

CTA Discussion Paper

Value Chain Finance for Agricultural Climate Change Resilience



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Acronyms

ABS	Asset-backed security	IPCC	Intergovernmental Panel on Climate Change
ACGSF	Agricultural Credit Guarantee Fund Scheme	ITF	International Task Force
ACP	African, Caribbean and Pacific Group of States	JV	Joint venture
ADB	Asian Development Bank	KYC	Know your customer
AfDB	African Development Bank	LEAP	Livelihoods, Early Assessment and Protection
AFK	Amiran Farmers Kit	LGF	Loan guarantee fund
ARC	African Risk Capacity	LPC	Loan portfolio cover
ASAP	Adaptation for Smallholder Agriculture Programme	LPO	Local purchase order
AVCF	Agricultural value-chain finance	MFI	Microfinance institution
Capex	Capital expenditure	MPCI	Multiple-peril crop insurance
CBA	Cost-benefit analysis	NBFI	Non-bank financial institution
CBI	Climate Bonds Initiative	ND-GAIN	Notre Dame Global Adaptation Index
CCRIF SPC	Caribbean Catastrophic Risk Insurance Facility Segregated Portfolio Company	NGO	Non-governmental organisation
CDO	Collateralised debt obligation	OTC	Over the counter
CMA	Collateral Management Agreement	P2P	Peer-to-peer (lending)
CPR	Cedula Produto Rural (rural finance note)	P4P	Purchase for Progress
CPRM	Commodity price risk management	PAIP	Pachamama' Agricultural Insurance Program
CSA	Climate-smart agriculture	PARM	Platform for African Risk Management
CTA	Technical Centre for Agricultural and Rural Cooperation	PCRIP	Pacific Catastrophe Risk Insurance Pilot
DD	Due diligence	PPCR	Pilot Program for Climate Resilience
DIB	Development impact bond	PPF	Prepayment finance
E-voucher	Electronic voucher	PPP	Public-private partnership
EU	European Union	PXF	Pre-export finance
FAO	Food and Agriculture Organization of the United Nations	R4	R4 Rural Resilience Initiative
FI	Financial institution	ROI	Return on investment
FinTech	Financial Technology	SIB	Social impact bond
GCF	Green Climate Fund	SMS	Short message service
GFDRR	Global Facility for Disaster Reduction and Recovery	SPV	Special-purpose vehicle
GIIF	Global Index Insurance Facility	UCB	Uganda Centenary Bank
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	UCE	Uganda Commodity Exchange
HARITA	Horn of Africa Risk Transfer for Adaptation	UNCTAD	United Nations Conference on Trade and Development
IDB	Inter-American Development Bank	UNFCCC	United Nations Framework Convention on Climate Change
IFAD	International Fund for Agricultural Development	US	United States
IFC	International Finance Corporation	VAT	Value Added Tax (also called Goods and Services Tax – GST)
IISD	International Institute for Sustainable Development	VC	Venture capital
ILS	Insurance-linked security	WFP	World Food Programme
		WINCROP	Windward Island Crop Insurance
		WOCCU	World Council of Credit Union
		WRF	Warehouse receipt financing
		WRMF	Weather Risk Management Facility
		XCF	Extreme Climate Facility

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Executive summary

Climate change will increasingly impact global agricultural production, particularly in the emerging economies of African, Caribbean and Pacific (ACP) countries. Delayed action on mitigation will increase adaptation costs, challenging the resilience of agricultural systems. Agricultural value-chain financing (AVCF) approaches can be utilised to support agricultural climate change resilience. This report introduces AVCF, in particular short-term debt financing and risk-mitigation instruments, and explores the potential for these products to promote resilience – including the potential contribution of development partners, using a range of case studies.

Achieving resilient agricultural systems requires long-term and short-term financing, equity and debt, and capital (capex) and operational expenditures (opex). Agricultural resilience should help farmers: access improved crops and livestock and good management practices; enhance access to and utilisation of appropriate technology; promote local safety nets; increase the use of resource-conserving technologies; facilitate open and transparent trade regimes; and improve risk sharing. Several financing entry points exist in agricultural value chains to achieve this, including input suppliers, farmers and farmer groups, traders, processors, marketing and storage companies, exporters, wholesalers and retailers, financial institutions (FIs) and stakeholders in government and in non-governmental organisations (NGOs).

Design of a suitable AVCF product is context-dependent. Categories of AVCF products include product financing of agricultural inputs and outputs (pre-financing), receivables financing (factoring, forfeiting, local purchase orders), physical asset collateralisation (warehouse receipt financing, storage, leasing), and risk-mitigation products (insurance, derivatives). Other AVCF products include pre-export finance (PXF) and prepayment finance (PPF), securitisation, bonds and notes, loan guarantees and various fund structures. Design of an AVCF product depends *inter alia* on the financing source, beneficiaries, size and term, expected return on investment and risks.

Product financing (pre-finance) may be offered by input suppliers and off-takers of agricultural

outputs and requires adherence to legally enforceable, pre-agreed quality specifications. Output-focused finance relies on trust (e.g. that farmers will not side-sell) and information (e.g. to forecast supply). Case studies are provided from One Acre Fund, Syngenta, TechnoServe and Amiran. This type of financing can help farmers access quality inputs, adopt good management practices and reduce market uncertainty, thus contributing to agricultural climate change resilience.

Receivables financing and factoring approaches monetise the future value of an agricultural commodity through monetisable contracts. An FI assigns value to the contract, based on its face value, the likelihood of the terms being met, and the legality of transferring contract ownership. Thus, farmers' payments are expedited, though at a discount. Factoring involves selling accounts receivable or sales contracts at a discount to a specialised company that collects these when payment is due. Biashara Factors and COPRORIZ are provided as case studies. Agricultural climate resilience can be promoted by providing special contracting terms for 'climate-smart' production. FIs may also consider the climate risk associated with certain producers and incorporate this into the discount rate they apply to receivables.

Physical asset collateralisation (inventory finance, leasing) is an AVCF category in which an existing asset is used to unlock access to credit or to production inputs. For example, warehouse receipts finance (WRF) and repurchase agreements ('repos') enable a farmer to effectively transform their agricultural products into cash prior to actual sale. In WRF, farmers access credit from receipts of their goods stored in approved warehouses. Leasing gives farmers access to equipment and inputs they may not otherwise be able to afford, i.e. more suitable technologies. Two cases from Uganda (Centenary Bank and the Ugandan warehousing system) are provided. Access to warehousing and storage facilities may help farmers reduce post-harvest losses and access credit. These AVCF products enable farmers to more flexibly manage cash, and invest in more resilient operations.

Risk-mitigation products: A range of products can be mobilised to mitigate risks, depending on the

Agricultural value-chain financing can support agricultural climate-change resilience.

nature and scale of risks faced by farmers and other value-chain participants, including micro-insurance, risk pooling, and reinsurance, and insurance-linked securities (ILS), including catastrophe bonds (Cat Bonds). Derivatives used for risk mitigation include futures, forwards, options and swaps: these are financial contracts that enable purchase or sale of a specific type of asset at a specific time and price, thereby reducing uncertainty and risk. Case studies on Agriculture and Climate Risk Enterprise (ACRE) Kenya, WINCROP (Caribbean), the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and the World Bank with Rabobank are used to illustrate this. Climate change introduces increased uncertainty to agriculture, thus risk-mitigation products are particularly relevant for minimising down side risks.

A variety of other relevant products are also described, including PXF, PPF, bonds, notes and other securitisations, impact bonds, funds and credit enhancements. The Root Capital Coffee Farmer Resilience Initiative case illustrates how long-term and short-term financing, combined with technical assistance and support for income diversification can enable resilience.

Development partners seeking to promote AVCF products must carefully consider:

- How to minimise distortion and ‘crowding out’ of private sector players
- How and where to target assistance

- How to ensure growth and impact beyond the funding period and enable scaling.

Local context, risks and primary resilience objectives influences how development partners could contribute to design and implementation. Support could take many forms including Loan Guarantee Funds (illustrated by a Nigerian case), and other forms of blended finance including payment for carbon (e.g. the World Bank and Kenya Agricultural Carbon Project). Development partners are able to sponsor creation of risk-mitigation facilities such as the Ethiopian Livelihoods, Early Assessment and Protection (LEAP) project, and the International Fund for Agricultural Development (IFAD) Adaptation for Smallholder Agriculture Programme (ASAP). They can also support the establishment of new AVCF products and delivery mechanisms to improve resilience through push and pull factors (e.g. Syngenta’s short message service [SMS] training platform for underserved farmers, and the World Food Programme Purchase for Progress programme, P4P).

In seeking to expand financing for agricultural resilience, development partners can support a broad spectrum of AVCF products, aligned with specific contexts and objectives. With climate change impacts already being felt in many ACP countries, there is an urgent need for development partners to proactively support the design and deployment of scalable AVCF products that promote climate-smart agriculture.

Introduction

According to the most recent Intergovernmental Panel on Climate Change (IPCC), climate change-related impacts on crop and food production systems are already evident (IPCC, 2014). In African, Caribbean and Pacific (ACP) countries, impacts have mostly been negative, leading to reductions in crop yields, an increase and spread of weeds and invasive species, and increased production variability. The reduction in yields, which will potentially accelerate, comes at a time when there are ever growing demands on the global food system: CGIAR estimate that global food demand will increase by 59–98% between 2005 and 2050 (Valin *et al.*, 2014). Similarly, the Food and Agriculture Organization of the United Nations (FAO) estimates that 70% more food will need to be produced by 2050, with increases in demand in particular for a relatively homogenous set of cereals and proteins (FAO, 2009).

Investment that facilitates adaptation to climate change, and builds resilience within socio-economic, food and environmental systems, are therefore critical. A variety of estimates exist for the global cost of adaptation, ranging from US\$28 billion per year by 2030 (UNFCCC, 2007) to US\$300 billion per year for developing countries alone by 2050 (UNEP, 2014). Estimates from 2013 suggest that developed and developing countries are currently spending about US\$25 billion per year to build climate change adaptation and resilience – though much of this may not be explicit (CPI, 2014). Estimates for adaptation investment requirements in the agriculture, forestry and fisheries sectors ranges from US\$3 billion (UNEP, 2014) to US\$14 billion per year (UNFCCC, 2007) (this figure excludes disaster risk management). Further delay in serious global climate change mitigation will result in greater resources being required for adaptation and resilience.

A number of definitions exist for climate resilience and adaptation. The IPCC defines resilience as the “amount of change a system can undergo without changing state” (IPCC, 2001). The Secretariat of the International Strategy for Disaster Reduction defines this as “The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organising itself to

increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures” (UN/ISDR, 2004). The concept of climate ‘adaptation’ is closely related to ‘resilience’ which is defined by the IPCC as “Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007). In this report, the term ‘resilience’ is also assumed to include adaptation.

Resilience has several facets:

- Social resilience, e.g. cohesion of social safety nets
- Economic resilience, e.g. household savings increase households’ ability to weather extreme events, and
- Environmental resilience, e.g. good soil management practices promote better water and nutrient retention ability and may increase the resilience of agricultural land.

Climate change mitigation, adaptation and resilience are closely linked. The concept of climate-smart agriculture (CSA) refers to agricultural practices and technologies that sustainably increase productivity, support farmers’ adaptation to climate change and contribute to greenhouse gas reductions (CCAFS and CTA, 2014). Long-term investments in CSA need to be coupled with short-term risk management interventions (World Bank, 2015).

Though adaptation interventions may help to reduce climate-related impacts, the success of specific interventions is case-specific. In the context of agricultural systems, adaptation and resilience interventions require a value-chain approach, i.e. approaches that consider agricultural systems from production, to marketing and distribution, to consumption. Financing appropriate agricultural interventions to build resilience must also be considered in the context of local social and economic issues e.g. nutrition and health needs, distribution of resources, and the trade and regulatory environment (Porter *et al.*, 2014).

The purpose of this report is to explore the potential for agricultural value-chain finance (AVCF) to promote climate change resilience in ACP countries, focusing on the experiences

Climate change mitigation, adaptation and resilience are closely linked.

of farmers and financiers with market-based lending and risk-mitigation finance products. This paper focuses on loans (i.e. debt, credit), but the role of concessional financing is discussed in the last section. By ACP countries, this paper specifically means the 79 state signatories to the Cotonou Agreement (the ACP-EC Partnership Agreement). These include 48 countries from Sub-Saharan Africa, 16 from the Caribbean and 15 from the Pacific.

The structure of the report is as follows: Section II describes different agricultural climate resilience investments and AVCF products. Section III describes AVCF product categories and products in greater detail, and provides several case studies. For each AVCF product category, a short discussion of relevance to climate change resilience has also been included. Section IV concludes by discussing the potential roles of development partners in facilitating such investments.

Overview of resilience investments and the AVCF ecosystem

Mapping agriculture, climate adaptation and resilience investments

To build climate resilience within agricultural value chains, a range of investments will need to be mobilised. Table 1 reviews major types of interventions in the agricultural sector, based on

IPCC classifications. According to the Asian Development Bank (ADB, 2009), the outcomes of such investments include:

- Increased adaptation of crops and livestock to climate stress (e.g. new and improved varieties, suitable management practices)
- Enhanced access and utilisation of technology and information

Table 1. Categories of agricultural climate resilience investments.

CATEGORY	SUB-CATEGORY	EXAMPLES
Structural, physical	Engineered and built environment	Water and pump storage, drainage systems, greenhouses, irrigation systems, warehouses and cold stores, maintenance of existing systems, e.g. upgrade of old irrigation canals, warehouse management and marketing
	Technological	Breeding of new livestock and seed varieties, ongoing purchase of new varieties, installation of early warning systems, access to weather information
	Ecosystem based	Ecological restoration, soil management techniques, replanting of mangroves, maintenance of conservation areas, e.g. riparian buffers
	Services	Credit provision, development of market and information platforms and marketing support
Social	Educational	Building farmers' awareness of good agricultural practices linked to climate resilience, extension services, technical assistance, learning and information platforms highlighting climate risks
	Informational	Early warning systems, climate and weather forecasting, information related to soils, crop and livestock species
	Behavioural	Soil and water conservation, crop switching, changing production practices, e.g. planting dates, reducing tillage, diversification, livestock management practices
Institutional	Economic	Insurance, catastrophe bonds (Cat Bonds)*, microfinance, disaster funds
	Laws and regulations	Standards, trade regulations or land zoning to require sustainable production, certification of seeds (e.g. drought-tolerance)
	Government policies and programmes	Sectoral sustainability plans, ecosystem based management, forest management, financial risk management frameworks that allow for better integration of climate risk information

* Risk-linked securities that transfer a specified set of risks from a sponsor to investors.

- Increased income generation (i.e. development of a financial safety net)
- Increased use of resource-conserving technologies
- Open and transparent trade regimes
- Improved risk sharing.

Within each category of agricultural climate resilience investment, financing is likely to be required for: (i) capex – capital expenditure for construction of buildings, equipment, training, etc.; (ii) opex – operations and maintenance, human resources; and (iii) research and development (either classified as capex or opex).

A number of studies have considered investment needs and potential climate adaptation benefits. For example, a study in Maharashtra, India, indicates the potential to avoid losses and the cost/benefit ratio for a selection of climate adaptation interventions. In this case, almost 50% of the expected loss under a high climate change scenario (i.e., a continued high use of fossil fuels) can be cost-effectively averted through irrigation, crop engineering and integrated pest management among other things. As illustrated in Figure 1, when these interventions are combined with index insurance this estimate rises to 80% (WEF, 2014).

