

Financing mitigation in smallholder agricultural systems

Issues and Opportunities

Working Paper No. 6

Tanja Havemann



Working Paper

Financing mitigation in smallholder agricultural systems

Issues and Opportunities

Working Paper No. 6

CGIAR Research Program on Climate Change,
Agriculture and Food Security (CCAFS)

Tanja Havemann

Correct citation:

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

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

This Working Paper is an expanded version of a chapter that appears in the book *Climate Change Mitigation and Agriculture*. Wollenberg E, Nihart A, Tapio-Biström M-L, Grieg-Gran M (eds). 2011. London: Earthscan.

Published by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

CCAFS Coordinating Unit - Department of Agriculture and Ecology, Faculty of Life Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: ccaafs@life.ku.dk

Creative Commons License



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

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

© 2011 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) 2011 CCAFS Working Paper no. 6

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of the CGIAR and the Earth System Science Partnership (ESSP). CGIAR is a global research partnership for a food secure future.

The program is supported by the Canadian International Development Agency (CIDA), the Danish International Development Agency (DANIDA), the European Union (EU), and the CGIAR Fund, with technical support from the International Fund for Agricultural Development (IFAD).

The views expressed in this document cannot be taken to reflect the official opinions of these agencies, nor the official position of the CGIAR or ESSP.

DISCLAIMER:

This Working Paper has been prepared as an output for the Pro-Poor Mitigation Theme under the CCAFS program and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS.

Abstract

This chapter describes obstacles to financing mitigation in smallholder agricultural systems, and provides recommendations to overcome these; it also emphasizes how smallholder agricultural finances overlaps with carbon finance. Analysis and recommendations are based on literature reviews and the author's experience. Descriptions of obstacles to financing both smallholder carbon credit projects and agricultural projects involving smallholders are given. Overlapping barriers are: ability to manage risks, access to inputs, aggregation, best practices and capacity and tenure, property rights and enforcement. The conclusion is that existing agricultural investment barriers are fundamental to the livelihoods of many, and go far beyond carbon finance issues, although significant overlap is acknowledged. By tackling these barriers, it may be possible to unlock some of the potential mitigation from agriculture. Vice-versa, 'fit-for-purpose' carbon finance for mitigation could help to overcome some existing barriers faced by smallholders. The paper provides recommendations to a variety of stakeholders on how they could help design fit-for-purpose carbon finance.

Keywords

Adaptation; Aggregation; Agriculture; Capacity; Capital; Carbon; Cash; Credits; Debt; Equity; Finance; Farming; Forest; Investment; Inputs; Interest; Land; Mitigation; Return; Resilience; Risk; Smallholder; Sustainable; Tenure

About the author

Tanja Havemann is a Director at Beyond Carbon GmbH, a Swiss company that advises on direct investments in sustainable land management. Tanja has worked with environmental investments for over seven years in a variety of roles with investment funds, private investors, multilateral and bilateral agencies, Governments and NGOs. She holds an LLM in Environmental Law and Policy, an MSc in Applied Environmental Economics and a BSc (Hons) in Tropical Environmental Science.

Contact information:

Titlisstrasse 35, 8032 Zürich, Switzerland

Tel: +41 (0) 786642790

E-mail: tanja.havemann@beyondcarbon.ch

Acknowledgements

I would like to thank the following for their input: John Booth (Conservation Finance International), Tracey Campbell (Forest Footprint Disclosure), Lizzie Chambers (Beyond Carbon Ltd.), Professor Calestous Juma (Harvard Kennedy School), Dr. Namanga Ngongi (AGRA Alliance). Note that the opinions expressed in this paper are solely those of the author.

Contents

Introduction.....	8
Carbon finance in the context of smallholder AFOLU practices	9
Characteristics of smallholder agriculture finance in developing countries.....	12
Markets and investments domestically driven and focused.....	12
Investments reflect stakeholders' risk and return profiles	13
There may be additional risks associated with production for export	14
Overlaps between financing for agricultural products and mitigation.....	15
Ability to manage risks	16
Access to inputs	18
Aggregation.....	19
Best practices and capacity	21
Tenure, property rights and enforcement.....	21
Conclusions.....	23
Governments, multilaterals and donor agencies	23
Companies, including investors and banks.....	24
NGO and research organizations	24
Appendix.....	Error! Bookmark not defined.
References.....	25
Glossary	Error! Bookmark not defined.

