micro-insurance providers to develop and implement land and activity registers, credit agencies and GHG data collection systems. This could go hand-in-hand with the development and implementation of 'climate smart' codes of conduct for contract farming and foreign direct investments (FDI) related to land use investments. Governments could support the uptake of these through appropriate legislation.

Legislature: creation, amendment, implementation, enforcement

Developing and implementing new, and, or amended, legislation is likely to be necessary. For example, governments could assess and improve the ease of registering businesses, cooperatives, and farmers' groups to encourage smallholder aggregation. This could also involve legalizing direct farmer-buyer transactions, promoting development of grades and standards of products, strengthening of farmers' organizations and other intermediaries, promoting PPPs in extension services, promoting competition and ensuring that contracts are enforceable (Minot 2011). In addition, they could consider developing a new registration category for 'mitigation cooperatives'. Ownership of the 'carbon benefit' is also often unclear. Governments could assess tenure arrangements related to mitigation activities (ownership of land versus provision of ecosystem services), and in particular women's access to these. Legislation needs to go hand-in-hand with improved law enforcement capacity.

5.2 Private finance institutions: investors, insurers, financial institutions, MFIs

Transparency and identifying opportunities for engagement

In the current context, where there is little prominence shown to how profits can be made from low carbon investments in agriculture, private financial institutions could work with governments to develop and implement GHG mitigation activities that engage smallholders. For example, they could design and test the spread of index-based insurance schemes that are appropriate for smallholders. They could also design locally-appropriate products that combine risk management, adaptation, GHG mitigation and GHG MRV, such as in agricultural NAMAs. However they are likely to require incentives and, or support from governments, donors or multilaterals to do this.

Company driven initiatives

Activities that they can do on their own include climate screening of investments and operations. Banks could, for example make certain types of loans conditional on adherence to codes of conduct that reduce GHG emissions. Businesses with supply chains in relevant areas may also wish to assess opportunities for setting up carbon insetting activities by building the costs of ecosystem services into supply chains (the Plan Vivo approach).

5.3 Multilateral agencies, research agencies, donors and NGOs

Integration into related initiatives

The IFC, World Bank and other multilateral and bilateral agencies (donors) are currently developing land investment principles to prevent 'land grabbing'. These could include requirements to assess and disclose GHG impacts. This could pave the way for rewarding lower-carbon FDI and help the national governments assess GHG emissions (MRV) where these investments are taking place. To facilitate this, these organizations could develop easy to read-and-apply manuals or tools to help investors and companies understand and quantify the environmental impact of agricultural investments. In addition, they could explore the possibility of a GHG mitigation incentive component being introduced under the Global Agriculture and Food Security Program.

Design and testing mechanisms

Where these organizations operate in relevant countries, they could also test and evaluate ways of delivering GHG mitigation benefits to smallholders, and the effectiveness of the different types of benefits (type, quantities and timing of these). This evaluation should consider how GHG mitigation benefits distribution, and GHG MRV initiatives could piggyback on existing information initiatives for smallholders.¹⁵

Facilitate agricultural extension

Another important role to play is to facilitate the provision of better agricultural extension services, including on-site and remote training programmes, and demonstration projects. They could address both GHG mitigation and adaptation. One issue that an interviewer mentioned was the inconsistency of agricultural extension services and advice provided by NGOs and other providers. Ensuring that collaboration and coordination exists when offering extension services, between these agencies, government and any locally operating private sector entities, is important. Guidelines could be developed, and organizations should sign up to these when providing agricultural extension services.

Support governments in service provision

These types of organizations can also provide support to governments to help them develop better institutions and processes. For example, they could assess government tenure and business registration arrangements for smallholder mitigation activities and work with governments to overcome these. They could also conduct and make available market research on smallholder requirements related to mitigation (and adaptation) so that government institutions and potential

investors can better develop appropriate products and services. In addition, they could work with governments to facilitate competitions to demonstrate how GHG mitigation can be incorporated into agricultural development initiatives that include smallholders, such as in the African Enterprise Challenge Fund (AECF). This could include elements for MRV and a guaranteed purchase of some, or all of the resulting mitigation by donors or multilateral funds. Finally, they could support standard-setting and local certification agencies in developing countries, particularly where mitigation opportunities are highest.

Building and strengthening local institutions

Institutions with a strong local presence can help by building bodies that aggregate smallholders, both horizontally and vertically, particularly focusing on women's participation and representation. They can also provide the necessary upfront funding and human resources required to develop smallholder-relevant businesses with positive GHG mitigation impacts. This could include facilitating 'patient capital' and similar blended funding instruments to leverage greater (and better quality) commercial investment in agriculture that provides benefits to the climate and to smallholders.