Mapping value-chain finance market participants and products

Different potential finance entry points exist within an agricultural value chain, including input supply, production, processing, wholesaling, retail and consumption (Noble *et al.*, 2014; Miller, 2015). Given the diversity of the agricultural sector, immeasurable combinations of different AVCF models are possible. While not exhaustive, the list below, based on the Miller and Jones (2010) classification, provides an overview of categories and illustrates the range of participants in the agricultural value-chain ecosystem. Traditionally, AVCF refers only to financing sources within the value chain and does not include financing from financial institutions (FIs), including banks and non-bank financial institutions (NBFIs) such as microfinance institutions (MFIs) as these are considered external, i.e. they are not directly involved in agricultural production, marketing or distribution. However, many of the case studies involve such institutions and they are therefore included in this report.

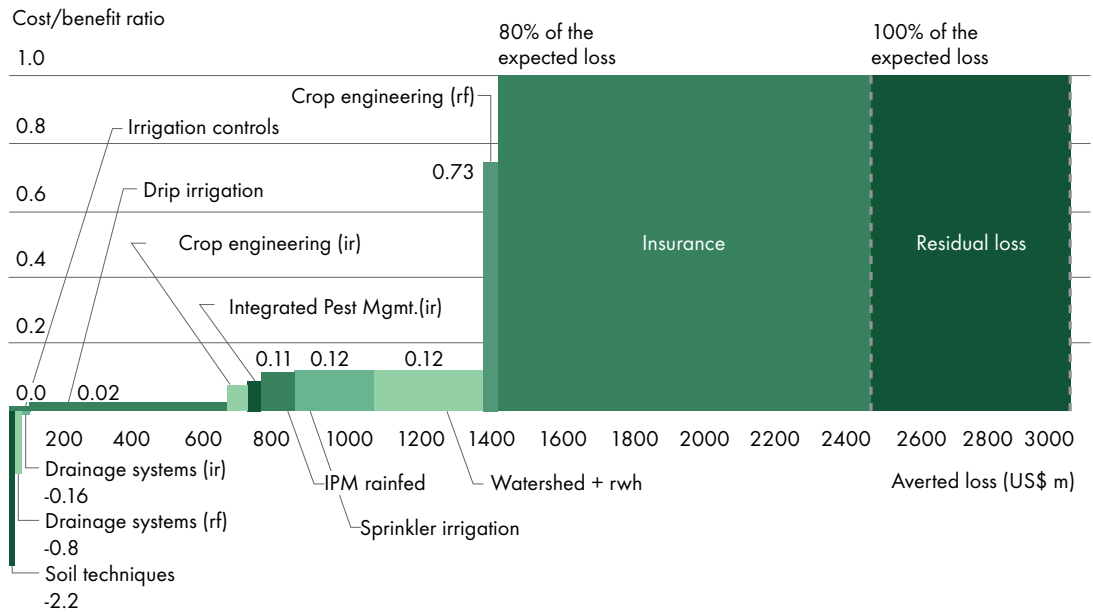


Figure 1. Impact of adaptation interventions on climate risk.

rf = rainfed agriculture; ir = irrigation-fed agriculture; IPM = integrated pest management; rwh = rainwater harvesting and watershed management.

Source: ECCWG (2009)

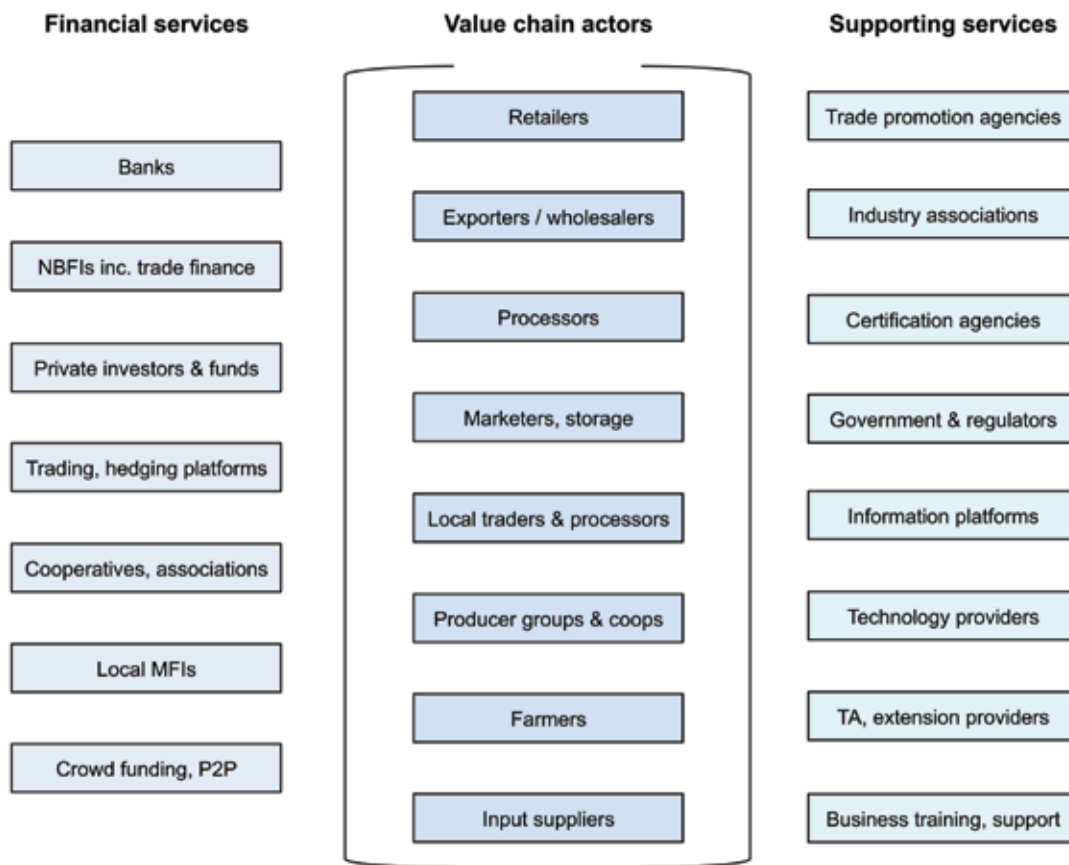


Figure 2. AVCF ecosystem (Note – does not include donors and NGOs, who would be expected to contribute to support services. Not all value chains will have all market participants, financiers and service providers.).

P2P = person to person; TA = technical assistance.

Source: Adapted from Miller and Jones (2010)

To determine the appropriate type of investment, it is important to consider the inter-linked characteristics and context of each specific AVCF need. Investment and investor issues to consider include the questions discussed below.

Source: who pays? Direct capital investments in public infrastructure, information dissemination and extension, regulatory changes, and emergency response procedures are typically the remit of the public domain (Chambwera *et al.*, 2014). However, private funding can be leveraged through licensing and concessions, e.g. the public sector can mobilise private finance in infrastructure by granting licences for private sector entities to build and operate (and eventually transfer back to the public sector) such infrastructure. Fundamentally, private financiers require an adequate estimated risk-adjusted

return on investment (ROI) in line with their expectations and remit. For example, pension funds are major investors that generally seek out a diverse range of large, low-risk investment opportunities that are relatively liquid, and are constrained by their fiduciary responsibilities that limit their ability to make high-risk investments – this is the case both for large western funds that are active globally and for national funds in ACP countries that are often restricted to investing in their own country.

Beneficiaries: who benefits and how? Some investments generate tangible monetary value that can easily be quantified, captured and assigned, either in the form of additional revenue generation or cost savings to specific groups within the agricultural value chain. For example, investment in drip irrigation may

tangibly reduce production costs in water-limited areas, in particular where there is drought risk or where water scarcity impacts production outcomes. Other forms of investment may yield benefits that are harder to pin down. For example, investment in flood plain restoration may generate benefits including for local residents and manufacturers, farmers and others, but the monetary value of these distributed benefits may be difficult to assign or capture. Such investments are more suited to public finance. Regulations may help to assign values to the benefits of interventions: by introducing fees or fines, ecosystem degradation is no longer without cost. Then, private sector investment can become engaged, to enable (in this example) local residents and manufacturers to avoid such fees or fines (e.g. wetland mitigation banking in the US, which permits people to offset the damage that they do to their immediate environment by improving nearby wetland areas, thus avoiding fines).¹

Some forms of investment may yield benefits that are harder to pin down.

Size: how much? Different forms of financing are appropriate depending on the size of the investment. At one extreme, small investments may be made through microfinance, crowd-funding platforms or Peer-to-Peer (P2P) lending platforms. At the other extreme, very large investments may require public financing as either direct government expenditure or facilitated by government guarantees where these are of national strategic interest.

Timing and term: when and for how long? The timing of a financing need and the time until payback influences the type of finance, the source of investment and the range of suitable potential investors. Is financing required only at the start of each seasonal farming cycle ('short-term finance'), or on an ongoing basis ('term finance')? When and how often are returns expected?

ROI: what is the cost and revenue profile and how is this manifested? All private financiers, and some public sector financiers, consider expected ROI metrics (including cost-benefit analyses, CBA) in order to decide whether to finance a particular intervention. ROI is heavily

influenced by the size of the initial up-front outlay (cost), and the timing and size of benefits expected, which are adjusted using a discount rate (i.e. the interest rate used to convert a stream of future cash flows to their present value) (Accounting Tools, 2016). In investor decision-making, the size of the initial financial outlay tends to be weighted more heavily than the subsequent scale and timing of additional costs and revenues. Importantly, many investments that generate adequate value for direct beneficiaries may not warrant involvement of an external financier with commercial return expectations. For example, an investment in a community-based production facility may generate adequate revenue to provide local employment and attain financial self-sufficiency, but not to engage an external investor or creditor.

As demonstrated by many of the case studies in the following section, within each specific financing transaction, several AVCF products are generally used in combination. One example of this is Hortifruti in Costa Rica, which consolidates rice grown by smallholder farmers and 'de-risks' commercial lending to farmers for input, production and storage costs (Coon *et al.*, 2010). Hortifruti guarantees to purchase crops from contracted farmers, which provides assurances to their local banking partner. Based on these contracts, the local bank finances 60% of farmers' production costs with no collateral pledge, but does require crop insurance coverage. Input suppliers provide inputs worth 35% of seasonal production costs. Farmers are contractually bound to deliver crops to a designated mill, so when produce is received, the local bank and input suppliers are paid back using the proceeds from the crop sales (Miller and Jones, 2010).

Table 2 describes the role of different market participants in agricultural value chains, their financing needs and links to improving agricultural climate resilience. Table 3 provides an overview of AVCF products, which, in Figure 3, are mapped in terms of their general position on the agricultural value chain.

¹ United States Environmental Protection Agency (US EPA): "A mitigation bank is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 or a similar state or local wetland regulation. A mitigation bank may be created when a government agency, corporation, nonprofit organization, or other entity undertakes these activities under a formal agreement with a regulatory agency." See the following website for more information: <http://water.epa.gov/lawsregs/guidance/wetlands/mitbanking.cfm>

Table 2. Agricultural value-chain participants' roles, finance needs and links to agricultural climate resilience (note that some roles have been combined).

VALUE-CHAIN PARTICIPANT	ROLE	FINANCE NEEDS	CLIMATE RESILIENCE LINKS
Input suppliers and agri-dealers	Provide agrichemicals, seeds, equipment, etc. – possibly with technical assistance.	Working capital to buy and stock inputs, credit to finance purchases.	Provide high-quality or improved (e.g. drought- or disease-tolerant seeds) inputs, training.
Farmers	Produce agricultural products, may carry out post-harvest processing and marketing.	Working capital to buy inputs and pay for labour, investment credit for equipment, land, etc., insurance products to reduce production risks.	Shift production practices to reduce climate risks.
Producer groups and cooperatives	Consolidates inputs (including finance) and outputs from farmers to gain economies of scale – may include branding, advocacy, training, certification.	Working capital to buy inputs for farmers and to buy products from farmers, investment in storage, transport and processing.	Support farmers' shift to risk-reducing practices, provide post-harvest storage facilities to smooth production and reduce losses.
Local traders and processors, marketing and storage businesses, processors	Consolidate agricultural outputs to sell in bulk, may verify product quality, transform raw products into marketable or consumer products, store (warehouse) agricultural products.	Working capital to buy product from farmers, investment in quality control equipment, storage, transport, processing equipment, working capital to transform product (labour, fuel), insurance.	Signal demand for sustainable products to farmers through purchases and quality assurance, enable farmers to smooth operations through purchases and storage, support sustainability certification.
Exporters and wholesalers	Sell to local retailers, international buyers, may verify product quality.	Working capital to buy products, manage stock, investment in storage, transportation and quality control, factoring/forfaiting* on behalf of suppliers, international trade finance, insurance.	Signal demand for products to farmers through purchases and quality assurance, source from different climatic regions to reduce risk.
Retailers	Brand and sell products to consumers.	Working capital to buy and market products, investment in shop inventory, insurance.	Signal demand for sustainable products to farmers through purchase programmes and certification standards.

* Financial transactions involving products or assets in which a purchaser earns a revenue for accepting product- or asset-associated risks.

Source: Modified from Jessop et al. (2012)

Table 3. Overview of debt-based agricultural value-chain finance products.

CATEGORY	INSTRUMENT	DESCRIPTION
A. Product financing or 'pre-finance'	(1) Input-focused	Input supplier advances in kind (e.g. seeds) or in cash to finance farmers' inputs, to be repaid at or after harvest with goods or cash.
	(2) Output-focused	<p><i>Trade credit:</i> Traders advance funds to producers to be repaid at or after harvest.</p> <p><i>Marketing company credit:</i> Marketing or processing company advances credit to be repaid at or after harvest.</p> <p><i>Lead firm financing or contract farming:</i> Firm provides direct finance to suppliers or guarantees off-take enabling access to finance from third parties.</p>
B. Receivables financing	(1) Trade receivables finance	<p>Bank/NBFI provides working capital to agricultural company against accounts receivable (i.e., sums due from buyers or clients for already-delivered goods or services), off-take or other forms of contracts.</p> <p><i>Bill discounting and dynamic discounting:</i> Sale of a bill of exchange (a binding commitment to pay a certain amount on a certain date) at a discounted value, prior to maturity date – amount received will depend on the amount of time left to maturity and the perceived risk.</p>
	(2) Factoring, reverse factoring, forfaiting, local purchase orders (LPO)	<p><i>Factoring (invoice factoring):</i> Sale of accounts receivable or sales contracts at a discount to a specialised company that collects these when payment is due (i.e., company A delivers goods to company B, with invoice requesting payment in x days; A then sells the right to be paid under its invoice to a factoring company, for immediate cash).</p> <p><i>Reverse factoring/confirming/LPOs:</i> Bank/NBFI takes on intermediation role on behalf of a buyer to accelerate payment to seller in exchange for a discount and with the guarantee of the buyer. Reverse factoring counts on the ongoing involvement of the buyer, who use it as a way to help their suppliers deal with cash-flow constraints without engaging their own funds.</p> <p><i>Forfaiting:</i> Specialised FI buys a receivable from an exporter (e.g. guarantees), usually for higher-value goods and over a longer credit period than factoring.</p>
C. Physical asset collateralisation	(1) Physical storage and warehousing related finance	<p><i>Warehouse receipts finance (WRF):</i> Receipts from a certified warehouse are used to access credit against the security of goods stored.</p> <p><i>Repurchase agreements (repos):</i> Buyer receives securities as collateral and agrees to buy them back at a later date. Commodities are stored in an accredited store who issue receipts with conditions of repurchase. Such agreements provide a buy-back obligation on sales enabling firms to access a credit line.</p>

CATEGORY	INSTRUMENT	DESCRIPTION
	(2) Lease and lease-purchase	<p><i>Equipment leasing:</i> Purchase of equipment on credit – either for rental or with a purchase condition at the end of the period. This reduces collateral needs for big expenditure.</p> <p><i>Operating lease:</i> Short-term contract for the use of equipment, usually to a number of different users.</p>
D. Risk-mitigation products	(1) Insurance	<p><i>Crop and weather insurance:</i> Pooling regular payments from clients to create a fund that can pay out upon pre-defined terms or events, e.g. when natural disasters occur.</p> <p><i>Reinsurance:</i> Sharing of risk among multiple insurance companies to reduce exposure.</p> <p><i>Micro-insurance:</i> Insurance with low premiums and low coverage (typically for disaster-like events, such as the loss of a cow or a drought destroying much of the planted crops), suited to low-income communities.</p> <p><i>Risk pooling:</i> Sharing of premiums and risks, including within a region (basket of countries).</p>
	(2) Derivatives, including forwards and futures	<p><i>Forwards:</i> Contract that stipulates the sale or purchase of an asset at a specific price and date. This enables price hedging (risk management) and can be used as collateral for AVCF.</p> <p><i>Futures:</i> Forward contracts that can be traded on futures exchanges – this facilitates liquidity and easier access to financing and financial management including hedging.</p>
E. Other financial products	(1) Pre-Export Finance and Prepayment Finance	<p><i>Pre-Export Finance (PXF):</i> Structure used to provide finance to producers of goods/commodities. A FI advances funds to a borrower based on proven orders from buyer(s).</p> <p><i>Prepayment Finance (PPF):</i> Payment in advance for goods/commodities to enable production.</p>
	(2) Securities, bonds and notes	<p>Cash-flow-producing assets are pooled and repackaged into securities sold to investors, e.g. Collateralised Debt Obligations (CDO): Can free up cash and can reduce cost of financing; e.g., an investment fund that has funded several projects, using debt instruments can sell its future earnings from these debts to a special-purpose vehicle that sells CDOs to raise the necessary funding.</p> <p><i>Bonds and notes:</i> An entity raises cash from private or public markets by issuing a debt obligation, e.g. on a company's balance sheet or through issuing an asset-backed security.</p>
	(3) Loan guarantees	Loan guarantees offered by value-chain market participants or third parties (e.g. government agencies) to attract finance and reduce lending risks.