Acronyms

AFOLU:	Agriculture, Forestry and Other Land Uses
CDM A/R:	Clean Development Mechanism, Afforestation / Reforestation methodologies
DRP:	Dispute Resolution Process
LU:	Land Use
N/A:	Not Applicable
NAMA:	Nationally Appropriate Mitigation Activity
NGO:	Non-Governmental Organization
SME:	Small and Medium sized Enterprise
VCMs:	Voluntary Carbon Market(s)
VCS	Verified Carbon Standard

Introduction

This chapter describes obstacles to financing mitigation in smallholder agricultural systems¹, and provides recommendations to overcome these. The emphasis is on smallholder agricultural finance and overlaps with carbon finance, rather than specific carbon finance issues. It is structured as follows: first, characteristics of carbon finance in the context of agriculture, forestry and other land uses (AFOLU) are summarized; second, the characteristics of smallholder agricultural finance are described; third, the overlaps between obstacles to carbon and agricultural finance are discussed; fourth conclusions are drawn.

¹ Smallholders are defined as commercial and subsistence-oriented farmers, managing less than 5 hectares of land

Carbon finance in the context of smallholder AFOLU practices

Smallholders can generate carbon credits through energy and land use (LU) practices. This chapter focuses on LU practices, summarized in Table 1.

Net increases in mitigation attributable to improved practices, compared to usual practices, are used to estimate carbon credit volumes. Credits must be quantified and independently verified according to a chosen carbon credit standard and a methodology under that standard. Although sales of carbon credits could be a valuable addition to smallholder incomes, a number of barriers have prevented this.

One barrier has been a lack of accepted standards with methodologies to quantify mitigation from agricultural practices, illustrated by Table 1. The lack of methodologies to credit increases in soil carbon is, however, currently being addressed. The Vi Project in Kenya is working with the World Bank to develop a Verified Carbon Standard (VCS) methodology to credit increases in both above and below ground carbon stocks.²

Other barriers to both energy and LU agricultural mitigation projects involving smallholders include:

- Small size of benefit per smallholder: projects require significant spatial scale to be economically viable, given the transaction costs of monitoring, measuring mitigation achieved.
- The informational complexity faced by the smallholder during the carbon credit registration and issuance processes.
- The sizeable up-front cost of project development. .
- Uncertainty of cash flow ex-ante; Projects using a voluntary carbon standard can be difficult to value, as Voluntary Carbon Markets (VCMs) are relatively un-transparent and illiquid.

² More information about this can be found on the Vi and World Bank websites, and at the following web link (last accessed 8 February 2011):

http://www.agriculture4development.se/document/56_100_Wakesa%20-%20Western%20Kenya%20smallholder%20agriculture%20carbon%20project.pdf

Table 1 Mitigation options for Agriculture³

Farm Practice	Carbon credits	Applicable standard	Farm Practice	Carbon credits	Applicable standard
Crop rotations and farming systems design			Nutrient and manure management		
Improve crop varieties	X	N/A	Improve nitrogen (N) use efficiency	X	N/A
Feature perennials in crop rotations	L	CDM A/R, VCS, Plan Vivo	Adjust fertilizer application to crop needs	X	N/A
Use cover crops to avoid bare fallows	X	N/A	Use slow release fertilizers	X	N/A
Enhance plant and animal productivity and efficacy	X	N/A	Apply N when crop uptake is guaranteed	X	N/A
Adopt farming practices with reduced reliance on external inputs	X	N/A	Place N into soil to enhance accessibility	X	N/A
Livestock management, pasture and fodder supply improvement			Avoid any surplus N application	X	N/A
Reduce lifetime emissions	X	N/A	Manage tillage and residues conservatively	X	N/A
Breed dairy for lifetime efficiency	X	N/A	Reduce unnecessary tillage using minimum and no-till strategies	X	N/A
Breed and manage to increase productivity	X	N/A	Maintaining fertile soils and restoring degraded land		
Plant deep-rooting species in primary production	L	CDM A/R, VCS, Plan Vivo	Re-vegetate	L	CDM A/R, VCS, Plan Vivo
Introduce legumes into grasslands	L	CDM A/R, VCS, Plan Vivo	Improve fertility by nutrient amendment	X	N/A
Prevent methane emissions from manure heaps and tanks	E	CDM, VCS, Gold Standard	Apply substrates such as compost and manure	X	N/A
Utilize biogas as a resource	E	CDM, VCS, Gold Standard	Halt soil erosion and carbon mineralization by soil conservation techniques e.g. reduced tillage, contour	X	N/A

