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**Agricultural insurances as market based tools for risk
management and agricultural development**

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Abstract

Based on a review of experiences with agricultural insurances, the paper discusses the extent to which insurances can be employed in developing countries as market based risk management tools to promote investment and improvements in agricultural productivity. Focus is on the role that public support should play and is in fact playing in the agricultural insurance market. Results indicate that successes and failures can be found among experiences entailing different forms and degrees of public intervention and partnership with the private sector, and to some extent even within different types of insurances, from the more traditional to the more innovative index based. However, extensive intervention in the market and premium subsidization are often associated with reports of inefficiencies, frauds and lack of financial sustainability. Experiences with non-agricultural insurances reveal that the spontaneous emergence of a market in poor rural contexts takes place mostly as an offspring of established networks, particularly of microfinance institutions. Far from being a panacea, insurances may contribute to remove obstacles to agricultural investment in poor developing countries, especially in connection with broader efforts aimed at establishing and promoting the market for agricultural services.

1. Introduction

Farmers normally operate within a highly uncertain environment, characterized by long production cycles. The amounts and quality of products that will become available several months ahead, the price that will materialize in output markets, the institutional framework that will prevail, and even technologies are subject to wide changes during the production cycle. This high degree of uncertainty implies a number of risks, which can arise mainly from unexpected changes in yields, input and output prices, natural hazards, and in the institutional environment¹.

Risks generated in agriculture by the interaction with long production cycles imposed by plants and livestock biology are among the justifications which have been given for extensive public support to the sector, along with the importance attached to securing food supplies and access to adequate levels of consumption. In fact, several forms of domestic support have a significant impact on risk, as recently observed by the OECD (2009b). The impact in terms of risk of subsidies granted to farmers in OECD countries has been widely analyzed and validated, both theoretically and empirically (Sckokai and Moro, 2006; Koundouri et al, 2009)².

¹ There are several classifications of the sources of uncertainty and risks in agriculture; reference is made here to the one proposed by Moschini and Hennessy (2001). OECD (2009a) offers a discussion on the distinction between risk and uncertainty; while the two concepts can be differentiated in several ways – normally risk implies knowledge of a probability distribution, while uncertainty does not – we concur with OECD (2009a) that the distinction is not particularly useful, given that in most cases uncertainty imply some risk and *vice versa*.

² Risks reduction is one of the channels through which subsidies which are considered “decoupled” from farmers’ production decisions at the margin – for instance those granted under the Common Agricultural Policy

Where agriculture is less generously supported than in the OECD, as it is the case in many developing and Least Developed countries (LDCs), farmers deal with risks by resorting to a plethora of more or less formal strategies and practices allowing to mitigate risk and prevent excessive income and consumption fluctuations. Despite being effective in many cases, these ex-post mitigation tools tend to force farmers to adopt a risk-averse attitude, hence potentially hindering investment, innovation and agricultural development (Alderman and Paxon, 1992), or even perpetuating poverty traps (Dercon, 2004, 2005; Barrett et al, 2008). Promoting the ability to manage risk, therefore, can be an important element in the promotion of investment for agricultural development.

Private insurances allow to pool risks across time and space, especially idiosyncratic risks. Large scale phenomena such as drought or floods, instead, are more difficult to insure, due to their covariate nature³. However, over the last few years there has been an increasing interest toward hedging against such events, following the expected growth in the likelihood of extreme phenomena related to global environmental issues such as climate change and global warming. Public intervention in this area seems to be on the raise as well, with government looking with growing interest towards market based tools to hedge their financial positions in case of adverse events. Newer and promising products, at both micro and macro levels, are indexed insurances, based on indemnities tied to predetermined indicators, most typically weather parameters.

Also at the micro level insurances seem to be considered a promising area for promoting agriculture in poor developing countries, as well as for managing safety nets, as shown by the increasing number of projects, pilots, experiments and even policy schemes which are being undertaken entailing some sort of agricultural insurances. As recently indicated also by the World Bank (2008), resuming investment to enhance productivity and production in poor countries requires a number of combined actions, and the reduction of exposure to risks can play an important role. Schemes involving insurances are considered to be one way of supporting agriculture without destroying market incentives, rather building on them: purchasing a policy is a voluntary choice, and private suppliers can be involved. In terms of the WTO classification, support to insurances can be notified within the green box measures, implying a null or minimal impact on trade; however, some schemes have been notified as amber box, under the *de minimis* provisions.

Agricultural insurances are subsidized to a variable extent in several countries, through more or less direct government intervention or donors' support, and different private-public partnerships. The records of these experiences tend to be mixed in terms of financial sustainability, and market development. Many schemes have been abandoned, and many markets failed to develop due to lack of interest from farmers, who simply did not purchase the policies. Based on a review of experiences with agricultural insurances, this paper seeks to shed light on the role which the public sector is playing in this market, and the role it should play, if any, in order to make use of the potential market based character of insurances as a tool for managing risk and promoting agricultural development.

of the European Union (ESU) - do in fact affect farmers' investment decisions. Such effects have been studied both theoretically and empirically, and their impact has also been observed *ex post*.

³ However, they can be re-insured in international financial markets, for instance through the so-called CAT bonds.

Next section uses result from the literature on risks management in agriculture to understand the role which governments are expected to play in order to promote a correct and complete functioning of the market for agricultural insurances. Based on such framework, section 3 reviews experiences with agricultural and non agricultural insurance schemes. Concluding remarks are in section 4.

2. Risk layering, government policies and public support to agricultural insurances

In general, the willingness to buy and supply an agricultural insurance depends upon farmers risk profile, and on the costs at the margin for insurance companies. *Per se*, insurances are private services, excludable and rival; hence the role of the public sector in their market should be limited to regulation: that is, providing the legal framework for enforcing contracts and ensuring competition. One additional important role for governments, however, is the collection and disclosure of information which can be asymmetric, costly and non rival nor excludable. Data on risk exposure and, possibly, on expected damages are needed on the supply side, to perform actuarial calculations; and on the demand side, to reduce the so called cognitive failure, that is, the tendency to underestimate the probability of unlikely events. Information required for the functioning of insurances may easily bear a public character, so that public intervention is in order.