CATEGORY	INSTRUMENT	DESCRIPTION
	(4) Funds (debt, mezzanine)	Investment funds specialising in AVCF, and providing equity/debt /mezzanine finance to investee companies (risk appetites of funds differ – some are willing to take high risks, so invest in equity, others are relatively risk averse and prefer debt, some are in between and invest in a range of instruments).
Source: Modified from Miller and Jones (2010), Miller (2012) and Miller (2015)		

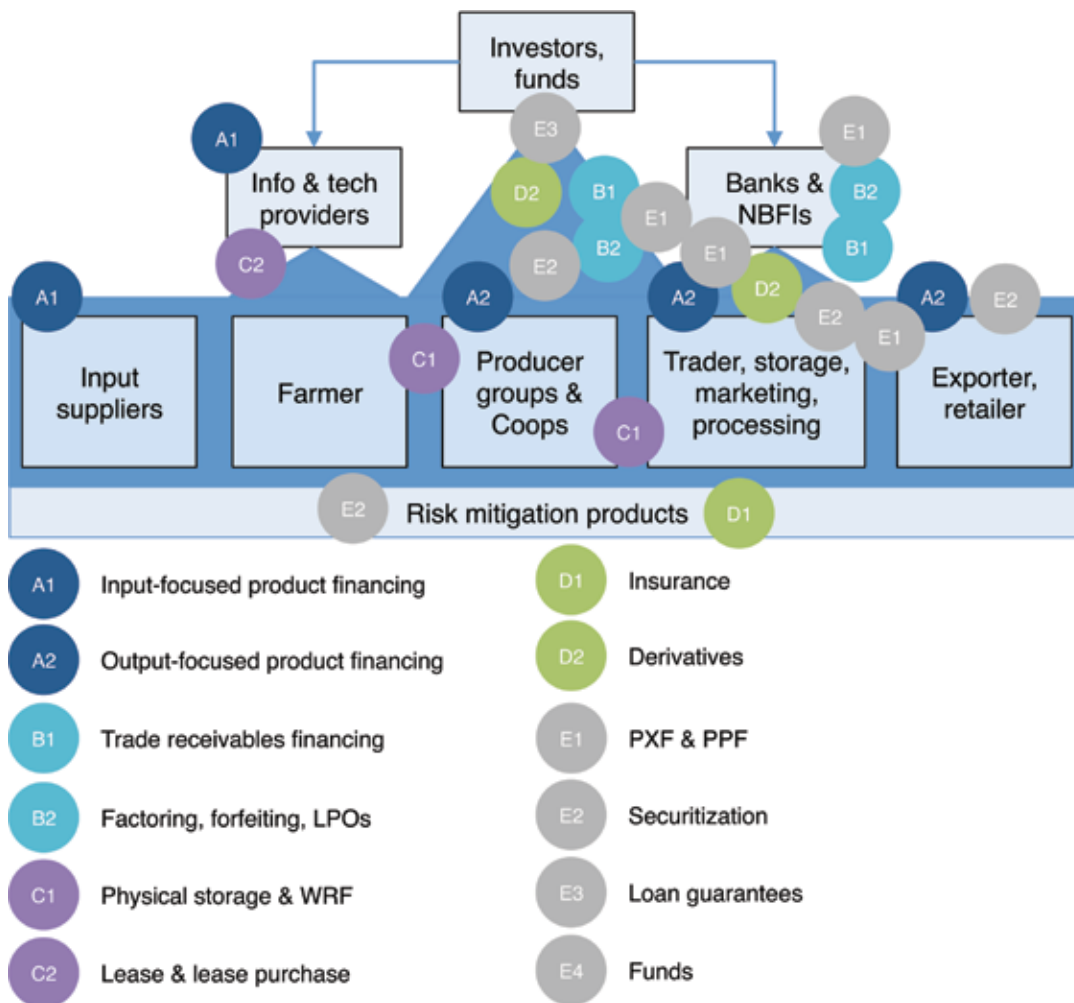


Figure 3. General overview of where AVCF products fit into the value chain (note - the dark blue areas indicate areas of interception, e.g. investors and funds can provide a range of financing directly to value-chain participants such as producer groups and cooperatives, and can act through other channels, including banks. Also note the clustering of AVCF products to one side of the value chain).

Agricultural value-chain products for climate change resilience

The purpose and objectives of AVCF is to align and structure financing to fit specific value chains, and to reduce the costs and risks associated with finance (Miller, 2015). In the context of seeking increased climate resilience, this means investments that:

- Increase revenues, e.g. increasing yield through improved varieties
- Reduce costs, e.g. lower price for high-quality inputs, storage to reduce losses, lower labour requirements and lower cost of capital
- Reduce uncertainty and risk, e.g. insurance products, access to weather information, reliable market access and prices, and certified products.

Camerinelli (2014) states that the likelihood of success of a specific AVCF product – including interest and commitment by potential parties and necessity of government or donor intervention – is determined by:

- Fee and cost structure: What is the cost associated with the finance mechanism? What are the up-front or establishment costs and ongoing costs to an AVCF product, and how are these assigned?
- Transfer of title and legal aspect of the title (e.g. rights to goods and purchase orders): Are these assignable? Are they enforceable? How are they valued fairly?
- Payments: Are there limitations on currencies and payment channels, both for money in and money out of the country?
- Dates: Since agriculture tends to be seasonal and highly time-sensitive, how does the AVCF product fit with value-chain market participants' financing needs and operational processes?
- Risk: What are the liabilities associated with the AVCF product to the lender and borrower? Are there any risks to other parties that should be considered?
- Benefits: Are the benefits to each party clear and tangible? Can they be quantified and monetised?

Another point to note is that many investors face legal limits: they are restricted in their choice of investments, in terms of countries, industries and/

or risk profile. Furthermore, investors and lenders have thresholds: they have internal rules that define the specific risk exposures that they are allowed to take (e.g., if they have already financed two companies in the industry they may no longer be able to finance a third, however good its credit risk may be). Finally, the legal environment in which the AVCF product is being deployed has an impact.

The following sub-sections describe the different AVCF product categories. Case study examples are provided, and for each category, the linkage to agricultural climate change resilience is explained. General case studies have typically been used, as there are few case studies available that explicitly deal with resilience finance. Each case study considers the motivations of financiers and other stakeholders who introduce AVCF products, provision of public support, participant experiences, farmers' uptake and repayment and other stakeholders' reaction. (Note. AVCF case studies for categories D and E, 'Risk-mitigation products' and 'Other financial products,' do not include farmers' reaction and repayment as these product categories are typically not offered to or involve farmers.)

Product financing or 'pre-finance'

This category of products focuses on pre-financing of inputs, such as fertilisers and seeds, and outputs, facilitated by purchase contracts from buyers. Inputs may be pre-financed with cash (e.g. by a local MFI in collaboration with an input provider) or in the form of goods (e.g. if the input provider sells goods on credit). One of the aspects of climate change is that farmers are exposed to new risks which can best be mitigated by buying new inputs – such as drought-resistant seeds, of pesticides to combat new types of pests. Input-focused financiers are motivated to enable farmer access to these finance products. For example, they may be local distributors working on behalf of seed or fertiliser companies. For farmers, this type of financing increases access to inputs (or cash to buy inputs) necessary for production at a time when they may be cash-strapped and otherwise unable to acquire inputs, which can result in higher climate-related production risks.

Output-focused financiers, such as exporters or processors who need a certain volume and quality of product, seek to obtain control over an agricultural product. For farmers, output-focused financing may provide access to cash at a critical time in their production cycle. If the financier is to be repaid with product rather than cash, a farmer may be inclined to side-sell if they receive a better price elsewhere so building trust within these types of relationships is an important success factor for output-focused AVCF.

Product financing tends to require strict and transparent adherence to quality, both for inputs and outputs, which may require the involvement of certification agencies. When the produce that

farmers sell does not meet the quality standards set by buyers, for example because crops were not treated in time, the financier risks not being paid. Whether the financing is anchored around inputs or outputs, clarity and transparency are needed around costs, such as the value of agricultural inputs provided on credit or the value of agricultural outputs. Financing the entire value chain of input producers, buyers, traders and distributors, not just farmers, is often an issue (e.g. working capital to agri-dealers). Output-focused financing primarily requires support in the form of information provision (e.g. weather forecasting) and technical assistance and extension to farmers to help them adapt to changes in demand and ensure delivery of quality product.

Case study 1

One Acre Fund: asset-based financing for smallholder farmers

Founded in 2006, One Acre Fund is a non-profit social enterprise that provides smallholder farmers in Eastern Africa with a combination of technical assistance, rural distribution of farm inputs and asset-based financing in order to improve smallholder livelihoods and reduce poverty and hunger. One Acre Fund provides flexible loans to match the irregular income flows of low-income farmers. This is combined with training and regular follow-ups, provision of improved inputs, facilitated access to marketing and storage, and crop and funeral insurance (the latter mitigates against loan repayment failure). One Acre Fund provides an average loan amount of about US\$80 per half an acre in the form of farming inputs such as seeds and fertiliser. Farmers are required to enrol in groups,

and to make a small down payment in order to join the programme.

One Acre Fund currently has around 300,000 farmers as customers and, in 2014, achieved average farm income increases of approximately 50% for enrolled farmers, significantly improving their resilience in terms of household incomes and risk exposure. One Acre Fund is working towards financial sustainability for its core field operations, and has an average loan repayment rate of about 99%. Farmer loan repayments covered 74% of field operating costs in 2014, with donor support covering the shortfall (e.g. from the United States Agency for International Development [USAID] and innovative partnerships with local governments under a government services unit focused on input distribution, training and extension partnerships).

Sources: Hilda Poulsen, Pers. Comm., November, 2015; Bain and Company (2014); One Acre Fund (2015).

Case study 2

Syngenta and TechnoServe: Mavuno Zaidi

Mavuno Zaidi (*Grow More*) is a partnership between Syngenta and TechnoServe focusing on smallholder potato and tomato growers in Kenya. The average farmer has less than one acre and was previously utilising low-technology tools and relying primarily on rainfall conditions, which have been unpredictable in recent years. Major challenges include underuse of high-quality inputs, poor production practices and inefficient value chains brokered by a large number of middlemen.

This initiative has demonstrated that improved access to seeds, fertilisers and crop protection disrupts these

patterns and improves climate resilience, if paired with improved awareness, affordability and aggregation:

- Awareness (extension through farmer groups): Mavuno Zaidi is implemented through existing farmer groups that have come together to market dairy, banana and passion fruit. Farmers are trained on best practices in vegetable production and business skills.
- Affordability (linking to financial products). Over US\$150,000 of crop inputs have been provided on credit to farmers (in the form of inputs repaid through dairy deliveries to farmer groups, and through formal loans from Equity Bank). Farmers who deliver milk to the cooperative (usually

daily) are able to access vegetable inputs on credit, which generates a large volume of sales through the input store. As farmers continue to deliver milk, a small amount is deducted daily to pay off vegetable inputs.

- Aggregation (collective sales and link to produce buyers). When farmers are confident that they will have a good market for increased production, they are much more likely to invest in better inputs. Collective sales through aggregation centres have increased farmers' bargaining power and attracted more committed, large-scale wholesalers to the area. The participating potato farmers have also built and operated low-cost charcoal storage facilities, which led to 400% price gains in the first year.

After the first year of the pilot, topline results are encouraging:

- 2,500 tomato farmers with an average increase in net income of US\$4,040 per acre (85%) and an increase in tomato yield of 113%.
- 5,300 potato farmers (Eldoret and Marakwet) with an average increase in net income of US\$568 per acre (45%) and an increase in potato yield of 37%. Results are expected to continue to improve dramatically since certified potato seeds were introduced in the area in November 2015.
- The programme started to provide traditional loans through Equity Bank in the fourth quarter of 2014. It has had a 100% repayment rate, and no guarantees were required. The initiative received minor funding from TechnoServe and the Rockefeller Foundation, but has primarily been funded by Syngenta.

Source: Pers. Comm. Peter Veal and Erica Bliss, Syngenta, Pers. Comm., November 2015.

Case study 3

Amiran Farmers Kit

Amiran is an equipment and inputs supplier, established in 1963, with a strong presence in Kenya. The company sought to diversify its customer base away from large-scale horticulture and floriculture farmers to smallholder farmers. Their Amiran Farmers Kit (AFK) programme, launched in 2009, had reached 200 youth groups and over 15,000 smallholder farmers (most of them organised in youth groups) in Kenya by the end of 2014 (Ndung'u, 2015). Under a programme managed by Kenya's district administrations, farmers determine the size of greenhouse and other kit they require and negotiate loan terms with a participating bank. These include Chase Bank Kenya, Equity Bank, K-Rep, Co-operative Bank and Kenya Women Microfinance Bank. The bank finances a proportion of the cost for the AFK; 75–90% depending on its relationship with Amiran.

The bank deposits funds in Amiran's account and after depositing their part of the cost, farmers are provided with the kits, which includes greenhouses, drip irrigation systems, solid water tanks, sprayers, high-quality seeds, nursery sets, fertilisers and agro-chemicals, health and safety information and protective gear, training and user manuals, agro-support post sales package and life and crop insurance provided by the Co-operative Insurance

Company of Kenya. The AFK ranges in value between US\$2,000 and US\$5,000. Farmers' output is sold to major exporters or supermarkets. Buyers pay for the farmers' produce through the participating bank. Repayment of the equipment is spaced over two years. With regard to climate resilience, AFK minimises water use and reduces weather risk for farmers. The maturity of the loan is three years, and it is interest-free (thanks to a government subsidy). The repayment starts four months after acquisition of the lease and is adjusted in case the crop chosen by the borrower has a longer maturity period.