³ Table adapted from Smith et al (2007)

			farming, strip cropping and terracing		
Compost manure	E	CDM, VCS, Gold Standard	Retain crop residues as covers	X	N/A
			Conserve water	X	N/A
			Sequester carbon by increasing soil organic matter content	X	N/A
Legend	X = Not yet possible to generate carbon credits L = Generates LU credits E = Generates energy credits				
Abbreviations	CDM A/R: Clean Development Mechanism, Afforestation / Reforestation methodologies VCS: Verified Carbon Standard				

Note: The table only refers to standards applicable in developing countries.

Additional barriers faced by LU projects (listed as “L” in Table 1) include:

- Lumpy cash flows; carbon credits can typically only be sold after a minimum of five years of operation (and are generated only once every five years)⁴, whereas significant costs are incurred in this period. Credit volumes are relatively small in the first issuance periods.
- Demand is primarily from VCMs, where prices and demand are more uncertain.
- Engagement in a carbon credit project may reduce the already limited smallholders’ land management options, which may be a dis-incentive.

⁴ An exception to this is the Plan Vivo standard, which does allow for significantly quicker crediting, but which suffers from relatively poor demand. More information on the Plan Vivo standard can be found at: www.planvivo.org and information on demand and prices can be found in: Hamilton, K., Peters-Stanley, M., and Marcello, T. 'Building Bridges: State of the Voluntary Carbon Markets 2010,' Ecosystem Marketplace, available from: http://forest-trends.org/publication_details.php?publicationID=2433

Characteristics of smallholder agriculture finance in developing countries

Many of the barriers to smallholder carbon credit mitigation projects are general issues associated with investing in smallholder agriculture, rather than carbon finance per se.

Markets and investments domestically driven and focused

Most agricultural investments in developing countries are funded domestically (Ritchie 2010). These sources of capital can be classified as informal (personal loans from family members or informal lenders) or formal. Formal sources include trade credit (e.g. seed and subsidy programs) and commercial lending by banks. Non-domestic sources include loans associated with international agriculture companies, banks, donors and NGOs.

Formal financial agents can engage with smallholders in a variety of ways, broadly categorized into short and long term credit, provision of risk mitigation instruments, and equity. Table 2 summarizes formal financing types that are not associated with an aggregating institution, such as contract farming (including share cropping), or to production (trade credit). The cost of providing such capital varies depending on factors including duration and location. Monies can be distributed through a company, individual or cooperative.

Various smallholder categories exist, and access to capital tends to reflect the smallholders' producer category. It is also influenced by location and local infrastructure (physical, social, institutional). Smallholder production categories include production for:

- Subsistence, as opposed to sale.
- Sale in domestic markets as opposed to for export.
- Export, as part of an aggregating institution, or on a more individual basis, for example, through a local trader.

It may be easiest for smallholders producing for export, particularly those part of an aggregating institution, to access formal sources of capital. These may also be the most accessible, in terms of financing improvements to their management practices. It may be difficult to claim a premium for 'climate-friendly' agricultural products from smallholders

who only supply their local markets, where customers typically are not in a position to pay a premium for ‘sustainable’ products.

Table 2 General agricultural finance categories

Financing type	What is it?	Example relevant to a smallholder	Example of requirements to access, if available
Short-term credit	Loans with a maturity \leq 12 months	Small loans to individual based on personal profile e.g. to purchase a cow	Group backing / good personal reputation. May require collateral e.g. bicycle
Long-term credit	Loans with a maturity of $>$ 12 months	Larger bank loans e.g. for machinery	More sizeable collateral including future production, land. Bank account.
Risk mitigation instruments	Insurance products, savings	Micro-insurance, weather-based insurance	Reliable local weather data, mobile phone
Equity	Ownership in a commercial company	Equity in a producer organization	Bank account, legally incorporated entity

Investments reflect stakeholders’ risk and return profiles

Investors pursue opportunities according to their specific goals. Investors pursuing riskier opportunities tend to require higher returns. Some investors may be subsidized by cheaper capital from multinational organizations, aid agencies or philanthropic sources.

Geographically and sector diverse investors operate according to different social and environmental ideals. Investor interest is also heavily influenced by local government policies and practices, e.g. taxation, stability of rule of law, foreign exchange constraints.