Moreover, not all risks are insurable. Highly frequent and small size risks may not be insurable, because the associated losses are small enough to discourage the purchase and the offer of a policy covering them. Other risks - the so called covariate or systemic risks such as large scale droughts or floods - involve widespread damages, and hence would command such high premiums to make it difficult for insurance companies both to sell them, and to pay indemnities to their customers in case of adverse events (Sawada, 2006).

Risk layering is one way of logically separating insurable from non-insurable risks, and defining the respective role of private companies and the public sector in the insurance market (World Bank, 2005; OECD, 2009a). Layering is the identification of areas in a probability distribution of potential losses associated with adverse events. Three “layers” can be identified: a “retention layer” including losses associated with normal variability in uncertain outcomes, which are normally retained by entrepreneurs; an “insurance market layer”, which includes losses that are large enough to disrupt normal business practices, but can be pooled in an insurance product to be sold by a private company; and “tail risks” implying catastrophic events that insurers are unwilling to cover, and only ex-post public intervention can deal with.

While layering is a useful exercise, quantifying losses and probabilities associated with risky events is not easy in agriculture, and this one of the reasons why commercial insurance tend to have a more limited diffusion compared to other types of insurance (FAO, 2005). A number of interesting insights, however, arise from considering the elements which can affect the size of each layer. Layers are primarily determined by the specific risks of each environment; however, the market for services employed by farmers and government’s policies which affect decision making also contribute to shape their size.

As mentioned, in the retention layer losses are highly frequent and of limited size, and this is the reason why, in most rural contexts, they are normally addressed through income diversification and consumption smoothing. Production variability tends to offer a natural hedge to farmers, given the inverse relation observed between prices and yields; but access to

the service market, such as credit and finance, the availability of storage and transport facilities, as well as other services, such as extension and technical assistance, are key elements shaping the ability of farmers to retain losses individually. Farmers require credit - or savings - even to bridge the time distance between sowings and harvests, given that revenues are usually collected at the end of the production cycle; hence purchasing inputs, even in absence of unexpected market or environmental swings, requires finance. Crop and plot diversification, saving, storage, and purchase of financial assets, where they are accessible, are common practices that serve the purpose of managing the expected price variability. If the physical characteristics of production and the institutional context allows to access storage and hedging, even unexpected price variability can be dealt with by farmers directly, and probably in a more effective way compared to public attempts to stabilize prices and incomes (Cafiero, 2008)⁴. The availability of updated and location-specific technical information is another element that helps farmers reducing their risk exposure, for instance the application of agronomic techniques can reduce the impact of pest attacks, or other sources of yields variability. Therefore, the extent to which agricultural service markets– from credit to transport, from storage to extension services - work effectively and meet farmers’ demands determines the size of the retention layer.

Where the markets for such services are incomplete or characterized by uncompetitive behavior, instead, the ability to retain risks is hindered; and this is frequently true in poor developing countries and, in general, for households close to subsistence conditions. Where service markets are incomplete, or of limited accessibility, farmers are forced to rely on mitigation strategies and other informal ways to smooth their consumption levels. Examples are crop and income diversification, or informal networks of relatives and friends, social safety nets, as well as contracts, such as share tenancy or credit contracts, or business contracts along a value chain in the more favorable cases (Alderman and Paxon, 1992). While some of these mitigation strategies are common in all agricultural environments – for instance crop and income diversification – there are contexts in which they result in the perpetuation of subsistence conditions, and hinder specialization and productivity improvements. Farmers may easily reject improved technology, such as new strains of seeds or improved cultivation techniques, due to the need to increase average income through diversification, and reducing the degree of exposure generated by costly direct or complementary inputs. Hence risk may prevent the development of agricultural productivity, leaving potentially usable resources idled (Carter, 2008). Income risk can be at the origin of poverty traps, and constitute a key constraint to agricultural development and the improvement of living standards of poor households (Dercon, 2004, 2005; Barrett et al, 2008).

As seen, policies also play a major part in shaping the ability of farmer’s to retain risks, despite the role of public intervention with respect to the goal of stabilizing agricultural income is questionable (Cafiero and Cioffi, 2006). Prices controls, particularly, can reduce the automatic hedging offered by the inverse relation with quantities, and redistribute rather than reduce volatility. However, where agriculture is widely supported by public resources as it is the case in OECD countries, the risk retention layer will likely become large, as subsidies and protection will increase farmer’s ability and willingness to retain individual risks directly. In developing countries, instead, public support to agriculture is usually more limited, and this tends to reduce the size of the retention layer, and to increase the need to resort to informal mitigation and smoothing mechanisms.

⁴ As shown already in the classic work of Newbery and Stiglitz (1981), attempts to stabilize incomes through prices mostly end up moving instability from one market to another, or from one group of agents to another.

Insurable risks, falling within the relative layer, are those which can be pooled within a market. In order to work effectively, however, such market requires both an institutional framework for enforcing contracts, and information on the probability distribution of the insurable events, to allow companies to determine the premiums and pay indemnities when adverse events materialize.

Traditional commercial insurances in agriculture include those covering specific risks, such as hail. These imply differentiated damages across groups of farmers, which can be more easily pooled. Multi-peril policies have also been developed in the past, insuring against a percentage of the expected yield. As mentioned, one of the main product innovations in this field are indexed insurances (Skees et al., 1999; World Bank, 2005; Skees et al, 2006; Varangis and Lewin, 2006). Indexed insurances are built around the idea that a pre-determined indemnities can be triggered by changes in an objective indicator – the index – which is expected to affect individual policy subscribers to a pre-determined extent. Damages, and the related indemnities are computed on the basis of their statistical association with the index⁵. After an initial investment in design and data gathering and processing, indexed contracts allow to avoid costly *ex-post* damage assessments which are required in traditional insurances, and this can reduce problems of asymmetric information and moral hazard. Due to these potential advantages, indexed products have also been proposed as means to provide and manage safety nets for poor farmers in developing countries (Chantarat et al, 2007; Barnett and Mahul, 2007; Skees et al, 2007). Against these advantages, indexed policies require that the insured assumes basis risk: as indemnities are pre-determined, no compensation is paid for damages which exceed – or is short of - what is predicted in the by correlation between with the expected damage (Berg and Schmitz, 2006).