The performance of the scheme has been below expectations. Uptake has been low. In particular, the requirement of 10% own-capital has been a hindrance, as has been the requirement for participating youth to show evidence of financial stability in the form of payslips, M-Pesa statements or bank statements. Repayment has also been poor, in line with the overall experience of Kenya's government-operated Youth Fund programmes where many beneficiaries are likely to see the loan as a grant, but also as a result of production problems. Where greenhouses were constructed, lack of water often proved a problem (a result of changing weather patterns), and young farmers were unable to cope with the bacterial wilt that affected tomato production throughout the country.

Relevance to agricultural climate resilience

Many adaptations of product-based financing models are currently being tested, however few have explicit links to enhancing agricultural

climate change resilience. Specific constructions of this type of financing and its relevance to climate adaptation and resilience will depend on local circumstances, and require assessment of financed activities that genuinely promote

Buyers can influence agricultural production through sourcing and purchasing strategies and any associated financial support offered.

‘climate resilience’. There are clear opportunities to enable farmers to improve their productivity and reduce production risks, which will impact their resilience (e.g. access to new seed varieties that may have better germination rates and better tolerate climatic variability).

In terms of output-focused models, buyers can influence agricultural production with both sourcing and purchasing strategies, and any associated financial support packages offered. For example, a buyer may foresee that climate change will impact sourcing and may diversify where they buy product from, although this may require external financial resources depending on product availability. Buyers may also create, or support the creation of, specific pre-financing lines for ‘climate-smart’ products to facilitate uptake and encourage security of supply. There are no climate-specific examples to date, however it is likely that this is already occurring through buyers collaborating with input companies to facilitate access to improved inputs, training, infrastructure and financing.

Receivables financing and factoring

This financial product is more commonly found in developed financial markets and countries, but simpler versions have been seen within developing countries. A receivables approach effectively monetises the future value of the commodity, specifically payment receipts related to forward-contracted future production. This typically requires a financial intermediary to assign value to the contract based on the face value of the agreement, the chance of that agreement being

met, and the assignability of the contract. For farmers, this can allow quicker access to cash, although at the expense of a discount on product value. For example, if a farmer regularly sells flowers to a supermarket, and the supermarket pays 3 months after delivery, then the payment obligations of the supermarket (the farmer’s receivables) can be sold to a third party. This is called factoring if the receivables already exist (i.e., after the flowers have already been delivered by the farmer) and future receivables financing if the receivables still have to be created (i.e., if the flowers still are to be delivered by the farmer).

For the financier, if a receivable is assignable (i.e., the entity to which the payment is due to be made has the right to irrevocably assign the payment to a third party) and there is a high likelihood that the contract will be made good, interest can be earned through relatively short-term lending. This is only really possible when farmers have a good track record and when the contract is with a credit-worthy counterpart. A receivables approach can be attractive because underwriting is based on the risk of the receivables (i.e. the buyer of the product) rather than the seller (GPI and IFC, 2012). In the example of the flower-selling farmer above: the financier takes no risk towards the farmer in financing him in return for the assignment of the receivables, because once the flowers have been delivered and the supermarket has acknowledged receipt, the supermarket is liable for timely payment. However, regulation must be in place that enables the validity of the assignment or onward sale of the receivables and the financial structure is intrinsically complex and administratively demanding.

Case study 4

Biashara Factors: agricultural factoring for tea in Kenya

Biashara Factors Limited² (since sold to Soko Letu Ltd.) was set up as the microfinance arm of the Kenya Gatsby Trust, part of the Gatsby Charitable Foundation. Biashara Factors Ltd. (Biashara) provides invoice factoring to small-scale tea, cotton, fish, horticulture, coffee and dairy producers in Kenya. In factoring, a financier provides immediate funds to suppliers who normally have to wait for payment by their clients, in return for the right to these future client payments. Tea producers in Kenya typically have to

wait up to three months before being paid for their product. As a result, cash-strapped farmers often choose to sell their output to private traders where they are paid quickly, but at a significant discount. A local tea cooperative approached Biashara to establish a factoring facility, based on consolidating smallholders’ tea and selling it directly at the Mombasa Auction. This resulted in a contract between the auction house, cooperative factory and the factoring company: twice a week, the auction house sends a receipt to Biashara, listing deliveries of tea it has received from the cooperative, thus enabling Biashara to pay out at least 70% of the money to the farmers.

² <http://www.biasharafactors.com/>

When the tea has been sold, the auction house pays the balance to the factoring company (Biashara), which deducts 10% of the total and pays this to the cooperative factory bank account. This ensures that Biashara is repaid for the risk it takes in effectively pre-financing farmers. The bank deducts the loan repayment from the factory account and the factory

cooperative pays the farmers the remaining amount minus interest. This model involves about 3,000 farmers, and its creation was motivated in part by the expressed need of the cooperative factory, together with Biashara, which has primarily an impact motive.

Source: Mathu (2010)

Case study 5

COPRORIZ and CAF: Isonga paddy commercialisation loan

COPRORIZ is a Rwandan rice growing cooperative established in 2003 by 280 rice growers. The cooperative manages relations with credit providers, transporters, millers and wholesalers on behalf of farmers. COPRORIZ provides inputs (fertilisers, seeds, pesticides), collects and bulks the rice that the farmers produce, manages relations with buyers and provides extension and training to its members. Previously, the cooperative lacked access to working capital to buy inputs in bulk for farmers, who were cash-strapped and would commonly under-invest in production, thus experiencing reduced yield (3 t/ha instead of 5 t/ha). Coupled with poor land management practices, low input use also encouraged the spread of pests and disease. Farmers typically had to wait two months for payment, and would instead sell to traders at a discount.

The cooperative decided to approach a local MFI, Caisse des Affaires Financières (CAF) Isonga. CAF created a range of financial services for cooperative members with technical assistance from SNV (a Dutch NGO) and Terrafina Microfinance. COPRORIZ also received donor support for its activities. CAF

Isonga provided credit to farmers to buy fertiliser and hire labour. COPRORIZ screens farmers for credit-worthiness and only farmers that are members of COPRORIZ can access loans under the programme. COPRORIZ guarantees the farmers and co-signs a loan agreement with CAF Isonga. CAF Isonga transfers money to the borrower's account, which is held by CAF Isonga.

The farmer repays the loan by delivering rice to COPRORIZ. If the farmer defaults COPRORIZ is liable. CAF Isonga developed a 'Paddy Commercialisation Loan', a specialised credit line that enables COPRORIZ to pay farmers on the same day they deliver rice to the warehouse. COPRORIZ bulks and stores the rice until it determines that it can secure a good price. It then transports the rice to the buyer and pays off the loan plus interest to CAF Isonga. This farmer programme is managed through a voucher-based system. In 2010, CAF Isonga faced a liquidity crisis, which impacted COPRORIZ and prompted them to seek other financing partners. Kenya Commercial Bank Rwanda entered into a partnership with the cooperative. COPRORIZ serves around 2,000 members. (No information is available on repayment record).

Source: Joseph (2010); Muragu and Zhang (2012)

Relevance to agricultural climate resilience

The link between receivables financing/factoring with agricultural climate resilience is not explicit. However, some buyers may be willing to provide special contracting terms for 'climate-smart' production, which may better enable monetisation of such agreements by the farmer (e.g. certified products, products that are targeted for 'deforestation free' supply chains). Additionally, any financial products that help farmers build better businesses, for example by freeing up cash flows for investment, has the potential to facilitate agricultural climate resilience.

Banks and buyers may also eventually consider the climate risk associated with certain producers and incorporate this into the discount rate they apply to such receivables. For example, a bank

or NBFi may apply a higher discount rate to the receivable if production practices are unsustainable or particularly prone to climate risk (e.g. cultivation of seasonal crops on steep slopes).

Physical asset collateralisation – 'inventory finance' and leasing

This AVCF product category uses an existing asset to unlock access to credit or to necessary production inputs (in particular moveable equipment). This may be in the context of a farmers' agricultural output or can be used as a way to enable a farmers' access to the inputs required for production.

WRF and repurchase agreements ('repos') enable a farmer to effectively transform their product into credit. In WRF, a farmer can store their product in a legally designated warehouse where it has been appraised (graded) using an accepted approach and certification scheme. With respect to repos, a farmer can sell their product to a specialised firm to unlock cash and are then able to buy it back at a later date based on a pre-agreed price. This type of AVCF product typically requires establishment of a Collateral Management Agreement (CMA): a tripartite agreement between a collateral manager or warehouse operator, named depositor or owner and a financier. The primary issues with respect to these systems are:

- The perishability and storage of goods
- Valuation procedures of the product (i.e. transparent and widely accepted grading and certification schemes to determine fair value)
- Availability of quality warehouses and storage, and associated personnel
- Finance providers' acceptance of such receipts, e.g. laws that give validity to such receipts and their eventual assignability.

Inventory finance also requires a performance bond (a guarantee from a third party such as an insurance company or a bank), an indemnity fund or some other form of acceptable insurance coverage to mitigate warehousing and storage risks, and relatively transparent agricultural prices. It is also suitable only for a specific set of commodities, typically non-perishable commodities that are traded relatively often, such as maize or rice.

Leasing and lease-purchase can give farmers access to equipment and inputs they may not otherwise be able to afford. For example, a farmer or a group of farmers may lease a tractor to allow them to be more efficient in their farming practices. In a lease-purchase, a farmer may effectively buy equipment on credit and pay back the purchase with interest over time as they use it. The key issues with respect to this model are the nature of the equipment and credit information, e.g. it is more difficult to repossess seeds or plants compared with a tractor. Credit information systems in ACP countries are often lacking, which adds an additional layer of risk. This model also requires appropriate legislation in terms of laws governing collateral and creditor rights.

Case study 6

Warehousing system and Centenary Bank coffee pilot

The Government of Uganda introduced a formal set of rules around WRF in 2006 (note that the rules governed only public warehousing, not collateral management). These rules cover issuance and negotiation of warehouse receipts, duties and responsibilities of parties to such a transaction, and provides a good basis for local banks to develop appropriate products and policies. This regulation enabled banks to provide financing to licensed warehoused depositors for a minimum tonnage (3 t) of certain commodities, including maize, paddy rice, coffee and cotton. Typical advances (loans) are up to 60% of the value of the deposited produce, for term lengths of loans (tenors) not exceeding 120 days, and the farmer/trader is required to sell through the Ugandan Commodity Exchange (UCE) trading floor. Repayment and resettlement happens between the UCE and bank (lender).

There was good uptake within the first year (about 100 clients), and it gave smaller sellers a platform through which to sell to large buyers such as the World Food Programme (WFP). Average loan sizes were about US\$7,000 per transaction and it was

predominantly accessed by local cooperatives. It also encouraged better post-harvest handling and storage. Challenges included technological hitches with electronic receipts, limited warehouse facilities and other related infrastructure (storage, transport infrastructure), a lack of enforced graded commodity standards in the country and the region, and unpredictable weather patterns. The electronic system was also challenged by user literacy, as well as system accessibility and reliability. UCE is now no longer operational. Lessons learned include: the need for a critical mass of licensed warehouses near key production areas, sensitisation of value-chain participants, technical assistance to producers to produce at adequate quality standards and promote bulking, and enforced standardisation of commodity grades (HFB, 2012).

Climate change (droughts, floods and changing rainfall patterns) is already negatively affecting Ugandan coffee production. In response, Uganda's Centenary Bank (UCB) has been developing a specialised product for the coffee sector together with other partners, including the International Institute for Sustainable Development (IISD). UCB is primarily an MFI that has begun to focus its efforts on the agricultural sector. In 2013, agriculture accounted for about 20% of the bank's

portfolio, involving around 32,000 farmers. In 2013, Centenary started what was essentially a factoring pilot with a warehousing element. UCB works with collateral managers who are private sector operators licensed by the government and act as intermediaries between the bank and producer associations or other product 'bulklers'. Once farmers' coffee has been assessed and accepted into the warehouse, the collateral manager notifies the bank and solicits clearance to release the stock based on the contract or invoice issued by the

collateral manager. Once cleared by the bank, the collateral manager pays out 80% to the bulker, who passes this on to the farmer immediately (for a fee). This reduces the standard waiting period of 90 days that farmers face. This programme supports climate resilience in that it helps farmers to reduce post-harvest losses through access to storage, and increases access to affordable and timely credit.

Source: Adapted from Dekens and Bingi (2014)

Relevance to agricultural climate resilience

Access to proper warehousing and storage facilities and repurchase opportunities naturally creates resilience for farmers, as it enables them to better manage cash for investment, and means that they can store their product in a safe environment (i.e. less post-harvest loss). Prioritising WRF in areas that are more prone to climatic risk supports adaptation and resilience, especially when coupled with technical assistance that encourages farmers to plant appropriate crops and practice good land management techniques.

Leasing and lease-purchase arrangements can help farmers access more appropriate technologies, thus helping them to improve their socio-economic and environmental resilience. For example, access to small-scale greenhouses and drip irrigation kits helps farmers to overcome environmental risks and gain access to no-till equipment (e.g. air seeding

equipment), which helps to maintain soil fertility and increase on-farm climate resilience.

Risk-mitigation products

Insurance products that mitigate negative impacts to farmers who experience extreme weather and crop failures play an important role in many developed countries, such as the US. In terms of direct-to-farmer insurance products, different options exist, such as: single-risk insurance, combined (peril) insurance, yield insurance, revenue insurance, income insurance, whole-farm insurance, area yield index insurance, area revenue index insurance, indirect index insurance and stabilisation accounts. Many of these products are only available in developed economies, for example, revenue and income insurance. In most countries, agricultural insurance is fully or partially subsidised (Bielza *et al.*, 2008).

Insurance definitions

Single-risk insurance: Insurance against a specific risk (e.g., flood or frost). In some cases, single-risk insurance can include other scattered risks; for example, hail insurance (the most widely used crop insurance in the EU and often the only kind of insurance available to European farmers) often also includes insurance against fire.

Combined (peril) insurance: A kind of insurance that bundles together multiple coverages that typically would be needed with each other (e.g., flood, drought, excessive rain, hail).

Yield insurance: An insurance that pays an indemnity if, because of any meteorological event, the farmer's actual yield is less than the guarantee (which is based on the farmer's past yields).

Revenue insurance: An insurance that pays an indemnity if the combination of a farmer's actual yield

and the cash settlement price for the relevant crop in the futures market is less than the guarantee.

Income insurance: The same as revenue insurance, except that the costs of production (e.g., fertiliser costs, diesel prices) are also taken into account.

Whole-farm insurance: Insurance that covers the combined yield of all the crops produced by the farm. A yield reduction in one crop will not be compensated by the insurer if the global production reduction of the farm does not reach the trigger level. This insurance uses the farmer's past revenues, according to their tax records, to determine a level of guaranteed revenue.

Area yield index insurance: An insurance that pays an indemnity whenever the realised yield for the relevant crop in the agreed region (e.g., a district – the index is generally based on official statistics) falls below a specified critical yield,

regardless of the realised yield of the farmer who took out the insurance.

Area revenue index insurance: An insurance that pays an indemnity whenever the realised yield for the relevant crop in the agreed region (e.g., a district) multiplied by that crop’s settlement price in the futures markets falls below a specified level, regardless of the actual revenue of the farmer who took out the insurance.

Indirect index insurance: An insurance that pays an indemnity whenever an index of meteorological

indicators (e.g., mm of rainfall) or satellite images show numbers that exceed certain threshold levels. Weather derivatives are often included in this category of insurance.

Stabilisation accounts: A form of self-insurance where farmers contribute an amount of money every year to their individual stabilisation accounts (managed by insurance companies), which they can withdraw in a year of big losses. The government pays a share when producers withdraw funding from their accounts.

