



Food and Agriculture Organization
of the United Nations

AGRICULTURE AND FOOD INSECURITY RISK MANAGEMENT IN AFRICA

Concepts, lessons learned
and review guidelines



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and review guidelines**

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ACRONYMS

ADPC	Asian Disaster Preparedness Center
APRM	Agriculture Price Risk Management
ARC	African Risk Capacity
ARM	Agricultural risk management
ASCS	Agricultural Stabilization and Conservation Services
ASSP	Agricultural Sector Strategic Plan
AU	African Union
AUC	African Union Commission
BISP	Benazir Income Support Programme
BM&F	<i>Bolsa de Mercadorias e Futuros</i>
BNDES	Banco Nacional do Desenvolvimento Econômico e Social
BULOG	Badan Urusan Logistik
CAADP	Comprehensive Africa Agriculture Development Programme
CAP	Common Agricultural Policy
CCT	Conditional cash transfer
CGIAR	Consultative Group on International Agriculture and Research
CGS	Credit guarantee scheme
COMESA	Common Market for Eastern and Southern Africa
CONAB	Companhia Nacional de Abastecimento
CT-OVC	Cash Transfers for Orphan and Vulnerable Children
CV	Coefficient of variation
DRM	Disaster risk management
DRR	Disaster risk reduction
DSIP	Development Strategy and Investment Plan, Uganda
EAC	East African Community
EPIICA	Ethiopian Project on Interlinking Insurance and Credit in Agriculture
EU	European Union
EWS	Early warning system
FAMIS	Food and Agriculture Market Information System
FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Famine Early Warning Systems Network, USAID
FPS	Fair price shop
G8	Group of Eight
G20	Group of Twenty
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GIEWS	Global Information and Early Warning System on Food and Agriculture, FAO
GIS	Geographic information system
HFA	Hyogo Framework for Action
HIC	High-income country
ICT	Information and communications technology

Acronyms

IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
KCC	Kenya Cooperative Creameries
LAC	Latin America and the Caribbean
LEAP	Livelihood Empowerment against Poverty
MDGs	Millennium Development Goals
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	Market information system
MPCI	Multiple-peril crop insurance
MSP	Minimum support price
NAFSIPs	National Agriculture and Food Security Investment Plans
NAIS	National Agriculture Insurance Scheme
NEPAD	The New Partnership for Africa's Development
NGO	Non-governmental organization
NPCA	NEPAD Planning and Coordinating Agency
P4P	Purchase for Progress, WFP
PAA	<i>Programa de Aquisição de Alimentos</i>
PARM	Platform for Agricultural Risk Management
PCIC	Philippines Crop Insurance Corporation
PIK	Payment-in-kind, USA
PROGRESA	<i>Programa de Educación, Salud, y Alimentación</i>
PSNP	Productive Safety Net Programme
R&D	Research and development
RVF	Rift Valley Fever
SAFEX	South Africa Futures Exchange
SDLOG	Standard deviation of changes in the logarithm of prices
SWOT	Strengths, weaknesses, opportunities and threats
TLTP	Thailand Land Titling Project
TWLB	Tanzania Warehouse Licensing Board
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WCDR	World Conference on Disaster Reduction
WFP	World Food Programme
WRS	Warehouse receipt system

EXECUTIVE SUMMARY

Effective agricultural risk management strategies play a vital role in fostering productive and sustainable investment across the food and agricultural value chain in order to ensure food and nutrition security, eliminate hunger and reduce poverty, and achieve the annual target of 6 percent agricultural GDP growth.¹ A real paradigm shift is necessary in order to manage risks efficiently. The underlying approaches to risk management and resilience building need to be based on market, policy and institutional reforms. It is against this background that the Comprehensive Africa Agriculture Development Programme in the New Partnership for Africa's Development (NEPAD/CAADP), in collaboration with FAO, decided to prepare this review of innovative approaches and guidelines for mainstreaming agricultural risk management.

Food and agricultural markets in Africa are affected by macro-economic disturbances, oil price shocks, disease outbreaks, and adverse weather events, such as floods and droughts, which may have become more frequent because of climate change. On a smaller scale, accidents, illness, death, fire risks, theft and divorce are examples of personal risks that can undermine livelihoods. The problem is compounded by limited access to healthcare services in rural areas.

Weather variability, price uncertainties, unexpected institutional and policy changes, personal risks, and so on strongly influence decisions pertaining to input use, investments and technology adoption. Production and price risks are major impediments to investment in land improvement, irrigation, farm equipment and inputs, including fertilisers and seeds. Agricultural risks are among the major reasons for poverty traps as they may influence decisions of smallholders in favour of subsistence farming with low risks but also low returns, rather than expanding investment into high-return farming enterprises. Unmanaged risks can lead to a cycle of shock, (partial) recovery, shock, eroding capital and natural resources with every shock.

Production and price shocks compromise the food and nutrition security of poor consumers in urban and rural areas. Poor net food buyers could be forced to draw down on their capital (distressed sale of assets, such as land or livestock) to maintain food intake in the event of high food prices. Other common coping mechanisms may include a reduction of food consumption, cut-downs on school fees, and cuts in health care spending. Reduced income levels have greater impacts on rural women and female-headed households, as they are less likely to be net sellers of food, and have less access to land and other resources.

¹ In July 2003, at the African Union (AU) summit in Maputo, Mozambique, African leaders committed themselves to reverse the underinvestment that had held the agriculture sector back for decades. Through the Maputo Declaration, African heads of state promised to allocate at least 10% of national budgets to agriculture and achieve at least 6% annual agricultural growth as specified in the Comprehensive Africa Agriculture Development Programme (CAADP). For further information, see: <http://www.nepad.org/system/files/Maputo%20Declaration.pdf>

Apart from producers and consumers, a large number of industries (textiles, biofuel, beverage, food, etc.) along the food supply chain are affected by unchecked risks that can significantly disrupt them. The high cost of doing business (due to production and market risks) can prevent suppliers, processors, transporters and marketing companies from expanding and improving their services. More importantly, shocks impacting the agricultural sector can adversely impact national gross domestic product (GDP) with long-term consequences for the country's economic growth. Agricultural production and price volatility may also induce instability in government tax revenues and balance of payments, weakening governments' fiscal positions especially in countries heavily dependent on agriculture.

Africa is one of the regions in the world most affected by food price volatilities and production variability. Spiking and volatile food prices have created uncertainty and risks for producers, traders and processors, resulting in increased food insecurity for consumers. At the root of the food price and production variability are hydro-meteorological disasters which comprise cyclones, floods, landslides, wild fires and dry spells. Drought affects the largest number of people on the continent, followed by floods and storms. Geological disasters, such as earthquakes and volcanoes, are relatively less frequent and impact fewer countries.

At household level, multiple covariant and idiosyncratic shocks have made farming, livestock rearing or fishing very risky in Africa. Crop failure due to erratic rains is often followed by very high prices, starvation and outbreak of diseases. Livestock and crop pests and diseases tend to be rampant in many areas. Rural households may suffer from vulnerabilities associated with chronic illness, disability and death. Valuable possessions such as crops in the field or stocks of grain and livestock can be stolen. Pastoralists living in the border regions (e.g. Uganda, Kenya and Sudan) are affected by cattle rustling which has become more common and dangerous. Fishers and fish farmers are affected by asset risks, production and management risks, market risks, and personal and health risks.

Dealing with production, market and other shocks would require various types of risk management techniques, ranging from those managed through market mechanism to catastrophic risks with high rates of frequency that require government intervention. In general, these strategies can be classified into four categories: (i) risk mitigation and reduction; (ii) risk transfer; (iii) risk coping mechanisms; and (iv) failure range. Risk mitigation (*ex-ante*) and reduction strategies are designed to limit the impact of the disasters and prevent risks while risk transfers (*ex-ante*) refer to the transfer of potential financial consequences of particular risks from one party to another to manage agricultural risks. Risk coping mechanisms include actions taken after the shocks (*ex-poste*) to mitigate or insulate the welfare impacts of the shocks. Failure range refers to catastrophic risks that occur very frequently, implying the activity under consideration needs to cease and households need to adjust to a new form of livelihood.

An effective risk management strategy allows producers to: (i) invest in higher payoff activities, instead of low-risk and low-return outcomes; (ii) invest in more resilient and dynamic farming systems, instead of depleting their assets and falling into a poverty trap; (iii) undertake longer-term investment, rather than being risk-averse with limited investment in land improvement or infrastructure; and (iv) access

loans to finance procurement of inputs and investment. Reducing food price risks not only ensures food security and reduces poverty among consumers, but also enhances investment along the value chain and fosters overall economic growth.

Market failures due to the presence of asymmetric information lead to adverse selection and moral hazard problems in market-based risk management for agricultural producers. For instance, private insurance is generally not available, or is unaffordable for smallholders. On the other hand, index insurance products are being tried in many countries to overcome the problems of adverse selection, moral hazard, and high transaction costs. Government intervention is needed to lower the cost and risks of introducing risk management tools, address distributional concerns and create markets.

Unlike in other parts of the world, most producers, consumers and operators along the food value chain in Africa have limited access to government or market-based risk management tools. Insurance and other forms of protection against natural disasters are rare in Africa, and rural women in particular experience shocks more severely than men do.

Despite the high variability and inadequacy of rainfall, investment in irrigation sub-Saharan Africa is very limited. The irrigated area in the region, extending over six million hectares, makes up just 5 percent of the total cultivated area, compared to 37 percent in Asia and 14 percent in Latin America. Two-thirds of that area is in three countries: Madagascar, South Africa, and Sudan. Spending on social protection is generally low in Africa, only 2.8 percent of GDP compared to 7.6 percent in Latin America and the Caribbean, 3.7 percent in Asia and the Pacific, or 18 percent in Western Europe.

A review of best practices and country experiences has demonstrated that there is no agricultural transformation without risk management. Therefore, mapping the various risks faced by farmers, value chain operators, and the households' access to food is fundamental. Governments support appropriate risk-hedging instruments, and engage in capacity development to increase the effectiveness of the different measures applied. It should, however, be noted that risk management strategies are context specific and vary from one region to another. For instance, developed countries and most countries in Latin America and Caribbean stress market-based instruments, such as commodity exchange, contract farming, and food and agricultural market information system, while many Asian countries rely on irrigated agriculture as well as government-based buffer stocks and strategic grain reserve to stabilize prices and support producers.

NEPAD, in partnership with FAO and the Platform for Agricultural Risk Management (PARM) hosted by IFAD, is supporting African countries and regional economic communities in mainstreaming agriculture and food-security risk management into investment plans to make sure that risk management interventions are planned, coordinated, budgeted and effectively implemented. For FAO, reducing risks by enhancing resilience to shocks and stresses of member countries is a new paradigm that is being promoted through its overarching goals to eradicate hunger, food insecurity, malnutrition, and poverty in an economically, socially and environmentally sustainable manner.

The last parts of the document summarize the procedures for effective integration of risk management tools into national investment plans. Effective integration of risk management tools into national investment plans should begin with a situation analysis of the risk profiles, inventory of existing management practices, institutional context and capacity (stakeholder analysis), policy environment, and regulatory and enforcement capacity. The extent and trend of price variability, production and yield fluctuations, income variability and vulnerability of consumers need to be part of the situation analysis, which is to be presented and discussed at stakeholders' workshop. Major national studies and findings in the area of agricultural risk management and related areas, as well as international and regional best practices, are also to be presented and discussed at the event. The goal for showcasing them is the creation of a committee for developing a roadmap with a comprehensive strategic framework for identifying multiple agricultural risk management tools and facilitating a holistic approach to their implementation and mainstreaming into investment plans and policies.

Among the major elements of the roadmap are: (i) policy and strategic framework using a holistic approach to address missing markets and support agricultural risk reduction, mitigation and coping, and making certain that all food security and agricultural development policies, programmes, and projects do not inadvertently increase vulnerability of the poor, especially women; (ii) programmes for institutional coordination and capacity development for enforcing contracts; (iii) steps in finalizing the integration of risk management tools into CAADP investment plans; and (iv) analytical works and database on price and production variability and risk management tools. The roadmap provides a guideline for generating and sharing knowledge, exchanging experiences, and fostering dialogue among public and private stakeholders in the field of agricultural risk management.

1. BACKGROUND AND OBJECTIVES

Risks and uncertainties disrupt production and food security. Weather variability, natural disasters, price uncertainties, unexpected institutional and policy changes, personal risks, and so on strongly influence decisions pertaining to input use, investments and technology adoption. Production and price risks are major impediments to investment in land improvements, irrigation, farm equipment and inputs, including fertilisers and seeds. Agricultural risks are among the major reasons for poverty traps as they may influence decisions of smallholders in favour of subsistence farming with low risks but also low returns, rather than expanding investment into high-return farming enterprises.

Most farmers in Africa have limited access to government or market-based risk management tools. Insurance and other forms of protection against natural disasters are rare in Africa, and rural women in particular experience shocks more severely than men do. Despite the high variability and inadequacy of rainfall, investment in irrigation leaves much to be desired in sub-Saharan Africa. The irrigated area in the region, extending over six million hectares, makes up just 5 percent of the total cultivated area, compared to 37 percent in Asia and 14 percent in Latin America. Two-thirds of such area is located in three countries: Madagascar, South Africa and Sudan.

On the other hand, disaster risk reduction and management has attracted greater attention in Africa, where several initiatives have been developed over time. The Africa Regional Strategy for Disaster Risk Reduction and the Extended Programme of Action for the Implementation of the African Regional Strategy for Disaster Risk Reduction (2006–2015), developed under the leadership of the African Union (AU), provide a comprehensive regional framework to strengthen preventive, monitoring and mitigation measures, as well as regional and sub-regional capacities and coordination to reduce disaster losses in the region. However, disaster risk management is often focused on mitigation measures and a few risk transfer options, mainly relief programmes (see section 3.2 for more details on risk mitigation and risk transfers). The role of the private sector in agricultural risk management, especially in the form of insurance services, is often overlooked, as is the complementary role of the finance sector. Moreover, the lack of effective institutionalization of disaster risk management as a priority item in public expenditure at the national or sub-national levels is a particular challenge. At the national level, the ability of African countries to recover and reconstruct after a major disaster is often put under pressure by limited fiscal space, weak infrastructure to manage resources and recover from disasters, and weak governance and institutional capacities. In many countries, resilience to disasters is further undermined by environmental degradation, climate change, extreme weather events and commodity price volatility.

Limited access to risk management tools has contributed to inadequate technology adoption and slow growth of food and agricultural production in Africa. Africa has lagged behind Asia and Latin America in terms of agricultural technology adoption. Although African agriculture was equally as capital intensive as Asian agriculture in 1965, this advantage was lost over the following 35 years. Growth in fertiliser use in Africa over the 1965–2000 period has been very slow in relation to the other two regions: fertiliser use

per worker increased only 3-fold in Africa, compared with seven-fold in Latin America and 12-fold in Asia. The diffusion of high-yielding seed varieties has been much more rapid in Asia and Latin America than in Africa. Millions of cattle, sheep, goats, camels and poultry are lost annually from parasitic and infectious diseases, droughts, floods, and other natural disasters.

In agricultural enterprise, credit is critical to facilitate the procurement of modern inputs and enhance long-term investment in farm equipment and infrastructure. However, financial institutions often shy away from serving agricultural enterprise because of the risks associated with crop failure and price uncertainties. Risk-averse commercial financial institutions, as well as microfinance institutions, prefer to operate in urban and peri-urban areas, undermining farmers' access to agricultural credit. Improved management of agricultural risks has the potential to significantly increase investments in agriculture in Africa.

The meeting of the Group of Twenty (G20) Ministers for Agriculture in Paris on 22–23 June 2011 identified the improvement and development of risk management tools for governments, firms and farmers as a major priority area of support for building capacity to manage and mitigate the risks associated with food price volatility, in particular in African countries. It was also recognized that each country, firm and farm face a different combination of challenges, and there is no single instrument that addresses all needs. Having a toolbox of instruments, from which to choose, tailoring them to the specific circumstances, was decided to be the most effective approach. This toolbox is expected to include assistance for helping governments, firms and farms develop the capacity to evaluate risks and ways of managing them. The G20 meeting took note of the initiative taken by the AU/NEPAD to encourage African countries to integrate risk assessment and management strategies into their agricultural development programmes, and to consider possible pilot projects/programmes at the regional and national level. The G20 ministerial meeting also welcomed the decision of the World Bank Group to develop innovative risk management tools for governments and firms in developing countries, including the International Finance Corporation's (IFC) new Agriculture Price Risk Management (APRM)² product. In December 2013, the International Fund for Agricultural Development (IFAD) launched a four year Platform for Agricultural Risk Management (PARM)³ to make risk management an integral part of policy planning and implementation in the agricultural sector in selected developing countries. In June 2014, the heads of state and government of the African Union in their Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods of the African Union made a commitment "to mainstream resilience and risk management in [our] policies, strategies and investment plans" (AU, 2014).

² The APRM tool's goal is to allow producers and buyers in Africa, the Middle East, and Central and Eastern Europe to lock in prices for agricultural goods and gain better access to finance.

For further information, see: <http://ifcext.ifc.org/IFCExt/pressroom/IFCPressRoom.nsf/0/486BBCC58194FDCC852578B600597CFC?OpenDocument>

³ PARM is an outcome of the G8 and G20 meetings and is supported by IFAD, the New Partnership for Africa's Development (NEPAD), the Government of Italy, the European Commission and the Agence Française de Développement (French Development Agency).

For further information, see: <http://www.ifad.org/media/press/2013/59.htm>

The New Partnership for African Development (NEPAD) Planning and Coordinating Agency promotes the integration of food security and vulnerability issues, including risk management tools, into the agricultural investment plans under the Comprehensive Africa Agriculture Development Programme (CAADP) framework. Such tools should be adapted to specific local contexts and integrated into agricultural development plans covering crops, livestock and fisheries, as well as markets and consumption. The risk management approach should thus be holistic, focusing on the interactions between different types of risks, complementarities between on-farm based strategies and commercial risk management services, and the impact of various government policies on risk management. Farmers face different types of risk and they may be positively or negatively correlated with each other. Lower level of yields, for instance, could be associated with higher level of prices. This approach also addresses several cross-cutting themes such as gender, nutrition, social protection and climate change. Furthermore, it is based on a clear understanding of why agricultural risks need to be managed and how they are handled in different parts of the world by mapping various risks faced in both rural production and households' food access, by identifying the appropriate risk hedging instruments, and by providing adequate training for increasing the effectiveness of the measures applied.

Specific attention is needed to ensure the inclusion of women in these risk management measures. Men and women have different entitlements in relation with production and consumption; therefore, they face different types and risk levels in accessing such resources, and thus have different strategies and opportunities available to them to manage those risks.

NEPAD/CAADP supports effective risk management strategies at regional and national levels in order to foster productive investment and achieve the annual target of 6 percent in agricultural growth. A real paradigm shift is necessary in order to effectively and efficiently manage risks. The underlying approaches to risk management and resilience building need to be based on market, policy and institutional reforms. It is against this background that NEPAD/CAADP, in collaboration with FAO, decided to prepare this review of innovative approaches and guidelines for mainstreaming agricultural risk management.

This document outlines the basic concepts and reviews country experiences on agriculture and food insecurity risk management. It provides background information to improve knowledge and develop capacity, promote policy dialogue and advocacy, and guide actions by countries and regions for the integration of risk management and resilience programmes into National Agriculture and Food Security Investment Plans (NAFSIPs) as part of CAADP. This manual can be used as a reference material for capacity development for improved understanding of key issues in food and agricultural risk management among stakeholders. It may be used by countries attempting to review available risk management instruments, as well as identify policy and institutional gaps. It can assist countries and regions to adopt and implement policies, institutional systems and regulatory frameworks for risk reduction and crisis management in line with the AU's goal to enhance "resilience of livelihoods and production systems to climate variability and other related risks" as stated in the Malabo Declaration (AU, 2014). It will also complement the African Risk Capacity (ARC), a joint initiative of the World Food Programme (WFP) and the African Union

Commission (AUC), whose objective is to establish a pan-Africa drought risk facility, which could offer countries access to timely funds based on objective triggers (e.g. weather index), reducing dependence on ad hoc and unreliable international appeals for emergency food aid assistance.⁴

This document is organized as follows: section two defines agricultural risk and resilience building, and the impacts of risks on producers, consumers and the macro-economy. Section three identifies the tools for risk management concerning market prices and production. This is followed by section four, which reviews agricultural risk management in different parts of the world. Section five provides an overview of effective integration of risk management tools and the considerations for mainstreaming them into investment plans. Finally, section six presents the concluding remarks.

⁴ For further information, see: <http://www.africanriskcapacity.org>

2. AGRICULTURAL RISKS

Farmers, particularly in Africa, face a number of interconnected risks. Risk can be defined as the probability of occurrence of hazards and shocks that negatively impact agricultural production, trade, markets and consumption. Risk management can be considered either as a range of techniques, tools and policies that can be applied in order to avoid or minimize losses coming from such risks, or directly addressing their root causes.