Risk and return characteristics also vary according to smallholder type. Smallholders that are highly reliant on the land for their livelihood may strongly favour short-term returns, i.e. they apply a high discount rate to evaluate any new activity. They may also engage in many different income-generating activities, on and off the land, to diversify their incomes and minimize risk. Risk related to uncertain land tenure and availability of land may increase smallholder preference for quicker returns, rather than returns associated with more sustainable, long-term LU practices.

‘Sustainable agriculture’ investments⁵, that maintain long-term productivity, may require significant upfront costs, potentially accompanied by a reduction in short to medium-term income. For example, it may take many years before benefits of new tree crops are realized. However, such an investment, once made, may translate into a lessened likelihood of abandonment by the smallholder. In order to be successful, payments must help smallholders overcome initial upfront costs, and reduce the short to medium term penalties associated with implementing a longer-term improved land management practice.

There may be additional risks associated with production for export

Although farmers may receive higher prices for export crops, particularly for certified produce, risks may also increase. They may take on significant risk in committing to deliver a certain type and volume of produce, potentially diverting productive capacity away from directly feeding their family, and reducing income diversity (in terms of products and seasonality). By selling into markets with higher standards, they take on new and additional costs (and risk) associated with certification. This issue was encountered by DrumNet in Kenya, where a company buying produce from smallholders suddenly stopped doing so because of lack of compliance with new European import requirements. This forced producers to sell their product below expected price and they returned to their subsistence crops (Ashraf et al. 2010).

Carbon credits could be considered a form of export produce, and existing risks could be lessened or exacerbated by carbon finance. Risks could be exacerbated if the benefit associated with mitigation is only provided to the smallholder after credits are issued and if the smallholder has to bear upfront costs associated with developing a carbon credit project. The effect on smallholders depends on the basis on which benefits associated with mitigation are issued, e.g. payments made for changing practices versus for the production of specific

5 This paper defines ‘sustainable agriculture’ investment as investments in a ‘integrated system of plant and animal production practices having a site-specific application that will, over the long term: satisfy human food and fibre needs; enhance environmental quality and the natural resource base upon which the agricultural economy depends; make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole.’

US Congress ‘Farm Bill’ (Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA), Public Law 101-624, Title XVI, Subtitle A, Section 1603

(Government Printing Office, Washington DC, 1990) NAL Call # KF1692.A31 1990).

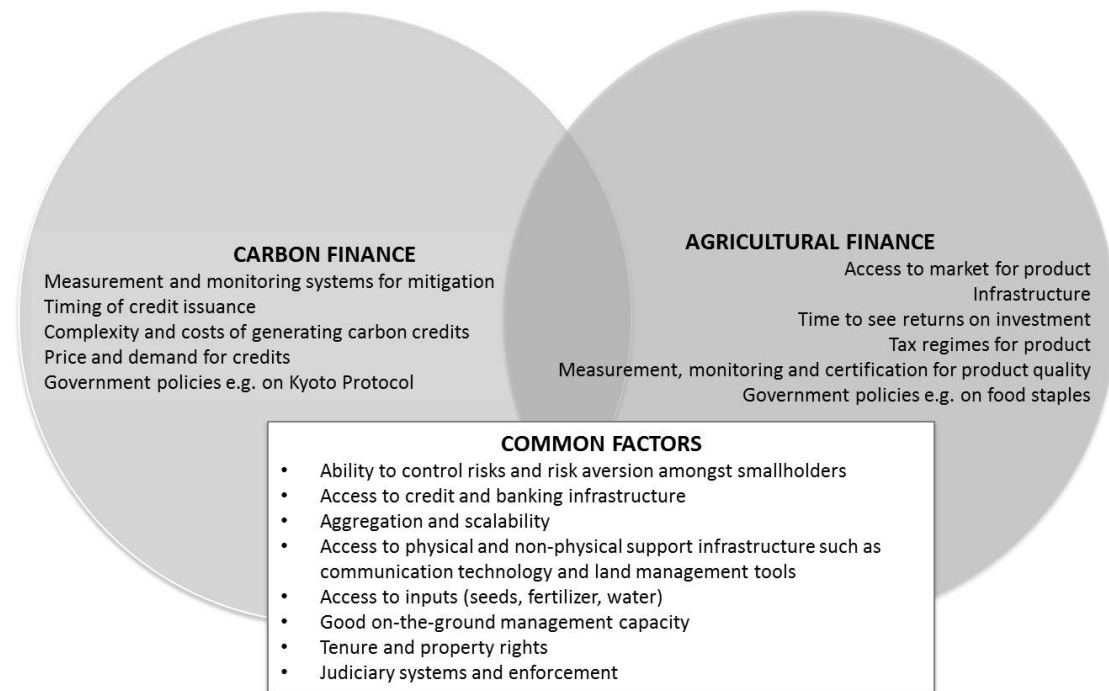
carbon credit volumes. The form and timing of when carbon-related benefits are provided will influence smallholders' appetite for engaging in mitigation activities.