Over the past decade, various new insurance products have been tested in ACP countries. As yet, there are few purely commercial products for agriculture, including in the Pacific and Caribbean, despite the heightened climate risk faced by many producers in the region. Examples of direct-to-farmer insurance products include the banana industry in the Eastern Caribbean and a subsidised agricultural insurance company in the Dominican Republic (Aseguradora Agropecuaria Dominicana SA – AGRODOSA) (World Bank, 2012). Various products are also available in Africa.

A range of insurance solutions exists, depending on the nature and scale of risk, and risk layering is increasingly practised. Risk layering is defined as “the process of separating risk into tiers that allow for more efficient financing and management of risks” (Cummins and Mahul, 2009). It

involves combining different insurance products from micro (household and project) to macro (government, multinational) levels. Figure 4 describes how risks tend to be allocated and illustrates the need for risk layering. Risks that are of relatively low severity and high frequency are usually managed by the farmer and are mitigated in part through access to savings and investments. Micro-insurance products for clients or lenders (i.e. combined with microfinance) may address this. For larger entities, climate risks may be insurable, especially when risks are of sufficient scale. Risks that are of high severity (‘catastrophic’), but high frequency are typically managed by risk transfer techniques including use of reinsurance or stop loss funds (these are captive funds in which a number of organisations pool funds to provide for payouts for large risks), and are appropriate only for very large entities.

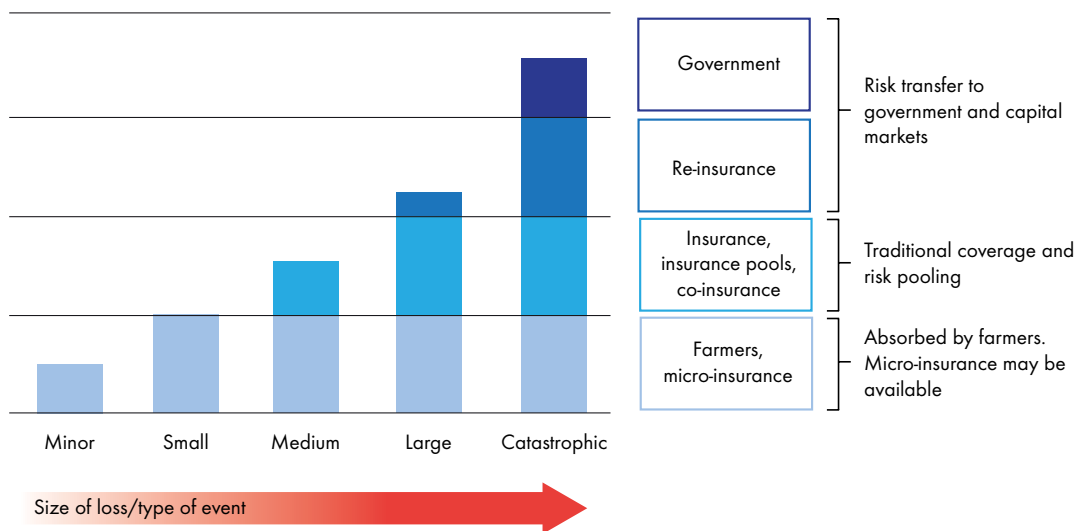


Figure 4. Risk layering in insurance.

Source: Mahul and Stutley (2010)

Whereas most insurance and insurance-related products are relevant only for larger institutions, micro-insurance refers to a range of insurance products offering coverage to low-income households. Given that this demographic is less able to pay for insurance coverage, methods are typically more indirect and based on independently verifiable factors that can trigger payouts, for example weather index crop insurance and multi-peril crop insurance based on different levels of coverage and including life and property risks (Aseffa, 2010). Typical payouts are generally small, but may be critical for vulnerable households. Indirect insurance, which can also be called parametric or index insurance, has increasingly received attention related to climate resilience. This type of insurance pays out based on triggers that can be inferred from ‘independent’ available information (e.g. information from weather stations or satellite data). Such insurance products do not require site-specific checking of claims for each individual claimant.

Products (i.e. Loan Portfolio Covers, LPCs) are also available for loan portfolios of lending institutions, in particular MFIs (MCII, n.d.). These have been used, for example, by MFIs to protect themselves against the widespread payment default that may occur in the case of a generalised drought in the area in which they are lending.

Reinsurance and risk pooling are ways for larger entities, in particular governments and insurance companies, to mitigate their risk. These products can ensure that adequate resources are in place for other parts of the value chain in case of catastrophic events. Reinsurance is simply a way for insurers to take on insurance, transferring risk and premium to other insurers and providing diversification of risks and financing. Risk pooling may be done at many different levels. Payouts may also be based on parametric conditions, such as extreme weather events, as these are relatively independent and measurable. A number of relevant cases are being tested under such risk-pooling programmes, including: the African

Risk Capacity (ARC)³ – a sovereign parametric risk pool for drought covering four African states; the Pacific Catastrophe Risk Insurance Pilot (PCRIP)⁴ – a sovereign parametric risk pool for cyclones, earthquakes and tsunamis; and the Caribbean Catastrophic Risk Insurance Facility (CCRIF)⁵.

As an alternative to reinsurance and risk pooling, insurance-linked securities (ILS) are used to mitigate exposure, in particular by insurance providers. One example is Cat Bonds, which are high-yield debt instruments that are usually insurance-linked and raise money in case of a catastrophe. The issuer (usually an insurance or reinsurance company) pays a yield (an interest rate) that is relatively high, but if they suffer a loss from a particular pre-defined catastrophe, then the issuers’ obligation to pay interest or even to repay the principal is deferred or forgiven (Carr and May, 2011). The risk to the Cat Bond issuer may be further alleviated in a ‘Cat Swap’⁶ (like in other swaps, two payment streams are exchanged: in this case, the insurer pays a stream based on its normal revenues, while the counterpart pays a stream based on an index of catastrophe losses).

In 2009, Mexico issued a series of Cat Bonds (notes), worth US\$290 million, based on risk assessments of the probability and likely severity of catastrophic events in Mexico. These were very well received in the market and led to the launch of the MultiCat programme, which gives the Mexican government and other public entities access to capital markets to insure themselves against the risk of natural disasters (GFDRR, 2013). The Cat Bond market was valued at over US\$20 billion in the first quarter of 2015 (Carpenter, 2015). New models, such as Food Security Catastrophe Bonds are being explored to tackle specific issues linked to climate change resilience and food security (Anon., 2013). In December 2014, ARC announced the establishment of the Extreme Climate Facility (XCF), a multi-year funding mechanism that will issue Cat Bonds to provide additional financing enabling ARC members to manage climate risks (ARC, n.d.).

Micro-insurance refers to a range of insurance products offering coverage to low-income households.

3 <http://www.africanriskcapacity.org>

4 <http://pcrafi.sopac.org>

5 <http://www.ccrif.org>

6 This occurs when a Cat Bond issuer enters into a swap with another financial institution, which agrees to pay the Cat Bond issuer interest payments based on LIBOR in exchange for earnings on the Cat Bond collateral. The Cat Bond issuer enters into this agreement to hedge its positions. More information is available at: <https://www.finra.org/investors/alerts/catastrophe-bonds-and-other-event-linked-securities>

The other sub-category of products under AVCF risk-mitigation products includes a range of other derivatives, including futures, forwards, options and swaps. These are essentially financial contracts that enable users to manage risks by enabling the purchase or sale of a specific type of asset (such as crops or livestock), at a specific time and price. This section will consider only futures and forwards.

Futures contracts are exchange-traded and are relatively standardised, with accompanying infrastructure such as clearinghouses and relatively high liquidity for a relatively narrow set of crops. Forward contracts are private agreements and are not as rigid in their conditions; they are traded ‘over the counter’ (OTC) and are hence significantly less liquid and standardised. Futures contracts are commonly used by large agricultural trading companies to ‘hedge’ or offset risks. There have been some tests to encourage greater participation by smaller agricultural companies with farmers,

notably in India (Rajib, 2015). Most exchanges in ACP countries are too small to sustain the volume of trade required to support an active market in relevant derivatives such as futures. The World Bank ran a pilot scheme in 1999–2006 where, in partnership with a few financial institutions (FIs) (e.g. Rabobank International), farming groups such as cooperatives in Central America and Africa were given training in, and access to, OTC instruments that were look-a-like options contracts, in order to protect producers against price deterioration (see case study 7).

A forward contract is basically the monetisation of some of the AVCF products that are discussed above, such as warehouse receipts. These are inherently credit instruments that can be used if a party has good credit. A farmer can use a fixed-price forward contract, whereby the farmer promises to deliver a certain volume of (standardised) produce on a certain day, to unlock pre-harvest financing, and FIs receive increased comfort that price volatility is reduced

Derivatives definitions

Clearing house On an organised exchange, the entity which automatically assumes the position of counterpart to both sides of a transaction once it has occurred on the exchange. This means that buyer and seller are no longer exposed to each other’s credit risk, but to the credit risk of the highly-rated clearing house.

Forward contracts Agreements to purchase or sell a specified amount of a commodity on a fixed future date at a predetermined price. Physical delivery is expected and actual payment occurs at maturity (the future date that has been agreed to in the contract).

Futures contracts Like forward contracts, futures are agreements to purchase or sell a given quantity of a commodity at a predetermined price, with settlement expected to take place on a future date. However, a futures contract does not necessarily imply physical delivery in fulfilment of the agreement. Rather, the usual outcome is the offsetting of the contract on or before maturity (the closing date of the contract) by an equivalent reverse transaction. Futures are traded on organised futures exchanges.

Hedging Using derivatives to protect against price risks on the physical market in which one is active. For example, to hedge, a producer planning a future physical sale would, at the time of planning, sell a futures contract. When, later, he actually sells his physical goods, he has to simultaneously buy a futures contract, to close out his position. For the physical sale, he receives the market price prevailing on the

day of the sale. If this price is lower than the price in the futures contract, the loss on the physical market is compensated by the higher price on the futures contract. On the other hand, if the price in the physical market is higher than in the futures contract, the gain on the physical market is offset by the loss on the repurchase of the futures contract. In either case, by hedging with futures the producer had locked in his future sales prices. If he had hedged with options, he would have secured a minimum price.

Option contracts An option contract is the right (but not the obligation) to purchase or sell a certain commodity at a pre-arranged price (the ‘strike price’) on or before a specified date. For this contract, the buyer or seller of the option has to pay a price to his counterpart at the time of contracting, which is called the ‘premium’; if the option is not used, the premium is the maximum cost involved. If an option gives the right to buy at a preset price, it is termed a ‘call option’. This right to buy at a preset price is attractive for those who think that the market price will increase: it will enable them to buy at the lower price. It gives price protection to consumers and to processors and traders for the cost of the commodities they purchase. If an option gives the right to sell at a preset price, it is a ‘put option’. This protects the seller against a price decline.

Source: United Nations Conference on Trade and Development, A survey of commodity risk management instruments, 1998, <http://unctad.org/en/docs/pocomd15r2.en.pdf>

or removed from the counterpart through the 'hedge'. Various mechanisms are possible to determine the price at which the product is fixed, including tripartite agreements where the broker of the FI or the FI itself is party to the 'hedge'.

One of the most well-known initiatives to use forwards to unlock AVCF at scale is the Brazilian rural finance note, the Cedula Produto Rural (CPR), which is a promissory note (a 'promise to pay' at a predetermined time in the future) that is typically backed by a promise to deliver future production. CPRs were initially created by the Brazilian

government to encourage lending to agribusinesses and producers. When a farmer issues a CPR, the CPR buyer pays a given amount in advance; often, the CPR buyer is an input supplier, who uses the mechanism to provide inputs on credit (Miller and Jones, 2010). These instruments are primarily used by medium-sized farmers, but could be used by aggregators of smaller scale farmers, e.g. operating in cooperatives (Zakai, 2014). Though CPRs have been extremely successful in Brazil, to date they have not been transferred to ACP countries (but there is a World Bank programme to pilot them in Africa).

Case study 7

ACRE Kenya (previously Kilimo Salama)

ACRE was initially established by the Syngenta Foundation for Sustainable Agriculture together with the Global Index Insurance Facility (GIIF) as Kilimo Salama in 2009. It is now the largest agricultural insurance programme in Africa targeting smallholder farmers. The company is not an insurance provider, rather it works with local insurers and other stakeholders in the agricultural insurance value chain. This involves undertaking risk assessments, product development and risk monitoring to facilitate access to agricultural insurance, enabling farmers to invest in high-quality inputs, increase their productivity and access to credit. Farmers can insure as little as one bag of seed and any payments are made to the farmers' 'electronic wallet'. Access to quality inputs, insurance and credit is complemented by technical assistance.

Payouts are based on parametric information (i.e. this is an index insurance product using weather,

area yield and satellite-based information). Insurance partners include UAP Insurance (Kenya), SORAS Insurance (Rwanda), Century UAP (Tanzania), and re-insurers Swiss Re and Africa Re. ACRE was transformed into a commercial company in June 2014.

According to 2014 figures, ACRE serves over 233,000 farmers in Kenya, Rwanda and Tanzania. A 2012 assessment found that farmers that participate in the programme tend to invest 19% more in their farm and earn 16% more than neighbouring uninsured counterparts. In 2013, 97% of insured farmers received loans linked to the insurance. ACRE cites its greatest challenges as variable national insurance regulatory environments (e.g. allowable fee percentages) and the greatest barrier to expansion as access to reliable long-term data to support indices.

Sources: <http://acreafrica.com> and http://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/industries/financial+markets/retail+finance/insurance/agriculture+and+climate+risk+enterprise

Case study 8

Winward Island Crop Insurance

Windward Island Crop Insurance (WINCROP) was originally established in the Windward Islands in 1987 by small-scale farmers with shared capital provided by the local Banana Growers Associations, and then spread to St Vincent and the Grenadines and Grenada. WINCROP provides crop insurance, laying off its risks in the reinsurance market. It provides statutory insurance and optional contractual insurance against loss of banana holdings by windstorm and volcanic activity. It traditionally used on-call assessors to carry out assessments of damage (World Bank, 2012), however this has proven to be quite lengthy and costly in terms of training and mobilisation and led to subjective damage assessments.

WINCROP is established as a mutual insurance company owned by the banana growers' association. The government provides enabling legislation, but otherwise is not involved in the company. In 1992, its top year, WINCROP had insured more than 30,000 growers, but by 2008 this was down to 2,380, because of a general decline in the farming population, resulting in considerable declines in WINCROP premium income (Carballo and dos Reis, 2013). Due to market pressures, only about 700 banana farmers exist in the Windward Islands today (Winfresh, n.d.), making insurance for this business increasingly difficult due to the economies of scale. The government has recently taken measures to try to increase engagement in agriculture, e.g. by

establishing a low-interest credit facility through the Farmers Support Company.

In 2010, a hurricane devastated the banana crop in St Lucia and St Vincent. After the hurricane, it became impossible for WINCROP to obtain affordable reinsurance. WINCROP therefore changed its cover to index insurance, based on weather events rather

than measured crop losses. This risk could be readily reinsured, with the Micro Insurance Catastrophe Risk Organisation (MICRO), a micro-insurance organisation established in 2011 in the Caribbean region with support from development organisations.

Case study 9

The Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC)

This is a not-for-profit risk-pooling facility, operational since 2007, which is owned, operated and registered in the Caribbean for the member governments (16 Caribbean countries and two Central American countries). It was established to offer parametric insurance (i.e., insurance in which payouts are based on the occurrence of certain parameters, such as a catastrophic event, or an index reaching a certain threshold), starting with hurricane and earthquake coverage. In 2012, it also added an excessive rainfall product, based on satellite data. Because it is based

on immediately available parameters, CCRIF is able to provide for fast payment when a policy is triggered.