5.4 Carbon finance and policy-makers engaged in climate change activities

Consider smallholders

Policy-makers focused on climate change should concentrate on the long-term viability and requirements of smallholder businesses (assets, risks, financing) when designing and implementing mitigation incentives. This requires thought as to who would generate the mitigation and how they would benefit - both financially and non-financially. They may also wish to carefully consider and design co-benefit offerings with smallholders and other potential stakeholders, such as potential investors (for example, private companies) so that they are adequate and appropriate.

Continue to develop and test project and non-project based approaches

Carbon financiers and policy makers may wish to consider ways to reduce reporting or MRV costs and the complexity of attaining mitigation benefits through collaborations with various types of organizations. Also, they should focus on promoting high quality projects through risk-mitigation instruments and standards. Good business practices should be employed, encompassing transparency, including facilitating mechanisms to increase GHG benefit transparency. Policy makers should promote liquidity and market certainty, if pursuing a market-based approach.

¹⁵ For example, build on the following initiatives: WorldAgInfo, Value-Chain Information System for Agriculture (VISA), real-time delivery of agricultural information to smallholders in Africa and South Asia through village based knowledge systems implemented by community knowledge workers / village knowledge centers, community radio support systems, low cost soil testing schemes etc. (Allen and Ochs 2008).

References

- African Economic Outlook. 2011. *The export-led recovery is broadening*. Issy les Moulineaux, France: African Economic Outlook. Available at: <http://www.africaneconomicoutlook.org/en/outlook/macroeconomic-prospects/the-export-led-recovery-is-broadening/>
- Allen DW and Ochs MA. 2008. Building Pathways out of Rural Poverty through Investments in Agricultural Information Systems. WorldAgroInfo Design Team Final Report. February 2008. Available at: <http://www.worldagroinfo.org/files/WorldAgroInfo%20Final%20Report%20Web.pdf>
- Berdegúe JA and Fuentabla R. 2011. Latin America: The state of smallholders in agriculture. Paper presented at the IFAD Conference on New Directions for Smallholder Agriculture, 24-25 January 2011 (Session 3). Available at: <http://www.landcoalition.org/publications/latin-america-state-smallholders-agriculture>
- Deere CD and Leon M. 2003. The Gender Asset Gap: Land in Latin America. *World Development*. Elsevier, vol. 31:6 pp 925-947.
- Devlin J and Kormawa PM. 2011. Promoting effective and innovative financing. In: Yumkella KK, Kormawa PM, Roepstorff TM and Hawkins AM. eds. *Agribusiness for Africa's Prosperity*. Vienna: UNIDO.
- Diakité S. 2011. Sustainable Solutions (April 4, 2011, Accra Ghana). Presentation by Stephanie Diakité, CATEK at Shea 2011: Available at: <http://www.watradehub.com/activities/tradewinds/feb11/resolving-constraints-access-finance-will-unleash-entrepreneurs-economic>
- FAO. 2004. *Smallholders, globalization and policy analysis. Agricultural Management, Marketing and Finance*. Occasional Paper no.5. Rome: Food and Agriculture Organization of the United Nations.
- FAO. 2006. Agriculture, Trade Negotiations, and Gender. Rome: Food and Agriculture Organization of the United Nations. Available at <ftp://ftp.fao.org/docrep/fao/009/a0493e/a0493e.pdf>.
- FAO. 2009a. FAOSTAT. Latin America and Caribbean – Land Use, agricultural land. Rome: Food and Agriculture Organization of the United Nations. Available at <http://faostat.fao.org/site/377/default.aspx#ancor>
- FAO. 2009b. *Gender equity in Agriculture and Rural Development*. Rome: Food and Agriculture Organization of the United Nations. Available at: <ftp://ftp.fao.org/docrep/fao/012/i1240e/i1240e00.pdf>
- FAO. 2010. *World Census on Agriculture (WCA2010)*. Rome: Food and Agriculture Organization of the United Nations. Available at: <http://www.fao.org/economic/ess/ess-wca/ru/>
- FAO. 2011. *The State of Food and Agriculture 2010-11, Women in Agriculture: Closing the Gender Gap for Development*. Rome: Food and Agriculture Organization of the United Nations. Available at: <http://www.fao.org/docrep/013/i2050e/i2050e.pdf>
- Gardi O, Robledo C, Shimizu T, Rattinger M and Rivera G. 2010. *Agriculture, forestry and Other Land-Use (AFOLU) for Addressing Climate Change Mitigation and Adaptation in the Latin American and Caribbean Region*. Washington DC: Inter- American Development Bank. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35453537>
- Haab T, Rodriguez F and Southgate D. 2009. A case study for subsistence farming in Ecuador. *Harvard International Review, Agriculture*. Available at: <http://hir.harvard.edu/agriculture/payments-for-sustainability>
- Havemann T. 2011. *Financing mitigation in smallholder agricultural systems, Issues and Opportunities*. CCAFS Working Paper no. 6. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org
- Hellmuth ME, Osgood DE, Hess U, Moorhead A and Bhojwani H. eds. 2009. Index insurance and climate risk: Prospects for development and disaster management. *Climate and Society* No. 2. USA: International Research Institute for Climate and Society (IRI), Columbia University. Available at: http://portal.iri.columbia.edu/portal/server.pt/gateway/PTARGS_0_5024_4201_0_0_18/Climate0and0Society0Issue0Number02.pdf
- IDB. 2011. *FOPEPRO Fondo para los Pequeños Productores Rurales en America Latina project abstract*. Washington DC: Inter- American Development Bank. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35182602>
- IFAD. 2010a. *IFAD's livestock position paper: Livestock planning, challenges and strategies for livestock development in IFAD*. Rome: International Fund for Agricultural Development. Available at: <http://www.ifad.org/lrkm/factsheet/livestockpaper.pdf>
- IFAD. 2010b. *Rural Poverty Report*. Rome: International Fund for Agricultural Development.