The extensive negative impact of natural disasters and complex emergencies has put the humanitarian system under considerable pressure. In fact, these not only result in significant economic losses, but they also require mobilization of large amounts of humanitarian aid from the international community. Despite meeting short-term humanitarian needs regarding survival, large-scale emergency interventions have not substantially improved regional or local capacity to withstand future shocks and stresses. Investment in early warning – early action, disaster risk reduction and agricultural risk management instruments to build the resilience of men, women and communities to cope with risk in disaster prone regions is more cost effective than humanitarian response.

The current agenda of the international community increasingly promotes programmes that seek to foster more resilient food production systems and livelihoods that are efficiently absorbing impacts and dealing with the negative effects of disruptive events. While the concept of resilience has emerged as a plausible framework for substantially improving regional or local capacity to manage risks, withstanding future shocks and stresses, and reducing the need for humanitarian responses, the NEPAD Agency and FAO are convinced that being able to absorb shocks is not enough. The root causes, which most often are structural constraints (e.g. lack of basic infrastructure such as roads and irrigation), must also be addressed at the same time.

The various types of risks are generally experienced differently by different groups of people. Rural women experience shocks more severely than men do, because of existing social inequalities or gender gaps in agriculture. These inequalities limit women's access to productive resources, services, and better-paid jobs, hindering their social participation and political representation, and placing them in a more vulnerable position in the face of price and production shocks. Furthermore, women and men have different roles and responsibilities related to agriculture that can vary from one country, livelihood group or community to another, affecting the risks they face and their individual priorities in managing them.

2.1 Types of agricultural risks

This section provides an overview of the different types of risk, their impact at household and national levels, and the nature of agricultural risks in Africa. Food security and agricultural risks can be categorized based on their frequency, impact or source.

2.1.1 Types based on frequency and impact

Risks can be classified according to the frequency of the occurrence of shocks, the magnitude of their impact (intensity) and the risk management options (see Table 1). The agricultural risk management instruments include risk bearing (RB), risk mitigation (RM), risk transfer (RT), and risk coping (RC), which may also be viewed as normal risk, transferable risk and catastrophic risk (OECD, 2011; Cervantes-Godoy, Kimura and Antón, 2013).

Table 1: Classification of agricultural risks: Frequency, intensity and responses to risks

Intensity	Frequency		
	Low	Medium	High
Low	Normal risks (RB, RM)	Normal risks and transferable (RB, RM)	Normal risk (RB, RM)
Medium	Transferable & normal risks (RB, RM, RT)	Transferable & normal risks (RB, RM, RT)	Catastrophic (RC, RM)
High	Catastrophic & transferable risks (RC, RM, RT)	Catastrophic risks (RC, RM)	Catastrophic risks (FR)

Source: Based on Hatch *et al.*, 2012, p. 1.

Note: Response options: RB = Risk bearing; RM = Risk mitigation; RT= Risk transfer; RC = Risk coping; FR = Failure range - stop the activity.

Normal risks

Normal risks may or may not be frequent and are usually associated with relatively limited losses and damages and refer mainly to idiosyncratic risks (i.e. farm-specific) leading to small variations in price and yield. Farmers manage this type of risk by themselves: risk bearing (e.g. instruments and strategies that are available at the farm and include savings and income diversification to cover potential losses). Farmers may also manage normal risks through risk mitigation: (e.g. through strategies that deal with income and consumption smoothing in the market, and through public, community or own investment in drought resistant seeds and irrigation to reduce future losses). The way farmers manage risks on the farm is affected by the resources available to them – women and men will have distinct strategies and instruments based on what their priorities and opportunities are.

Transferable risks

Transferable risks are not very frequent and may not involve huge losses affecting a very large area at the same time. Apart from measures related to risk mitigation (and to some extent risk bearing), producers can rely on insurance and marketing contracts to manage transferable risks.

(i) Insurable risks

Risk transfer mechanisms include the use of insurance or reinsurance to lay-off a portion of one's risk to others. Insurable risks correspond to risks that are more significant in scope than normal risks,

but whose potential losses are definite and measurable. The intensity and frequency range from low to moderate, but both frequency and magnitude are in the feasible/profitable range for transferring, sharing or pooling through the market mechanism, hence their acceptability by insurance companies. In most developed countries, farmers use specific market instruments, such as insurance, or options that are particularly designed to deal with farming risk. A sustainable insurance contract can be expressed in the following form (Hazell, 1992):

$$(A + I) / P < 1$$

Where: A = average administrative costs per insurance contract;

I = average indemnities paid;

P = average premiums paid.

The premium collected on an insurance scheme must exceed the average payouts (sum of administrative costs and indemnities). In Africa where the insurance markets are underdeveloped and premium prices are high, farmers depend on self-insurance (risk bearing). Risk mitigation activities have the potential of bringing down premium prices (e.g. selecting short production cycles or planting drought tolerant seeds). Reinsurance occurs when multiple insurance companies share risk by purchasing insurance policies from other insurers to limit the total loss the original insurer would experience in case of disaster or catastrophic risks.

(ii) Production and marketing contracts

Production and marketing contracts between farmers and the downstream industry or cooperatives are another important risk management tool. The government has to ensure that the legal system properly underpins the development of these contracts, allowing enough flexibility and security of transactions. It also has to provide for the appropriate framework to address possible constraints for women in accessing these contracts.

Catastrophic risks

A catastrophic risk that is associated with low frequency risks but very large losses can be managed mainly through public support systems, in addition to risk-mitigation measures. A shock with high overall losses for a region or a country implies that catastrophic risk can be understood as systematic (OECD, 2011) or highly inter-related covariate risks. Because of growing concentration of population and assets in risky areas and increases in climate variability, the economic costs of catastrophic events, which may take the form of major slow-onset disasters (e.g. drought) or rapid-onset disasters (e.g. hurricanes, earthquakes), are on the rise in developing countries (Cummins and Mahul, 2009). These characteristics make catastrophic risks difficult to share or pool through the insurance market. Most market approaches and informal farming strategies that deal with risk management tend to fail in cases such as large-scale droughts or widespread floods, and the problem is further compounded when such events become more frequent. These types of risks generate a large amount of damage throughout the agricultural value

chain, distressing consumers' access to food, and disrupting farming activities. Hence, governments have an important role to play in managing catastrophic risks and often intervene with *ex post* payments to help victims cope (risk coping) with the shock. Disaster risk management strategies are designed to save lives, protect livelihoods, and invest in risk mitigation activities to ensure that those affected are provided with recovery and rehabilitation support. There are catastrophe insurance programmes in developing countries, but only a few countries have developed affordable, effective and sustainable programmes without heavy public subsidies (Antón *et al.*, 2013).

A catastrophic risk that involves high frequency risks and very large losses cannot be managed. A recurrent widespread crop failure, for instance, implies that crop production is no longer a viable option in the area (failure range - stop the activity). Other activities such as livestock husbandry or non-agricultural employment may be pursued as crop production ceases to provide sustainable livelihood. The situation may also fuel out-migration owing to deteriorating livelihood conditions and continuous dependence on handouts.

2.1.2 Types based on sources of risks

Agricultural risks such as price volatility, market and institution failure, weather shocks such as drought and floods, or biological factors such as insect pests and diseases tend to be connected and mutually reinforcing, affecting the entire agricultural value chain. The different types of risk factors are highly sensitive to gender. Women comprise 50 percent of the agricultural labour force in sub-Saharan Africa, but throughout the continent have less access than men to productive resources and opportunities, meaning they will be hit hardest by shocks affecting production. In the urban population, women are typically the decision-makers on food consumption and nutrition and are often forced to adopt negative coping strategies in the face of price shocks.

Market-related risks

Market-related risks include uncertainties relating to: availability of inputs, availability of markets for farm and off-farm products, the price of inputs, the price of farm products, and the income derived from farming operations. Price risks are of serious concern to farmers, traders, processors, agricultural finance providers, and other operators along the value chain. Many factors contribute to output price variability. On the demand side, an increase or decrease in income and population growth, energy prices, and biofuel production may contribute to sudden price changes. On the supply side, overinvestment or underinvestment in rural infrastructure and agricultural sciences could lead to fluctuations in production and prices. Price and production risks are highly interrelated; therefore, variability in production can result in high food price instability and vice-versa, meaning that high volatility in input prices for example can affect the level of productivity and production. Moreover, low or high levels of stocks can be associated with high price volatility. Variability in fuel and fertilizer prices appear to be the main components of input price variability in crop production, partly because fuel and fertiliser account for most of the input

cost in agriculture, and partly because, as commodities themselves, are subject to price fluctuation. These variabilities are expected to increase in line with increased volatility of energy prices (World Bank, 2005b; Antonaci, Demeke and Vezzani, 2014).

Production risks

Production risks are those resulting in production losses: agricultural producers deal with risks associated with negative outcomes mainly deriving from extreme weather shocks such as drought, floods, or cold waves. Finally, biological factors such as insect pests, crop and livestock diseases are recurrent events affecting agricultural production. One of the major consequences of loss following the outbreak of a serious livestock disease is the impact on exports, as importing nations often impose a ban on exporting countries. A widely recognised feature of these and related threats is their spatial correlation. Climatic and biological events normally hit the overall farming population of a certain area with serious implications for managing agricultural risks. Due to climate change and globalisation, production risk is likely to grow (World Bank, 2005a).

Human and personal risks

Human or personal risk refers to factors such as problems with human health or family relationships that can affect production activities. Accidents, illness, death, fire risks, theft and divorce are examples of personal risks that can undermine livelihoods. Farmers also face personal health risks associated with occupational pesticide exposure and environmental contamination. The problem is compounded by the limited access to healthcare services in rural areas, given that health facilities tend to be concentrated in cities and rural people have difficulties in accessing them because of inadequate transport and communications (Feinstein International Center, 2013).

Institutional and policy risks

Inadequate regulatory measures, inappropriate policy decisions, and weak market information systems aggravate market and production risks. Regulatory frameworks as well as agricultural policies (e.g. subsidies, regulations for food safety and environmental regulation) or trade policies are not always well informed, and are often subject to sudden and frequent change. Abrupt change in government decisions that do not correspond to farmers' and other value-chain actors' expectations often have negative impacts on production or marketing decisions and income.

Trade restrictions and inadequate rules for creating fair and competitive markets and trade have increased transaction costs for private investment in risk management tools. The challenge in Africa is about securing an effective and consensual legal framework, and developing a business and economic environment that contributes to the emergence of different equitable solutions for pooling or sharing production and marketing risks. Most governments have yet to include market and production risk management policies in their national development plans (World Bank, 2005a; Cervantes-Godoy, Kimura and Antón, 2013).

Price and production risk management activities are often adversely affected by ad hoc safety net programmes designed to support consumers. Government interventions to lower prices for consumers through the distribution of grain (often non-targeted) at subsidised prices or banning grain export or marketing have discouraged investment in private storage or commodity exchanges. A good social protection scheme delivers timely, multi-year, guaranteed and predictable transfers to poor women and men without undermining the business environment for investment in risk management tools and policies.

Inadequate risk management tools for addressing price and production risks in African agriculture are also linked to weak information systems. Producers, traders, and other operators along the food and agriculture value chain have no access to reliable agricultural information systems. Women farmers have even less access than men to quality information and communication systems, due to their social status and a comparatively lower level of education, especially in sub-Saharan Africa and in North Africa.

2.2 Risk impact

Adverse consequences emanating from systemic or idiosyncratic risks may destroy lives and assets. Agricultural risks are among the major reasons for poverty traps and low growth, as they could influence decisions of smallholders in favour of subsistence production with low risks/low returns. Production and price shocks compromise the food and nutrition security of poor consumers in urban areas, while discouraging investment in the supply chain of food and agricultural products. Different studies have shown that there is a strong negative relationship between GDP growth and shocks, and that the impact is larger in developing countries with less developed financial systems (Baker and Bloom, 2013).

2.2.1 Impacts on producers

The decision of smallholders on how to allocate their land, labour and other resources reflects not only available opportunities but also the need to minimize exposure to shocks and deal with negative coping strategies in time of crisis, discouraging investment in new opportunities. Agricultural risks affect farm production and investment behaviour in a number of ways: production decisions, on-farm risk management strategies, long-term investments, and access to financial services. Unmanaged risks lead to a cycle of “shock, (partial) recovery, shock”, eroding capital and natural resources and endangering the transition from subsistence to commercial agriculture (OECD, 2013). There is also an important gender dimension, as women and men farmers are likely to manifest different investment behaviours based on their roles and entitlements, access to farm resources, agricultural services, and information systems.

Production decisions

In the absence of instruments for managing risks, farmers will base their production decisions on minimising exposure to risk, rather than maximising production or profit. For small farmers, production and price shocks can endanger their very survival. With no insurance or other options to cope with

the shocks, they understandably tend to be risk averse and prefer low-risk and low-return outcomes, instead of higher but more uncertain payoffs. Survival is best ensured by choosing low-risk production technologies and low-risk crops, one of the main reasons why small farmers remain subsistence producers. Such choices result in a lower average income and lower levels of economic efficiency, as resources may not be directed towards the most profitable farm enterprises (World Bank, 2005a).

Gender also plays a role in production decisions. Women tend to take care of subsistence crops and are ultimately responsible for putting food on the table. Their responsibilities for the food and nutrition security of the household could be a factor in making them more risk averse. Albeit not by choice, external factors such as climate shocks will increase the time women spend on domestic activities, such as collecting water, fuel, wood and fodder, reducing the time available for productive activities.

On-farm risk management strategies

With no access to risk management tools, smallholders cope with shocks through depletion of productive assets and savings, migration, diversification, and informal insurance mechanisms, which tend to be exhausted over time since there is no mechanism for informal reinsurance. In marginal and resource-poor areas, asset depletion may have already run its course with a diminished capacity to bounce back from shocks and stresses. Inadequate resilience could eventually lead to stagnating investment for agriculture in risk-prone regions. Limited capacity to restore farm productive capacity is often aggravated by the fact that farmers face a buyer's market in a disaster year and a seller's market in a post-disaster year (Walker and Jodhao, 1982). During a disaster year, households desperately look for a buyer to sell off their assets, leading to a situation where supply exceeds demand. As purchasers have an advantage over sellers in price negotiations, disaster-afflicted families are forced to accept very low prices for their properties. On the other hand, demand exceeds supply in post-disaster periods, as sellers have an advantage in price negotiations over the vast number of households looking for buying opportunities for recovering the assets lost during disaster years. Asset depletion and replenishment cycles are often very unfavourable, leading to a reduced resilience of families over time in Africa. Diversification into non-farm activities, while being a coping strategy option, might also reduce agricultural production capacity, in terms of time, labour, and other physical and financial resources.

Long-term investment

Identifying market trends is often the basis on which modern farm businesses make their long-term investment decisions. However, this planning type is near impossible for farmers when output prices are volatile. This unpredictability creates risk-averse producers who are unlikely to invest in land improvement or infrastructure. The issue of long-term investment is exacerbated when uncertain prices and market perspectives are combined with issues of tenure insecurity and land degradation. Inefficient credit markets and the absence of risk management tools further compound the problem. Tenure insecurity has been one of the greatest detriments to long-term investment in Africa, affecting women in particular, as they own less land and are less tenure secure comparatively to men.

Access to financial services

In the developed world, agriculture typically is a capital-intensive industry, with investments in farmland, buildings, machinery, equipment and breeding livestock dominating the asset structure of most farms. Readily available credit has facilitated many of the significant, long-term changes in the farm sector – commercialisation, consolidation and larger farm sizes, specialisation, and increased capital intensity. However, this is not the case in most African countries where financial institutions are reluctant to lend to the agricultural sector. This reluctance is based, to a large degree, on the real and perceived high risk associated with the sector. Women generally own fewer formalized assets (such as deeds, titles, etc.) that could be used as collateral; this negatively affects their chances of accessing financial services.

2.2.2 Impact on consumers (households and communities)

Most high-income consumers are only marginally affected by a rise in food commodity prices since only a small share of their incomes is spent on food. Moreover, they consume processed products in which the share of raw commodities, such as wheat, in the final consumption basket is small. Naturally, the situation is very different for poor families in developing countries, where the share of food in their total expenditure is very high, and consumption of processed products limited. Shocks such as droughts and food price spikes can affect individuals who normally have sufficient access to food, threatening the stability of food security.

Temporary reduction in income due to price and production shocks can lead families to draw down on their capital to maintain food intake, resorting to distressed sale of assets such as land or livestock. Poor households faced with negative events are trapped in a vicious poverty cycle that makes it increasingly harder for families and communities to lift themselves out of poverty. Coping mechanisms often entail a significant deterioration in living conditions and can include cutbacks on consumption, school fees, and healthcare spending. Relying on social capital in the community is another option, but this strategy often fails in case of large and sudden shocks. Reduced income levels have greater impacts on rural women and female-headed households, as they are less likely to be net sellers of food and have less access to land and other resources. They are also usually poorer and therefore spend a higher share of their income on food (Slater, Holmes and Mathers, 2014; Feinstein International Center, 2013).

2.2.3 Supply chain and macroeconomic impact

A large number of industries (textiles, biofuel, beverage, food, etc.) along the food supply chain are dependent on agricultural supply chains for their operations. Unchecked risks can significantly disrupt supply chains and the high cost of doing business (due to production and market risks) can prevent suppliers, processors, transporters, and marketing companies from expanding and improving their services. Furthermore, shocks impacting the agricultural sector can adversely affect political stability and national GDP with long-term consequences for the country's economic growth. In Asia, large waterworks for both irrigation and flood control has allowed the expansion of food production to meet the demand of the rapidly growing population, averting the threat of famine and unrest (Barker and Molle, 2004).

Reducing food price risks through price stabilisation measures (which include investments to address production and supply variability) has been viewed as essential not only as a way to ensure food security and reduce poverty, but also to enhance long-term investment and economic growth. For instance, Timmer (2002) for instance, showed that rice price stabilisation added one-half to one percent point of GDP growth per year to the Indonesian economy in the 1970s, when rice was still a large share of the economy and the world rice market was particularly unstable. It is also argued that food (rice) price stability in Asia is a key ingredient of the macro stability, a critical factor for private investment and growth (Dawe, 2001). Agricultural production and price volatility may induce instability in government tax revenues and balance of payments, weakening governments' fiscal position, especially in countries heavily dependent on agriculture.

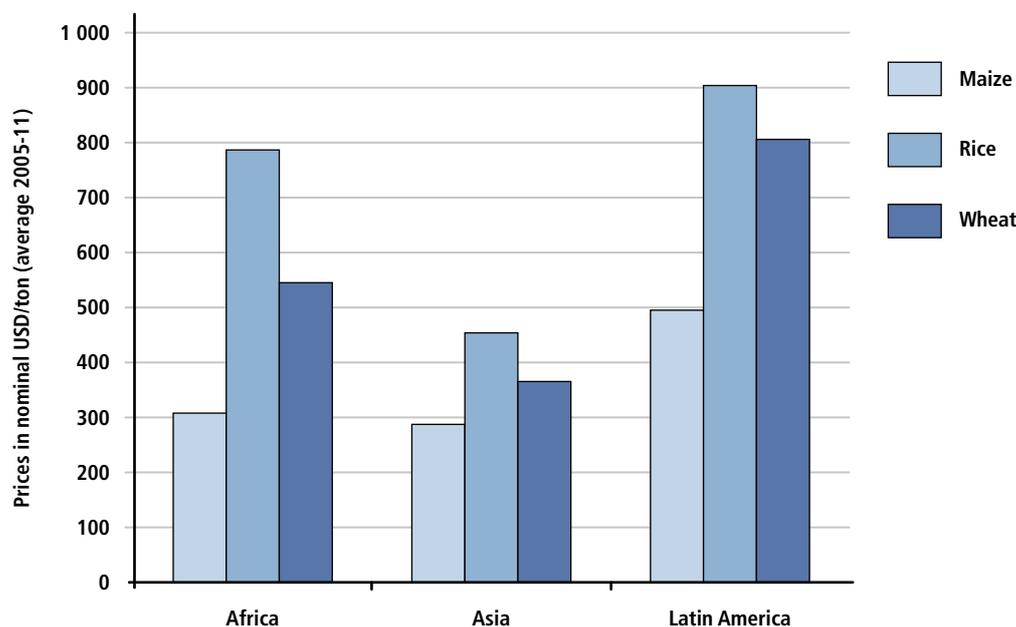
The impact of price uncertainty may vary depending on the trade status of a country. Countries likely to be most concerned by macroeconomic impacts of agricultural price volatility are developing or emerging economies that are dependent on agricultural commodities for a large share of their export revenues, or whose food imports are significant in balance of payment or government finance terms. For exporting countries heavily dependent on agricultural commodities, exceptionally low prices will have an immediate balance of payments impact, but beyond that, uncertainty may curtail investment and affect capacity utilisation. There is also some evidence of long-lasting, significant negative effects on growth. Importing countries faced with exceptionally high prices may also experience deterioration in the balance of payments and deterioration in their public finances. Food price increases can have major repercussions on the whole economy, e.g. for low-income food-importing countries, high food prices can result in inflation (Laframboise and Loko, 2012).