It is the world's first regional risk-pooling fund issuing parametric insurance and thus offers member governments the opportunity to buy natural catastrophe coverage at a significant discount compared with individual policies. Since its inception in 2007, the facility has made 13 payouts for hurricanes, earthquakes and excess rainfall to eight member governments. CCRIF was capitalised with contributions from a variety of donors and is sustained through fees paid by the insured countries.

Case study 10

World Bank and Rabobank: Commodity Price Risk Management pilots

In 1999, the World Bank formed the International Task Force (ITF) to develop and test several innovative pilot transactions to enable farmers' access to price stabilisation measures. The Rabobank Commodity Price Risk Management (CPRM) unit in London among other institutions participated in the ITF. Products developed included exchange-based swaps and cotton and fertiliser swaps for the coffee, cotton and cocoa industry (Jaffee *et al.*, 2008). As part of this programme, Rabobank worked with a Ugandan cooperative to help it manage coffee price risk. The company bought a small volume of price insurance for three primary producers associations and sold back the insurance when it was no longer needed. The small transaction benefitted about 450 small coffee farmers and as a result, further transactions occurred (WBCSD, 2004).

A simple example of how a price management product works is as follows: a producer buys price insurance that allows it to sell its crop at 30 cents/pound (the 'strike price'). The insurance premium is 4% of this strike price (1.2 cents/pound). If, at harvest, the international price of the commodity is 30 cents/pound or less, insurance can be claimed. The producer receives 30 cents/pound minus the insurance

premium, resulting in 28.8 cents/pound net to the producer. The producer knows that they will receive this minimum amount and are better able to plan purchases and investments. If the price goes beyond the strike price, e.g. to 35 cents/pound, the producer only pays for the insurance and receives net 33.8 cents/pound (WBCSD, 2004).

Though these AVCF products have significant potential for producers, challenges included sufficient trading volume and stringent due diligence (DD) and "Know Your Client" (KYC) requirements of FIs – both requirements impose high fixed costs on the FI, with there always remaining a risk that an issue has been overlooked, leaving the FI exposed to the risk of high regulatory fines. Additionally, it was found that many agricultural companies in emerging markets have more critical operational problems, and price risk management may not be a priority, especially when commodity prices are relatively high and stable. Lessons from the work included focusing on technical assistance and in particular on providing information on global markets and training on standard trading techniques to assess, quantify, and monitor physical and financial exposures to enable local agricultural businesses to make better business decisions and equip them with the knowledge of how they might reduce their risk exposure.

Relevance to agricultural climate resilience

According to the World Bank, weather-related losses and damage from destroyed property to crop failures have increased from an annual average of US\$50 billion in the 1980s to almost US\$200 billion in the first decade of this century (World Bank, 2013). There has been much discussion about the issue of ‘loss and damage’ under the United Nation’s climate negotiations (UNFCCC). This has led to the creation of several finance facilities including the Global Facility for Disaster Reduction and Recovery (GDFRR)⁷ and the Climate Investment Fund’s Pilot Program for Climate Resilience (PPCR).⁸ Notably, climate change itself is impacting the insurance industry (for example, making the analysis of historic data an inadequate tool for predicting future risks) and relatively poor levels of data availability in many emerging markets complicate financial product development.

Compared with other sectors, agriculture has distinct issues in dealing with risk and insurance. For example, the CCRIF provides coverage for 1:15 to 1:20 year events, yet the agriculture sector usually requires greater coverage (1:5 to 1:10). This means that there is a gap between the risk coverage provided and the actual frequency of climatic events impacting agriculture. Additionally, in places such as the Caribbean, weather and climate monitoring stations are usually concentrated in more urban areas, and may not accurately reflect impacts on the agricultural sector (World Bank, 2012). According to Nnandi *et al.* (2013), in ACP countries, agricultural insurance can increase climate resilience within the agricultural sectors by:

- Cushioning the shock of disastrous crop losses
- Stabilising farm incomes (and thus the rural economy) over time
- Improving farmers’ access to credit, through banks, cooperatives and NBFIs
- Providing farmers with greater revenue confidence, which encourages adoption of improved farming practices and use of higher quality inputs, enabling them to invest more in their agricultural business
- Replacing haphazard and sporadic grant and relief operations.

A number of emerging market governments are designing and testing different insurance

products to deal with climate change issues in the agricultural sector. For example, the Senegalese government created an agricultural insurance company, Compagnie nationale d’assurance agricole du Sénégal (CNAAS), for which it subsidises the premium by 50% and exempts CNAAS’ policies from value added tax (VAT). The purpose of this initiative is to make agricultural insurance available for 500,000 Senegalese farmers who are particularly vulnerable to climate change (Ndiaye, 2015). Although it started with traditional single- and multiple-peril insurance, it has also piloted a rainfall index insurance product.

In Bolivia, the government is working with resources from the PPCR through the Inter-American Development Bank (IDB) to create a Stop Loss Fund (a second layer of insurance) to cover a portion of the losses of the ‘Pachamama’ Agricultural Insurance Program (PAIP). This permitted the expansion of PAIP, which until then was limited by the risk absorption capacity of the Bolivian government (which covered all the risks). In the first phase of PAIP’s expansion, an agricultural insurance programme for municipalities with higher levels of extreme poverty (under a programme called SAMEP) was developed. In the second phase, commercial agricultural insurance products for small and medium-sized farmers were developed under a new public–private partnership arrangement: the policies were administered by private insurance companies, part of the risks were covered by PAIP (Anon., n.d.). Figure 5 describes the overall structure of the scheme (Anon., n.d.).

Designing appropriate strategies for the agricultural sector is complicated, in particular when there is poor data availability and there are a multitude of crop types produced at different times and places (e.g. multi-cropping systems or complex agroforestry systems). In many ACP countries, there are few affordable delivery mechanisms or infrastructure to reach individual farmers. Also, ‘free’ emergency support in some areas may also reduce farmers’ willingness to invest in climate risk reduction (Carballo and dos Reis, 2013).

Coordinated financial product development and distribution is required in order to develop products suitable for different types of risks, at

Agriculture has distinct issues in dealing with risk and insurance.

7 <https://www.gfdrr.org/our-portfolio>

8 <http://www.climateinvestmentfunds.org/cif/node/4>

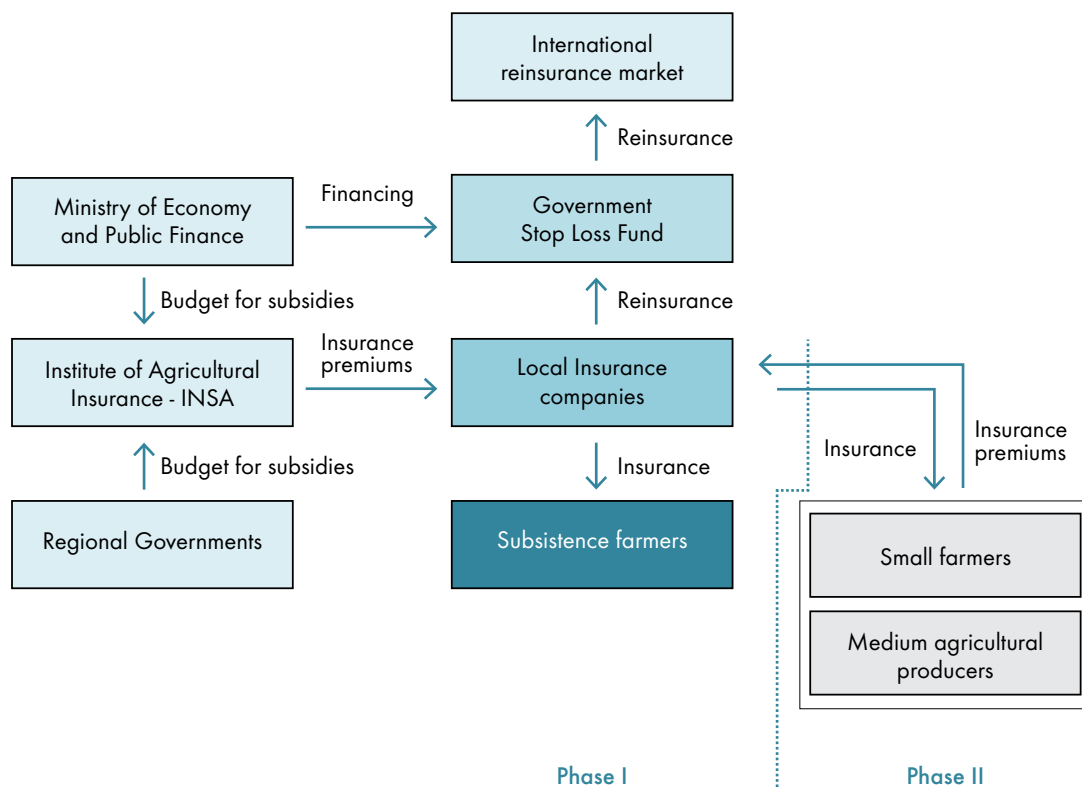


Figure 5. Layering of risk coverage in agricultural insurance in Bolivia.

Source: Anon. (n.d.)

different scales. It is important to consider appropriate risk management strategies for different situations. At the individual farmer level, and for more frequent events, loss is largely absorbed through savings and credit mechanisms including cooperatives and increasingly, MFIs. At a larger corporate or government level, risks are managed through insurance and reinsurance products. At a macro level, loss is dealt with through capital and reinsurance markets, backed by governments and international institutions. There is a clear need for coordinated approaches, for example combining government-supported parametric insurance to help manage spikes in food prices and parametric micro-insurance for smaller scale producers. A diverse set of programmes interacting at local, national, regional and even global levels can help to manage costs associated with climate-related risks.

There are some examples of coordination, including the ARC index insurance with ACRE seed insurance (Ogden *et al.*, 2015). Various donor and NGO supported programmes are developing and attempting to scale such approaches, including the Horn of Africa Risk Transfer for

Adaptation (HARITA) initiative pioneered by Oxfam America, the Relief Society of Tigray and Swiss Re (Oxfam America, 2011), and the R4 Rural Resilience Initiative (R4) developed by WFP and Oxfam America (WFP, 2016a). R4 is particularly innovative in that farmers can access index insurance by paying with their labour and it facilitates farmers’ access to savings.

Derivatives, in particular futures and forwards, have the potential to be used by agricultural value-chain market participants to manage risks, thereby improving resilience. In the face of climate change, price stabilisation measures are particularly important when there is high dependence on a narrow set of commodities at local and/or government public expenditure levels. This also leads to increased risks for lenders, who respond by increasing interest rates, and, or, collateral requirements (WBCSD, 2004).

Through derivatives, farmers that may be exposed to, for example price hikes in input costs, could gain an opportunity to lock-in some proportion of returns or costs and thereby improve their economic resilience, allowing them

to maintain investments in their farm, and maintain environmental resilience (Coon *et al.*, 2010). However, use of these instruments requires quite a high level of sophistication and aggregation, and is typically only suitable for a relatively narrow set of commodities. Though developing countries contribute a large proportion of global agricultural commodities, price stabilisation instruments such as hedging are not common. In 2004, developing countries accounted for only about 2% of the futures and options instruments traded worldwide (WBCSD, 2004). These instruments are important in promoting financial deepening;⁹ however, significant investments in infrastructure (in particular to promote access to markets and information), in knowledge and services and in increased access to capital would have to occur for this type of AVCF product to be scaled to promote resilience in developing countries.

Other financial products

This category includes a variety of other products which are relevant to agricultural value chains. Some are more nascent in their application to the agricultural sector than others, but may be of interest to groups wishing to explore new opportunities. The products are presented in order of complexity:

Pre-Export Finance (PXF): At its most basic, PXF is simply secured lending to a producer of goods or commodities. Normally associated with larger cooperatives or larger aggregators within producing countries, where sales are made internationally ('export'), the loan will be secured by:

- A security assignment of the relevant delivery contracts (which will ideally be long-term committed contracts) between the producer and the purchaser (or 'final offtaker') and the receivables generated under that delivery contract following the delivery and sale of the relevant goods. Under the security assignment, the producer transfers their rights under the contract with the offtaker to the financier, and gives an irrevocable instruction to the offtaker to buy the goods delivered by the producer to a collection account.
- A charge over the collection account (in the

producer's name) into which the proceeds of sale are paid by the final offtaker. The charge gives the financier priority rights over the sums paid into the account, enabling them to deduct the sums due to repay the loan before any sums can be paid to the producer.

This basic structure can be made more complex. If, for example, commodity price (or, more rarely, interest rate) protection is required, hedging arrangements can be entered into (and assigned for the benefit of the lenders). Additionally, many such structures will involve a special-purpose vehicle (SPV)-borrower setup for the sole purpose of the financing mechanism in order to avoid, for example, existing contractual restrictions that may apply to the relevant producer or to 'move' the transaction offshore.

Such an SPV will apply the proceeds of the loan made to it in prepayment for goods to be delivered to the SPV (by the relevant producer) under a primary delivery contract. The SPV will then on-sell those goods to final customers pursuant to secondary or final delivery contracts. Such structures are often known as SPV prepayment financings. In this structure, the security required for the transaction is created by the SPV-borrower, and so could avoid any contractual restrictions on, for example, creation of security by the actual producer and any legal issues that may arise (e.g. in relation to the enforcement of security) in the producer's own jurisdiction.

More commonly, sophisticated producers, particularly those producing commodities, will have their own captive trading entities. In such a scenario, the PXF structure has to accommodate several contractual levels. For example, the producer (which will normally be the borrower) may sell goods to another group member (often known as the 'trader', who will, most likely, be incorporated in a tax-friendly jurisdiction). The trader will, in turn, on-sell those goods to other group members incorporated in relevant target markets (local traders or local off-takers). These entities will finally sell to the ultimate purchasers (or final off-takers). Such 'triple-decker' structures, while more complex from a contractual perspective, retain the same essential factors and

9 This report uses a very broad definition of this term, as proposed by the IMF, to mean "a combination of depth (size and liquidity of markets), access (ability of individuals to access financial services), and efficiency (ability of institutions to provide financial services at low cost and with sustainable revenues, and the level of activity in capital markets)". From IMF, 2015: Rethinking financial deepening: stability and growth in emerging markets. IMF Staff Discussion Note. May 2015. Available at: <https://www.imf.org/external/pubs/ft/sdn/2015/sdn1508.pdf>

Case study 11

An example of a PXF – groundnuts in The Gambia

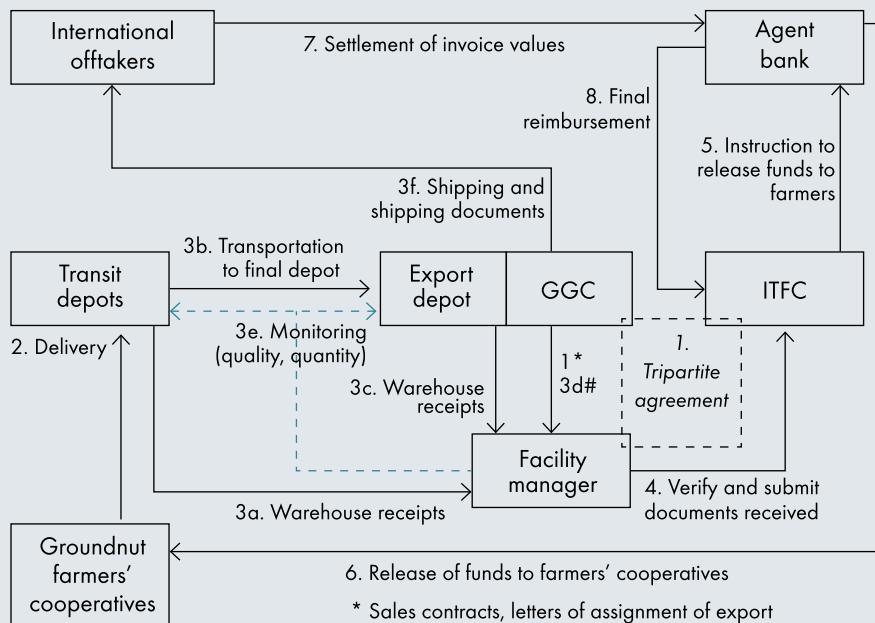
In 2010, the government of The Gambia found itself confronted with the prospect of a bumper groundnut harvest – the country’s main export crop and the mainstay of its farming population. But there was a serious threat that buyers could not be found for the entire crop. Gambian banks were incapable of financing such a large purchase, and no international bank had the risk appetite to lend enough to Gambian banks.