- IFOAM. 2002. Characteristics of smallholders as defined by the Organic World Congress working group. International Federation of Organic Agriculture Movements. Bonn: Germany. Available at: <http://www.ioia.net/images/pdf/CGGDefinition.pdf>
- IPCC. 2007. Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Available at: http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg3_report_mitigation_of_climate_change.htm
- Jayne TS, Yamano T, Weber MT, Tschirley D, Benfica R, Chapoto A and Zulu B. 2003. Smallholder income and land distribution in Africa: implications for poverty reduction strategies. *Food Policy* 28 (2003), pp 253-275.
- Livingston G, Schonberger S and Delaney S. 2011. Sub-Saharan Africa: The state of smallholders in agriculture. Paper presented at the IFAD Conference on New Directions for Smallholder Agriculture, 24-25 January 2011. Session 3. Rome: International Fund for Agricultural Development .
- Meherette E. 2009. *Providing Weather Index and Indemnity Insurance in Ethiopia, Innovations in Insuring the Poor*. Focus 17, Brief 8. IFPRI, World Bank. Available at: <http://www.ifpri.org/sites/default/files/publications/focus17.pdf>
- Minot N. 2011. Contract farming in Africa: Opportunities and challenges. IFPRI Paper presented at the AAMP Policy Seminar ("Successful Smallholder Commercialization"), 22 April 2011, Kigali, Rwanda. Available at: http://www.aec.msu.edu/fs2/aamp/Kigali%20Conference/Minot_Contract_farming_in_Africa.pdf
- Moschini G and Hennessy D. 2001. Uncertainty, Risk Aversion, and Risk Management for Agricultural Producers. In: Gardner B and Rausser GC. *Handbook of Agricultural Economics*. Amsterdam: Elsevier.
- Munich RE. 2010. *Protecting cooperatives and their low-income members in the Philippines against extreme weather events through micro-insurance*. Press Release October 2010. Munich: Munich RE. Available at: <http://www.munichre.com>
- National Bureau of Statistics of China. 2010. *China's Second National Agriculture Census Data Compilation*. Hong Kong: China Statistics Press.
- New Agriculturalist. 2011. Uganda's red hot chili trader. *New Agriculturalist*, May 2011. Available at: <http://www.new-ag.info/en>
- NSSO. 2006. *Some aspects of operational land holdings in India, 2002-03*. NSS Report No. 492(59/18.1/3), National Sample Survey Organisation, Ministry of Statistics & Programme Implementation, Government of India.
- Oxfam. 2009. *From Guatemala's local fresh food sector to EU and US Markets: the Aj Ticonel/OPCION enterprise*. Oxfam GB. Available at: <http://policy-practice.oxfam.org.uk/publications/download?id=366073&dl=http://oxfamlibrary.openrepository.com/oxfam/bitstream/10546/123626/1/fresh-food-eu-us-markets-guatemala-190509-en.pdf>
- Pfizer M, Bockstette V, Meier S and Davies J. 2010. A Trend Analysis of the Corporate Leadership Coalition for Smallholder Farmer Livelihoods. Corporate Leadership Coalition for Smallholder Farmer Livelihoods.
- Reiquam S. Undated. The private sector and smallholder agriculture: best practices with relevance to Mali, Zambia, India & Sri Lanka. Agpedia. Available at: <http://www.worldaginfo.org/files/Agpedia.pdf>
- Schiff H and Stallard J. 2009. *Purchase order finance in Bolivia: Innovations in financing value chains*. Micro report # 151. Washington DC: United States Agency for International Development. Available at: http://microlinks.kdid.org/sites/microlinks/files/resource/files/ML6629_purchase_order_finance_in_bolivia_final.pdf
- Seeberg-Elverfeldt C and Tapio-Biström ML. 2010. *Global Survey of Agricultural Mitigation Projects, MICCA (Mitigation of Climate Change Agriculture)*. Mitigation of Climate Change in Agriculture Series 1. Rome: Food and Agriculture Organization of the United Nations. Available at: <http://www.fao.org/docrep/012/al388e/al388e00.pdf>
- Srang-iam W. 2011. Fighting global climate change, securing local livelihood: The paradox of carbon reduction and agricultural vulnerability in Thailand. Paper presented at the 2011 Colorado Conference on Earth Systems Governance. Available from: http://cc2011.earthsystemgovernance.org/pdf/2011Colora_0309.pdf
- Statz J. 2011. Enhancing agricultural productivity. In: Yumkella KK, Kormawa PM, Roepstorff TM and Hawkins AM, eds. *Agribusiness for Africa's Prosperity*. Vienna: UNIDO
- Streck C and Burns D. 2011. *Removing Barriers to Smallholder Adoption of Climate Smart Agriculture: The Role of Climate Finance*. Amsterdam: Climate Focus.
- Thapa G and Gaiha R. 2011. Smallholder farming in Asia and the Pacific: Challenges and Opportunities. Paper presented at the IFAD Conference on New Directions for Smallholder Agriculture, 24-25 January 2011. Rome: International Fund for Agricultural Development . Available at: <http://www.ifad.org/events/agriculture/doc/papers/ganesh.pdf>