2.3 The nature of agricultural risks in Africa

Africa is one of the regions in the world most affected by food price volatility and production variability. Spiking and volatile food prices have created uncertainty and risks for producers, traders and processors, and resulted in increased food insecurity for consumers. The continent's recurrent and long history of rainfall fluctuations of varying lengths and intensities along with inadequate infrastructure, limited storage facilities and market imperfections are among the major causes for food price and supply variability. Price volatility is very high in Africa: average white maize price volatility is higher in Africa (0.097) than in Latin America and the Caribbean (0.079) or Asia (0.055) (2005–2011). Price volatilities of the largely imported staples, wheat and rice, were also found to be higher in Africa (Figure 1). Among African countries with above average levels of volatility are: Uganda, Rwanda, Nigeria, Mozambique, Benin, Malawi and Tanzania. This is understandable given the weak institutions and persistent infrastructure deficit often found in many African countries (WB/OECD, 2015).

Food and agricultural production in sub-Saharan African countries is highly exposed to a wide range of natural disasters, with hydro-meteorological hazards affecting the largest number of people. Hydro-meteorological disasters in the region comprise cyclones, floods, landslides, wild fires and droughts.

Figure 1: Price volatility of staple crops in Africa, Asia and Latin America between 2005 and 2011



Source: NEPAD/FAO, 2013

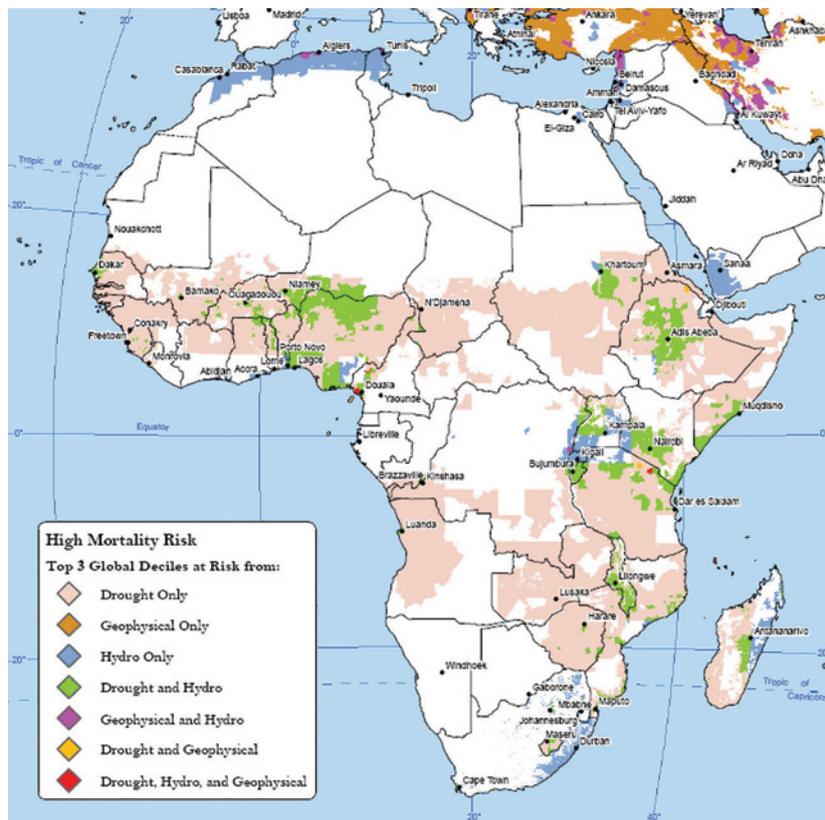
Geological disasters, such as earthquakes and volcanoes, are relatively less frequent and impact fewer countries. Droughts affect the largest number of people on the continent, followed by floods and storms (Figure 2).

Exposure to natural disasters in sub-Saharan African countries is also increasing. The number of disasters reported in Africa has shown an upward trend since the 1970s (Figure 3). Over the last four decades, sub-Saharan Africa has experienced more than 1000 disasters, with 300 disasters between 2005 and 2009 alone. This trend is largely attributable to an increasing amount and concentration of population and assets in zones at risk of natural hazards.

Apart from variable production and yield levels, institutional and policy risks have contributed to high price volatility. Policy responses to high food prices have included export bans and restrictions, tariff reductions, price controls, and distribution of grain at subsidised prices. The responses were largely unpredictable and ad hoc in nature, thus creating market uncertainty and additional price volatility. In the past, many African countries intervened in the food sector, but the objective often focused on supporting consumers rather than producers.

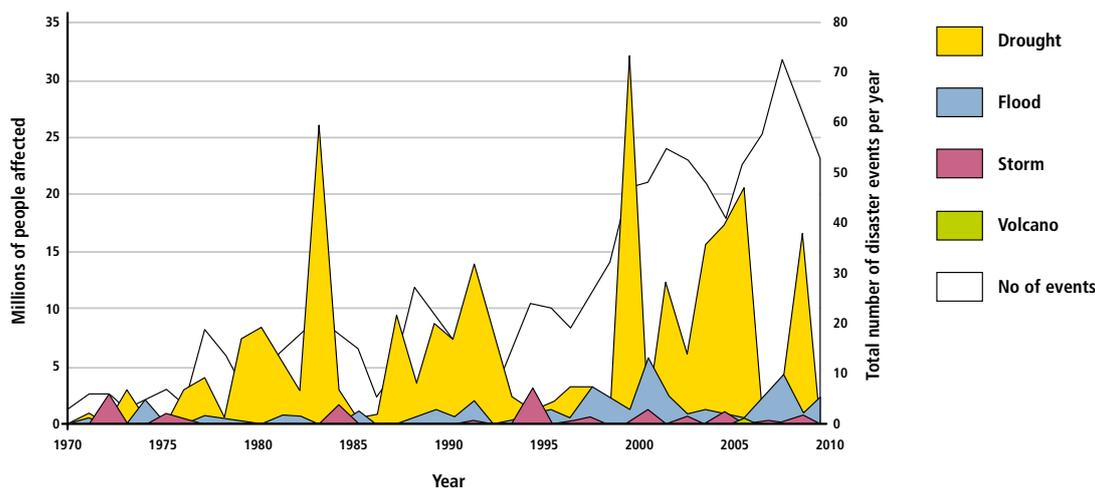
At household level, multiple covariant and idiosyncratic shocks have made livelihood very difficult among rural communities of Africa. Crop failure, mainly caused by drought and floods due to erratic rainfall patterns, is often followed by very high prices, starvation and outbreak of diseases. Prolonged and chronic droughts disrupt and threaten the livelihood of pastoralists living in arid and semi-arid parts of Africa. Insect pests and disease lead to serious loss of crops in the field and in the storage. Losses of livestock, particularly cattle utilized for draught power can negatively affect crop production and food security of households.

Figure 2: Distribution of hazard risk hotspots in sub-Saharan Africa



Source: de la Fuente and Dercon, 2008.

Figure 3: Number of reported disasters, type and number of people affected in Sub-Saharan Africa



Source: WB, 2012.

Producers of staple grain operate under variable prices caused by supply or demand shocks, such as the aforementioned ad hoc policy interventions, and imperfections in input, output, credit and insurance markets. Even bumper harvests can cause hardship as prices may fall to very low levels. The other related factor affecting rural livelihood is inability of farmers to purchase and apply optimal fertilizer to the

soils and inability of pastoralists and agro-pastoralists to access veterinary services for their livestock. Poor infrastructure in rural areas has led to development of thin output markets and consequently total market failure and high price volatility in rural areas.

Furthermore, rural households suffer from vulnerabilities associated with chronic illness, disability and death. When a household is affected by chronic illnesses such as by HIV/AIDS, agricultural productivity declines due to fact that more time is spent on caring for the sick at the expense of farm work. The phenomena of husbands deserting their wives and families puts further pressure on women. In some occurrences, men simply fail to cope with the demands and responsibilities of looking after their families and desert them or abandon their families through migration to other districts in search of employment (Kalinda, 2014).

Crime related attacks such as theft pose major threat in rural areas. Valuable possessions such as crops in the field or stocks of grain and livestock can be stolen. Households that are victims of oxen theft are unable to cultivate their crop fields in a timely manner. Loss of farm assets to theft can be a great setback since these prized possessions are cash reserves, useful in periods of food shortage (Kalinda, 2014; Kessy, 2005). Pastoralists living in the border regions (e.g. Uganda, Kenya and Sudan) are affected by cattle rustling which has become more common and dangerous with the availability of cheap and easy-to-use high-powered assault rifles, namely the AK-47 (Leff, 2009).

Households whose livelihood depends on fishery and forestry also operate under a very risky environment. Fishers and fish farmers are affected by asset risks, production and management risks, market risks, and personal and health risks. Most forest peoples, who grow some crops but still rely on the natural productivity of the forests, are affected by violent conflict and unstable government policies, deforestation and industrial logging.

3. RISK MANAGEMENT OPTIONS IN THE FOOD AND AGRICULTURAL SECTOR

The role of risk management in saving lives, averting damages and preventing development setbacks and unleashing opportunity has attracted increasing attention in recent years. According to the 2014 World Development Report (WB, 2013):

[...] Development can occur only by successfully confronting risk and pursuing opportunity. Many crises and development losses are the result of mismanaged risks. No less important, many opportunities are missed because preparation for risk is insufficient and necessary risks are not taken—the “risk of inaction.” It is therefore essential to shift from unplanned and ad hoc responses when crises occur to proactive, systematic, and integrated risk management.

In order to cope with various production and market risks, farmers normally engage in informal risk management mechanisms, ranging from income diversification activities and production strategies, to common risk sharing mechanisms based on kinship and social networks. However, these traditional risk management methods tend to fail in the presence of large shocks affecting wide areas. Evidence suggests that without government support and formal risk management, less risky and less profitable farming practices are adopted, resulting in lower productivity. The high cost of doing business due to production and market risks prevents suppliers, producers, processors, transporters, and marketing companies from investing to expand and improve their services.

At times of crises, small farmers may fall back on negative coping strategies, which can have specific gender implications – such as households cutting down on their food consumption, health services, and education for female children. These negative consequences can have life-long implications for the well-being and productive capacities of the affected infants and children. Thus, decision-makers also need to integrate gender-sensitive agriculture and food security risk management strategies into their policy framework, in order to provide an adequate institutional mechanism for men and women confronted with different types of risks.

3.1 Market failures and government intervention

In theory, government interventions to manage risks in agriculture must be driven by a clear justification that associated costs are outweighed by benefits or returns to the interventions. Often, governments intervene when the market has failed to provide a satisfactory outcome, and to improve the outcome by government policy. There are three main grounds for policy intervention in relation to agricultural risk markets: (i) to address inefficiencies in the operation of markets and institutions; (ii) on equity or distributional grounds; and (iii) for market creation.

3.1.1 Inefficiencies in risk management

In the context of managing agricultural risk, the relevant question is whether there are efficiency issues arising from private risk markets; i.e. is there a market failure? Inefficiencies can arise in agricultural risk markets from three sources: (i) imperfect (or costly) information; (ii) the existence of externalities; or (iii) where insufficient competition in agricultural risk markets gives rise to market power for providers of risk management instruments.

High information costs

Risk management services rely on the accurate assessment of the magnitude and probability of losses incurred. Agricultural risks are highly unpredictable and diverse in nature. Acquiring this knowledge can be difficult, if not costly, as risk information is often incomplete and unequal between farmers and other operators along the value chain on the one hand, and insurance companies on the other hand. Known as asymmetric information, this inconsistency results in insurers setting premiums based on average risk, potentially excluding some farmers from risk management services, and making insurance protection more expensive for those who face less risk than the average. There is also the burden of acquiring and processing risk-related information, which can be prohibitive for small farmers. On the other hand, some farmers may come to rely on insurance payouts without taking adequate measures to reduce risks. These distributional and equity issues may make it extremely difficult for small farmers to get coverage from private insurers. Government intervention is necessary to overcome these problems and help quantify risk by facilitating research and filling the gaps in information for analysis of weather patterns and disease prevalence. Governments can also help reduce the costs of sharing information between various stakeholders (such as farmers and insurers) and ensure that the information shared is presented in a form and language easily accessible to farmers. Those most exposed to risk, such as poor female-headed households, will usually have less skills in the type of literacy required to assess risk, and with less access to information in general, will be in need of government intervention to help bridge these gaps.

Externalities

Externalities are the side effects, or consequences, in economic activity that affect other parties, without being factored into the costs. In the context of agricultural risk, animal and plant diseases are particularly relevant. The cost of using of natural resources (water, soil, and biodiversity) is also important. Insurers are required to assess the risk level that their client may suffer a loss, but this assessment can be complex, as the risk of loss for single farms depends both on their level of investment in bio-security and on the level of investment by their neighbours. Externalities in agriculture make attaining this information costly for insurers. Many farm businesses and households, especially in situations where veterinary services are weak, are likely to receive sub-optimal or no insurance coverage at all, for potential losses from animal and plant diseases. For these reasons, government action may be essential to address the negative externalities.

Market power

Where a market is characterised by very few suppliers, as is the case in many markets for agricultural insurance, the suppliers will tend to have some power to influence market prices and, ultimately, the ability to generate economic rent or abnormal profits. In the context of agricultural risk management, the result is that even subsidies on insurance premiums may not always benefit farmers, as suppliers of agricultural insurance are able to capture such subsidies as economic rent. In such cases, the government may have a role in improving market competition, for instance by removing barriers to entry in order to increase competition in the insurance market.

3.1.2 Distributional concerns

Households and businesses that rely on farming are most vulnerable, as they are less able to manage risk privately than operators in other industries. This is even truer in Africa than other parts of the world, as existing social welfare arrangements often do not provide a sufficient safety net. Greater uncertainty increases the risk for agricultural activities and the wide range of factors on which they depend. Logically, government intervention is justified when there are concerns over the distribution of market outcomes. Nevertheless, government intervention in agricultural risk markets must be weighed against the potential costs of market distortions. Policies must be sensitively applied so that market solutions are not impinged upon, nor are the incentives for farmers to manage risk privately reduced (OECD, 2009; Goodwin, 2001).

3.1.3 Market creation

Where there are missing markets for risk management, the government may have a role in helping the development of new markets or market creation. Markets, including risk management markets for agriculture, develop much more easily when the macroeconomic and business environment is stable. Providing this environment is an important role for governments. In some particular markets (such as futures and options), the government needs to understand the opportunities and challenges related to the development of such markets, conduct cost-benefit analyses, and provide the appropriate legislation and institutions to facilitate the development of markets.

The role of government in direct research and production of the missing information, to reduce the scope for moral hazards or facilitate information sharing, would generate confidence in the fairness of the market instruments, and thereby stimulate demand. On the demand side, risk management skills of men and women farmers can be improved through training and information about the working of different risk management instruments, and through addressing different learning needs by gender. On the supply side, enforcement of fair competition among insurance companies should make products more attractive and more accessible to farmers.

Government may also alter incentive prices – through taxes and subsidies – in order to bring the economy to a more efficient outcome (under the assumption that it has developed the internal capacities and

institutions to properly achieve such objectives). The absence of some risk management markets may mean that insurance levels are sub-optimal; hence, governments provide subsidies to stimulate demand for risk management tools. These subsidies, however, need to be well targeted to the observed market failures.

Agricultural insurance is one of the tools where private insurance schemes face market and government failures. For instance, private insurers have not been able to cope with systemic, non-diversifiable risk in crop yields due to natural disasters affecting a large number of farms over a widespread region. Even with the possibility of reinsurance, it is hard to calculate fair premiums in order to develop sufficient reserves for low probability but high-loss events. Moreover, the presence of asymmetric information can lead to adverse selection and moral hazard problems, raising the cost and risks of introducing crop insurance products or other risk management instruments such as contract farming. Adverse selection in insurance markets refers to the situation where insurers find it impossible, or very expensive, to distinguish between high-risk and low-risk insurance applicants, and thus price insurance contracts at the average premium can be very expensive. Because of adverse selection and moral hazard, private insurance is generally not available, and if it is available, it is not affordable to small holders.

3.2 Risk management options

A variety of strategies can be used to manage agricultural risks. In general, these strategies can be classified in three categories: risk mitigation, risk transfer and risk coping (OECD, 2009; Cervantes-Godoy, Kimura and Antón, 2013) and failure range where current activities become unviable. Risk mitigation strategies are *ex-ante* measures designed to stabilize production, price or income, like reducing or eliminating production or price risks, and include: development of market infrastructure and institutions; trade facilitation; irrigation; integrated pest management systems; and diversification across commodities, regions, and/or off-farm enterprises. Risk mitigation strategies may be applied by the farmers themselves (risk retention or risk bearing) or implemented through government actions or through public-private partnerships. Risk mitigation cuts across all the different categories of risk management strategies and is the dominant approach across all frequency and severity levels (Table 1).

Risk transfers are also *ex-ante* actions and refer to the transfer of potential financial consequences of particular risks from one party to another. Risk transfers are more appropriate for low frequency and moderate or high losses (Table 1). Insurance and futures market contracts are among the well-known forms of risk transfer. In developed countries, farmers often have access to risk transfer mechanisms such as futures market contracts (or derivatives thereof) to help manage price risk and crop insurance to help manage yield risk. Risk transfer mechanisms are generally much more limited and informal in developing countries. Typically, informal mechanisms involve smoothing inter-temporal consumption across low- and high-income periods through saving (in good years) and dis-saving (in bad years).

Risk coping mechanisms are *ex-post* measures and include actions taken after shocks to mitigate or insulate the welfare impacts of the shocks. Government assistance to farmers, debt restructuring, selling assets by households affected, etc. are examples of risk coping mechanisms. In general, actions taken to avoid transfer or reduce risks or exposure to risk are considered *ex ante* risk strategies, while measures taken after the shocks for mitigating or insulating the welfare impacts of the shocks are known as *ex post* shock coping strategies.

As noted in section 2.1.1, a catastrophic risk that occurs very frequently entails a failure range, implying the activity under consideration needs to cease. The failure range starts from the point where the magnitude of the damage is such that existing livelihood cannot be sustained without continuous external support or coping mechanisms. Areas where households have become dependent on humanitarian aid on a perpetual basis due to desertification or extreme land degradation need to look for alternative livelihood strategies.

3.2.1 Tools for managing price risks

Risk management tools include measures designed to mitigate the impact of price volatility and supply shocks, mainly on production incentives and food security. A number of instruments can be applied to manage price risk. The objectives, characteristics, and challenges faced in implementation are discussed in this section.

Contract farming

Contract farming is a risk transfer mechanism intended to solve the problems of imperfect product market, price uncertainties, and credit market failures. A contract agreement obliges farmers to supply their product to agro-enterprises or other users. The two parties engage in “forward agreements” with well-defined obligations and remunerations for tasks done, often with specifications of pre-agreed price, volume, quality, and time of delivery. The food supply chain has increasingly become vertically coordinated in developed and emerging countries, with contract farming as the main instrument of coordination for most traditional commodities. The reduction of transaction costs is the major reason why farmers opt to contract with a downstream processor and marketer. In developing countries, where farm scale tends to be small, and farmers are generally less educated, contracting with a large agribusiness firm may be the only way farmers can access higher end markets and receive higher returns. By entering into contract, farmers can have easier access to inputs along with credit from sponsors. Contract farming takes the form of outgrower schemes, multipartite models (in which government plays a key role) and intermediary models (in which cooperatives play a major role). In most countries, the proportion of women members participating in outgrower schemes remains low.

Over the last two decades, contract farming in the production and marketing of agricultural products has seen a rapid expansion. In particular, livestock products such as dairy, poultry, and pigs have attracted a lot of attention by agro-processing enterprises. In the case of dairy, contracts may offer the guarantee of supply of intermediate inputs, livestock services, and market outlets for smallholder producers in exchange for the guaranteed supply of milk to the processor. In Kenya, dairy cooperatives provide integrated services to small producers (Box 1).

Box 1: Dairy marketing in Kenya

Farmer cooperative processors have demonstrated the potential of enhancing the competitiveness of the smallholder dairy sub sector because of their ability to assure farmers of a ready market for the milk produced. Furthermore, the cooperatives also operate based on the Dairy Hub Model, where they offer embedded services to their members, such a supply of better feed, provision of artificial insemination and veterinary services, investment capital, training and capacity building, and overall business development services. Other small processors include some private dairies and many backyard mini-processing units. The three main large-scale processors include the Kenya Cooperative Creameries (KCC) (government parastatal), Brookside, and Spin-Knit. Of these three, the New KCC is the leading buyer of milk, and its presence in the region plays a major role in milk price stabilization. A few farmers' co-operatives (Lari Limuru and Githunguri) are now active players in the formal processing sector (Jomo Kenyatta University of Agriculture and Technology/Central Artificial Insemination Station/Kenya Institute of Public Policy Research Institute, 2012).