An example of how international commodity producers could facilitate mitigation is Cadburys, which is investigating if carbon credits could be used to help finance Ghanaian farmers in transitioning to shade grown, rather than un-shaded cocoa. However, this approach may be limited to a tree crops for which there is a robust market, and to companies that can afford the upfront cost of sustainability and that can pay for developing the carbon credit project.

Overlaps between financing for agricultural products and mitigation

Profitability of both agriculture and carbon credit projects is a factor of production volumes, expected product prices and the size and timing of production costs. While there is some difference between specific barriers associated with improved and increased investment in smallholder agriculture and carbon credit projects, significant overlap exists. Figure 1 illustrates some of these overlaps. Selected the overlapping factors are described in the sub-sections below.

Figure 1 Overlap of barriers to carbon and agricultural finance



Ability to manage risks

The ability to control risks helps to smooth income. Smallholders may be sensitive to agricultural risks due to lack of income or food source diversity. They face risks related to production (e.g. adverse weather, pests), overdependence on a few crops, price volatility and changes to regulatory frameworks – for both agricultural products and carbon credits.

Weather-related risks are likely to increase as a result of climate change.

Insurance and risk mitigation challenges are linked to infrastructure (e.g. weather stations), government policies and legislation (Kloppinger-Todd and Sharma 2010). Large agricultural companies and investors control financial risks through expert credit evaluation systems, portfolio diversification, managing exposure limits, provisioning and hedging. These are not available to the smallholder.

Many smallholders rely on traditional coping methods and formal or semi-formal arrangements to manage financial risk e.g. social networks, informal loans, contract farming and sharing liability amongst a group. These methods are more limited in their ability to transfer and diversify risk and context sensitive. More formal risk mitigation methods e.g.

insurance, tradable futures contracts⁶ and guarantees are less readily available in developing countries. Combining micro-insurance with access to credit has demonstrated some successes, however this form of risk mitigation is still relatively new (Kloeppinger-Todd and Sharma 2010).^{7,8}

Risk within a project should be transferred to the entity best able to control it. There are risks specifically associated with a carbon credit project (registration, monitoring, reporting and verification), in addition to the general implementation risks mentioned above. The project developer, rather than the smallholder, is best equipped to manage specific carbon credit project risks.

Links to adaptation and resilience programs could also be explored. For example, a program to develop increased smallholder resilience could support a third party insurer to provide affordable insurance against non-controllable risk related to climate change. Access to low cost insurance could encourage the smallholder to invest in mitigation and at the same time increase their resilience to climate change, an example of this could be ENSO insurance offered in Peru (Skees and Collier 2010).

Box 1 The risk trap for subsistence smallholders (Doran et al. 2009)

'The cash-flow and risk-management needs of agriculture-dependent households prevent most smallholders from allocating capital sources towards more specialized and profitable production activities for market. Most rural households operate tiny land holdings (less than 2 Ha) for a range of subsistence production activities and they diversify their income sources across farm and non-farm economic activities. They tend to favor low-risk, low-return crops that do not require significant investment in inputs but are more robust even in unfavorable weather and soil conditions. For example, 1 Ha of maize, which requires several applications of (costly) fertilizer, can yield 3x as much as 1 Ha of millet or sorghum. A study in Kenya found that less than one-half of farmers who intended to invest in fertilizer actually did so even though fertilizer increases yield returns up to 36% over several months. For cash constrained households, the security of a sub-optimal supply of food is frequently the only rational option. This subsistence approach to farming minimizes demand for external capital and its potential returns.'

6 Tradable futures contracts are standardized, transferable, exchange-traded contracts that require delivery of a commodity at a specified price, on an agreed future date.