Weather parameters are the most widely applied indexes, consistent with the notion that yield failures arising from climatic variability are the first most important reason for vulnerability, especially in developing countries' agriculture (Barnett and Mahul, 2007; OECD, 2008). However, a variety of indicators may be utilized to design insurances and safety nets, including, for instance, food security indicators (Chantarat et al, 2007).

In some OECD countries, the agriculture extensive support programs enjoyed by farmers can crowd-out private insurances: subsidies increase the ability to retain risks individually, and this undermines private to purchase insurances. The “insurance market layer” becomes smaller: unless premiums too are subsidized, farmers don't find it useful to purchase a policy (OECD, 2009b; Roth et al, 2007). Subsidized insurances imply a distortion of production decision, whose size increases when they are granted with reference to specific agricultural activities, as they change the distribution of expected revenues and can encourage production on land that might not otherwise be used, and non optimal investment in risky productions (Young and Westcott, 2000). Moreover, subsidies may translate directly into rents for insurance companies, especially if the insurance market shows concentration (Capitanio and Cafiero, 2006).

The “insurance market layer” can be small also in poor developing countries, albeit for different reasons: markets tend to be highly incomplete, just as those for other agricultural

⁵ Indemnities are computed on the basis of the correlation between the index, say millimeters of rain at one gauge, and the damage suffered by farmers of the area around the gauge. When the millimeters of rain reach the established trigger point, indemnities are paid to subscribers of the insurance, based on the statistically computed expected damage, without individual damage assessment.

services. On the demand side, premiums may result expensive for poor and subsistence farmers, who may value them more than the worst possible insurable outcome. Poverty may also imply a high rate of discount on the future, hence reducing the willingness to purchase insurances; and cognitive failures about risky events may be considerable⁶. On the supply side, high transaction and delivery costs in remote rural areas may result in high premiums, and undermine incentives for insurance companies to operate. Also, controlling contractual conditions may be difficult due to the asymmetry of information: companies may frequently lack the information on the degree of exposure of farmers to different sources of risks, as data are seldom available for remote communities. Actuarial calculations may thus become difficult. For this very reason, indexed insurances are seen as a promising alternative: they can tackle major constraints such as transaction costs, the need to damage assessments and the associated asymmetric information and moral hazard problems.

As for the so-called “market failure” layer, highly infrequent and damaging event are usually not insured by private companies, due to their covariate nature and the magnitude of the associated losses, on the one hand; and due to the cognitive failure which reduced the willingness of farmers to insure against unlikely events. Hence tail risks usually call for the establishment of public-private partnerships, allowing to transfer risks at a higher level⁷. Examples of such type of extended partnerships are the Turkish Catastrophe Insurance Pool; the Andhra Pradesh micro insurance program; index-based weather derivative for farmers facing drought in Malawi; the Caribbean Catastrophic Risk Insurance Facility (CCRIF), co-financed by the World Bank. Farmers often develop expectations of receiving support from governments in case of extreme events and large covariate damages, such as droughts, floods or earthquakes. This may reinforce cognitive failures, and contribute to depress market demand, hence reducing the size of the “insurance market layer” from the left hand side.

Given this framework, one relevant question is what role can policies play, if any, in promoting an increase of the ability of farmers to retain risks, and hence be able to access the insurance market? There are reported cases in which informal mechanisms as well as micro-insurances can be crowded out by public intervention (Skees and Hess, 2003); but there are also reported cases in which even informal mitigation strategies may exclude the poorest, and hence call for some kind of public intervention (Santos and Barrett, 2006). Also a relevant issue is how to best organize public support, where is required, in order to preserve incentives, so that insurances are subscribed where and when needed, and maintain realistic financial profiles.

Next section proposes a review of experiences with agricultural insurances, focused on the role of the public sector, aimed at understanding the logic behind it, and the viability of subsidies to insurance in developing countries as a tool to stimulate investment, innovation and productivity in agriculture.

⁶ Evidence on this point is not straightforward: empirical studies have shown that subsistence farmers, even under extreme conditions, make considerable efforts to preserve productive assets, showing reduced rates of time preferences; see for instance, Moseley (2001). Also, risk perceptions can be extremely variable, depending upon contingent events (Doss et al, 2008).

⁷ The World Bank (2005) provides indications on the specific means that Governments can use to transfer risk, via direct transfer to the re-insurance market of packaged or individual contracts; or via re-insurance of pooled risks, which leave some basis risk to the lower level.

3. Experiences with agricultural insurances: what are governments doing in fact

Public intervention in insurance markets is quite widespread, and takes different forms. Broadly speaking, the experiences reviewed here, which are far from being exhaustive, indicate there are three broad approaches taken in public sector intervention in the agricultural – as well as non agricultural – insurances markets. Firstly, the minimal regulatory role which is necessary for enforcing contracts, and is appropriate for the market of an entirely private good. Secondly, public resources can be employed to ease the functioning of the private insurance markets by contributing re-insurance for covariate risks and coverage for extreme events. Thirdly, public resources can be employed to directly subsidize premiums, either by organizing supplies through State companies, or through private insurance companies. Examples of these three types of approaches are found in several different countries, independently from the income level.

It is important to remark that these three approaches are considered here mostly for illustrative purposes. In fact they tend to be non mutually exclusive; rather, they are incremental levels, given that premium subsidization is normally implemented on top of the provision of a regulatory framework and the financial support to public or private companies supplying insurances. Moreover, the distinction between them is often blurred: premium subsidization and financial support to private insurers is often provided in relations to risks which are assumed to be highly covariate and catastrophic; or to counteract cognitive failures. Hence in many cases it may be questionable the extent to which public resources are in fact used to supply goods with a public content.

The rest of this section provides a summary description of these mechanisms in the different cases, starting from developed countries, and reporting on both agricultural and non agricultural insurances in developing countries.