Contract enforcement and limited capacity of small farmers are major constraints, particularly as many agribusinesses and supermarkets would rather not work with small quantities (Box 2). Governments need to promote contract farming by regulating the terms of the contract and improving enforcement mechanisms, including measures to strengthen the court systems and to promote group contracts. Formal contracts provide superior enforcement options but no contract can cover the different contingencies associated with agricultural production and distribution. Contract farming works better in the case of export crops (e.g. tea in Kenya) and high value crops, than for staple cereals. The success of contract farming depends on how fair the clauses are in the definition of terms for integrating small-scale men and women producers into value chains. Governments can play a role in strengthening bargaining capacities of men and women farmers, and their organizations, so that they are able to negotiate appropriate price and contract clauses.

Contract farming has been a useful mechanism for helping farmers to diversify into new, high-value crops such as horticulture, cotton, tea, tobacco, poultry, or dairy, but there are very few successful examples of contract production of staple grains and root crops for food production (Minot, 2011). However, WFP has been attempting to change this situation through its Purchase for Progress (P4P) programme in recent years. As the world's largest humanitarian agency and a major staple food buyer, WFP's local purchase provides smallholder farmers in 20 pilot countries with the possibility to manage price risks and sell to a reliable buyer. It was envisioned that WFP's P4P programme as a way to encourage other buyers of staple commodities, including governments and the private sector, to buy from smallholders (Box 3).

Box 2: Challenges of contract farming

One of the major problems of contract farming schemes is the high cost of dealing with large numbers of dispersed contract farmers. This is particularly true when the company distributes inputs, provides credit, and organizes the collection of the crop. Contract enforcement can be expensive, or even impossible, in the event of default or breach of contract by large number of small clients. This is one of the main reasons why companies often prefer to work with larger-scale farmers. One solution is to have another organization act as intermediary between the company and the farmers. A non-governmental organization (NGO) or donor-funded project may help organize farmers. Alternatively, a farmer cooperative may serve as an intermediary, facilitating the distribution of inputs and technical assistance, as well as the collection of the crop.

Another common problem in on-going contract farming schemes is *side-selling*, the sale of contracted output to other buyers. In some cases, farmers sell to other buyers in order to avoid repayment of inputs they received on credit. The problem of strategic default on credit has been exacerbated in some countries by lax enforcement in government-run credit programmes, leading to the perception among farmers that non-repayment is an acceptable option. Some approaches used to reduce defaults are: group lending, a group of farmers taking joint responsibility for repaying the loans of any defaulting members; information sharing among buyers, where buyers exchange information about contract farmers, their debts, and credit history; and incentives for repayment and strict treatment of defaulters, including exclusion from future contracting and asset seizure (Minot, 2011).

Women are generally less likely to adopt contract farming than men in developing countries. Established institutional arrangements may provide women with disadvantageous contract opportunities and conditions. In Africa, limited access to land and control over the allocation of labour and cash resources have hindered women's ability to benefit from contract farming. Women involvement in farming contracts in the high-value tea and horticulture sectors is low, mainly due to lack of title deeds to land. Governments need to address issues relating to women's lower land access and ownership rates in order to enhance their ability to participate in contract farming.

Warehouse receipt systems (WRSs)

WRS is a risk mitigation strategy aimed at protecting farmers from seasonal price risk variability by giving them the opportunity to store their product and receive a receipt indicating its existence and availability. Most smallholder farmers are currently compelled to sell the bulk of their produce immediately after the harvest season, when prices are very low. They cannot delay their sales and benefit from price increases

Box 3: The P4P initiative of the World Food Programme (WFP)

WFP's five-year Purchase for Progress (P4P) pilot initiative was launched in September 2008 and ended in December 2013. The pilot tested new procurement modalities with the potential to contribute to developing the capacities of smallholder farmers. This ultimately aimed to increase smallholders' incomes from participation in formal and structured markets for staple food commodities. One of the procurement modalities tested was the forward delivery contract, an agreement committing the WFP, the buyer, to procure a commodity of specified quantity and quality from a registered P4P vendor, the seller (typically a farmers' organization), at an agreed time in the future. To date, seven of the 20 P4P pilot countries, including Burkina Faso, Ethiopia, Kenya, Mali, Mozambique, Sierra Leone, South Sudan, Uganda, Tanzania and Zambia, have experimented with this type of contract. Country experiences suggest that the contracts are largely used to facilitate commodity aggregation and manage price risk at farmers' organization level. Farmers and their organizations are receptive to the forward delivery contract as it provides a guaranteed market and price, with a provision committing WFP to a price renegotiation process when market prices increase. A key P4P objective is to support smallholders' engagement with formal markets beyond WFP on a sustainable basis. By investing in capacity development and supporting emerging structured trading systems, such as warehouse receipt systems in Uganda and Tanzania, and commodity exchanges in Ethiopia, Malawi and Zambia, P4P has been searching for solutions to challenges such as side selling, poor crop quality, price volatility, and insufficient access to credit (WFP, 2014).

later in the year because they lack suitable storage facilities, or they cannot meet household consumption needs and loan repayment obligations without selling their crop. With the WRSs, farmers are able to access inventory credit and therefore overcome the risk of low prices. Transferable receipts can be sold,⁵ or be used as proof of collateral for loans. WRSs allow farmers to access formal credit markets by offering a collateralisation service which is generally based on a tripartite agreement involving a financial institution, a borrower (the depositor) and a collateral manager (the warehouse operator).

The WRSs facilitate aggregation of grains and other commodities by smallholder farmers, and allow grading and standardization to ensure that the quality and quantity of the grain specified in the warehouse receipt is correct while the operator guarantees delivery. As a result, farmers can transact directly with larger-scale buyers, such as wholesalers, processors and exporters, without going through multiple

⁵ In this case, the property rights of the commodities are transferred free of any outstanding claim not reported on the receipt (e.g. outstanding storage charges), resulting in an exchange of the title of ownership over the underlying goods.

layers of intermediaries, and with much less risk of unfair, low or volatile prices. Besides these direct benefits, WRSs play an important role in introducing other market innovations like commodity exchanges. In some countries, warehouse credit systems are managed by farmers' organizations, including women-only organizations, which reduces dependence of farmers on the warehouse owners, and provides opportunity for diversifying incomes (see Box 4).

Box 4: Warehouse receipt system for men and women farmers in Niger and Tanzania

The *Cigaba* Union of producer organizations, based in the region of Dosso in southeast Niger, brings together 51 village groups comprising about 1 500 men and women farmers. Despite good harvests, Union members tended to sell off their products cheaply in order to obtain cash, only to be faced with food shortages during the lean season. To counter these problems, the Union turned to the warehouse credit system. Thanks to support by the Food and Agriculture Organization of the United Nations (FAO), five warehouses have been built by the Union, which has enabled the Union to reduce its members' reliance on warehouse owners, and has enabled women to strengthen their presence within the warehouse receipt system. In addition, several initiatives were promoted that have fostered the creation of income generating activities for women members of the Union (FAO, 2012).

A recent review revealed that Tanzania has one of the most advanced WRSs north of South Africa. Warehousing services are largely provided by private operators licensed by the Tanzania Warehouse Licensing Board (TWLB). Inventory financing is provided by commercial banks, and smallholder farmers are able to access these facilities as groups mobilized by the primary-level co-operatives and farmers associations. However, it is in export commodity sub-sectors (cashew, coffee and, to some extent, cotton) that the system has been most successful. Efforts to extend the WRS to grains in Tanzania have not yet gained sufficient traction. As in many other countries, the grain WRS centres around surplus-producing communities are lacking appropriate storage infrastructure. Success depends not so much on enacting enabling legislation, but on strengthening the capacity of regulatory agencies to robustly enforce adopted rules and standards. Even more crucially, it is important to remove, or at least reduce, policy-related uncertainties such as ad hoc imposition of export bans or waiver of import duties, which undermine private storage incentives. This, for instance, appears to be a defining factor in explaining the differences in outcome in Tanzania (between the WRS for the grains sub-sectors and for export commodities). The same conclusion appears to apply in most African countries (Rural 21, 2013).

Major challenges in implementing WRSs are related to institutional bottlenecks. It requires well-established grades and standards, regular quality control and preservation, a reliable trading platform and an enabling policy environment, a developed and affordable financial market, and an effective legal environment to enforce contracts. Systems of standard grades and measures are poorly developed for staple grains, making it difficult for WRSs to be effective. When a WRS is developed without complementary structures, such as effective grading systems, high storage quality and reliable trading platforms to facilitate sale of the stored commodities, it is difficult to assure significant utilisation of the system. Banks have limited confidence in the collateral value of stored commodities when there is no structured trading system in place to liquidate the collateral in the event of a default. Countries such as Tanzania, Uganda and Zambia, have tried to resolve this problem by enacting enabling warehouse legislation, but concerns about the capacity of regulatory agencies to effectively enforce such laws have remained high. Unfavourable policies in the form of interventions in grain markets, such as unpredictable imposition of export bans, waiver of import duties and price controls in grain markets due to food security concerns, have also created uncertainty in the grain market, undermining the development of WRSs in Africa. As traders and processors are unwilling to keep large inventories of grain or tie themselves to forward contracts involving fixed future prices, smallholder end up holding stocks and being exposed to price shocks.

It is thus important not only to enact enabling legislations, but also to address policy constraints that undermine the development of WRSs. It is also relevant to empower and develop the capacities of men and women farmers and their organizations to engage in aggregation and collective marketing.

Commodity exchanges

Commodity exchanges provide a centralised marketplace, options to simplify title transfers, perform the “price discovery” mechanism, and deal with price risks and market uncertainty. In a commodity exchange, commodity-linked contracts are traded on the basis of rules and procedures determined by the exchange. The contracts commonly include spot trading, futures contract, and options (Box 5).

Price discovery, a major benefit of futures markets, allows market agents to be informed of the true market-clearing price in a quick and efficient manner. This information is also vital when making marketing and production decisions for all participants including farmers, exporters, and retailers. The futures markets provide a transparent price that can be used by traders as a benchmark to determine spot prices for a vast array of cash market contracts. Traders also make forward contract offers to farmers based upon current futures prices. However, futures markets cannot discover price in the absence of reliable market information. Comprehensive and frequently published supply and demand information is critical for futures markets to operate effectively. In the US, for example, an important source of such information is the United States Department of Agriculture (USDA): crop reports of the Department contain valuable information that is quickly incorporated by the corn futures market (McKenzie, 2012).

Box 5: Commodity exchange contracts and conditions for success

The major contract types in a commodity exchange include: (i) spot trading – a basic market where commodities are bought and sold for immediate cash and immediate delivery, and the spot prices are disseminated through various media outlets as reliable and transparent information to facilitate grain buying and selling; (ii) futures contract – an agreement to buy or sell a given amount of a commodity at a predetermined price and date, hence buyers use the contract to avoid the risks associated with the price fluctuations of the product, while sellers try to lock in a price for their products; (iii) option – the right, but not the obligation, to buy or sell a commodity at a predetermined price at any time within a specified time period. A put option gives the option seller the right to sell the underlying commodity, while a call option gives the option buyer the right to buy the underlying commodity for a given cost, known as option premium.

Key policy conditions to create a successful agricultural commodity exchange market should:

- Create an economic environment in which the private sector can play a more active role in both the domestic and regional/international grain trade. Avoid non-transparent government intervention in markets (buying, selling, price setting, export bans, etc.) to ensure regular seasonal price increases (to cover the additional cost of handling, storage, regulation, etc.).
- Improve the harmonization of quality and grading standards. Warehouse receipts and grading standards should replace the traditional system of visual inspections.
- Improve basic transportation infrastructure, pursue policies to increase investment in private storage facilities, and facilitate better access to credit.
- Establish an independent institution to document, publish, and disseminate market information on price, production and demand data.
- Ensure that an adequate regulatory framework exists to police futures exchanges. A trusted regulator ensures that the systems are transparent and participants comply with their rules. The regulator can be a government body or a private sector body, but must be independent of external influence, and completely trusted by the private sector players (particularly the financial sector).
- Provide adequate sources of credit and financing to potential hedgers (McKenzie, 2012).

Several conditions contribute to a well-functioning commodity exchange: large trading volumes per transaction, a huge amount of liquidity in the market, grades and standards of quality, storage facilities, a reliable banking service, and a strong legal framework to enforce commercial laws and contracts (Box 5). The South Africa Futures Exchange (SAFEX) is by far the most successful exchange in Africa. The primary objective of the commodity derivatives market is price risk management, not physical delivery of the underlying commodity. On average, SAFEX trades futures and options contracts amounting to 200 000 tons of white maize per day. The SAFEX silo receipts have enhanced efficient trading of agricultural commodities to such a degree that many financial institutions have been accepting them as collateral. Most large-scale farmers in South Africa sell their grains through SAFEX, usually through brokers.

Governments need to take measures to strengthen the institutional, legal, policy, and infrastructural environments for standardized grading and weights, standardized storage facilities, professional storage management, suitable insurance products, and enforceable standardized contracts and development of market intelligence. In particular, as smallholders face a major hurdle of meeting the minimum quantity required to trade in such markets, farmer organizations, including smallholder women's groups, need to be supported to meet the requirements. Governments can play an important supporting role by publishing good quality data on prices, production, storage, exports and imports, etc. A free flow of information is necessary to attract trading and speculative interest in a contract. They also need to avoid non-transparent government intervention in markets that result in unpredictable price volatility.

Food and agricultural market information and early warning systems

Food and agricultural market information systems (FAMISs) refer to a process and tools to collect and deliver market information in order to reduce risks and lower transaction costs for farmers and other stakeholders of agricultural value chains. As noted above, FAMIS is a major prerequisite for effective operation of commodity exchange, contract farming and warehouse receipt system. It increases the transparency of markets and improves the bargaining power of smallholder farmers who were previously unable to obtain market and price information because of their remote locations. Access to information about current prices, seasonal price trends and production levels allows farmers to avoid the risk of selling when price are low and choose preferred markets to sell their goods. Small agribusiness traders also use FAMISs to decide how to price goods or when or where to sell them.

Market information systems have expanded in recent years due to the increase in the availability and use of cell phones and internet in Africa. Between 2000 and 2012, the growth of mobile phone subscribers and internet users has accelerated. Mobile phone-based FAMIS models have high potential to improve market information flows between traders and producers directly without intermediaries. Beyond market information systems, the new generation of mobile platforms have evolved to include services such as agricultural extension and advisory services and mobile financial services (banking, saving, credit, remittances and payments), reducing transaction costs and risks traditionally associated with the investments in the agricultural value chains.

In Africa, various types of market information systems have emerged: some are government-owned, some are private initiatives and a few are public-private partnerships. Both public and private initiatives in Kenya, Uganda and Tanzania saw an expansion of mobile technology. A recent study (Demeke *et al.*, 2014) noted that:

Kenya, for example, is one of the countries where the use of ICT-based market information systems has grown rapidly and become common practice. At the end of 2011, Kenya was the leading country in East Africa in terms of mobile usage with a 67.2 percent mobile penetration rate. The new technology has allowed farmers, traders and other beneficiaries to access information on the pricing of inputs and outputs and on finding and connecting suppliers, buyers or logistics providers (e.g. storage) and transport companies. Several West African countries, including Burkina Faso, Ghana, Mali and Nigeria, have also benefitted from the expansion of ICT-based market information systems. In North Africa, Morocco developed a public market information system known as Asaar (prices in Arabic) in 2011, to provide accurate data on agricultural product prices, using hi-tech data collection and transmission tools.

Despite the progress in the use of information and communication technology (ICT), FAMISs in many countries lack key market data. Information providers often do not include data on trade volume, quality/grade of commodities, location, price trends, and production forecasts in their market information systems. Limited attempt is made to analyse price data to provide insight about whether prices are increasing or decreasing over time. The absence of clearly defined grades and standards has also reduced the value of price information. Some rudimentary grades and standards may be instituted, but no regulatory body exists to ensure that the grades and standards are applied (Box 6 on the following page). Many private operators of FAMISs also struggle to remain financially sustainable and rely on donor support to cover their costs. Raising user fees is not feasible as this will deter most farmers from accessing market data. Since market information has a public good nature, it is necessary for governments to support private operators and ensure the sustainability and effectiveness of FAMISs in African countries.

Early warning systems (EWSs) collect, analyse and disseminate timely and effective information about hazards and food security risks, allowing actions to avoid or reduce risks and prepare an effective response. There are different types of EWSs, each with a particular focus, (e.g. earthquakes, health or income monitoring), but the two major global EWS that are more suited to deal with agricultural risks are the USAID Famine Early Warning Systems Network (FEWSNET) and the FAO Global Information and Early Warning System (FAO-GIEWS). These combine information on prices, crop production, weather hazards, and vegetation conditions. Regional, national and subnational early warning and food information systems have been established to provide critical information. However, adequate investment in physical infrastructure (e.g. ICT and computers) and human capacity development is required for national and subnational EWSs to be effective.

Box 6: Agricultural information systems – challenges and opportunities

Increasing food price volatility in recent years underlines the importance of sound agricultural market information systems. The availability of timely and quality data on food prices serves as fundamental information for food security monitoring and analysis as well as for policy and decision makers. Agricultural market information systems can be classified as market information systems (MIS), and weather forecast and early warning systems (EWS). MIS is often taken as synonymous with price information (daily or weekly average). However, there are challenges concerning the reliability and validity of the data in certain country and regional contexts. Problems of grades and standards, inadequate financing, inability to collect reliable market information, poor quality and outdated information, and biased information on production forecasts, and costs of production are among major constraints to a functioning MIS. In addition to the inherent gaps and inconsistencies of a MIS, the issue of uncoordinated data collection and data analysis among different stakeholders also impedes coherence in existing market price databases. Enhanced cooperation and collaboration among the respective governments, agencies and development partners is thus crucial for better data as the basis for more coherent information systems and should gain prominence on the MIS agenda. EWSs also suffer from a number of shortcomings and the preconditions for well-functioning EWS are: data accuracy, clear risk assessment and definition of systems' objectives, context-based indicators, timely warnings, and easy-to-use information (Antonaci, Demeke and Vezzani, 2014).

Grain stock management

The idea of holding grain reserves to mitigate food supply/price risks and stem hunger is an ancient idea. It is meant to address the inherent structural pitfalls of agriculture, the presence of relatively constant, inelastic demand, as opposed to a much more variable short-term supply. Nowadays, stock management refers to government-maintained stocks such as strategic grain reserves, which are used to address food price instability, and emergency stocks, which are employed for food transfer programmes. Strategic stock is generally operated through parastatal organisations that announce specific prices, ceiling and/or floor prices, at which they sell and buy grains to influence market prices. The concept of strategic reserve has been expanded to include the maintenance and replenishment of feedstock reserves against future emergencies affecting the livestock sector (Pica-Ciamarra, Otte and Martini, 2010).

The costs and impacts of stock management strategies on food prices highly depend on the threshold prices adopted for purchases and sales (Minot, 2011). There are two main policy options.

- A large price band: government interventions may be required only in cases of large shortages or surpluses. This would trigger small running costs and less distortive intervention in the market, but large bands would mean a lower level of price stability.
- A tight price band: allows smaller fluctuation than seasonal storage costs, but this would displace private trading activities and generate higher costs.

The price band should be set with reference to market prices. A floor price, which is too high relative to market prices, would mean large reserves need to be accumulated due to higher levels of purchases, and this will increase costs and could exhaust storing capacities. Similarly, low ceiling prices relative to market prices would deplete available stock (as grain is released into the market to bring down market prices). In both cases, the government would not be able to support prices; this is why it is extremely important to undertake an in-depth analysis and continuous monitoring of market prices in order to support price band decisions. The floor price should be set considering production costs, in order to guarantee farmers' capacity to invest in the next production cycle, but to avoid extra-profits, which would make the buffer scheme acting as a subsidy. Important variables to be taken into account in setting the price band are transport costs and location of storage facilities. In fact, the higher the transportation costs, the wider the effective price band compared to the one set by the government. Moreover, transportation costs determine the minimum price difference between markets in surplus and deficit areas. Where prices are driven by different market fundamentals, this should be taken into account when designing price stabilisation policies.

From all the above considerations, it appears that specific technical knowledge and continuous market monitoring mechanisms are necessary to guarantee an efficient price stabilisation policy. Most Asian countries maintain national stocks for price stabilisation and emergency responses, and some (such as Indonesia) have succeeded in achieving their goals of boosting production and reducing rural poverty (through price stabilization) with limited amount of stock, and without discouraging the private sector (Box 7).

Evidence from national and international experiences suggests that buffer stocks have been more effective in moderating downward price movements than price increases. In the latter case, buffer stocks can be released until depleted, but beyond this point there are no means to limit price surges (FAO et al., 2011). An effective strategy could be to use buffer stocks to defend producers from downward price risk by setting floor prices and using alternative approaches, such as safety net schemes or trade policies, to deal with price surges and support vulnerable consumers. School feeding programmes have provided a major outlet for public stocks. India and Brazil have developed a public policy, which combines a procurement system to help farmers, and a distribution system to support poor consumers and school feeding programmes (see Box 8).