7 Micro-insurance is defined as 'protection of low-income people against specific perils in exchange for a pre-specified payment determined in proportionate to the likelihood and cost of the risk involved and made in advance.' Definition from a presentation entitled 'Microinsurance markets: An Overview', presented by N. A. Fernando, Principal Finance Specialist (Microfinance), Asian Development Bank, Regional Workshop on Microinsurance Sector Development, Colombo, Sri Lanka, 28-29 June 2007. Available at: www.adb.org/Documents/Slideshows/Microfinance/Microinsurance-Sri-Lanka-Mission.pdf

8 For an example of a successful combined micro-insurance and credit scheme, see 'Microinsurance Matters' No. 9, 'Dry Day Weather Index Insurance' p.

4. November 2010. Available at: www.microensure.com/images/library/files/Newsletters/microinsurance_matters_issue_9.pdf

Access to inputs

Access to credit and banking infrastructure can help smallholders reduce risk, manage cash flows and invest in increased productivity. Risk and credit issues are interlinked. Credit worthiness is, for example, evaluated on the basis of repayment capacity and assets (collateral). Seeds, fertilizers and equipment also require either cash or forms of credit. Table 3 describes some of the commercial credit sources – note that it excludes informal sources.

Table 3 Overview of credit sources

Provider	Description	Issues
Local bank	A bank with significant operations in the country.	Many are not active in rural areas, e.g. local banks in sub-Saharan Africa allocates on average less than 8% of their lending to agriculture.* Where such lending takes place it is typically targeted to high value export crops.**
Agricultural bank	Specialized bank lending money to farmers, typically over long time periods and at low interest rates. May be government subsidized.	Few successful agricultural banks exist and many are Government controlled. They may only invest in projects of a certain size or producing a particular product - this may exclude smallholders.
Microfinance Institution (MFI)	Organization providing small, short-term loans to individuals.	Have traditionally not been active in rural areas as they thrive on attaining a certain scale. Lending is typically to an individual, rather than for specific production outcomes.
Public sector credit (local Government)	Credit, and other resources such as seeds are provided below market rates by the government.	This is hostage to government policies and management infrastructure. Long term sustainability may be an issue.
Rural financial cooperatives	This can refer to several models, including Village Savings and Loans Associations (VSLA) and Self Help Groups.	Success depends on interest rates charged, to whom loans are provided and on what terms and how funds are distributed. A poorly diversified customer base may increase risk, governance and management may be poor and the facility vulnerable to liquidity shortages.
Trade credit (from company purchasing products)	Financing based on the product value chain, for example a processing company lending to a producer and recouping the loan upon product delivery.	Limited flexibility and funds are tied to the product, this may be open to misuse by the credit provider.
Socially Responsible Investor (SRI)	Investors seeking social and environmental outcomes as well as	These investors typically require a minimum return (although this may be lower than normal investors). They require a minimum deal size and tend to invest in the

	financial returns.	generation of a specific product. Investment that is subsidized may not be sustainable.
Carbon financier	Investment is based on expected carbon credit revenues.	Requires a minimum scale, for example in terms of number of participating households and tons of carbon mitigated. Carbon financiers are also influenced by fund life and the timing of market demand, e.g. associated with length of a commitment period.
* Doran et al. 2009 ** Ritchie 2010		

Various actors have a role to play in improving access to both agricultural and financial inputs. Fertilizer companies are, for example, repackaging products to make them more accessible to smallholders. Mobile telephone banking is helping smallholders to access micro-insurance. Aggregation is important in improving access, e.g. by making leasing of farm tools to make them more affordable and by pooling collateral necessary to purchase infrastructure. Government policies could help improve access to inputs, including credit, e.g. by developing credit bureaus and property registries, information technology infrastructure to support monitoring and gather weather data, financial education and development of risk transfer mechanisms and guarantees. Mainstreaming recognition of other sources of collateral, including warehouse receipts, accounts receivable, equipment, standing crops and livestock are also necessary. Carbon credit purchase contracts could, for example, be a form of collateral.

Aggregation

Aggregation, for example through farmer cooperatives, can improve access to resources including credit and risk mitigation products and can increase bargaining power. Investors for both carbon credits and agricultural products require a minimum scale of operation to justify time, effort and costs associated with making an investment.

Commercially viable models do exist for engaging smallholders, but require aggregation to help reduce barriers to inputs (credit, fertilizer, seeds etc.), access markets and infrastructure. Group members can, for example, guarantee each others' loans, and group purchase agreements with buyers can help increase access to seeds and fertilizer.