In the OECD, several countries provide public support to agricultural insurances, both in terms of subsidization of the premiums, and in terms of support to re-insurance. In the EU, for instance, 17 member countries provide direct support to the payment of premiums for a variety of agricultural insurances, in the framework of farmer's income stabilization programs. Insurances include both traditional products, such as policies covering specific risks like hail, as well as combined products based on yields, and index-based policies; however, the latter are far less widespread than the single risk: yield insurances, for instance are reported to be available in five countries, and index-based products in three countries (European Commission, 2008). The share of the premiums which is subsidized is estimated to vary between 2 percent and 67 percent, with some large countries –such as Italy and Spain – subsidizing the more substantive shares. In five EU member countries, public re-insurance is also operated, either through public insurance companies, or through mandatory public re-insurance (Bielza et al, 2007).

Also in the US, the several existing types of agricultural insurances benefit both from subsidized premiums and from support to re-insurance against catastrophic events. Available policies cover yields from multiple perils; revenues for specific products, and the revenue of the whole farming activity, under the Adjusted Gross Revenue scheme; insurance policies are sold by private companies, but the USDA Risk Management Agency subsidizes premiums and administrative costs. Index-base insurances, relying on vegetation indexes computed from satellite imagery, have also been introduced, and they also benefit from public support. Estimates of the aggregated market impact of the US subsidies to agricultural insurances have, however, show that this may be limited, especially in terms of production choices and

changes in foreign trade volumes (Young and Westcott, 2000). A recent comparison of the incidence of subsidies to agricultural insurances in the EU and the US indicates that public intervention in the agricultural insurance markets accounts for about 32 percent in the EU and 58 percent in the US (European Commission, 2008).

Agricultural insurances are widespread and subsidized also in a number of other OECD countries, such as Mexico, Japan, and Turkey and others. In Mexico, up to 2001 agricultural insurances used to be supplied exclusively by the National Agricultural and Livestock Insurance Company, a State entity. Following the liquidation of this company, insurances have been managed through Agroasemex, another public entity which however operates mostly as a re-insurer of private companies (Barnett and Mahul, 2007; Angelucci, 2008.) Since 2002, Agroasemex has also started piloting, and subsequently operating, index based insurance policies, tied to drought, rainfall, temperature and wind speed parameters, and later on to a vegetation index. Apparently, the switch to the private companies has been successful in terms of farmer's demand for the policies, while at the same time smoothing financial requirements of the State Governments in case of extreme events; a further expansion of the system is deemed to be constrained only by the availability of weather stations (Agroasemex, 2006).

As mentioned, considerable emphasis has been put, in recent years, on projects and pilots of index-based insurances, given their promising features in terms of transaction costs. However, also some traditional agricultural insurances are known for implying little or no direct public involvement. Some of them were not successful: it is the case, for instance, of Argentina, where about 25 companies, are operating on a purely private basis, and provide insurances against single risks, typically hail, as well as multi peril policies (FAO, 2005). The market is quite limited: less than 1 percent of the total land in the country is reported to be covered by these companies (IICA, 2008). Ukraine is another case in which traditional insurances, operating on a totally private basis, never developed significantly, due to lack of interest from farmers, despite several companies are actively competing in the sector, and offering a variety of products, including weather index based policies (Angelucci, 2008). The reason offered such low interest range from lack of transparency in the design of contracts, to expectations of protection from the Government in case of extreme events, developed by large landowners (Barnett and Mahul, 2007). Others, more innovative projects entirely based on private initiative, are still in the pilot phase, or never reached factual implementation, as it the case of the Ocean surface temperature in Peru to insure against floods in the Northern areas of the country (Skees et al, 2007). In this last case, the project involves partnership with a local micro-finance institution, as well as the intervention of an international re-insurer. Entirely private agricultural insurances also operate in India, on high value added product; but they seem to account for quite a small share of production and land (FAO, 2005; Skees and Hess, 2003).

In many other countries, agricultural insurance schemes carry a higher degree of public participation, following, to some extent, the same type of approach described for Mexico, as well as the more innovative index approach. One case of careful design is that of the livestock insurance in Mongolia. Risk for herders is layered: an index based privately-operated insurance can be purchased by herders. The Government, however, provides stop-losses to the operation of this insurances, as well as coverage for extreme covariate risks, with assistance from the World Bank in the form of a loan. The attempt in this case is to preserve market incentives in the scheme, allowing private incentives to operate within the "market layer", while allowing the public sector to play its subsidiary role in the "insurance market failure" layer (Angelucci, 2008).

Ethiopia offers another example of insurance operating with public – in fact donor’s - support at the macro level, to cover for the highly covariate risk of drought. In this case, however, it is the World Food Program which purchases the index insurance; this agency has thus insured its own ability to intervene in Ethiopia in case of drought, and pay a premium for ensuring a timely availability of financial means to support interventions. While the idea is certainly interesting, the scheme is deemed to be financially unsustainable (Barnett and Mahul, 2007).

Macro-level support is also offered by the World Bank in India, to the operation of the agricultural index insurance started in 2003, to cover for insufficient water availability mainly in Maharashtra. At the micro level, policies are offered by the private company ICICI Lombard, through BASIX, which is a microfinance institution, and cover basic products such as rice and groundnuts. However, contrary to Mongolia, the performance of this scheme is considered to be unsatisfactory, (Skees and Hess, 2003), as it would be crowded out by the more general yield insurance which is made available to Indian farmers at subsidized prices. Apparently, the weather based policies of ICICI Lombard would become appealing for farmers only if subsidized to the same extent as the other State run insurance scheme known as National Agricultural Insurance Scheme.

Another example of agricultural insurances working effectively with assistance from the public sector is the project started in Malawi in 2005 (Hess and Syroka, 2005). In that case a micro level insurance is managed by private companies operating in conjunction with a farmers association, and assistance from the World Bank and other international institutions. The scheme is deemed successful, reaching several thousands of policies sold within the first three years of operation. At the same time, a macro-level scheme has also been designed, to cater for emergency relief in case of drought (Angelucci, 2008).