Box 7: Public rice procurement in Indonesia

During the 1970s and 1980s, Indonesia's rice policy aimed to ensure that poor consumers would have access to adequate and affordable rice, and rice farmers would get reasonable returns for their produce. The price policies included public storage of rice, and the setting of floor and ceiling prices. The National Logistics Agency, BULOG (Badan Urusan Logistik), bought rice when necessary to lift the price on rural markets to the floor price, and stored it in warehouses, while rice was traded at the wholesale level. These rice stocks, accumulated through domestic procurement and imports (BULOG had monopoly over international trade), were then used to defend a ceiling price in urban markets.

Indonesia's experience shows that government intervention can be highly adaptive to a changing context, and can contribute to rapid economic growth, while at the same time promoting the development of the domestic market. From 1975 to 1985, public procurements never exceeded 12 percent of total production and 15 percent of consumption (10 percent during normal years), while the ceiling price for consumers was maintained around the international price level. Consequently, the efficiency of the private marketing structure was always crucial for Indonesia. The price band was set in order to not discourage private trade. The margins were primarily determined with reference to the storage and distribution costs incurred by the private sector. The band was progressively widened once the country had reached self-sufficiency. At this time, Indonesia also lowered its stocks to give more flexibility to the system, and was even more effective at stabilising domestic prices.

The "big country" argument, which implies that because Indonesia's shares in total world rice trade were large enough its trading could affect the world market prices, was used to justify state controls over international trade. In response to the high cost of rice price stabilization in the 1990s, BULOG was reorganized in 2003 (Perum BULOG) to improve the efficiency of its operations. In 2013, BULOG increased its rice stock to 3 million tons compared to its usual stock of 1.5 to 2 million tons (Institute for Agriculture and Trade Policy, 2012). However, BULOG's recent price support programme for rice, the delivery of rice at subsidised prices to poor households and trade restrictions have been criticized for failing to improve the different dimensions of food security, including stability. Price support interventions have caused high prices (relative to international ones) and increased undernourishment among the poor (OECD, 2009).

Box 8: Producer and consumer support in India and Brazil

The Government of **India** pursues a remunerative and stable price environment through the implementation of a minimum support price (MSP) using the Food Corporation of India, a government-owned corporation, which procures and maintains the Public Distribution System. At present, MSPs are announced for 25 major agricultural commodities, covering all important cereals; these take into account several factors including production costs, change in input prices, and input/output price parity. The index of input/output price parity is calculated based on index of prices paid for agricultural inputs as compared to index of prices received by farmers. In addition to ensuring a reasonable price to the farmers, the main objective is to support poor consumers and maintain a strategic grain reserve for food security reasons. A public distribution shop, also known as fair price shop (FPS), is used to distribute rations at a subsidized price to the poor. India's school feeding programme, the largest in the world, relies on the Public Distribution System.

Brazil uses its national food reserve system to stabilize local prices of staple crops such as maize, and also to foster and support smallholder agriculture and family farms. The National Supply Company (CONAB), which monitors food supply, stocks and distribution, and the programme for the acquisition of food from family farming (PAA), which guarantees a minimum price to small food producers, are used to buy grains from smallholders at subsidized rates. The food purchased is then donated and re-circulated through local food-security related organizations, or lodged in the national or local food reserves. Price support levels have tended to increase in recent years. Milk is purchased from small domestic producers for school feeding programmes. In 2009, Brazil expanded its national school feeding programme, *Merienda Escolar*, in place since 1955, by extending the coverage to pupils and adult students of all basic education enrolled in public schools, benefitting 45 million students in 2012 (Demeke *et al.*, 2014).

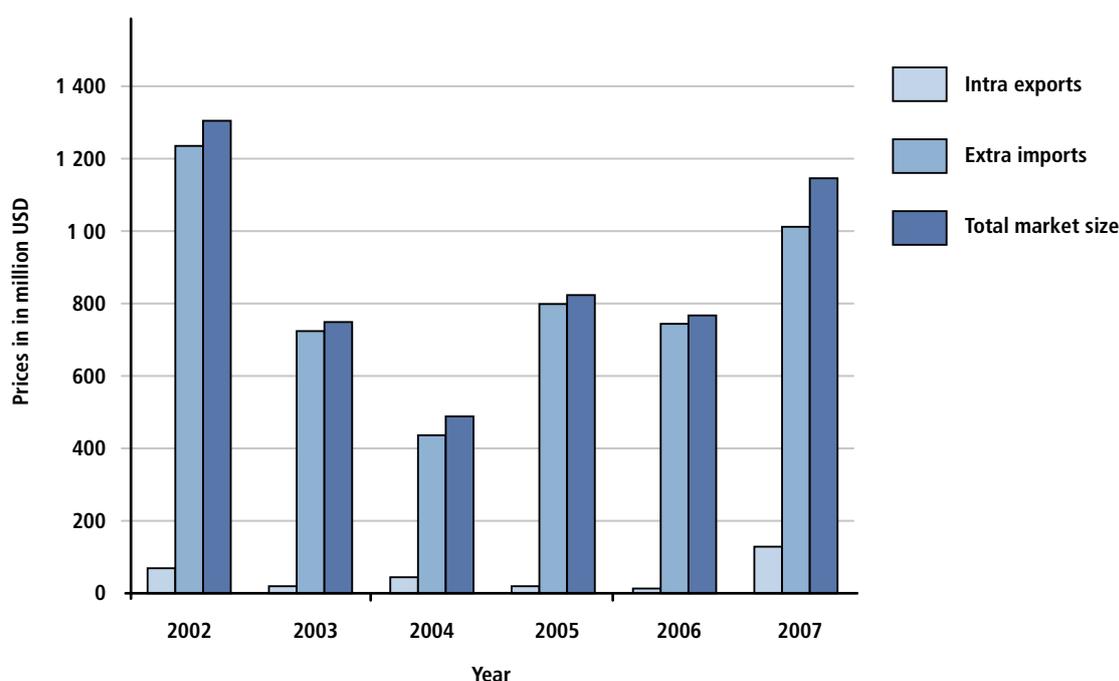
In some countries, cereal banks established by producer organizations, a village, or a group of villages, play an important role in assuring the food security during periods of high prices or emergencies. Cereal banks buy, store and sell food grain, and are managed by a committee appointed by the organization/village. While the goal of cereal banks is to assure the food security of the concerned organization/village, they can also play a role in stabilizing prices and affording consumers access to food grain at reasonable prices, as well as in allowing producers to obtain a reasonable return on their productive efforts. Providing support in order to increase the level of stocks in the cereal banks is, however, necessary to ensure that they do have an effective impact on food prices and help men and women farmers manage risks.

Trade-related measures

Regional trade can help reduce domestic food price volatility by shifting food staples from areas where local markets are unable to absorb surplus production to food deficit regions. Regional trade effectively expands the size, scope and location of the market; regional trade in sub-Saharan Africa has contributed positively to the region’s food security situation, with neighbouring countries essentially pooling production through trade to help stabilize local markets. This is particularly important in regions reliant on rain-fed food staples, and which are susceptible to climate risk and associated production shortfalls or bumper harvests.

The high costs of stock management suggest that price stabilisation policies should rely not only on stocks, but also on trade policies. A key determinant of increased intra-regional trade is sustained private sector engagement and associated investments in market development. However, levels of engagement and investment have been muted because of uncertain business environments. A number of factors, including the price depressions associated with rapid increases in import volumes, and weak, often uncompetitive performance of market structures, have exacerbated trade-related risks. Such factors, along with the ad hoc use of trade and market interventions in an attempt to manage national food availability and/or food prices in imperfectly functioning markets, have created significant uncertainty, suppressing private sector actors’ investments in market development, and reducing their engagement in formal cross border trade. Figure 4 shows that the share of Eastern and Southern African countries in the total regional market for maize was less than 2 percent during the period 2002–07.

Figure 4: COMESA and EAC maize intra exports and extra imports



Source: Kagira, 2009.

A transition to a rule-based approach requires that governments gain increased confidence that they will be able to ensure food security related objectives through a more nuanced use of both public sector interventions and market-based approaches. Increasing confidence requires equal appreciation of the merits of alternative market-based instruments and regulations, as well as discretionary policy environment whenever necessary. An appropriate blend of policy and market instruments, in addition to improved dialogue and capacity development to generate stakeholders' willingness to adopt these instruments, is critical. Many actors have a stake in policy decisions, and many organizations are contributing to policy debates, but often this dialogue is insufficiently coordinated. Key areas for further research and dialogue include: evidence on the contribution of increased intraregional trade in reducing domestic market price volatility; the extent to which discretionary trade and market policy interventions affect regional trade positively or negatively; the relative merits of different types of market-based instruments in mitigating price volatility, and in improving staple food availability. Another point to be further developed is the extent to which these instruments can be designed to adapt to discretionary policy interventions.

3.2.2 Production risk management tools

This section focuses on different direct and indirect production risk management tools and explains them in more detail. Risk management tools such as food and agricultural market information and early warning systems (mentioned above, under price risk management section) are cross cutting and can be used to manage production and food-security risks.

Financial markets

Financial services, apart from facilitating warehouse receipt systems, can help in dealing with production shocks. Farmers can cope with emergencies if they have access to short-term loans. Financial institutions located in areas with frequent natural catastrophes can help their clients obtain agricultural insurance, and also develop specific emergency loans. Many institutions provide grace periods for loans of clients affected by disasters, while others give small and standardized loans to help clients cover basic needs. Loans issued under emergency situations may also require a grace period before repayments start. Some lenders can offer this type of loan at reduced interest rates.

Long-term loans to finance investments, such as land levelling and irrigation facilities, improve farmers' capacity to cope with disasters. Loans for tree crops and farm machinery also contribute to increased income and better capacity to manage agricultural risk. Long-term loans generally involve higher risks than short-term loans because the probability of an adverse event is more likely over a longer period. Suitable collateral and an adequate legal framework are necessary for farmers to access long-term loans, but such conditions are often lacking. Rural land and small-plot landowners often cannot mortgage their land as collateral for loans because lack of title or agrarian reform legislation prevents them from doing so, or because they are renting the land they till. This problem is more serious for women than men. Apart from land records, there must be appropriate policies, laws, institutions and practices that define,

assign and enforce land rights in order for land titles to improve access to credit (Box 9). Restrictive legal systems in developing countries that often confine collateral to titled land also need to be relaxed in order to ensure that moveable properties are used as collateral.

Box 9: The Thailand Land Titling Project success story

Thailand had a land titling system as early as 1901. However, by 1984 only 12 percent of occupied agricultural land was held under formal titles. The Thailand Land Titling Project (TLTP) was introduced that year with the goal of issuing formal titles to all remaining eligible landholders. Costs of the project were fairly low, at around US\$39 per title.

A number of outside evaluators have judged the project to be very successful. By project end, 13 million households received land titles. Land titling was found to raise property values by 75–197 percent, and increase access to formal credit by 75–123 percent, allowing farmers to benefit from interest rates 27 percent lower on average than in the informal credit sector. Several studies found that land titling increased use of seeds and fertilizer, yields, and land transactions, though these outcomes varied across different regions of the country.

Suggested reasons for the success of TLTP include Thailand's long history of private land tenure, which meant land titling did not represent a sudden cultural change; implementation by a well-organized and experienced body, the Department of Lands; and strong commitment to the project over 20 years by both the government and outside funders like the World Bank. Finally, the Thai government also invested significant resources in complementary programmes, including widespread provision of credit by the Bank for Agriculture and Agricultural Cooperatives (USAID, 2013).

Financial institutions shy away from extending credit to farmers because of the high production and market risks in agriculture. Governments play a key role in addressing the market failure in the financial sector by establishing state-owned development banks, and developing innovative financial products, such as credit guarantee schemes (CGSs) that can help farmers access credit to manage production risks. Several public development banks or agricultural financial institutions have survived economic reform programmes and played an important role in the rural credit market. In Rwanda, for instance, the Banque Rwandaise de Développement was reformed and expanded to provide loans to micro-finance institutions and cooperatives. A government fund for refinancing and development of microfinance increased during the reference period. The Government of Rwanda has recently launched the Girinka Programme to provide credit to very poor families for buying a cow. The role of state-owned development banks has been critical in providing long-term credit without undermining the private sector in emerging economies such as Brazil (Box 10).

Box 10: The Banco Nacional do Desenvolvimento Econômico e Social

The Banco Nacional do Desenvolvimento Econômico e Social (BNDES) is Brazil's premier state-owned development bank, providing the bulk of long-term credit (more than 70 percent) in the country, and supporting activities in agriculture, industry and service sectors. The BNDES is an institutional response to perceived market failures in the domestic financial market where the cost of credit is among the highest of any major economy in the world. The federal government thus feels compelled to provide subsidized credit to productive sectors of the economy, especially areas of the economy that are underserved by the private financial systems. It finances infrastructure projects and export activities, acting in a similar function to the Export-Import Bank of the United States. Loans in excess of R\$10 million are granted directly by the BNDES. Smaller transactions are conducted indirectly through local commercial banks. Indirect lending is based on a wholesale lending model where the BNDES lends to retail banks that in turn lend directly to customers at subsidized rates. The model allows the development bank to disburse large amounts of credit to clients throughout the country while maintaining a relatively small staff of around 2 500 employees. BNDES, the largest creditor in South America, provides subsidized financing in a country where credit is expensive by international standards and still generates a huge profit. In 2011, the BNDES generated US\$ 4.5 billion in profit. In the same year, it lent three times more than the World Bank, and is now the largest creditor in South America (Colby, 2012).

CGSs are aimed at increasing access to credit by covering a share of the default risk tied to loans, guaranteeing lenders with a minimum repayment in case of default. CGSs absorb an important share of borrower risk, and could compensate for factors such as insufficient collateral and weak creditor rights. Public guarantee schemes involve state subsidies that are less distortive for the market than other options, such as subsidies on interest rates. In case of loan default, the guarantee is paid out directly from the government budget, resulting in higher credibility within the banking sector (OECD, 2013). Tanzania, Nigeria and Kenya, for instance, have a positive experience in CGS. Financial sustainability, ensuring accessibility for low-income women and men, and keeping moral hazards at reasonable levels (minimising deliberate default) are among the major challenges (Antonaci, Demeke and Vezzani, 2014).

High food prices do not automatically translate into greater profits for rural women producers (neither do they for men) who face the strongest barriers for accessing and acquiring resources to respond to high prices. Addressing risk aversion and lack of access to credit and other financial resources is fundamental in helping women farmers invest in and improve their agricultural contributions. They may also need

to be assisted in securing land tenure (as they tend to be the most disadvantaged parties) by ensuring them both primary and extension education, and market access to inputs and value-added processes to improve their livelihoods.

Agricultural insurances

Insurance schemes are instruments designed to pool risks from a large population to cover payouts encountered by a small portion of that population. Innovative insurance schemes have become useful risk transfer tools for poor farmers in managing climatic risks, which tend to affect large populations in a given area. Insurance coverage also improves credit-worthiness of participating farmers. Nonetheless, most smallholders in developing countries rarely have access to formal insurance coverage. Crop insurance is constrained by large informational asymmetries and high transaction costs of dealing with many small farmers in Africa. Government involvement in agricultural insurance and reinsurance is a common practice in developed and developing countries, and has increasingly favoured public-private partnerships. Public insurance and related schemes refer to state-owned insurance companies and government-based re-insurance (last resort) programmes. There are a few cases of public livestock insurance schemes (e.g. India), but the focus is on more commercialised owners of crossbreds and other high-yielding cattle and buffaloes (Roberts, 2007).

New innovative approaches in agricultural insurance markets have the potential to address the challenges of conventional insurance in the agricultural sector of African countries. Among the most promising "new" insurance mechanisms are index-based insurances: financial products designed against specific risks linked to an index highly correlated with the production of a commodity, but not based on specific losses a farmer may encounter. Area-yield index and the weather-based Index are the two main index insurance schemes. The first offers compensation based on the expected losses when average yield on a geographically defined group falls below a specified threshold. The second provides a payout to farmers when an index (normally rainfall) falls below a certain threshold level; the payout will compensate farmers from the reduced production. Index insurance products apparently offer a practical solution to many of the barriers to conventional crop and livestock insurance for smallholders: adverse selection, moral hazard, high transaction costs, and high loss assessment expenses (Roberts, 2007).

By solving many of the informational problems associated with traditional crop insurance, index insurance has the potential to succeed where traditional approaches have failed to reach small farmers. However, index insurance is associated with its own set of difficulties, including the fact that prospective insurers face significant data requirements and start-up costs. Farmers are often cash constrained and hesitant to buy into the idea. These difficulties have constrained private sector investment and up-take of index insurance by farmers. Significant expansion will happen slowly, and only with sustained private- or public-sector investment for making index insurance affordable to smallholders.

-Events that typically hit agriculture are spatially correlated, hence insurance companies operating at regional or country level are not able to pool risk efficiently and protect against systemic risks such as

droughts, floods, earthquakes, etc. Crop or livestock insurance schemes in Africa have limited scope and are mostly supported by donors (Box 11). In order to support local insurance companies, governments or international insurance companies would need to eventually reinsure them at affordable premium prices. These tools require reliable historical data to define accurate pricing, and secure weather stations to increase insurance providers' confidence.

Box 11: Pilot insurance schemes

Most country experiences in Africa are still at pilot level and are supported by international organisations and global insurance companies. For example, Ethiopia, Kenya, Malawi and Tanzania are piloting different types of weather-based index insurance, particularly against drought risks. The Ethiopian Project on Interlinking Insurance and Credit in Agriculture (EPIICA) works with a local insurance company, in partnership with an international reinsurance company, to offer rainfall-based index insurance.

In Kenya, low-cost livestock insurance was launched in 2012 to protect small dairy farmers against major losses resulting from the death of their cattle. Small dairy farmers who have opted for crossbred or exotic animals face challenges related to cattle deaths connected to hunger, disease or other factors, slowing down dairy production, and limiting milk incomes and consumption (on the farm). The scheme, developed by the Syngenta Foundation's Kilimo Salama, Tanykina Dairy Cooperative, Kenyan insurer UAP, Heifer International's East Africa Dairy Development project, and the Lundin Foundation, is the first ultra-affordable insurance available to dairy farmers in Kenya.*

* For further information, see: http://www.syngentafoundation.org/__temp/Livestock_Insurance_Launch_Release_6_Feb13_final.pdf and <http://www.heifer.org/join-the-conversation/blog/2013/March/east-african-dairy-farmers-implement-innovative-livestock-insurance.html>

Micro-insurance

Micro-insurance is another innovative approach developed as a mechanism to protect poor people against risk in exchange for payments tailored to their needs, income, and risk level. Micro-insurance has the potential to reach poor men and women for whom some of the other risk management tools might be inaccessible. Insurance companies, micro-finance institutions, mutual/community-based organizations, cooperatives, and informal providers are among the most significant delivery channels of micro-insurance in Africa. For micro-insurance providers, the poor in general, but especially poor women, are new clienteles, opening up a market of millions of prospective clients. Effective programmes offer clear and simple information on the schemes, and have an educational element to ensure the clients and

prospective clients understand how the micro-insurance works. Micro-insurance products range from the fairly simple (such as credit, life and funeral insurance) to the very complex (such as indemnity health insurance and index-based agriculture products). However, providing micro-insurance to poor people has not been easy: (i) it requires specialized actuarial capacity, which is complicated due to a lack of reliable data in Africa; (ii) most low-income households do not understand micro-insurance, or may be biased against it; (iii) it requires a distribution system that can handle small financial transactions efficiently in convenient locations; and (iv) it needs to be given explicit policy recognition – policy and strategy documents do not yet make explicit references to micro-insurance services (Amha *et al.*, 2012).

The challenge with micro-insurance is to provide coverage that meets the needs of poor women and men, minimizes operating costs for the insurers and the delivery channels, and keeps premiums low enough to ensure affordability and accessibility. Insurance coverage can expand only if government creates an enabling environment for a diversity of providers to emerge. Government support is also critical in making sure that clients are informed and understand micro-insurance.

Farm support programmes

Any formal or informal insurance cannot credibly offer full protection against natural disasters and limited access to inputs. Farm support programmes provide assistance to social groups that are most vulnerable to external shocks or suffer from chronic poverty. The role of such interventions to protect farmers against natural disasters as well as risks due to limited access to inputs or lack of resources has attracted the attention of policy makers. However, ad hoc aids or assistance in case of major natural disasters usually cause big distortions in the national budget. For this reason, many governments create specific calamity funds. Such funds have the purpose of accumulating money every normal year to provide assistance whenever a calamity or a natural disaster strikes.

Many developing countries operate regular programmes aimed at assisting agricultural production through input distribution schemes, which mainly focus on targeted fertiliser distributions to poor and vulnerable households. However, these interventions are mostly designed and implemented as ad hoc policies without proper planning, resulting in temporary and scattered interventions. Failure to properly target families requiring assistance and delays in input distributions are also of serious concern. A gender and socio-economic analysis will guide the targeting of households most in need. Proper targeting of input distributions is critical in order to limit the costs associated with the scheme and avoid the crowding out of commercial sales. Subsidised private insurance is another option to avoid some of the problems of weak safety nets.