- UNEP/GRID-Arendal. 2011. UNEP GRID Arendal. Latin America greenhouse gas emissions by sector. Arendal: United Nations Environment Programme / GRID-Arendal. <http://maps.grida.no/go/graphic/latin-america-greenhouse-gas-emitters-by-sector>
- USAID. 2003 *Leveraging the Jamaican Diaspora for Development*. Washington DC: United States Agency for International Development. Available at: <http://www.tcgillc.com/tcgidocs/Jamaica031124.pdf>
- Wenner MD. 2010. *Credit Risk Management in Financing Agriculture*. Focus 18, Brief 10. IFPRI, World Bank. Available at: http://www.ifpri.org/sites/default/files/publications/focus18_10.pdf
- World Bank. 2009. *Gender in Agriculture Source Book*. Washington DC: World Bank. Available from: <http://siteresources.worldbank.org/INTGENAGRLIVSOUBOOK/Resources/CompleteBook.pdf>
- Zhou Y. 2011. *Smallholder Mapping II Trends in Demographics and Driving Forces*. Syngenta Foundation for Sustainable Agriculture. Available from: http://www.syngentafoundation.org/__temp/Smallholder_mapping_II.pdf

This paper proposes that international financial mechanisms established as a result of the United Nations Framework Convention on Climate Change are largely inaccessible to smallholder groups who have important roles to play in reducing net global greenhouse gas emissions (GHG). The purpose of this paper is to examine the finance and risk-related obstacles that hinder smallholders from participating in carbon finance mechanisms and to suggest a framework for prioritizing and aggregating smallholders to achieve mitigation at scale. The author submits that smallholders can play a significant role in the mitigation of climate change, supporting this by:

1. Defining smallholders in a global context, and detailing their importance to climate change mitigation and adaptation, particularly as aggregated groups managing large areas of land. While reminding the reader of current carbon finance schemes, the author asserts that the issue of scale is important to achieve meaningful results and suggests that incentives linked to terrestrial mitigation can have significant social and economic benefits.
2. Identifying eight potential sources of funding for smallholder activities and examining risks that smallholders face on a daily basis, compounded by climate change. The author claims that risk management strategies can reduce the incidence and severity of adverse events and may be an important co-benefit when smallholders participate in climate mitigation programmes.
3. Comparing smallholder versus carbon financier requirements and providing a general framework for developing approaches for large-scale mitigation activities that include smallholders.
4. Recommending suitable action to various stakeholders including governments, private investors, donors and policy-makers.

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