Mauritius provides an example of a traditional insurance, managed by the public sector on the basis of incentive-compatible criteria (FAO, 2005). The Mauritius Sugar Insurance Fund (MSIF) was launched in the 1960s to cover for risks arising from cyclones. Later on it started covering also other less catastrophic damages, such as fire and excessive rainfall. Subscribers are classified on the basis of the claims they submit, on a dynamic scale which praises reliability.

In some developing countries the public sector intervenes in the insurance market also in a more direct way, at the micro level, by subsidizing premiums. As seen, one example is offered by the National Agricultural Insurance Scheme (NAIS) of India, which is a vast Government program, mainly run with social objectives. NAIS is estimated to cover about 10.5 million farmers, corresponding to about 15.7 million hectares of land, and covers credit default risk for most crops at premium rates of 1.5 to 3.5 percent of the amount of the loan. Premiums and indemnities are inequitably distributed across crops and States, with more than half being disbursed in one single State; and the program is considered to suffer from inefficiencies, such as long delays in payments of indemnities, frauds, and lack of financial sustainability (Skees and Hess, 2003).

The experience of Morocco is similar to some extent. The Government *Programme Sécheresse*, started in 1995, supplied yield insurance through a mutual company called MAMDA. The main goal of the program was in fact securing loans on the asset portfolio of the *Caisse Nationale de Credit Agricole*, a public lending entity. Critiques pointed mainly to excessive administrative cost and lack of fiscal sustainability (Stoppa and Hess, 2003; FAO, 2005; Angelucci, 2008).

Contrary to India, however, in Morocco index based insurance did not take off. A scheme for a weather index-based insurance was developed in 2004 with assistance from the World Bank, for inadequate rainfall. This was designed to pay indemnities based on an index showing a high degree of correlation with yields. However, its implementation was unsuccessful, as it started during a period of unfavorable rainfall, which generated losses in the first year and quickly made the program financially unsustainable.

The Philippines offer another example of a traditional agricultural insurance, granted within a wider agricultural support program, and directly operated by a State parastatal, named the Philippine Crop Insurance Corp (PCIC). This is a subsidiary of the Land Bank of the Philippines, and supplies insurance policies in connection with credit, at heavily subsidized premiums and high administrative costs. Subscription of policies covering potential damages from cyclones is mandatory in high potential areas; policies against drought and pests are also supplied, especially in the Southern areas of the country (FAO, 2005).

In many other countries, innovative insurance schemes are being assessed or piloted, often on the basis of the development of weather indexes; this is the case of drought and flood indexes in Bangladesh; of a drought pilot index for vegetables in the Chinese province of Shanghai; of indexes in Thailand and Vietnam for drought and flood risks respectively (Barnett and Mahul, 2007). Feasibility studies have been promoted to assess the viability of insurances in Syria, South Africa, and in Nicaragua in the past. Renewed efforts are underway in this last country – where the project encountered resistance and competition from subsidies – as well as in Honduras and Guatemala (FAO, 2005). Studies have simulated insurance schemes in Ghana (Molini et al, 2006). Livestock insurances schemes have been assessed and proposed for Kenya, Cameroon (Otieno et al, 2006; Barrett et al, 2008), and for Sub-Saharan Africa in general (Gautam, 2006).

In the examples of agricultural insurances reviewed so far, subsidization of premiums was considered necessary in order to make policies attractive to farmers, as well as financially viable. This seems to be the case in India, Morocco, Ukraine and some OECD countries like the US and the EU; as opposed to the virtuous examples of Mongolia or Malawi, where market incentives seem to have worked effectively for individual farmers, and public support was limited to the macro level and re-insurance against covariate risks. However, there are also cases in which some public support has managed to support the functioning of the market, without undermining incentives or creating financial problems, such as those of Mauritius, or the Agroasemex in Mexico.

More indications on public support and the conditions for the development of the insurance market can be derived also from experiences with other non-agricultural insurance in developing countries. A wide collection of case studies with insurances at the grassroots level has been published by the International Labor Office (ILO). Most of those insurances operate within environments characterized by limited ability to pay premiums, high transaction costs, and incomplete service markets; and many of them are based in rural areas, where there are constraints in terms of market development which are similar to those faced by agricultural insurances at micro level. Information and lessons learned are available on some 24 micro insurances in developing countries. The table below reports offers a synoptic presentation of these case studies.

country	name	risk covered	supplier	Government role	remarks	author(s)
Peru	SERVIPERU'	funeral, health care	SEGUROSCOOP, then SERVIPERU'; own network	none	not tied to credit	Rodríguez and Miranda (2004)
Poland	TUW SKOK	loan protection; later property and personal	Credit Union	none	decentralized managerial structure, with incentives for sales agents	Churchill and Pepler (2004)
Vietnam	TYM's Mutual Assistance Fund	life, some illness	Microcredit institution	none	fixed benefits and premiums	Tran and Yun (2004)
Philippines	CARD-MBA	life, and later disability, pensions	Microcredit NGO; then independent	none	Both CUs and their members as costumers	McCord and Buczkowski (2004)
Guatemala	COLUMNA	life	Credit unions	none		Herrera and Miranda (2004)
Malawi	MUSCCO	loan protection; life	Microcredit co-operatives initiated by the Catholic Churc (SACCO)	none	highly decentralized delivery and control system	Enarsson and Wirén (2005)
Uganda	AIG Uganda - GPA	personal accidents	microfinance institution (FINCA)	none	good business; could be expanded	McCord et al (2005)
Zambia	MADISON INSURANCE	loan protection to microcredit, funerals	MADISON treats microfinance institutions as policyholders under a collective contract, for a commission or profit sharing	none	costumers don't like the idea that insurance is mandatory to get credit	Manje (2005)
Uganda, Zambia, Malawi, Philippines, Mexico	OPPORTUNITY INTERNATIONAL with 5 companies	mostly loan protection to microfinance institutions; some funeral (similar)	microfinance institutions	none	keep it simple and offer incentive to the microfinance institutions	Leftley (2005)
Colombia	LA EQUIDAD SEGUROS	life; loan protection	microcredit institutions, acting as agents	none	good business	Almeyda and de Paula Jaramillo (2005)
Bangladesh	BRAC, GRAMEEN KALYAN, SSS	health, targeting rural poors	own network	donor-funded	potential costumers reluctant to pay premiums; no professional management: development people	U Ahmed et al. (2005)
India	TATA-AIG		first tried through microfinance; then own network of micro-agents	none	scheme is recent; results still to be assessed	Roth and Athreye (2005)
India	microfinance: SPANDANA, SHEPHERD, ASA	SPANDANA: only life; SHEPHERD: life, health, assets; ASA: in between	microcredit perspective:	none	trade-off: many costumers with few mandatory products, or few with complex voluntary; price matters!	Roth et al. (2005)
India	VimoSEWA	multirisk	NGO SEWA: women's group in Gujarat initially selling public insurances; begun own products to cope with inefficiencies	public insurances were subsidized; GTZ supplying technical assistance	difficulties; need more assistance	Garand (2005)
Guinea	Union des Mutuelles de Santé de Guinée Forestière (UMSGF)	health;	association of Mutual Organization	none	Support from International Centre for Development and Research (CIDR) as part of regional initiative; financially unsustainable	Gautier et al. (2005)