3.2.3 On-farm strategies to overcome climate change, disease and related risks

Climate change will affect agriculture through higher temperatures, greater water demand for crops, more variable rainfall, and extreme climate events such as heat waves, floods and droughts. It has been reported that the African continent has warmed by about 0.5 °C over the last century, and average annual temperatures are expected to rise by about 3-4 °C by 2080, greater than the global average. Increased

temperatures and changes in precipitation will stress agricultural and natural systems through: increased water shortages, shorter growing periods in some areas, increased magnitude and frequency of flooding and drought, changes in plant and animal diseases and pest distribution patterns, and, more generally, reduced suitability of some areas for agriculture. Parts of sub-Saharan Africa – where high vulnerability to weather shocks already exists – are expected to be hit the hardest (Branca *et al.*, 2012).

Climate change will affect the productivity of rain-fed crops and forage, reduce water availability, and change the severity and distribution of crop, livestock and human diseases. Preserving and enhancing food security requires agricultural production systems at farm level to change in the direction of not only higher productivity, but also lower output variability in the face of climate risks, as well as risks of an agro-ecological and socioeconomic nature. In order to stabilize output and income, farmers need to adopt technologies and cultural practices for managing efficiently their resources (e.g. land, water, soil nutrients, and genetic resources). Climate-smart agriculture includes both proven practical techniques, such as mulching, intercropping, conservation agriculture, crop rotation, integrated crop-livestock management, agro-forestry, improved grazing, improved water management, and innovative practices, such as better weather forecasting, more resilient food crops and risk insurance. Improved water harvesting and retention (such as pools, dams, pits, retaining ridges, etc.) and water-use efficiency (irrigation systems) are fundamental for increasing production and addressing increasing irregularity of rainfall patterns. In Mali, a comprehensive reform of the irrigation system, which included new legislation providing tenure security, full cost recovery, and joint management of the scheme by farmers and government staff, triggered an increase in production and productivity: paddy yields increased from 1.5 to 5.5 tons/ha and production more than tripled to about 300 000 tons (Reij and Steeds, 2003).

The adoption of farm technology can be critical in overcoming production variability caused by climatic events, disease and pest attacks. Improved seed varieties that offer higher and more stable yields and are resistant to multiple stresses, can be developed (Box 12). New technology packages, such as drought-tolerant millet and sorghum, together with integrated pest management, can increase output and productivity and lower production risks. The use of new information technology, such as remote sensing images and geographic information systems (GIS) to identify yield gaps, input use efficiencies, soil and water constraints, and climate projections on regional scales, could help improve the ability of farmers to respond to resource and climate changes over time. Conservation agricultural technologies, which include minimal mechanical soil disturbance, maintenance of organic matter covering the soil and crop rotation, are also increasing yield levels and reducing yield variability while improved practices of agricultural intensification and diversification are generating new income and more resilient livelihood strategies for small farmers. A critical step will involve developing technologies that are labour saving, not labour increasing, particularly for women, who already bear a double burden of productive and reproductive work. These technologies need to be culturally and socially acceptable for women to use, accessible and affordable. Demand for new technologies has also increased with labour shortages following high rates of rural out-migration and migration out of agriculture due largely to low returns, high risks and negative perceptions associated with farm life.

Box 12: Seed systems

Efficient seed production systems are required to ensure rapid access of farmers to varieties adapted to their new agro-ecological conditions. In northern Cameroon, local varieties of millet, sorghum and maize were not adapted to lower rainfall and increased drought. The agriculture research institute developed earlier maturing varieties of these crops and with the support of Food and Agriculture Organization of the United Nations (FAO), farmer seed enterprises were organized to produce certified seed for sale to farmers in the surrounding villages. The new varieties produced good yields, which has resulted in high demand, and led to the creation of 68 community seed enterprises with over 1 000 members (both women and men), producing over 200 tonnes of seed per year. There are similar projects in other countries (FAO, 2010a).

Measures that focus directly on animal productivity, feed, and manure management need to be complemented by a range of grassland management practices that can address mitigation and improve resilience of pastoralists and herders. Arresting further degradation and restoring degraded grasslands through grazing management and revegetation are important coping strategies. Supplementing poor quality forages with fodder trees, as in silvo-pastoral systems, can also contribute to increase productivity, resilience, and boost carbon removals. Improved forecasting of risks, determination of the effects of climate change, early detection, and control of disease outbreaks are also fundamental in allowing prompt responses and building resilience (Box 13). The integration of aquaculture within broader farming landscapes provides further opportunities for diversification to manage risks. More strategic location of aquaculture infrastructure can also avoid potential climate change risks and minimize the impacts on natural systems such as wetland, mangroves and reefs.

In terms of risk management in the livestock sector, there is also need to optimally manage the size of herds based on available resources, in terms of access to veterinary services and feedstock. Animal disease could be much easier to control if herd size were optimized.

Traditional farming systems already use a diversity of crops in both mixed and relay intercropping, as well as integration of crops with livestock, aquaculture, and tree crops. For small-scale producers, mixed cropping can be associated with potential yield improvements and monetary advantages, as well as positive implications for food security, dietary balance, and nutrition. In the absence of risk management systems and lack of a developed factor and output market, production diversification to produce nutrient-dense crops and small-scale livestock (for example, horticultural products, legumes, livestock, small scale aquaculture, underutilized traditional crops, and bio-fortified crops) has a positive impact on nutrition and diet diversification, besides reducing the impact of crop failure and price fluctuations (Box 14). It can also reduce the need for expensive inputs if crop residues from leguminous intercrops,

Box 13: Control of animal diseases related to climate change – Rift Valley fever

The recent outbreak of Rift Valley Fever (RVF) in Madagascar in 2008 provides an example of how principles and tools such as rapid disease detection, early warning, and early response, as promoted in the Emergency Prevention System for Animal Health (EMPRES) programme, can be used for the control of emerging diseases. The virus, which causes high livestock losses and is also a severe threat to human health, was found in test samples that triggered a countrywide survey of livestock, and the establishment of surveillance systems. Sentinel screening of herds in thirteen locations were established through the contracting of local private veterinarians to undertake field surveillance and undertake weekly visits to communities. Mosquitoes and other samples were collected in the infected areas in order to identify vector species. To prevent human contamination, information campaigns were organized and protective equipment was distributed to professionals working in slaughterhouses. In autumn 2008, a month after the first training, a veterinarian in a remote area launched an alert. The implementation of local measures immediately after detection of the first cases prevented the outbreak from spreading (Food and Agriculture Organization of the United Nations, 2010b).

supplemented where appropriate with rock phosphate, are returned to the soil. Mixed and/or rotational cropping offers increased protection from disease and pest damage, thus potentially increasing profitability and income. All of these attributes reduce risk in the food supply system and thus favourably influence food security (FAO, 1997). Diversified production systems are important to vulnerable producers by enabling resilience to climate and price shocks, allowing for more diverse food consumption, reducing seasonal food and income fluctuations, and providing greater and more gender-equitable income generation.

One of the main challenges of productive on-farm risk management strategies in Africa is ensuring adequate investment in agricultural research, supportive policy, institutional environment, and strong political commitment to support technology adoption and improved cultural practices by small farmers, both women and men. The recent food crisis has contributed to putting agricultural research and development (R&D) in the international development agenda as there is an increasing recognition of its role in reducing hunger and malnutrition. The World Bank, the G8, and other major development actors have stepped up their support to agricultural R&D through the Consultative Group for International Agricultural Research (CGIAR). The effort at international level needs to be matched by strong support at national level for research and extension service systems of African countries.

Box 14: Integrated irrigation aquaculture practices

There are several potential advantages that can be derived from integrating aquaculture with other smallholder farming system components. The diversification of farming systems to include aquaculture diminishes the risks associated with small-scale farming. This is because pond water not only yields fish, an edible and tradable commodity, but can also contribute to crop irrigation and livestock watering in the dry season, thereby increasing the viability of year-round production. The extra production from aquaculture can imply an increased availability of protein for household consumption. Alternatively, aquaculture products can be treated as a commodity, which can be traded for cash or essential household items. Both strategies increase household economic security.

A study in the Philippines demonstrated that although a shift from rice monoculture to rice-fish farming requires a 17 percent increase in labour investment and an initial 22 percent increase in investment capital, the additional fish production increases overall farm income by 67 percent. A project with 256 farmers in Bangladesh revealed that net benefits of the integration of fish farming were more than 20 percent more than rice cultivation alone as farmers stocking fish used less fertilizer and pesticides. Overall, net benefits in integrated systems were 64 percent higher in the dry season, and 98 percent higher in the wet season (Food and Agriculture Organization of the United Nations, 2000).

3.2.4 Social protection against risks of food insecurity

Social protection is rapidly attaining prominence in the development agenda. Social protection instruments are increasingly popular in Africa and have proven to be effective in improving the ability of small farmers to manage risks, and should therefore be an integral element of risk management options within national agricultural development plans. However, social protection programmes are seldom institutionalized and are rarely used as a risk management instrument for addressing food and nutrition insecurity. Due to a lack of access to agricultural risk management (ARM) instruments and liquidity constraints, smallholder farmers have weak capacities to manage such risks. Consequently, households adopt strategies that help them smooth their consumption in the short run, but that in the long run undermine their ability to earn higher incomes and improve their food security. In order to enhance the resilience of rural households, the crucial role of social protection programmes in strengthening their risk management capacities needs to be recognized.

Safety net programmes, for instance, are policy interventions that enable governments to meet immediate needs of vulnerable households. These schemes are critical in minimizing the negative effects of large price and production shocks in both urban and rural areas. In the context of farming households, social

protection instruments may alleviate credit, savings and liquidity constraints, providing certainty, and thus protecting households against risks. They contribute in building long-term resilience of women and men, and ensuring sustainable food security. Safety net programmes not only guarantee an adequate level of food consumption in distress situations, but also prevent people from adopting coping strategies that result in depletion of assets. Consumer support schemes are mainly designed as food and cash transfer programmes that can be distributed through food vouchers or in-kind distributions. Effective social protection programmes are based on an analysis of the different risks and vulnerabilities men and women face, and are designed to address any gender-specific constraints in accessing them. An understanding of intra-household dynamics will facilitate decisions on the type of transfers (e.g. cash or food) and through whom distribution should occur. Policies and programmes must acknowledge the important roles that women play in maintaining household food security, as well as providing care by incorporating flexibility into working hours and responsibilities.

The African Union's Social Policy Framework for Africa (AU, 2008) recognizes that social protection programmes have an important role to play in improving risk management. There is also robust evidence that social protection instruments have leveraged sizeable gains in building resilience and accessing health and education services of poor women and men. Nonetheless, the role of social protection in contributing to agricultural risk management is not yet fully appreciated. Several major challenges need to be addressed in the African context: (i) how to change perceptions and bring social protection into the national policy framework; (ii) how to finance social protection; (iii) how to conduct proper targeting to avoid exclusion of beneficiaries and inclusion of non-beneficiaries; and (iv) how to ensure that increased demand through such mechanisms will boost local production and supply of goods and services.

The perception of social protection needs to change in recognition of the capacity of social protection policies in driving economic growth, as successful protection interventions can increase consumption and production. Social protection needs to move away from solely *ex post* responses to vulnerability, and concentrate on *ex ante* fundamental human rights-focused policies, which could prevent and mitigate shocks. Policies must prioritise the most vulnerable and at risk, with the understanding that regular and predictable social protection programmes strengthen the risk management capacities of rural households by enabling them to increase savings, pay-off debts, and thereby increase the flow of cash within social networks. For instance, the evaluation of a social protection programme, specifically Ghana's Livelihood Empowerment against Poverty (LEAP), found that the programme contributed to an 11 percent increase in savings among beneficiary households. Another study finds that Ethiopia's Productive Safety Net Programme (PSNP) prevented 60 percent of the beneficiaries from engaging in distress sales during a drought.⁶ The Malawi Social Cash Transfer pilot scheme reduced begging for food or money

⁶ The government-sponsored Productive Safety Net Programme of Ethiopia is designed to: (i) smooth consumption and protect assets of chronically food insecure farming households by providing them with predictable and adequate transfers of cash and/or food; and (ii) build community assets (e.g. roads, soil and water conservation structures, and schools) through labour intensive public works. The goal is to "graduate" people from food insecurity through a combined effort of the PSNP and complementary programmes providing access to credit, agricultural extension, and other services. (Devereux and Guenther, 2007)

by 14 percent and school dropout rates by 37 percent. In Ghana and Kenya, the LEAP and Cash Transfers for Orphans and Vulnerable Children (CT-OVC) programmes reduced child labour, distress asset sales, and indebtedness (Tirivayi *et al.*, 2013; Alderman and Yemtsov, 2012).

Financing social protection is possible, provided there is appropriate political commitment. Governments need to mobilize resources by undertaking a review of existing financial arrangements, including the tax system, the incidence of tax and inequities in public expenditure subsidies. Spending on social protection is generally low in Africa, only 2.8 percent of GDP compared to 7.6 percent in Latin America and the Caribbean, 3.7 percent in Asia and the Pacific, or 18 percent in Western Europe (Table 2). It should however be noted that there are significant variations in social protection spending within Africa, ranging from highs of over 12 and 8 percent of GDP in the Seychelles and South Africa respectively, to lows of under 0.5 percent of GDP in Chad, Sudan, Guinea, Niger, Uganda, and Zimbabwe. Low level of spending shows the very limited coverage of social protection in Africa.

Table 2: Social security expenditures excluding health expenditure (percentage of GDP)

Region	Regional average (weighted by population). Latest available year
Western Europe	17.98
Central and Eastern Europe	14.08
North America	8.98
North Africa	11.02
Commonwealth of Independent States	9.93
Middle East	7.09
Latin America and the Caribbean	7.63
Asia and the Pacific	3.65
Sub-Saharan Africa	2.81
World	5.72

Source: WB/HDA, 2012.

4. AGRICULTURAL RISK MANAGEMENT IN OTHER PARTS OF THE WORLD: POLICY AND INSTITUTIONAL APPROACHES

The sources of agricultural risks affecting farmers in both developed and developing countries are similar. For the most part, they emanate from shocks in production (e.g. weather, disease and pests), in prices (i.e. price volatility), and institutional and political settings, none of which are exclusive to any particular country (Cervantes-Godoy, Kimura and Antón, 2013). This section provides an overview of regional and country experiences of agricultural risk management. Over the years, countries at various stages of economic development, facing a range of economic climates, political, social and environmental challenges, have used a combination of instruments in an attempt to ensure price and production stability. These range from income support measures and social protection, to insurance and futures, as well as options trading of agricultural products in investment markets.

4.1 United States of America

The Agricultural Stabilization and Conservation Services (ASCS) programmes of the USDA were implemented during the Great Depression (1930s), when farm failures were widespread. These early programmes identified several basic crops for price support to manage price risks, one of the greatest risks facing farmers. The Federal crop insurance was also introduced in the 1930s to help agriculture recover from the combined effects of the Great Depression and the Dust Bowl. However, growth in farm productivity, encouraged by higher and more stable prices, resulted in overproduction beyond the market's capacity to absorb. Three main policy instruments were used to solve the problem: (i) subsidising sales abroad, or food aid; (ii) implementing acreage reduction programmes; and (iii) permitting market prices to fall while compensating producers with "deficiency" payments. The supply control programmes helped prevent the accumulation of price-depressing government stocks. During the 1980s acreage reduction and paid land diversion programmes, including Payment-in-Kind (PIK), were employed as supply controls for grains (Dimitri *et al.*, 2005; Zulauf and Orden, 2012).

The 1973 Farm Bill introduced target prices and deficiency payments as income support measures. Target prices, which are set through bargaining between farm organisations and the federal government, and are somewhat higher than market prices, were instituted as an income guarantee to programme participants when market prices were low. United States farmers still receive various types of payments that are often inversely proportional to current market prices. Marketing loan programmes and countercyclical payments cover commodities such as wheat, corn, sorghum, barley, oats, cotton, rice, soybeans, minor oilseeds and peanuts, and encourage overproduction by setting a floor on crop prices, and by reducing the price variability that would otherwise face producers in open markets.

The crop insurance programme has grown considerably since 1995 in levels of subsidisation and types of insurance available, insuring about 100 different crops in 2002, covering about 75 percent of the

planted acres of major field crops. In addition to providing premium subsidies, which account for about 60 percent of the total crop insurance premium, the Government of the United States supports crop insurance through administrative and operating subsidies to private insurance companies, and reinsurance of crop insurance policies. The United States crop insurance programme, managed through the Risk Management Agency of the USDA, runs both “yield” and “revenue” insurance schemes to protect farmers against adverse weather, pests, and low market prices. It includes traditional multiple-peril crop yield insurance as well as more recently developed revenue insurance. Under revenue insurance, an insured producer’s coverage is set, and insurance payments are triggered based on expected revenue, which is the product of historical yields and market-based price expectations. Therefore, revenue insurance provides a degree of price risk protection in addition to yield risk protection.

The Farm Service Agency of the USDA provides assistance for natural disaster losses, resulting from drought, flood, fire, freeze, tornadoes, pest infestation, and other calamities. Government provisions for disaster relief in the United States have been in existence since the nineteenth century. In 1949, Congress established the Farmers’ Home Administration emergency disaster loan programme for offering low-interest loans to producers who suffered significant yield losses. Agricultural disaster payments were initially established in the 1970s. Producers who suffered catastrophic losses (typically yields below 50–60 percent of normal) were reimbursed for a portion of their losses through disaster payments by the government. Incentives to participate in the insurance programme, especially by low-risk producers, were thus significantly diminished by continual disaster relief. Disaster relief became so frequent in the 1970s, 1980s and 1990s that producers took it for granted. The virtually certain disaster relief payments became a form of free insurance, and thus incentives were greatly diminished for lower-risk producers to pay even the subsidised insurance premiums for multiple peril insurance. In 1994, policy-makers passed the Crop Insurance Reform Act with the objective of reducing taxpayer outlays on agricultural disaster assistance programmes, while guaranteeing farmers consistent and reliable access to government support when they experienced poor crops. The act introduced a new form of catastrophic insurance coverage that was made mandatory for participation in any other farm programmes (Goodwin, 2000).

Much of the risk protection afforded to producers has taken the form of crop insurance and disaster relief payment. However, United States producers are also able to manage price risk through forward contracting, and by using futures and options. Options markets provide an explicit market-based insurance policy for prices, which when combined with crop insurance, enable producers to achieve a considerable degree of revenue protection. Futures markets provide extensive mechanisms that permit producers to hedge price uncertainty. The recent trend towards providing government-backed revenue insurance contracts would seem to involve duplicating much of what is already available for risk management in private futures and options markets. Naturally, it must be acknowledged that adoption of these risk management mechanisms by individual farmers may be constrained by the fact that contract designations may not match an individual’s needs. In addition, futures markets may be underdeveloped or even non-existent for many of the minor crops that are important for many producers. Although hedging is particularly popular

among large-scale farmers, only 20 percent in the United States were reported to be using it in the early 1990s. Nearly all farmers benefit from the USDA's Agricultural Marketing Service, which administers programmes that facilitate the efficient, fair marketing of United States agricultural products.

In order to cope with the price volatility of recent years, the United States provides targeted food assistance to poor consumers as well as countercyclical payments to farmers. The number of people benefiting from the Supplemental Nutrition Assistance Programme (SNAP), which replaced the traditional Food Stamp Programme, rose sharply from 33.5 million to 40.3 million people between 2009 and 2010; and in 2011, the number of beneficiaries increased to 46.5 million. Between 2012 and 2014, SNAP beneficiaries has fluctuated between 45.0 and 47.8 million.⁷

4.2 The European Union (EU)

4.2.1 EU-wide policies

Traditionally, the core of the Common Agricultural Policy (CAP) consisted in the management of European markets for major agricultural products, through both domestic and border measures aimed at supporting producer prices at a high and stable level, thus largely eliminating price risk for many important products. The domestic side of this policy came in the form of intervention buying at policy-determined floor prices. At the border, this policy was defended, for most products, through variable levies, making sure that imports could not enter the EU market below threshold prices set well above the EU's domestic intervention prices. This policy, introduced when the CAP was originally established in the early 1960s, provided strong incentives for EU farmers to expand production beyond what was economically justified, even to the point where the EU became an exporter, even though under market conditions it would have been an importing region. The EU, therefore, resorted to subsidised exports, grossly distorting world markets and denying opportunities for more competitive producers in other parts of the world, including developing countries. The policy also resulted in the infamous "butter mountains" and "wine lakes" (Tangermann, 2011).