A solution was found by structuring the loan as a PXF – in this case, a Sharia-compliant PXF provided by the Islamic Trade Financing Corporation (ITFC), an arm of the Islamic Development Bank. From a banking perspective, this shifted most of the financing risk to international buyers.

by buyers in the UK and France. ITFC used a local facility manager to check the groundnut warehouses, and collect and transmit all relevant documentation.

The facility was issued in late February 2011, and covered the full marketing cycle of groundnuts (which takes some 4.5 months from start of harvest to last exports, and then another month for the final payments to be received). On receipt of documents, ITFC authorised Maybank to release the corresponding funds to the relevant cooperatives (through a Gambian facility bank). The transaction worked smoothly, with farmers being paid as soon as the documents relating to their delivery were processed – which was very fast by the standards of earlier campaigns.

This transaction could have been made more complex had it been useful: if the transaction had included



* Sales contracts, letters of assignment of export proceeds, letter of guarantee by Gambia government.
Copies of invoices.

The Government of the Republic of the Gambia was the beneficiary of the facility, but appointed as its agent The Gambia Groundnut Corporation (GGC), the state-owned monopoly groundnut exporter, to act as ITFC’s agent for buying and selling groundnuts. The loan was a 6-months revolving facility, meaning that during 6 months, as soon as buyers paid, new funds became available to GGC to finance new local purchases. The initial US\$14 million ITFC loan was used to buy groundnuts (farmers cooperatives were paid once ITFC’s local agent bank received the documents evidencing cooperatives’ deliveries into a collection warehouse), and arrange for transport from collection warehouses to export warehouse. From there, the groundnuts were loaded into ships arranged

more buyers or was for a longer term, a SPV could have been interposed between the international buyers and the agent bank. If groundnut price risks could be hedged (they cannot – there is no international futures contract), then this SPV could have ensured that eventual low prices paid by the international buyers would be compensated by profits on the hedge contracts. If GGC wanted to repeat the transaction structure in future years, it could set up a SPV itself which becomes the beneficiary of the export contracts and use this to secure funding – but there are high legal costs to such an arrangement which do not make it worthwhile for a transaction of this size.

Source: Based on IITFC (n.d.)

risks as the more basic PXF structure. Case study 11 illustrates the structuring of a PXF.

Prepayment finance (PPF): Buyers frequently provide finance facilities to commodity producers by paying in advance for goods and commodities. PPF is an established structure used to provide finance directly to buyers or traders of goods and commodities and indirectly to producers or exporters of goods and commodities. These arrangements are useful for producers because it allows them to access credit that would not be available to them through the banking system. For buyers it allows them to negotiate long-term supply contracts with producers in exchange for the provision of finance.

They are particularly useful where the producer is based in a country that has exchange control regulations or a taxation regime that prohibits or penalises direct lending to producers by overseas FIs. Such regimes often permit advance payments to producers for the purchase of goods.

A typical PPF facility will have a tenor of between one and five years, although it is also common for facilities to be extended. This can have added benefits for the planning of capital expenditure and building of infrastructure critical to the supply chain.

PPF facilities are usually secured by two security packages:

- one which supports the producer's obligations to the buyer under advance payment arrangements, and;
- one which supports the buyer's obligations to its lender.

PXF and PPF products can allow sizeable flow of liquidity 'upstream' through the supply chain towards the farmer. But organisational infrastructure and appropriate governance is required to ensure that financial flows actually reach producers, and enable and encourage them to adopt sustainable farming methods and environmentally sustainable practices.

Bonds and notes are debt securities (a promise to repay a lender in accordance with specific terms) that can be offered by any entity, including a corporation, government or SPV. Notes are basically bonds, but with shorter-term maturities. When bonds and notes are unsecured, i.e. only backed by a promise by the issuer to pay, these are

'debentures'. Bonds or notes backed by specific, ring-fenced assets (such as an agro-processing plant and its future sales) are referred to as asset-backed securities (ABS). Bonds may be listed on an exchange to promote liquidity (i.e., make it easier for buyers to re-sell them, which makes them a more attractive investment instrument).

Securitisation refers to the packaging of a group of financial assets into a portfolio in which investors can participate. For example, holders of land with the capacity to produce palm oil can transfer the production rights of this land into a portfolio, using a SPV structure. This portfolio acts as collateral, on the basis of which debt can be issued, usually in capital markets (i.e., becomes a Collateralised Debt Obligation, CDO). The portfolio may be segmented by risk into various tranches, allowing investors to participate based on their risk-return requirements and comfort level. This is a form of off-balance-sheet financing (i.e., it does not count towards a company's debt), in that assets can be taken off the balance sheet and into a SPV, which issues the debt. Securitisation may be the basis for offering bonds or notes.

Most large-scale agricultural companies and governments access the debt capital market for a proportion of their financing. FIs such as banks may also issue bonds to finance their activities. For example, in October 2015, China Agricultural Bank sold a US\$1 billion dual currency bond (partly denominated in US\$, partly in Renminbi) labelled a 'green bond' as the proceeds would be primarily used to finance renewable energy and energy efficiency projects (Mittal, 2015). Larger corporations, governments and FIs can also issue such securities for climate resilience investments. For example, the African Development Bank (AfDB) has issued Food Security Bonds, underwritten by Japanese investment bank Nomura, where the proceeds will be used for AfDB's portfolio of food security projects, including rural infrastructure such as irrigation, storage facilities and supply networks (AfDB, 2014).

Over the past 5 years there has been increasing interest from investors to purchase such securities, especially when the use of proceeds is clearly ring-fenced and there is independent verification to ensure that funds raised through such an issue are used for initiatives with a clear environmental and social benefit. For example, the Climate Bonds Initiative (CBI) reports on the

rapid growth of the green bonds market, and notes that, “the total climate-aligned bonds universe stands at US\$597.7 billion – a 20% increase from last year [2014]. Almost a third of this year’s [2015] increase (US\$95 billion) was due to the rapid growth of the green bond market” (Kidney, 2015). (Note that certification guidance is being developed for bonds issued in the agriculture, forestry and other land use sectors, released at the end of 2015.¹⁰)

Impact bonds, including Development Impact Bonds (DIBs) and Social Impact Bonds (SIBs) are other structures that have received much attention, however they should not be confused with ‘normal’ bonds. These instruments are also known as ‘Pay for Success bonds’ or ‘Social Benefit bonds’ and rely on state or concessional (donor or foundation) funding. In its simplest form, these bonds provide up-front funding for development programmes by private investors, who are remunerated by donors or host-country governments, and earn a return if evidence shows that programmes achieve pre-agreed outcomes (CGD and Social Finance, 2013). For example, an NGO receives loans from investors which will be used to reduce the recidivism of criminals. If successful, the NGO is paid pre-agreed sums by the government, which it uses to pay the investors. If not successful, the investors lose their money. The expected savings must be large and tangible (i.e. measurable, independently verifiable) enough to repay up-front debt financing from an investor. There are no examples where these have been used to finance agricultural resilience initiatives to date.

Investment funds are other structures to involve investors in agricultural finance. Several funds exist that are specialised in lending to the agricultural sector in emerging markets. In addition to One Acre Fund, notable examples include Root Capital,¹¹ responsAbility Fair Agriculture Fund¹² and Triodos’ Sustainable Trade Fund.¹³ In order to operate One Acre Fund and Root Capital

rely on significant, ongoing concessional funding from financiers who do not seek commercial rates of return. Trade finance funds also exist, which provide shorter-term debt to agricultural companies; these include funds such as Barak¹⁴ and Scipion.¹⁵

Credit enhancements, including loan guarantees have been important in leveraging additional investment into the agricultural sector. In a loan guarantee, a third-party guarantor such as a donor or a foundation may step in to fully or partially cover the borrower in the case of a default. This includes surety bonds and ‘risk wrappers’, both of which may be issued by commercial providers or Development Finance Institutions. Other important forms of internal credit enhancements include excess spreads (surplus revenues are deposited into a reserve account), cash collateral accounts (pre-funded reserve accounts), and overcollateralisation (the expected revenues are, say, 120% of the required loan repayments).

Relevance to agricultural climate resilience

Specialised investment products that evaluate non-financial (impact) as well as financial metrics may create effective channels for financing within the agricultural value chain in a way that specifically focuses on building climate resilience in emerging markets. Discussions with institutional investors indicate an increasing interest in such AVCF products and regulations are being developed in various markets to further promote impact and sustainable investing. For example, in 2014, the US National Advisory Board on Impact Investing released its report, “Private Capital, Public Good,” which outlined a framework for supportive policy action.¹⁶ In October 2015, the US Labor Secretary removed a 2008 restriction on the Employee Retirement Income Security Act that had limited impact investing by pension funds (USDIL, 2015). Many European investors have, and are, considering

10 For the most up-to-date version, please refer to the Agriculture, Forestry & Other Land Use standards guidance on the Climate Bonds Initiative website: <https://www.climatebonds.net/standards/agriculture-forestry2>

11 <http://www.rootcapital.org>

12 <http://www.responsability.com/investing/en/1245/Investor-Update-From-responsAbility-Fair-Trade-Fund-to-responsAbility-Fair-Agriculture-Fund-Expanding-the-universe-for-the-benefit-of-all.htm?Article=27470> [Accessed 11 May 2016].

13 <https://www.triodos.com/en/investment-management/our-funds/overview-all-products/sustainable-trade-fund/about-the-fund/>

14 <http://barakfund.com>

15 <http://www.scipion-capital.com>

16 <http://www.nabimpactinvesting.org/>

increasing allocations to such investments (Saltuk, 2014). Impact investment requires exact impact measurement, based on robust data and a sound application of accepted methodologies. Challenges will lie in designing and bringing to market investment products that balance the potential costs of impact

measurement and reporting around an inherently complex, very context-specific, theme (i.e. agricultural climate change resilience), and ensuring that financial products are cost-effective and fit with investors' fiduciary responsibilities around term, liquidity and exposure.

Case study 12

Root Capital: Coffee farmer resilience initiative

Root Capital is a non-profit social investment fund focused on the agricultural sector in Africa and Latin America. Root Capital provides credit, targeted technical assistance and strengthens market linkages. Root Capital was started in 1999, and has disbursed approximately US\$1 billion in loans since its inception, executed over 2,500 deals and has a 98% repayment rate. In response to the Central American roya (coffee rust) crisis, Root Capital launched a 'climate-smart' investment strategy for coffee renovation and rehabilitation (the Coffee Farmer Resilience Initiative) in 2014. Specifically, this involves long-term financing of coffee renovation and rehabilitation, short-term lending for trade credit and capital expenditure, technical assistance for financial management and agronomic practices, and support for income diversification strategies. In its first year, the initiative disbursed roughly US\$8 million, rehabilitating an area of about 2,000–3,000 hectares in South and Central America, and directly impacting the lives of around 1,000 farmers and 5,000 household members. While after its first year, the initiative's outcomes have generally been positive, there have been several challenges, including farmers' ability to manage long-term loans (up to 7 years) and ongoing commodity market volatility. In particular, the lows experienced by the coffee market in 2014–2015 undermined farmers' interest in investing in their coffee farms.

One key component to the project has been provision of technical assistance and leveraging regional technical expertise. Root Capital works closely with a network of regional advisers, both to screen potential deals and also to coordinate local technical assistance. In addition to credit, Root Capital has secured a small matching grant facility with USAID to help farmers access the local technical resources they require to make best use of the loan. This facility provides grants of up to US\$25,000 per year and the grant will be limited to the early stages of the initiative. Loans provided under the facility come with a two-year grace period (on the principal only – interest payments have to be made from the beginning) hence there is as yet no repayment track record. However, there has been full repayment on the interest to date. Root Capital finances the initiative through a mix of private and public sources. Notably, they receive guarantees from development agencies and foundations, which they use to attract additional private capital. Root Capital secures private capital through a series of notes, ranging in tenor up to 10 years and paying 0–4%. Root Capital expects to scale the fund up to US\$15m, and is now considering other commodities and regions. Based on this, and its other experiences, Root Capital sees significant opportunities for bringing financial expertise in from the start of AVCF project development in order to ensure that projects are eventually able to become financially self-sustaining.

Sources: Benjamin Schmerler, Director, Root Capital, Pers. Comm., 18/11/2015; WEF (2014)

Potential roles of development partners

There are many strategies that development partners could pursue in promoting AVCF products for agricultural climate change resilience. In choosing their roles, it is crucial that development partners carefully consider the following related points:

- How to minimise distortion and ‘crowding out’ of private sector players.
- How and where to target assistance. Should concessional funding be provided to governments, producers and value-chain actors, or to investors, NGOs and other service providers? How should this be provided, e.g. in the form of money or goods and services – and in the case of the latter, how are these sourced and valued? How to ensure a balance between impact reporting and measurement and execution?
- How to ensure growth and impact beyond the funding period and enable scaling?

The suitability of different AVCF products depends greatly on market structure (location and commodity, value-chain participants and their relations) and the general socio-economic and regulatory environment.

Financiers in agricultural value chains are faced with several risks, summarised in Table 4. These risks are combined and magnified in the case of new ventures as well as small-scale agriculture in ACP countries, and further impacted as a result of climate change – for example, due to the farmers’ limited ability to invest in infrastructure and adequate inputs. Therefore, there are numerous potential roles for development partners, and all of them, one way or another, fall under the title of ‘Public–Private Partnerships’ (PPPs). At the same time, given the various AVCF alternatives described in the previous sections, the importance of coordination must be highlighted.

Table 4. Agriculture value-chain finance risk, risk-mitigation strategies and potential roles for donor or government support.