country	name	risk covered	supplier	Government role	remarks	author(s)
India	KARUNA TRUST	health, drugs, hospitalization, wage and income losses	Ngo piloting health insurance on behalf of National Insurance Company (NIC) in Karnataka	NIC is public; support from UNDP; subsidized premiums	decided to subsidize for the poor, to familiarize and create complementarities in view of financial sustainability; reported frauds	Radermacher et al. (2005a)
India	YESHAVINI COOPERATIVE FARMER'S HEALTH	Surgery in rural areas of Karnataka	own network	subsidized by the Government	high premiums for high cost/low frequency events; lack of transparency and client orientation	Radermacher et al. (2005b)
Sri Lanka	ALMAO	disability, hospitalization, death and maturity	Sanasa movement and credit cooperatives	none	democracy is needed for operating on a mutual basis; need public/donor support at the beginning	Enarsson and Wirén (2006)
Sri Lanka	YARISU	disability, hospitalization, death	NGO All Ceylon development Council, reinsured by Rabobank	none	democracy is needed for mutual basis; need public/donor support at the beginning	Enarsson and Wirén (2006)
Benin	Association d'Entraide des Femmes, or Women's Self-help Association (AssEF),	health; microfinance loan protection	microfinance arm of AssEF	support from ILO-STEP programme	success depends upon performance of the microfinance; still in initial stage	Louis (2006).

As it is evident, most insurances studied by the ILO offer policies covering health, death, and disability risks, as well as funeral expenses. Public intervention is quite limited in these cases: direct subsidization only occurs in two Indian insurances – the Kuruna Trust and the Yeshavini Cooperative – while donors support is present in the VimoSewa and Kuruna Trust, also in India, in the AseF group in Benin, and in the Bangladeshi health insurances provided by the Brac, Grameen, Kalyan, and SSS groups. In some of these cases, the subsidization of premiums is indeed associated with reports of frauds and inefficiencies.

The other case studies concern organizations which are entirely private, and/or subsidiaries of large-scale national and international companies; for instance Tata-AIG in India or AIG-Uganda. What is interesting of these experiences is mostly the fact that a number of them started operating on behalf or in relation to microfinance institutions: this is the case in 17 of the 24 total cases reported. In most cases insurance policies were started as a by-product of the operation of micro-credit, with the objective of protecting loans against risks of default arising from health problems or death of the members. Members were initially proposed to apply a surcharge on their loan repayments, covering for default risks. From this narrow base, the same organization began differentiating policies, and proposing coverage for a wider spectrum of risks. In most cases, coverage for loan protection and health was offered by microfinance institutions at very low cost, which also contributed to make them affordable.

Hence microfinance institutions supported the initial learning and transaction costs required to generate the demand for insurance policies from poor – often rural – communities. Moreover, it is interesting to observe that in successful experiences mutual trust of members in the organizations involved was built before and independently from the sale of insurance policies; and mostly in non-governmental organizations, some of which bear a confessional or other group identity. Such identities were valuable assets in terms of building sense of ownership, increasing mutual control across members, and lowering transaction costs.

4. Concluding remarks

The quick review of experiences with agricultural insurances proposed in this paper indicates that very few of them work on a purely market basis, and that even several of the more innovative indexed policies often require support from the public sector or foreign donors. This is the case in countries where agriculture enjoys extensive support, such as the US and the EU, as this tends to crowd out private insurances, so that subsidies seems to be required to stimulate demand and address re-insurance and potential cognitive failures, at least for risks which are deemed highly covariate or catastrophic. But public support to agricultural insurances appears to be widespread also in developing countries, where farmers are generally less supported by Governments. Where local resources are more constrained, foreign resources are employed to finance agricultural insurance schemes, at least for facilitating re-insurance. And there seem to be cases in which the lack of public funding has been crucial in shaping the fortune of insurance schemes. For poor farmers in developing countries, motivations for public intervention in agricultural insurances range from the need to re-insure systemic risks, to the need to overcome start-up information and transaction costs; to the very fact that premiums may be unaffordable for subsistence farmers and poor households leaving on little cash incomes.

In general, Governments seem to intervene well beyond what would be expected to do: subsidization of premiums and financial support to the operation of private companies or

parastatals is widespread in many countries, even beyond the correction of market failures generated by catastrophic risks, and the provision of regulation and information. While this can entail an advantage for insurance companies, it is not always clear what is the effect on agriculture. In fact, premium subsidization is often associated with reports of inefficiency and frauds, and targeting insurances towards poorer farmer is difficult: most schemes do not even try to. Moreover, despite the lack of counterfactual evidence makes an exact quantification difficult, in more than one case subsidized premiums are reported to crowd-out market based insurances at least to some extent, by undermining farmer's incentives to subscribe.