For a long time during the 1970s and 1980s, the EU tried to suppress the most problematic symptoms of its excessive price support policy through various forms of supply management, including production quotas for sugar and milk. However, intervention buying and export subsidy expenditure continued to mount, generating a growing burden on the EU budget. At the same time, tensions with the EU's trading partners and international criticism of the CAP intensified. In the Uruguay Round of General Agreement on Tariffs and Trade (GATT) negotiations, a point was finally reached where the EU could no longer sustain its outdated market policy under the CAP. The 1992 reform cut the level of price support and introduced direct payments to EU farmers as compensation. This opened up the way to a successful conclusion of the Uruguay Round, which also did away with the EU's variable levies, replaced by fixed and reduced tariffs.

⁷ For further information, see: the Food Research and Action Center:
<http://frac.org/reports-and-resources/snapfood-stamp-monthly-participation-data>

A large part of former price support has been transformed into “decoupled” direct payments to EU farmers. While not expressly designed as a risk management tool, direct payments have the undeniable effect of shielding EU agriculture significantly against revenue fluctuations. This is already obvious from the financial flows involved. In 2009, for instance, factor income of agriculture in the EU amounted to €118 billion, while EU expenditure on “decoupled” direct aids in 2009 was €33 billion. In other words, 28 percent of factor income in EU agriculture, i.e. nearly one third, resulted from “decoupled” payments. Given the complete lack of any variability in direct payments, this element of the CAP creates a significant element of risk reduction. As a matter of fact, analysis of the evolution of variability of farm income in the EU has shown that income stability has improved as direct payments increased over time.

4.2.2 National policies of member states

At the national level in the EU Member States, institutional regimes, which are set up to manage risk, focus on production risks resulting from adverse weather events, or sanitary and phytosanitary conditions. However, approaches to managing production risks in agriculture differ significantly across member states, in terms of both coverage and institutional design, and they continue to evolve. In all member states, farmers can have some form of insurance against farming risks that result from natural conditions (Tangermann, 2011). Single risk insurance, in particular against hail damage, is available in all member states, mostly on a private basis, but in some countries also partially subsidised. In several member states, farmers can also take out combined risk insurance against different weather risks (drought, freeze), or more general yield insurance. A system of multiple-peril crop yield insurance coverage is provided through public-private partnerships that include international reinsurance companies in Spain (Figure 5 and Box 15). In some Member States, more than one-half of the overall value of crop production is insured against some form of natural risk (Box 15).

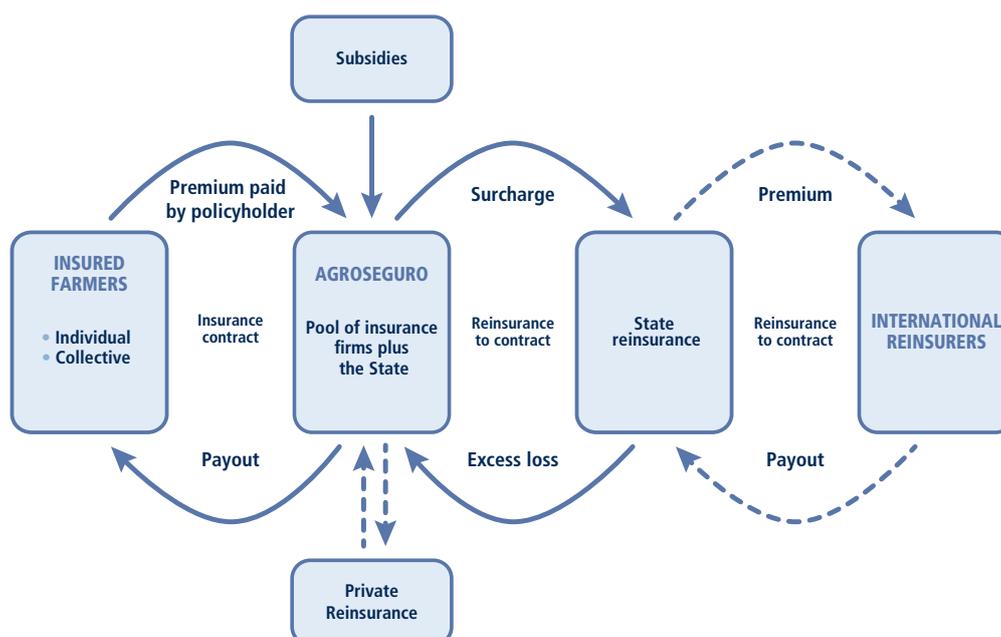
Payments in the form of calamity funds exist in most European countries. Calamity funds are provided every year by the government, and mobilised under the declaration of catastrophes (Tangermann, 2011). Such funds, unlike ad hoc aids, avoid major distortions to the government budget. However, these public aids can have a perverse effect on farmers’ risk appetite, i.e. farmers may have less incentive to reduce either the risk of losses, or the farm’s exposure before-hand. Their actions and choices (disease control, crop selection) may not be as judicious as if they were bearing the full consequences of any adverse event. In some countries, there are no public fund payments if insurance is available (e.g. Austria, Greece, Portugal, Spain and Sweden) (Schaffnit-Chatterjee, 2010)

In Europe, there have been considerable efforts to develop agricultural futures and options markets. At least four new commodity exchanges that offer futures and options based on agricultural commodities have been established since 1988. In addition, European commodity exchanges have introduced trading in at least 38 new agricultural futures and options markets (Dismukes *et al.*, 2004). However, forwards, futures, and other derivatives are used much less in the EU than in the United States, for several reasons. First, public market management instruments have been more broadly available in the EU.

Box 15: Agricultural insurance schemes in EU countries

A comprehensive regime of insurance against all sorts of natural risks exists in Spain, where multiple-peril crop yield insurance is available through a public-private system. Coverage is available for a large number of crops, including fruits and vegetables. Farmers choose the level of coverage and the perils to be covered, including “all-risk” insurance, where the government provides premium subsidies and reinsurance. An association of insurance companies, Agroseguero, has a large administrative role in the programme and pools risks. Public support accounts for around 50 percent of all costs including administrative costs. In Spain, participation of producers in agricultural insurance is high, relative to many other European countries: about 70 percent of the acres planted to cereals are insured. Many other European countries, in contrast, have systems of agricultural insurance that receive less government subsidies, and cover fewer crops than Spain. Perils covered are usually limited to a few perils, such as hail and frost only, or coverage is limited to specific product qualities, such as sugar content for sugar beets, and starch content for potatoes. Germany and the Netherlands have agricultural insurance products that are, in most cases, limited to hail and plant disease coverage, and operated without subsidies (Dismukes *et al.*, 2004).

Figure 5: Example of a public-private insurance scheme: Spain



Source: Hatch et al., 2012.

As mentioned above, with the CAP providing security, farmers have had little incentive to turn towards market-based risk management tools to deal with price risk; rather, the expectation has been that the consequences of adverse events on farmers' incomes will be borne by taxpayers. Another reason is the higher level of consolidation of farming in the United States, especially for the big commodities: in the EU, grains are still often grown by small undercapitalised farms, which are much less inclined to use financial innovation. Larger farms tend to use more risk management strategies in general, but this holds especially true for hedging.

European consumers have access to social protection, which is regarded as a kind of insurance policy against poverty, a tool for delivering social justice and a means of promoting inclusive development. Social protection is delivered to those who need it through a variety of mechanisms, including unemployment benefits, pensions, child support, housing assistance, national health insurance, job-creation schemes, retraining programmes, and more. Despite increasing pressure from austerity measures, and looming challenges in the form of an ageing population, social protection is an integral and essential component of the "European social model", which is about combining economic dynamism with social justice, and is even enshrined in Article 34 of the EU's Charter of Fundamental Rights (European Report on Development, 2010). Over the decades, social protection has helped millions of Europeans weather personal and collective crises, including the recent recession. Due to the austerity measures, charities across Europe are increasing their assistance in the distribution of food parcels to the extremely poor.

4.3 Latin America and the Caribbean

Falling commodity prices preceding and following the Great Depression of the 1930s deeply affected the economies of many Latin American countries that relied heavily on the export of agricultural commodities. The production of staple food was also affected, leading some Latin American and Caribbean (LAC) countries (e.g. Mexico and Colombia) to introduce price support programmes. However, in the decades immediately after the War many governments implicitly taxed agriculture. Efforts to stabilise and improve price incentives for producers were largely inadequate. Nevertheless, many countries used farm credit and fertiliser subsidies to offset production disincentives due to policy distortions. In recent years, Brazil has introduced minimum guaranteed prices for targeted commodities, in addition to preferential and subsidised credit for agriculture (Demeke *et al.*, 2012).

Agricultural insurance has a long history in LAC countries. Agricultural insurance was provided by public sector insurance companies from the 1950s up to the end of the 1980s. In this period, there was major growth in public sector multiple-peril crop insurance (MPCI) in Latin America, often linked to small farmer seasonal production credit programmes offered by the public sector. Most of these public sector agricultural insurance programmes performed very poorly, with high operating costs and very high loss ratios, which were exacerbated by very low premium rates and poor management. Most public sector programmes were terminated by 1990. However, the provision of agricultural insurance through the private sector and public-private partnerships is a new trend in the region (WB, 2010).

Livestock insurance is offered by the private insurance industry in several countries. Agricultural insurance is currently available in most LAC countries, and is relatively well developed in comparison with other regions, such as Africa and many Asian countries. Several countries have established public sector agricultural risk units, often under the Ministry of Agriculture, to provide technical support to agricultural insurance companies, and many countries subsidise agricultural insurance premiums in an effort to support the development of the market. Brazil, for instance, has been subsidizing agricultural insurance premiums, ranging from 30 to 60 percent of the premium, and the federal government manages the subsidy scheme through its Ministry of Agriculture. In Argentina, on the other hand, government support to agricultural insurance, which is channelled through the Agriculture Risk Office of the Ministry of Agriculture, is limited to information and capacity building, product research and development, and risk mapping (WB, 2010).

The Latin America and the Caribbean region is one of the world's most vulnerable to a diversity of hazards that have, in part, been intensified by climate change. Before the 1990s, disaster risk management (DRM) strategies were biased toward providing emergency aid, and proved to be highly inadequate at dealing with the social, economic, and environmental impacts of natural disasters. Many LAC countries have opted for implementing a systems approach in order to structure and engage the complex and multiple actors, processes, and actions that are required for mainstreaming DRM, in line with the UN World Conference on Natural Disaster Reduction (WCDRR), which resulted in the Hyogo Framework for Action 2005-2015 (HFA) and the Sendai Framework for Disaster Risk Reduction 2015–2030.⁸ One recent initiative in managing disaster was the creation of public-private partnerships for financing catastrophic agricultural risk layers in the region. The public sector (at the national and sub-national levels) in several LAC countries has recently begun to purchase private agricultural insurance coverage to transfer catastrophic agricultural risks to international markets, and protect small traditional and semi-commercial farmers. Some countries in the region have developed special agricultural insurance programmes that target small and marginal farmers, contributing to the exponential growth of agricultural insurance premiums in LAC.

Market-based price risk management options in the form of agricultural commodity exchanges have long existed in the LAC region. In fact, Argentina is home to one of the world's oldest grain cash-commodity exchanges and chambers of commerce (e.g. Bolsa de Cereales de Buenos Aires, 1856 and Bolsa de Comercio de Rosario, 1884). The region has seen a steady increase in the establishment of exchanges, which in the last two decades exchanges have spread throughout the region. The Bolsa de Mercadorias & Futuros (BM&F) of Brazil stands out as one of the most successful cases in the region. Created in 1985,

⁸ The Hyogo Framework for Action (HFA) is the first plan to explain, describe and detail the work that is required from all different sectors and actors to reduce disaster losses. The HFA outlines priorities for action, and offers guiding principles and practical means for achieving disaster resilience. Its goal is to substantially reduce disaster losses by 2015 by building the resilience of nations and communities to disasters. In March 2015, the Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted by UN member states at the WCDRR. The Sendai Framework is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action.

the exchange had 122 million futures and option contracts in 1997 and in 2008 the BM&F was ranked 12th globally for the number of futures traded and/or cleared. Currently, there are at least 10 countries in the LAC Region with at least one functioning agricultural commodity exchange. However, the agriculture sector throughout LAC is heterogeneous, thus, so is the level of, and preconditions for, the development and growth of their agricultural commodity exchanges (Arias *et al.*, 2011).

Social protection systems in Latin America have been transformed in the past two decades. Until the 1980s, those who were not covered by the social security arrangements, available primarily in the urban formal sector, received little public assistance beyond universal subsidies for some food or fuel purchases. During the early 1990s, as the continent sought to recover from the prolonged recessions of the 1980s, several countries also instituted a new set of programmes that became known as social investment funds. The introduction of non-contributory social insurance programmes (including social pensions) and conditional cash transfers has substantially extended the coverage, and improved the incidence of social assistance.

Conditional cash transfers (CCTs) are an endogenous innovation of Latin America and the Caribbean (LAC) that aims break the intergenerational transmission of poverty, reducing current poverty while developing the human capital of the next generation. Pioneered in Brazil and Mexico in the late 1990s, by 2011 CCTs had spread to 18 countries in the region and covered as many as 129 million beneficiaries. The example of the Mexican PROGRESA programme shows that CCTs that targeted women in particular have been successful in empowering women in various ways by improving their health, nutrition, education, and enhancing their resources (Stampini and Tornarolli, 2012).

4.4 Asia and the Pacific

The food supply situation in Asia and the Pacific came under pressure in the 1950s and 1960s due to yield stagnation, exhaustion of uncultivated land, and price risks. The Green Revolution was thus launched to boost production, and ensure food security in several Asian countries. However, the Revolution required support and stable prices for the success to be sustained. Many countries have maintained a policy of stabilising grain prices at or above world price levels: India stabilised domestic prices well above world prices, with the exception of a few years (when prices fell below international levels). The Philippines stabilised at levels above world prices, while Indonesia stabilised around the trend level of world prices. Pakistan, on the other hand, stabilised below world prices. In India, the Agricultural Price Commission (set up in 1965 and renamed the Commission for Agricultural Costs and Prices in 1985) advises the government on price support policies for farmers. Traditionally the Government of Thailand has provided a price pledging, or price support programme, for rice farmers under which the government would purchase large quantities of rice at above market prices for storage. In recent years, the government has operated an alternative Price Guarantee Scheme (for three commodities: rice, maize and cassava, to overcome the high cost of holding stock). Widespread use of irrigation has also addressed the risk of drought for many farmers in most Asian countries (Demeke *et al.*, 2012).

There is a lengthy tradition of agricultural insurance in the region. In 2010, agricultural insurance was available in five (63 percent) of the eight South Asia region low-income and lower-middle-income countries, namely Bangladesh, India, Nepal, Pakistan and Sri Lanka, but was not available in Afghanistan, Bhutan and the Maldives. In the East Asia and Pacific region, agricultural insurance was available in 15 (42 percent) countries, comprising: two low-income countries, Democratic People's Republic of Korea and Viet Nam; five lower-middle-income countries, China, Indonesia, Mongolia, the Philippines and Thailand; one upper-middle-income country, Malaysia; and seven high-income countries, territories and areas (HIC), namely Australia, French Polynesia, Guam, Hong Kong SAR (China), Japan, New Zealand and the Republic of Korea. Governments provide premium subsidies, but some countries have implemented reform programmes to encourage private sector participation (Box 16).

Box 16: Reforms of agricultural insurance schemes in Asian countries

Government support to agricultural insurance is often managed through ministries of agriculture, livestock and/or cooperatives (with special insurance units) in Asia and the Pacific region. The most popular form of support is crop insurance premium subsidies that are provided by governments. However, public sector subsidised multiple-peril crop insurance schemes in Asia and the Pacific region have either been reformed or replaced by public-private partnerships. In Bangladesh, the former public sector crop insurance scheme has ceased operating; in the Philippines the national rice and maize insurance scheme, implemented by the Philippines Crop Insurance Corporation (PCIC) has undergone major rate increases over time to improve performance; and in India, the government decided to start reforming the National Agricultural Insurance Scheme (NAIS) in 2010/11, and to move this from a social insurance programme to a market-based, and commercially implemented crop insurance scheme. In China, where former state insurance company has enjoyed a near monopoly over agricultural insurance since the mid-2000s, the government has promoted a major expansion of private sector led agricultural crop and livestock insurance (G20, 2011b).

Weather index insurance was first introduced into India in 2003, and is now being researched and/or pilot tested in China, India, Indonesia, New Zealand, Philippines, Sri Lanka, Thailand and Vietnam. All the programmes in the region are developmental or micro level programmes targeted at individual farmers. In India, both the public sector and the private sector are involved in underwriting weather index insurance, and this product is being scaled up massively with premium subsidy support from the government as an alternative to the traditional NAIS area-yield-based scheme.

The Asia-Pacific region is the most disaster-prone area of the world and it is the most seriously affected one. Government investments in disaster risk reduction (DRR) have increased following the implementation

of MDGs and the HFA. A high proportion of rural households in Asia and the Pacific region are dependent on publicly provided *ex post* disaster relief assistance. In response to the very high exposure to loss associated with typhoons, flooding and tsunamis, most countries in the region have well developed natural disaster risk management programmes that combine preventative measures with well-established post-disaster response programmes involving relief, recovery, and reconstruction operations. Farmers in these countries typically receive post-disaster compensation in the form of replacement poultry and small livestock, and free seeds and fertilisers to enable them to replant their crops. While there has been some progress towards a more explicit risk reduction strategic orientation in some countries, many governments remain primarily dedicated to disaster preparedness and emergency response or relief responsibilities at the time of a crisis. Of the 61 countries and areas in Asia and the Pacific, 30 have enacted national or central legislation that specifically deals with disaster risk management. The Asian Disaster Preparedness Center (ADPC) has also been implementing, since 1998, projects on disaster risk management in Indonesia, the Philippines, Vietnam, Laos, Cambodia, India, and Bangladesh.

Agricultural commodity exchanges generally play a minor role in Asia, but many Asian countries have started promoting them, mainly to allow trade in futures contracts as one of the price risk management and price discovery instruments. China's first commodity exchange was established in 1990 and reorganised in 1995–98. The Agricultural Futures Exchange of Thailand trades white rice, in addition to natural rubber. India has one of the largest futures and forward trading in agricultural commodities among developing countries (UNCTAD/Swiss Futures and Options Association, 2006). Farmers do not need to directly use commodity exchanges. They benefit indirectly when aggregators (e.g. cooperatives, purchasers and financiers) use commodity exchanges, and contribute to price stability.

Many countries in the Asia-Pacific region are spending relatively little on social protection. Among the main reasons for low coverage of social security are financial constraints, limited statutory mandates, and the massive size of the informal economy, which accounts for about 60 percent of the total employment in developing Asia. However, there is a growing trend of recognizing the indispensability of social security for the long-term prosperity of people, society, and the economy. Some countries have introduced social protection programmes, funded through general taxation (non-contributory programmes), for the poorest households. In China, two new minimum living standard guarantee schemes, financed entirely by the government, provide income security to both urban and rural residents with low incomes. In India, the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) was enacted in 2005 to improve the purchasing power of rural people by providing primarily semi- or un-skilled work to people, whether or not they are below the poverty line. Pakistan initiated a social safety net called Benazir Income Support Programme (BISP) in 2008, which is a cash transfer mechanism to the five million poorest families. Other countries are considering income security for old age, which will become even more important as the elderly population expands: Nepal has long provided basic pensions to all residents over 75 years of age, and is now considering expanding the scheme to all those over 65 years and increasing the amount. Various forms of non-contributory pensions are also being implemented or

considered in Bangladesh, India, Sri Lanka and Thailand (Handayani and Burkley, 2009).

To sum up, the above review of best practices and country experiences clearly shows that there is no agricultural transformation without managing risks. Mapping the various risks facing farmers, value chain operators, and households' access to food is fundamental. Governments support appropriate risk-hedging instruments, and engage in capacity development to increase the effectiveness of the different measures applied. It should, however, be noted that African countries need to take note of the fact that risk management strategies are context specific and vary markedly from one region to another. For instance, developed countries and most countries in Latin America and Caribbean stress market-based instruments, such as commodity exchange, contract farming, and food and agricultural market information system, while many Asian countries rely on irrigated agriculture as well as government-based buffer stocks and strategic grain reserve to stabilize prices and support producers. Asia's agricultural production capacity is based on irrigation, with roughly one-third of the continent's cultivated land under irrigation, and approximately three-quarters of the world's irrigated area (McCornick, 2012).

5. EFFECTIVE INTEGRATION OF RISK MANAGEMENT TOOLS

Risk management is a cross-sectoral issue, hence the concerted effort required to integrate it into development activities. It is through the consolidated and joint efforts of all stakeholders that effective integration of risk management tools is attained. Importance of mainstreaming is also recognised by the Sendai Framework for Disaster Risk Reduction 2015–2030.

National and sectoral development and strategic frameworks are the driving forces to plan, implement, and monitor all food security and agricultural development activities in a country. The purpose of integrating risk management tools is therefore:

- i. to ensure that national and sectoral food security and agricultural development policies, programmes and projects are designed taking into account the impact of markets, production, and other risks at micro, meso and macro levels;
- ii. to ensure that all relevant policies and programmes in food security and agricultural development do not inadvertently increase vulnerability to risk, with special attention to women, youth, and marginalized groups; and
- iii. to ensure that all relevant policies and programmes in food security and agricultural development contribute towards reduction of production and consumption risks.