RISK TO FINANCIER	RISK-MITIGATION STRATEGIES	DONOR/GOVERNMENT SUPPORT
<p>Production risks: produce not up to standard (volume, quality, timing), which impacts ability to repay</p> <p>Climate risks: weather shocks that negatively impact farming activities</p>	<ul style="list-style-type: none"> • Assessing production track record • Well-integrated supply chains and access to infrastructure (e.g. access to high-quality inputs and equipment) • Ability to hedge inputs/ outputs • Access to information • Insurance products (e.g. micro-insurance) • Product and portfolio diversification • Technical assistance on appropriate land management practices • Farmer saving programmes 	<ul style="list-style-type: none"> • Funding production-related technical assistance • Facilitating linkages to strengthen supply chains • Infrastructure investment • Subsidising micro-insurance and other risk-mitigation instruments • Subsidising early warning response tools and coping mechanisms (e.g. seeding risk-pooling funds)

RISK TO FINANCIER	RISK-MITIGATION STRATEGIES	DONOR/GOVERNMENT SUPPORT
Supply risks: farmers produce enough but do not honour contracts (e.g. side-sales)	<ul style="list-style-type: none"> • Group liability schemes • Pre-selling through factoring, WRF systems • Collateral coverage • Commitment savings, in which farmers cannot withdraw saved funds until they have reached a preset goal. 	<ul style="list-style-type: none"> • Legislation, including for WRF schemes and contracts • Rule of law - i.e. ability to enforce law and contracts
Finance and collateral risks: non-repayment of credit	<ul style="list-style-type: none"> • Guarantees • Group liability • Credit information systems • Quality, maintenance and proper registration (perfection) of collateral 	<ul style="list-style-type: none"> • Partial guarantees and guarantee funds (government and donors) • Technical assistance to establish and maintain cooperatives • Support to build information systems including credit and collateral registries (the latter permit financiers to check whether an asset is already pledged as collateral for a loan)
Marketing risks: inability to access markets	<ul style="list-style-type: none"> • Fixed contracts with off-takers • Market infrastructure 	<ul style="list-style-type: none"> • Market infrastructure • Rule of law • Trade agreements and support
Price risks: price fluctuations that impact profitability	<ul style="list-style-type: none"> • Access to market information • Hedging instruments such as futures and options • Storage 	<ul style="list-style-type: none"> • Access to market information • Investments in storage facilities
Sources: Miller (2012); AfDB (2013)		

Loan Guarantee Funds (LGFs): banks, NBFIs and financiers in general have a choice in where to allocate their resources, and will typically do so to optimise the risk-adjusted rate of return profile of their portfolio. In most emerging markets, the opportunity costs for AVCF are high, resulting in banks favoring lending to non-agricultural sectors such as consumer loans (Miller, 2015). There have been many development assistance-funded programmes to provide partial or full guarantees to local banks to stimulate lending to the agricultural sector (i.e. LGFs), including in Cambodia, Ghana, Nigeria and Vietnam. A study by the International Fund for Agricultural Development (IFAD) indicates

that LGFs have largely been unsuccessful (IFAD, 2014), and that are best used where:

- A quantifiable market demand has been demonstrated
- The guarantee is professionally managed by an independent, specialised FI and has been co-designed with relevant participating institutions
- A significant part of the default risk remains with the FI to avoid moral hazard
- Technical assistance is available, including training on good lending practices for the agricultural sector, and to promote international good practice within local FIs.

Case study 13

Nigerian loan guarantee fund

Nigeria's Agricultural Credit Guarantee Fund Scheme (ACGSF), established in 1977, had a four-pronged approach: support farmers to create self-help groups where they could eventually approach a bank for joint-liability loans; creation of trust funds where funds were placed with banks to reduce the need for farmers' security and promote lending; an Interest Drawback Programme allowing farmers to borrow from lending banks at market rates and a fund providing an interest rebate when loans were repaid

on time; and a Refinancing and Rediscounting Facility. A 2009 review found that, though the results were relatively mixed (the repayment rate was quite low, less than 70%), there were signs that the ACGSF had positive impacts. However, as the loans were not tied to specific environmental outcomes, there were some signs that increased access to credit supported unsustainable practices (soil erosion). An added drawback of the scheme was the operational costs associated with proper management and oversight, especially as numbers rose from less than 500 to over 500,000 beneficiaries (FAO, 2013; Onuoha, 2014).

Participation in LGFs is not limited to donors. Several governments have attempted both a carrot and stick method, establishing regulations that require a minimum amount of lending per bank to the agricultural sector with LGFs and twinning this with guarantee facilities (e.g. case study 13).

terms including low interest rates) to smaller farmers to participate in professional commodity exchanges and storage facilities.

'Blended finance' refers to the complementary use of public funding and private funding to make projects financially viable/sustainable.

Blended finance: LGFs are one form of 'blended finance' (the complementary use of public funding – low-cost loans and/or grants – and private funding to make projects financially viable/sustainable). Other models include junior or subordinated (i.e., higher risk-bearing) tranches in financial products (softer or longer-dated loans), which improves the return profile for more commercial investors. Equity and grants may also count as blended finance. One recent example explicitly used to promote climate resilience and adaptation is the IDB loan (with a risk-sharing guarantee from the Canadian Climate Fund for Private Sector in the Americas) to coffee trading company Ecom – this loan will be used for on-lending to Central and Latin American coffee farmers to help them replace diseased coffee plants, and technical assistance to make farming practices more sustainable (IDB, 2015). The International Finance Corporation (IFC) and other donors also have programmes to support transactions with blended capital approaches and expertise (IFC, 2016). Another example is the provision of soft funding (loans with preferential

Investing in and facilitating risk-mitigation facilities: Development partners and local governments can share some of the significant initial investments required to assess potential climate risks, and to implement risk-mitigation initiatives that local governments can eventually sustain – e.g. donors supported the Government of Ethiopia to develop an early warning response tool that triggers contingency funding (LEAP) (WFP, 2013). However, designing financially self-sustaining solutions is a challenge. Insurance to very vulnerable agricultural areas and populations is likely to be viable for the foreseeable future only with ongoing support by governments and/or donors. For example, Aseguradora Agropecuaria Dominicana (AGRODOSA), a majority government-owned insurance company in the Dominican Republic, offers Multiple-Peril Crop Insurance (MPCI), supported by a government crop insurance subsidy programme (Carballo and dos Reis, 2013). Investment is required not only for infrastructure (such as weather and climate information systems), but also for technical assistance. These investments need to happen both at a macro level (regional, national and even global), and at a more local level.

Case study 14

Livelihoods, Early Assessment and Protection (LEAP) project

The Government of Ethiopia and WFP developed the LEAP project, which combines early assessment, planning and capacity building with contingent finance and a software platform that provides an estimate of funding needs in the event of a weather

shock. The software uses ground and satellite rainfall data to calculate weather-based indices for Ethiopia; this is integrated with livelihoods and vulnerability data at local and regional levels and used to deploy contingent financing. This is being refined to include a flood index and climate change and seasonal forecast component (World Bank, 2010).

Case study 15

IFAD: Adaptation for Smallholder Agriculture Programme (ASAP)

This donor-funded programme was launched by IFAD in 2012, focused specifically on channelling climate and environmental finance to smallholder farmers in emerging markets, to help them build their resilience. ASAP finances a range of initiatives including mixed crop and livestock systems that integrate the use of drought-tolerant varieties, introduction of improved land management techniques and trialling of other climate information systems, risk-mitigation systems, post-harvest storage and marketing (IFAD, 2013). By May 2015, the programme had mobilised about US\$366 million, most of which has been allocated to countries designated as having 'high' or 'very high' climate vulnerability according to the Notre Dame Global Adaptation Index (ND-GAIN).

The programme has had a positive start, but results are only beginning to emerge due to a lengthy programme design and disbursement process associated with complex projects (ODI, 2015). ASAP has built relevant infrastructure in countries such as Mozambique in order to facilitate climate resilience investments, including a network of weather stations, forecasting and early warning systems, and advised smallholders on using forecast information and information delivery through SMS and radio (IFAD, 2013). IFAD is also partnering WFP on the Weather Risk Management Facility (WRMF), which was established in 2008 to reduce smallholders' vulnerability to weather and other risks limiting agricultural production (WFP, 2016b).

At a macro level, the World Bank has explored the development of a global catastrophic reinsurance facility or the development of a global catastrophe mutual bond, which would structure a global parametric insurance pool underwritten by the World Bank and capitalised by private investors (Ogden *et al.*, 2015). The Global Index Insurance Facility (GIIF), also hosted by the World Bank Group, facilitates access to information, capacity building and financial support to lower the cost of agriculture insurance¹⁷. Another idea is the establishment of a facility to conduct risk assessments and monitoring of climate change events on a continuous basis, e.g. a climate insurance clearinghouse managed by an international financial institution such as the Green Climate Fund (GCF) or the World Bank. The purpose of this would be to provide a timely, central source of quality information, to inform development and implementation of insurance products (Ogden *et al.*, 2015).

At a regional level, initiatives such as the Caribbean Catastrophe Risk Insurance Facility (which have been discussed in previous sections) have benefitted from initial development assistance, with a view to eventually being maintained by participating governments. A similar regional initiative is the Platform for African Risk Management (PARM), managed by IFAD and focused on

creating more structured coherent approaches to investment in agriculture including technical assistance to track and deal with climate-related risks (IFAD and NEPAD, 2013).

In general, insurance-related products are relevant in the context of agricultural climate resilience, but usually require concessional funding, in particular to cover the establishment and ramp-up phases (Ogden *et al.*, 2015). Donor funding should be designed to encourage eventual financial sustainability and resilience investments, e.g. by adopting pricing schemes or discounts when investments are made that reduce long-term costs and exposure to various risks (see case study 15).

One component of these systems that are a clear 'public good' is an information platform, based on which private companies can develop business solutions that address climate risk. This means investment in information collection systems (e.g. networks of weather stations paired with satellite data) and an open-source data access point. Examples of such platforms exist,¹⁸ and complementary to this, an African soil map has been developed and is being improved.¹⁹ There is also value in working with governments on climate-related risk assessments and prioritisation frameworks for the agricultural sector, and this is being done in some countries (Chavez *et al.*, 2015).

17 <https://www.indexinsuranceforum.org/overview-global-index-insurance-facility>

18 For example, from <http://glcf.umd.edu/data/>, <https://climatedataguide.ucar.edu/climate-data>, http://www.cmsaf.eu/EN/Home/home_node.html

19 <http://africasoils.net/services/data/digital-soil-mapping/>

Case study 16

SMS training platform for underserved farmers

In April 2015, Syngenta launched an SMS training hosted by Arifu (education technology company based in Kenya). The platform provides training on everything from land preparation to harvesting across four main crops: maize, potato, tomato and cabbage in both Swahili and English. The training is free to farmers and works on any phone in Kenya (feature or smartphone). Multiple versions of the content were created in the first season to test which led to greater engagement with the learning content and adoption of good agricultural practices.

In the first season (April-July 2015) the average farmer increased their net income by US\$187 per acre (28%), and 5,000 active users participated in the training with an average of 14 messages per user. So far in season two (August 2015 – present day) 40,000 active users are using the platform, with an average of 26 messages per user. Eighty per cent of the farmers who took the training in season one also used the training in season two when new crops

were added. Of the active users, 75% had never met someone from an input company and 60% had never been to any agricultural training (NGO, government or private sector), enabling a completely new set of farmers to access information.

Key lessons include the need for a programme to be farmer-centric. In this programme the farmer decides what they want to see when. They can take the training all at once or follow the season and review while on the farm. It is affordable (i.e. in this case, free). Companies are interested in providing such information as it helps them better understand market demand, tailor products and quickly respond to customer needs.

In order to be sustainable, such a programme must be cost-effective. In season one the cost per farmer was US\$6, which will drop to about US\$2 at scale. As a result, the company plans to ramp up in Kenya and Tanzania to 1 million farmers in 2016.

Source: Erica Bliss and Peter Veal, Syngenta, Pers. Comm., November 2015.

Integrating climate risk information with credit and collateral systems: credit and collateral systems in many emerging markets are still under-developed. These are important, especially when integrated with risk assessments and environmental data, as tools to create awareness about and mitigate climate risks for lenders and investors. Information on climate risk and resilience within agricultural systems are important for value-chain actors and financiers alike, and are increasingly being explored by a variety of data and technology driven businesses, including Gro-Intelligence,²⁰ Palantir²¹ and F3 Life.²² It is also likely that, as credit information systems become more centralised, there will be greater opportunities for integrating climate risk information, including in developing, implementing and assessing AVCF products. However, this requires basic investment in data gathering infrastructure and legal frameworks (e.g. around how credit scores are assessed, how credit information is kept and how collateral is valued). Development partners have a clear role

to play in investing in the basic infrastructure, and in exploring and building partnerships to increase climate risk assessment capability (e.g. between banks and information providers).

Information systems and financial technology: there is increasing interest by AVCF actors, including input providers, traders and FIs, in 'FinTech' (financial technology) solutions within the agricultural sector. Applications include rural client assessment (registration of clients, their assets and their activities, and the evaluation of this information to assess credit risk), last mile distribution of loans and collection of repayments (e.g. myAGRO in West Africa).²³ Technical assistance and market information can also be delivered through such systems to rural communities (e.g. Esoko,²⁴ case study 16). An example of a development partner involved in this is a collaboration between Germany's development agency, GIZ, and a leading business applications software developer, SAP, to pilot a smartphone application to improve access to

20 <https://gro-intelligence.com>

21 <https://www.palantir.com>

22 <http://www.f3-life.com>

23 <http://www.myagro.org/model/our-model/>

24 <https://esoko.com>

finance along selected agro-value chains in Ghana and Uganda (developppp.de, 2014). E-voucher programmes can also be used to stimulate uptake of a particular product or approach and have been relatively successful in Malawi and Mozambique, however not in Zambia (Mangisoni *et al.*, 2007).

Technical assistance: a range of technical assistance is required in order to support farmers to adopt new technologies, access new markets, develop new higher-value products, generate new revenue streams and expand domestic sales, among other objectives (Westlake, 2014). Development partners can support some of the up-front costs required to develop new, locally appropriate AVCF products. For example, USAID supported the World Council of Credit Union (WOCCU) to design an appropriate financial product in Peru, resulting in five credit unions launching a new financial product in 20 different value chains. Participating producers attained a 54% increase in coffee prices due to improved production methods (USAID, 2009).

Technical assistance to governments may also be relevant: a governments' lending policy framework is an important factor in the success of AVCF products. This includes issues such as:

- Commercial laws affecting secured transactions
- Regulations on capital movements and foreign exchange
- Creditor rights and their judicial enforcement
- Regulation of FIs including capital adequacy ratios (the capital that banks have to put aside as provision against the risks of their loans)
- Restrictions on lending
- Barriers to entry and state ownership of FIs
- Information infrastructure including tax and accounting practices and credit information systems
- Secured transactions frameworks.

Reforms in the enabling environment can unleash significant private investment. For example, in China, the creation in 2007 of a national online registry for security interest in

receivables (where all lenders register the collaterals that are assigned to them to secure their loans and can check whether prospective borrowers have already pledged their assets as collateral) led to an increase in the use of factoring for medium and small enterprises from US\$2.6 billion in 2003 to around US\$70 billion in 2009 (Senior, 2012). By June 2011, a cumulative US\$3.58 trillion in accounts receivable financing had been reached, including US\$1.09 trillion in lending for smaller enterprises (IFC, 2011). However, such measures are often challenging when a government needs to both increase and diversify its tax and income base, attract investment and encourage climate-smart solutions and green growth through its fiscal policies. Government-supported measures to promote private sector participation in key sustainable development sectors remain minor: the United Nations Conference on Trade and Development (UNCTAD) (2015) estimated that only 8% of such measures between 2010 and 2014 were specifically targeted at private sector participation in these sectors, including climate-related investments (UNCTAD, 2015).

Creation of demand: another approach, which is being pursued by WFP under their Purchase for Progress (P4P) programme,²⁵ creates demand through procurement, paired with technical assistance. P4P buys directly from farmers through direct and forward contracts, which gives farmers more security. It does this in combination with support to local structured trade systems (e.g. WRF and commodity exchanges) and supports development of local food processing capacity and linkages between relevant value-chain actors.

In summary, development partners have a wide choice of options with respect to how they support unlocking AVCF for increased climate resilience within ACP agricultural sectors. However, the most effective intervention strategy will depend ultimately on the context. With climate change impacts already being felt in many ACP countries, there is an urgent need for development partners to support the design and deployment of scalable AVCF products that promote CSA.

A governments' lending policy framework is an important factor in the success of AVCF products.

25 <http://www.wfp.org/purchase-progress/overview>

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The Technical Centre for Agricultural and Rural Cooperation (CTA) is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food and nutritional security, increase prosperity and encourage sound natural resource management in ACP countries. It provides access to information and knowledge, facilitates policy dialogue and strengthens the capacity of agricultural and rural development institutions and communities. CTA operates under the framework of the Cotonou Agreement and is funded by the EU.

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