The Chiansi irrigation project in Zambia developed by InfraCo (Palmer et al. 2010) provides an example of how benefits can be increased through aggregation. 'Patient capital' and an

appropriate benefit-sharing model were used to overcome investment barriers, including high up-front costs, long payback periods and a perception of high risk by investors. This concept of developing appropriate local benefit sharing models with ‘patient capital’, ‘...’*long-term, subordinated capital invested at sub-commercial cost, which is used to fund the one-off start-up costs and part of the cost of the very long-life assets*’ (Palmer et al. 2010) could be an interesting model to examine to in the context of mitigation.

Business models to engage smallholders through different aggregation models are summarized in Table 4 (Cotula and Vermeulen 2010). Many variations of these models exist. Note that the terms ‘out-grower scheme’ and ‘contract farming’ are used interchangeably and describe a situation where a smallholder has a contractual relationship with a purchaser of agricultural goods. The smallholder is paid for production and may as part of the deal get access to production-increasing goods and services including improved seed varieties, credit or storage facilities.

Table 4 Overview of aggregation models

Model	Sub-model	Description
Driven by smallholders		
Cooperatives and farmer controlled institutions	Associations, trusts, enterprises, cooperatives, farmer owned companies	Formalized groups of smallholders that have legal standing. Many different structures exist depending on the institutions purpose, e.g. marketing agency vs. producers cooperative.
Contract farming	N/A	Smallholders group together to lease land to a third party, for example to a commercial farm manager.
Driven by third-party such as an agribusiness company or exporter		
Contract farming	High 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 (JV) between a third party and a local entity representing smallholders and in contractual relationships 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	N/A	Contracting of smallholders to manage land owned or leased by a third party.

Formal credit attached to the supply chain, through one of the aggregation models described in Table 4, has been the dominant source of working capital for smallholders (Doran et al. 2009). However, the reach of formal credit to smallholders has been hampered by lack of organization, transparent pricing and fragmentation (van Empel 2010).

Despite their diversity, aggregation models have some common ingredients for long-term success, including:

- Clear participation criteria for the farmers e.g. minimum landholding size, demonstration of sufficient entrepreneurial spirit or engagement, basic understanding of business planning and farm management skills;
- Transparent terms of reference for the product, e.g. describing quality requirements, pricing arrangements and services provided such as input, credit and extension services;
- Trust between parties in the model, for example established in agreed codes of conduct;
- Registration and record keeping.

Best practices and capacity

Many smallholders lack access to extension services that could help them improve yields without increasing costs. Such services may be paid for by the farmer (privately), an NGO or the government or provided by the aggregating entity. NGOs such as Land O'Lakes have been instrumental in providing extension services but the sustainability of this provision may be an issue. Information technology may help to overcome some of these barriers, e.g. by providing advice via text messages. It is likely that both carbon credit project developers and agricultural investors will have to invest in improved extension services to train smallholders.

Tenure, property rights and enforcement

Tenure and property rights are often unclear – in the context of agricultural production and carbon credits. Various access and user rights may be attached to the land, these may be

allocated to parties other than the landowner. Improper consideration of tenure issues may exacerbate inequality within the community and lead to conflict, compromising investment returns. Differences in rights to below and above ground carbon can also be unclear. Enforcement of rights including proper arbitration processes for dispute resolution processes (DRPs) may also be lacking. DRPs must be transparent, accessible and must not be too lengthy in order to encourage investment. For example, Indonesia is considering establishing 'Green Benches' to tackle disputes arising as a result of carbon-related investments.

Conclusions

Existing carbon finance approaches, with their complex procedures, unpredictable and often long payback periods are exacerbated by existing agricultural finance barriers. Financing barriers faced by smallholders are more fundamental to address than barriers specifically related to carbon credit development. If designed correctly, carbon finance could reduce some of these hurdles by providing revenue diversification tied to sustainable practices and by encouraging aggregation which could increase the accessibility of services and products. The forms of carbon finance which will be most appropriate to smallholders will likely be those which particularly target improving their long- term productivity while at the same time increasing mitigation (and resilience).

Agricultural mitigation finance could result in win-win situations for smallholders. However, the profitability of pure agricultural carbon projects involving smallholders is often too low to be of interest. It may therefore be necessary to design carbon finance in such a way that it helps to bridge the gap until the project becomes economical.