Mainstreaming risk management and building resilient communities should result in:

- i. the development of mutually reinforcing policies, and mobilisation of national and international funding and other resources;
- ii. continuous considerations of underlying risk factors throughout the planning, funding, and implementation stages of any development framework; and
- iii. a consensus and active participation of decision-makers and planners at the national level, and all related ministries, but also support from the private sector and development partners.

Designing a risk management strategy at the country or regional level, and integrating it into investment plans suggests adopting several steps, including:

- i. undertaking a situation analysis or a baseline study;
- ii. holding a multi-stakeholder workshop for awareness-raising and information sharing;
- iii. developing a roadmap for mainstreaming risk management tools and policy instruments;
- iv. conducting feasibility studies for identified priority ARM tools and designing supportive policy instruments;
- v. holding a validation workshop for implementation; and
- vi. facilitating and supporting implementation of demonstration projects.

5.1 Situation analysis of the country

5.1.1 What are the risk profiles?

The baseline study, to be conducted prior to the in-country workshop, should help in understanding what has been done so far in the field of risk management in the country, as it relates to agricultural production, markets, and trade. It is important to consider the institutions available for risk management with the objective of understanding the performances of the system for further improvement. The following questions should be answered:

- i. What are the major risk factors during the past ten years, at the national, local and regional levels? As part of the identification, mapping and characterization of risks:
 - assess risk factors by major agro-ecological zones, farming systems, major agricultural commodities, etc.;
 - establish the extent of market and production variability at national and provincial/ district levels; and
 - assess the gender implication of the risk factors.
- ii. How have the risk factors been managed (using which tools and policy instruments) and what is the available capacity in terms of institutional and human resources to address and manage risk?
- iii. What are the strengths and weaknesses? What are the gaps that need to be addressed in order to achieve the objectives risk management?

In particular, the different components identified for risk management (e.g. production, market and institutions, and policies) should be reviewed and assessed in the country's policies and in the NAFSIPs as well. Although they may not be managed in an integrated manner, it is highly likely that elements of each may be found in country agriculture policy and trade documents, and/or in the NAFSIPs.

Assessing price volatility and uncertainty

Price variability or risk can be measured using ratios of successive prices, price at time t (p_t) divided by price at $t-1$ (p_{t-1}), P_t/P_{t-1} , instead of differences, P_t-P_{t-1} . Ratios offer several advantages. First, the use of ratios may eliminate the need to make adjustments for inflation, provided that inflation rates are approximately constant over the period analysed. Second, ratios are unit free, which facilitates comparisons among commodities. Third, measuring price variability using ratios allows the comparison of volatilities estimated over time intervals of different lengths. For example, the price volatility estimated with daily data for a given month can be compared with the volatility estimated for a year using this procedure.

The coefficient of variation can also be used to assess the degree of variation in prices. The coefficient of variation (CV), which is the standard deviation of a group of values divided by their mean, is the simplest, but can give misleading results if there are strong trends in the data. A better alternative is the standard

deviation of changes in the logarithm of prices (SDLOG), which is less affected by strong trends over time.

Price volatility differs between retail, wholesale, and producer levels. In Africa, producer prices can be more volatile than retail or wholesale prices. Price volatility also differs among commodities. Maize price volatility is found to be higher than rice or wheat price volatility. Crop prices can also be more volatile than livestock prices, largely reflecting the importance of yield risk in crop production. Price variability may increase or decrease over years. Some studies suggest that price volatility has increased in recent years. While price volatility (as well as price levels) can vary substantially over time, prices can be correlated geographically, provided markets are integrated. Small and isolated markets are expected to show more volatility than large and integrated markets.

Concerning the price data available for the baseline study, it is also important to note that sex-disaggregated data could help identifying whether men and women are facing the same risks. Prices might vary for men and women for selling the same product. Several factors might contribute to this issue: restricted mobility of women selling their products at nearby markets, or via intermediaries at lower market prices; restricted access to market information and market prices; and less bargaining power vis-à-vis buyers among others.

The assessment of price volatility needs to include the causes and welfare implications for producers and consumers as well as the impact on the economy as a whole. Identifying supply shocks (e.g. widespread crop failure) or sudden demand changes (e.g. biofuel demand) responsible for price volatility can provide a useful guide for policy responses (von Braun and Tadesse, 2012). Formal regional trade and cross-border trade arrangements have significant impact on price stability in many African countries (Chapoto and Jayne, 2009). It is important to document the implications of food price volatility for food security and nutrition at household, community, regional and national levels.

Yield and production variability

Yields vary from year to year and extreme weather events, such as frost, droughts, floods and storms can heavily damage agricultural output. Yield variability is often measured by the coefficient of variation, which measures randomness relative to the mean (or average) value in the yield series. The CV may be calculated over a period of 10 years or more.

Yield variability tends to be lowest in irrigated areas, and in areas where soils are deep, and rainfall is dependable. By contrast, variability is bound to be higher where production is dependent on erratic rainfall and the topsoil is thinner (due to degradation).

Yield variability can be measured using farm, regional or national level data. Estimates tend to be lower when variability is measured at the higher regional or national levels of aggregation than at the farm level of aggregation. This is because random deviations tend to offset each other when averages are taken across farms. Farmers' risks can be seriously underestimated by using yield variability measured at the county level.

All the major factors causing production risks need to be evaluated and prioritized. The economic and social impact of weather related problems, plant and animal diseases, high price of inputs, poor quality inputs (e.g. fake seeds), insecurity and theft, and human or personal risks (e.g. accidents, illness, death, etc.) need to be established. The impact of financial risks resulting from rising interest rates or restricted credit availability needs to be assessed. Agricultural production is also influenced by uncertainties or changes in government actions. A comprehensive assessment of agricultural risks that shows the impact of the different risk factors on producers, food security, value chain operators and agricultural GDP is vital for policy makers, civil society organizations, development partners and other stakeholders.

5.1.2 What are the different risk management instruments? – SWOT analysis

Conducting a SWOT (strengths, weaknesses, opportunities and threats) analysis of available risk management tools is useful to discuss and assess four main categories of issues:

- i. What goes well (strengths) and what does not (challenges)?
- ii. What are the perceived gaps (weaknesses) and what should be done to strengthen them?
- iii. What opportunities exist and which situations can be taken as advantages?
- iv. Which threats influence the functionality of the risk management tools?

The SWOT analysis should include existing and potentially available risk management instruments. The analysis should be preceded by a review of ongoing projects related to instruments for production (disaster risk management, safety nets), production and consumer oriented, insurance schemes, financial products – including microfinance, technology adoption and market and trade risk management (warehouse receipt systems, commodity exchanges, market information systems, contract farming, grain stock management, and trade policies). In each case, the review should:

- i. provide background information, including type of ownership of risk management programmes and projects (public, private, cooperatives, NGOs), coverage, major hurdles (in relation to accessing the instrument by small holders), etc.;
- ii. review and assess the performance of existing regulations, legal frameworks, programmes, and policies in place;
- iii. identify a number of relevant tools and policy instruments that should be discussed at the national workshop for further improvement/design to support risk management initiatives in the country; and
- iv. identify institutional and policy gaps, and chart out a strategy/direction to meet the diversified needs of the rural community.

5.1.3 What are the institutional risks and policy environments?

Weak human and institutional capacities, lack of inter-institutional coordination, and ad hoc policies with no empirical evidence are among the major institutional and policy risks. These risks also relate to the

weakness of information systems pertaining to agriculture, early warning, and market and food security. In several countries, case studies have shown that even when evidence-based information is available, it might not be used by decision-makers. This may be due to either a lack of appropriate procedures to convey the information on a timely basis or to a hidden agenda that does not coincide with the information made available by technical experts. Such systems have, in most countries, been set up with the support of donor-funded projects, but are often not sustained by government budgets. An assessment of institutional gaps and weaknesses, and capacity development needs for effective risk management institutions or functions need to be undertaken:

- i. At country level: The combination and integration of various tools should be analysed. Each country needs to combine tools relevant to its risk profile and integrate them into a comprehensive and coherent risk management strategy with appropriate institutions and human resources. An effective implementation of this strategy also requires good governance, predictability in government decision-making, public-private partnership, and the provision of public goods (that should be included in the investment plan). Most of those tools require also private involvement and investment, based on strong public-private partnerships.
- ii. At regional level: The regional level must also be involved in order to harmonise tools (avoiding disruptions on regional markets), to adopt common positions in international forums, and to mutualize risks.

A review of investment plans and agricultural and trade policies is an important element to assess the policy environment. This step starts with a critical review on how risk management is addressed in the investment programme, in the agricultural and food security strategy and trade policy. In this review, some key questions should be addressed:

- i. **Resilience to climatic hazards:** Does the investment plan adequately provide for resilience tools for weather/climate risks (irrigation, early maturing seed varieties, hazard-tolerant crops, conservation agriculture, crop diversification, and so on)?
- ii. **Public goods and regulatory framework for improving the functioning of the domestic market:** does the government provide the necessary public goods, such as transport, infrastructure, agricultural information systems, legal framework for warehouse receipt schemes, storage credit innovative mechanisms and agriculture insurance (e.g. weather and crop insurance) and build stakeholders' capacities to use risk hedging tools?
- iii. **Price stabilisation and trade policy:** Does the government have a clear and predictable strategy for food price stabilisation (management of public stocks, tariff modulation, or other trade policy measures)? Is this strategy conducive to an adequate functioning of the market?
- iv. **Mitigation of disaster risks and food security for the vulnerable population:** Are the disaster mitigation tools (emergency stocks, safety nets) sufficient to cope with potential risks? Is the need for permanent safety nets for the most vulnerable populations sufficiently taken into account? Are these tools adequately related to other price risk mitigating tools? Are the financing

mechanisms adequate for integration of several tools in the risk management and resilience building strategy? Are the tools developed based on participatory gender analysis, that is, are the different and gender-specific risks and vulnerabilities understood, and have the vulnerable men and women participated in the development and planning of the tools?

- v. **Platform for public-private cooperation:** are the required public-private dialogue mechanisms in place to develop private risk management tools (insurance schemes, private storage, guaranty funds, and so on)? Do they function effectively and efficiently? Are men and women farmers' interests adequately represented? What policy or investment measures are needed to introduce new instruments or to develop the existing ones? Are the identified needs for capacity strengthening of the relevant stakeholders, including public and private sector, taken care of?

5.1.4 What are the institutional contexts and capacity? – Stakeholder analysis

- i. **Roles and responsibilities of different stakeholders:**
- government (ministries, meteorological service providers, national banks, etc.);
 - private sector (banks, microfinance institutions, insurance firms, farmers and farmer groups and organizations (formal and informal), including cooperatives, traders and trader groups, transporters and transport groups, processors and processor groups, etc.); and
 - disaster relief agencies, NGOs and development partners, women's groups, gender-progressive NGOs.
- ii. **Key drivers or stakeholders:**
- advocates: idea creators, designers;
 - champions: to lead the change;
 - supporters: "critical mass";
 - decision makers: to approve critical change enablers, such as policies, funds, people; and
 - opinion leaders: influential members of the community, special interest groups that sustain people's awareness of the need for change (lobby groups, NGOs, media).
- iii. **Coordination and participation:**
- role of the lead ministry (Ministry of Agriculture);
 - coordination mechanisms; and
 - participation of stakeholders.
- iv. **Capacity development:**
- scientific and technical capacity: link between risks and food insecurity as well as poverty;
 - analytical and policy development capacity; and
 - organisational capacity and empowerment.

5.2 Multi-stakeholder workshop: awareness raising and information sharing

Elements of these guidelines and the results of the baseline study should be presented in a national multi-stakeholder workshop for awareness raising, validation, and ownership. The national workshop should:

- i. introduce the different concepts underpinning agricultural and food insecurity risk management and raise awareness about the criticality of managing risks instead of crises for sustaining agricultural growth and development;
- ii. establish the rationale for mainstreaming risk management into CAADP investment plans and other national agriculture and food security policy documents;
- iii. share experiences of risk management in different parts of the world to draw lessons;
- iv. identify key risk management tools and complimentary policy instruments relevant for the country or region;
- v. draft guidelines for defining a risk management strategy in coherence with existing national and regional agriculture and food security policies;
- vi. define a methodology for conducting feasibility studies on those risk management tools and policy instruments agreed upon; and
- vii. develop a roadmap for capacity development at all levels: make use of FAO's e-learning courses and local universities/colleges to build capacity aimed at improving farmers' access to effective risk management instruments.

Key questions to be discussed during the national workshop:

- i. What are the key drivers of market and production risks?
- ii. What are the gaps in managing price and production risks?
- iii. What are the most appropriate tools and policy instruments that could be applied to the local food security and agriculture context, taking into account the different needs and priorities of men and women farmers?
- iv. What are the advantages and disadvantages of each of these instruments?
- v. What are the institutional arrangements for coordination and for monitoring the integration of agricultural risk management into CAADP investment plans?

The consultation process should ideally provide the following outcomes:

- i. a characterisation of the country risk profile and a review of what has been achieved and the assessed needs;
- ii. a review of risk and crisis management tools and policy instruments already used in the country, based on the list of identified tools and their efficiency and effectiveness. An alternative approach consists in reviewing risks and risk management tools along the value chain of a particular commodity;

- iii. a review of agriculture and food security policies implemented in the country regarding agriculture development, food security, trade, public finance, in view of ensuring consistency in the global risk management approach and tools used, and, when needed, proposals for amendments;
- iv. a review of the investment plan from a risk management view, examining how the existing tools are integrated or not, and when necessary, making proposals to amend or to complement the plan in order to build or strengthen the overall risk management strategy;
- v. an analysis of gender issues relevant for the risk management strategies, and concrete suggestions on how to address these;
- vi. the identification of key policy and capacity development issues for further action; and
- vii. the establishment of a Steering Committee to guide the whole process of integrating risk management along with the formulation of its terms of reference that include the development and implementation of a roadmap.

5.3 Roadmap for mainstreaming risk management tools, policy instruments and resilience building

The roadmap is supposed to provide a comprehensive strategic framework that identifies multiple agricultural risk management tools and that proposes a holistic approach for the implementation and integration of those tools into national investment plans and policies. A case by case analysis dealing with only a specific source of risks, a specific farmer's strategy or a specific policy response could be inefficient and ineffective. Instead of focusing the analysis on a single risk, the holistic approach considers the correlation between various risk factors and their influence on each other. It also identifies the ARM tool that provides the most impact to manage risks. The different groups of stakeholders need to work together in a coordinated manner in order to efficiently deal with the identified risk factors (government, financial institutions, service providers and private sector).

The roadmap may have four major components:

- i. Formulation of a comprehensive policy and strategic framework for managing agriculture and food security risks**

The process of policy formulation using a holistic approach has two major parts:

- Policies for the development of institutions to address missing markets for risk management in production, marketing, processing and distribution: this requires government policies aimed at ensuring a stable macroeconomic and business environment framework and regulations for scaling up risk management initiatives. Some examples of such policy measures are: risk management training for farmers, both women and men; facilitating information sharing on risks; and increased competition in the insurance market.
- Policies that support risk reduction, mitigation and coping: these refer to the role of government in reducing the probability and/or the adverse impact of hazardous/catastrophic events. Some

examples of such policy measures include: drought mitigation (for instance, irrigation); disaster prevention (e.g. flood control); prevention of animal diseases (domestic and border measures); R&D of new varieties or breeds; price support and stabilization programmes; tax systems for income smoothing; and calamity funds for catastrophic events.

ii. Institutional capacity building and development

Institutional capacity building activities will involve three different levels: the individual, organizational and coordination levels.

- **Individual level:** in the context of agricultural risk management, capacity development at individual level relates to training women and men farmers, extension workers, traders, processors, market information workers, warehouse operators, commodity exchange managers, relevant staff from insurance and banking industry, relevant staff from disaster risk reduction and social protection, researchers, government regulators, and the like. Capacities developed at the individual dimension lead to changes in skills, behaviours, and attitudes among the different actors. Gender-sensitive training, knowledge sharing, and networking are ways of strengthening capacities at this dimension.
- **Organizational level:** organizational capacity building refers to a host of organizations, including ministries of agriculture, finance and trade, as well as producer organizations and related civil society organizations, women's groups, financial institutions (e.g. insurance and banks), trade, marketing and related companies, disaster reduction and social protection organizations, universities and research institutes, etc. Institutional capacity for regulating the terms of the contract, as well as the capacity of the police and court systems to help enforce the terms of the contract, needs to be built up. Efforts to enhance organizational capacity in these sectors need to begin with the mapping of relevant institutions, needs assessment, and a plan to address the most important shortcomings or gaps indicated by the analysis. Four different types of institutions comprise the food security and agriculture risk management system: production and value chain institutions, service providing institutions, knowledge support institutions and coordination institutions.
- **Coordination level:** collective efforts need to be strengthened where two or more institutions are linked through a coordination mechanism to achieve a common objective. Capacity development needs to consider the following issues: political commitment and vision; policy, legal and economic frameworks; budget allocations and processes; gender issues, equity, governance and power structures; incentives and social norms. Managing complex institutional cooperation needs the application (and development) of a different set of analysis and support tools.

iii. Integrating risk management tools into the CAADP investment plans and development process

Mainstreaming risk management should start with enacting different policies in support of risk management. The main task is ensuring that the CAADP investment plan provides for specific allocations for risk management in the national budget. The procedures for mainstreaming may vary from country to country, but some basic steps are common to all. For instance, the Ugandan investment plan, known as the Agriculture Sector Development Strategy and Investment Plan (DSIP) 2010/11–2014/15 (Republic of Uganda, 2010) has identified four programme areas for investment:

- programme 1: Enhancing Production and Productivity;
- programme 2: Market Access and Value Addition;
- programme 3: Improving the Enabling Environment; and
- programme 4: Institutional Strengthening in the Sector.

Agriculture and food security risk management and resilience building programmes are part of programme 3, “Improving the Enabling Environment”. Many of the different components and sub-programmes are also continued in the new Agricultural Sector Strategic Plan (ASSP), 2014/15–2019/20. The main responsibility of the Steering Committee, which was established in May 2013, following the national workshop on risk management, is to develop a sub-programme on risk management and resilience with all required activities and proposals to be implemented under the ASSP. The Committee should also ensure that the food security and agricultural development policies, programmes, and projects do not inadvertently increase vulnerability of women and men or households to price, production, and other risks.

iv. Analytical works and database on price volatility, production variability, and impact of price and production risk management tools

Analytical and database work can focus on two main areas: price and production volatility, and price and production risk management.

Price and production volatility

- i. Domestic price index of tradable and non-tradable commodities: country-level domestic price index is calculated for basic commodities using wholesale, retail, and producer prices, and is updated regularly.
- ii. Annual price volatility index of staple food commodities: country-level price volatility index is computed for comparison with other countries and international food price volatility.
- iii. Impact analysis of price risks on producers and consumers and key drivers of price volatility and price levels: in partnership with other projects and programmes, analysis and research into the causes of food price volatility and its consequences on markets, producers, and consumers is conducted. If sex-disaggregated data are available, the analysis should be based on it to

understand the different impact of price risks on women and men producers and consumers.

Price and production risk management

- i. Database on price and production risk management tools: price and production risk management tools are mapped out.
- ii. Analysis of the impact and effectiveness of different risk management tools: the impact of alternative risk management tools on food security and agricultural production is carried out at individual, household, and national levels. The assessment also includes the differential impact on men and women.

Each component can be developed by a group of national experts focusing on background and rationale, objectives, strategy, and activities or project proposals (including the budget).

- i. Background and rationale: discuss the existing situation and identify key problems, issues, and gaps. The problem analysis identifies the negative aspects of an existing situation and establishes the "cause and effect" relationships between the identified problems, establishing the rationale for the intended action.
- ii. Objectives: the objective develops solutions for the identified problems, identifying means to an end. The objective should provide a summary picture of the desired future situation, including the indicative means by which ends can be achieved.
- iii. Strategy: the strategy identifies different possible alternative options/strategies, assesses the feasibility of these, and selects the most appropriate one based on expected contributions to key policy objectives, financial and economic returns, and technical feasibility.
- iv. Activities/project proposal: determine the sequence of specific tasks to be performed in order to achieve the stated objectives. In many cases, the activities may include a project proposal. Note that a project is a series of activities aimed at bringing about clearly specified objectives within a defined time-period, and with a defined budget.

5.4 Validation workshop

A final validation workshop is held for the implementation of the roadmap. It is expected to discuss:

- i. How to promote policy dialogue and advocacy to support mainstreaming of risk management tools into CAADP investment plans and agriculture and rural development programmes.
- ii. A joint monitoring mechanism for implementation of the roadmap. All stakeholders including farmers' organisations and women's associations are expected to participate.
- iii. How could financial resources be raised and mobilised? What should be the role of all potential participants, including international finance institutions, technical partners, civil society organizations, including farmer organisations and private sector?

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