However, it is also interesting to observe that it is possible to identify both successful cases and failures among agricultural insurance schemes entailing different forms and degrees of public intervention and partnership with the private sector, and to some extent even within different types of insurance products, from the more traditional to the more innovative or index based and derivatives. For instance, the MSIF of Mauritius is a traditional insurance with direct public support which seem to work effectively, thanks to what is described as a sound incentive structure. While the Moroccan or the Ukrainian experiences with innovative private-based index insurances have been discontinued, as farmer would not purchase them; contrary to what is reported for a country like Malawi, in which index-based insurances seem to be taking off following a consistent effort to promote agricultural productivity in general.

All this indicated that the specific incentive structure which prevails in the organization of agricultural insurances, as well as the more general agricultural economic environment, can be very important in determining outcomes; and perhaps more important than the extent of public support per se.

As suggested by the literature, intervention in re-insurance should be preferred to direct subsidization of premiums; however, even this should not be regarded as a fully general point, as there are cases reported in which premiums may simply be too high to be purchased by poor farmers; and where even informal networks do not work for the poorest.

Looking outside agricultural insurances, the case studies collected by the ILO on micro-insurances mainly indicated that entirely private insurances in poor and remote rural areas can emerge when pre-existing organizations support "start-up" costs: the spontaneous emergence of insurances at the micro level is mainly observed as an offspring of well established microfinance institutions. They provided the institutional framework to market insurances based on consolidated relations and trust build independently from the insurance business. Where non-governmental or private communal organizations are not available, there may be scope for governments or donors to intervene and support the start-up costs. In fact this is not a frequent experience, while it is frequent to observe public entities ending up with inefficiencies and frauds. There are, however, two criteria in government's intervention which may contribute to reduce the risk of such undesirable outcomes. Firstly, avoid direct premium subsidization, while focus intervention toward facilitating re-insurance or even stop-losses to protect the financial sustainability; this may leave more room to incentives on both the demand and the side of insurances, and reduce inefficiencies. Secondly, support could be framed and organized on a temporary basis, with some financial "graduation" system, which lowers through time the safety net offered by the government. This may prevent the constitution of rents, both in agriculture and in the insurance industry, which may be difficult to remove.

Altogether, the review of experiences also shows that insurances should be regarded as one of the areas in which Governments, especially in developing countries, may identify least

distortionary and WTO-compatible ways of supporting agricultural development, and increasing productivity and production. However, they are far from being a panacea, nor necessarily a way to reduce Government's involvement and efforts by delegating functions to the private sector. Insurances may be one element contributing to remove obstacles to agricultural investment; but their promotion should be consistent with the broader objective of promoting the establishment of a complete and functioning market for agricultural services, which is important, as seen, to allow farmers to retain non-insurable small risks, and is a necessary pre-condition for insuring against more disruptive risks. This is particularly true with respect to credit and finance, which are in fact forming the centerpiece of several recent projects, also in connection with agricultural insurance schemes. An improved ability to purchase inputs allows to reduce yields risks, to access better infrastructures, storage, transport and other services, as well as insurances and other risk management tools (Sawada, 2006; Boucher et al, 2008). In turn, an improved risk management affect the ability to invest and innovate, and ultimately to increase productivity (Carter, 2008; Barham et al, 2008).

In other words, where the "retention layer" is small, due to small ability to retain highly frequent risks, also the "insurance market layer" is likely to be small; the first may constitute a necessary, though not sufficient, condition for the existence of the second. The ability to mitigate and smooth the consequences of expected variability in prices and yields, in other words, can be seen as a necessary pre-condition for farmers to be able to access insurances against more risky events. In fact, insurances have frequently developed in connection to the market for other services, and particularly credit, which seems to be able to play a catalytic role and provide the first and most important opportunity for farmers to improve their ability to retain variability and smoothing incomes and consumption. Access to credit as other services, on the one hand, and insurances on the other, are mutually reinforcing.

References

- Agroasemex, 2006 The Mexican Experience in the Development and Operation of Parametric Insurances Applied to Agriculture
- Alderman, H. and C. H. Paxon (1992) Do the Poor insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries. Policy research working Paper. Agricultural and Rural Development department, the World Bank, WPS 1008
- Almeyda, G. and F. de Paula Jaramillo (2005) La Equidad Seguros – Colombia. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 12. Geneva, International Labour Office
- Angelucci, F. (2008) "Weather indexes in agriculture: a review of theoretical literature and developing countries' experiences" AAACP Paper Series n. 1 Trade and Markets Division, FAO, Rome.
- Barham, B. S. Boucher and M. Carter (2008) Are Land Titles the Constraint to Enhance Agricultural Performance? Complementary Financial Policies to Crowd-in Credit Supply and Demand in Risk-constrained Rural Markets. mimeo

- Barnett B. J. and Mahul O. (2007) “Weather Index Insurance for Agriculture and Rural Areas in Lower-Income Countries”. *American Journal of Agricultural Economics* 89 (Number 5, 2007): 1241–1247.
- Barrett, C. B., M. R. Carter and M. Ikegami (2008a) *Poverty Traps and Social Protection, Special Protection and Labor Discussion Paper n. 0804*
- Barrett, C. B., M. R. Carter, J. McPeak and A. Mude (2008b) Grant proposal. *A productive Safety Net for Northern Kenya’s Arid and Semi-Arid Lands: the HSNP Program, mimeo*
- Berg E. and B. Schmitz (2006) *Weather based instruments in the context of whole farm risk management. paper at the 101th EAAE Seminar “Management of Climate Risk in Agriculture”, Berlin*
- Bielza M., J. Stromblmair and J. Gallego (2007) *Agricultural Risk Management in Europe. Paper at the 101th EAAE Seminar “Management of climate risks in agriculture”, Berlin, Germany*
- Boucher, S.R., M. Carter, and C. Guirkingner (2008) *Risk Rationing and Wealth Effect in Credit Markets: Theory and Implications for Agricultural Development. American Journal of Agricultural Economics* 90(2), 409-423
- Cafiero, C. (2008) *Agricultural producer risk management in a value chain context: Implications for Developing Countries’ agriculture, AAACP Paper Series n. 4 Trade and Markets Division, FAO, Rome.*
- Cafiero C. and Cioffi A. (2006) *The changing role of Public Policies in farm income stabilization, in Cafiero C. and Cioffi A. (eds) Income Stabilization in Agriculture. The role of Public Policies. ESI, Naples,*
- Capitanio F. and C. Cafiero (2006). *Public intervention in the management of Agricultural Risk. Who benefits from insurance subsidies? in Cafiero C. and Cioffi A. (eds) Income Stabilization in Agriculture. The role of Public Policies. ESI, Naples,*
- Carter M. R. (2008) *Inducing Innovation: Risk Instruments for Solving the Conundrum of Rural Finance. Keynote Paper Prepared for the 6th Annual Conference of the Agence Française de Développement and The European Development Network Paris, 12 November*
- Chantararat S., Barrett C.B., Mude A.G., Turvey C.G. “Using Weather Index Insurance to Improve Drought Response for Famine Prevention. *American Journal of Agricultural Economics*, 89 (Number 5, 2007): 1262–1268
- Churchill, C. and T. Pepler (2004) *TUW SKOK - Poland CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 2. Geneva, International Labour Office*
- Dercon S. (2004) *Insurance against poverty. London: Oxford University Press.*
- Dercon S. (2005) *Vulnerability: a Micro Perspective, mimeo, April*