Recommendations to various groups for developing win-win approaches that address smallholder financing (and carbon finance) barriers are given below:

Governments, multilaterals and donor agencies

- Develop sectoral approaches e.g. Nationally Appropriate Mitigation Activities (NAMAs) encouraging smallholders to adopt improved practices by providing trade credit and adopting legislation requiring banks to lend to Small and Medium sized Enterprises (SMEs) that promote climate friendly agriculture, subsidizing certification;
- Support infrastructure development that improves smallholders' access to financial inputs (e.g. credit bureaus, weather stations);
- Support controlled productivity gains e.g. access to input through broad co-investment subsidies;
- Evaluate government policies e.g. taxation to encourage increased investment in improved smallholder agriculture;

- Re-examine trade rules that act as barriers to agricultural producers in developing countries and ‘climate friendly’ labelling;
- Develop private public partnerships catalyzing improved investment in agriculture such e.g. leveraging ‘patient capital’ and credit guarantee facilities. An example of this is the US\$10m guarantee facilities developed by AGRA and its partners;
- Support pilots that promote improved agricultural practices.

Companies, including investors and banks

- Test the application of carbon as an additional revenue stream in existing smallholder production systems;
- Develop new products that can be used by smallholders to overcome barriers, e.g. M-PESA, the Kenyan mobile payment system;
- Test the use of new forms of collateral e.g. carbon credit purchase contracts;
- Help leverage and invest ‘patient capital’.

NGO and research organizations

- Explore opportunities for adding a mitigation element to existing private and public extensions services (e.g. piggybacking on PepsiCo’s Indian distribution system);
- Develop and test instruments to help farmers overcome barriers, e.g. risk mitigation instruments, securitization of future carbon revenues;
- Facilitate aggregation, e.g. support the building of farmers’ organizations, act as a trusted intermediary.

The barriers that must be overcome are fundamental to the livelihoods of many, and go far beyond carbon finance issues, although significant overlap is acknowledged. By tackling these barriers, it may be possible to unlock some of the potential mitigation from agriculture. Vice-versa, ‘fit-for-purpose’ carbon finance for mitigation could help to overcome some existing barriers faced by smallholders. In designing fit-for-purpose carbon finance, emphasis must be on overcoming these fundamental, traditional barriers faced by smallholders and to financing sustainable agriculture in general, rather than on generating discrete units of mitigation.

References

- Ashraf N, Giné X, Karlan D. 2010 *Finding missing markets (and a disturbing epilogue): Evidence from an export crop adoption and marketing intervention in Kenya*. Wahington, DC: World Bank.
- Campaigne J, Rausch T. 2010. *Bundling Development Services with Agricultural Finance: The Experience of DrumNet*. IFPRI & World Bank.
- Cotula L, Vermeulen S. 2010. *Making the most of agricultural investment: A survey of business models that provide opportunities for smallholders*. IIED & FAO.
- Doran A, McFadyen N, Vogel RC. 2009. *The Missing Middle in Agricultural Finance: Relieving the capital constraint on smallholder groups and other agricultural SMEs*. OXFAM GB: England.
- Palmer K, Parry R, MacSporren P, Derksen H, Avery R, Cartwright P. 2010. *Chiansi irrigation: Patient capital in action*. InfraCo.
- Kloeppinger-Todd R, Sharma M. 2010. *Innovations in rural and agriculture finance*. Wahington, DC: World Bank.
- Ritchie A. 2010. *Community-Based Financial Organisations: Access to Finance for the Poorest*. Washington, DC: World Bank.
- Skees JR, Collier B. 2010. *New Approaches for Index Insurance: ENSO Insurance in Peru*. Wahington, DC: World Bank.
- Smith P, Martino D, Cai Z, Gwary D, Janzen H, Kumar P, McCarl B, Ogle S, O'Mara F, Rice C, Scholes B, Sirotenko O. 2007. *Agriculture in Climate Change 2007: Mitigation*. Cambridge: Cambridge University Press, United Kingdom and New York, NY.
- van Empel G. 2010. *Rural Banking in Africa: The Rabobank Approach*. Wahington, DC: World Bank.



The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic initiative of the Consultative Group on International Agricultural Research (CGIAR) and the Earth System Science Partnership (ESSP), led by the International Center for Tropical Agriculture (CIAT). CCAFS is the world's most comprehensive global research program to examine and address the critical interactions between climate change, agriculture and food security.

For more information, visit www.ccafs.cgiar.org

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