- Doss C. L, J. McPeak and C. Barrett (2008) Interpersonal, Intertemporal and Spatial Variation in Risk Perceptions: Evidence from East Asia. *World Development*. Vol 36, No. 8, 1453-1468
- Enarsson, S. and K. Wirén (2005) MUSCCO - Malawi Union of Savings and Credit Cooperatives. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 8. Geneva, International Labour Office
- Enarsson S. and K. Wirén (2006). ALMAO and YASIRU - Sri Lanka. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 21. Geneva, International Labour Office
- European Commission (2008) Agricultural Insurance Schemes. Joint Research Centre – ISPRA Institute for the Protection and Security of the Citizen, Agriculture and Fisheries Unit
- Food and Agriculture Organization of the United Nations (FAO) (2005) Insurance of crops in Developing Countries, FAO Agricultural Services Bulletin n. 159, Rome
- Garand, D. (2005). VimoSEWA India. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 15. Geneva, International Labour Office
- Gautam M. (2006) managing Drought in Sub-Saharan Africa: Policy Perspectives. Paper at the 26th Conference of the IAAE, Gold Coast, Australia
- Gautier, B., A. Boutbien and B. Galland (2005) L'Union des Mutuelles de Santé de Guinée Forestière - Guinea. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 17. Geneva, International Labour Office
- Hess. U. and J. Syroka (2005) Weather-based Insurance in Southern Africa. The Case of Malawi. Agriculture and Rural Development Discussion Paper, 13. Washington DC, The World Bank
- Interamerican Institute for Cooperation in Agriculture (IICA) (2008). Agricultural insurance. A powerful tool for governments and farmers. COMUNIICA, perspective
- Koundouri, P. M. Laukkanen, S. Myyrä, C. Nauges (2009) The effects of EU agricultural policy changes on farmers' risk attitudes. *European Review of Agricultural Economics* vol 36, 1: 53-78.
- Leftley, R. (2005) Technical Assistance for the Promotion of Microinsurance. The Experience of Opportunity International . CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 11. Geneva, International Labour Office
- Louis, O. (2006). Association d'Entraide des Femmes – Benin. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 22. Geneva, International Labour Office
- Manje, L. (2005) MADISON INSURANCE – Zambia. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 10. Geneva, International Labour Office

- McCord, M. J. and G. Buczkowski (2004). CARD MBA - The Philippines. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 4. Geneva, International Labour Office
- McCord, M. J., F. Botero, and J. S. McCord (2005). AIG Uganda - A Member of the American International Group of Companies. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 9. Geneva, International Labour Office
- Molini V. M., M. Keyzer, B. Van den Boom and W. zant (2007) Creasting safety nets through semi-parametric index-based insurance: a simulation for northern Ghana. Paper at the 101th EAAE Seminar “Management of climate risks in agriculture”, Berlin, Germany
- Moschini, G. and D.A. Hennessy (2001): Uncertainty, risk aversion, and risk management for agricultural producers”. Chapter 2 in Gardner, B. and G. Rausser Eds.: “Handbook of Agricultural economics, Vol. 1. Elsevier Science.
- Moseley W. G. (2001) African Evidence on the Relation of Poverty, Time Preference and the Environment. *Ecological Economics*, 38, 317-326
- OECD (2008) An Assessment of Risk Exposure in Agriculture. A Literature Review. TAD/CA/APM/WP(2008)23FINAL
- OECD (2009a) Risk Management in Agriculture. A Holistic Conceptual Approach TAD/CA/APM/WP(2008)22/ FINAL
- OECD (2009b) An Overview of Risk-Related policy Measures TAD/CA/APM/WP(2008)24/REV1
- Otieno D. J, W. Oluoch-Kosura, J. T. Karugia, A. Drocker and E. Rege (2006) Risk Management in Smallholder Cattle farming: a Hypthetical Insurance Approach in Western Kenya. Paper at the 26th Conference of the IAAE, Gold Coast, Australia
- Radermacher, R., N. Wig,, O. van Putten-Rademaker, V. Müller, and D. Dror (2005b) Yeshasvini Trust, Karnataka - India. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 20. Geneva, International Labour Office
- Radermacher, R., O. van Putten-Rademaker, V. Müller, N. Wig, and D. Dror (2005a) Karuna Trust, Karnataka – India. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 18. Geneva, International Labour Office
- Rodríguez M. U. and B. Miranda (2004) SERVIPERÚ – Perú. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 1. Geneva, International Labour Office
- Roth J. and V. Athreye (2005) TATA-AIG Life Insurance Company Ltd. – India. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 14. Geneva, International Labour Office
- Roth, J., C. Churchill, G. Ramm and Namerta (2005) Microinsurance and Microfinance Institutions. Evidence from India. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 15. Geneva, International Labour Office

- Roth M., C. Ulardic and J. Trueb (2007) Critical Success factor for weather risk transfer solutions in the agricultural sector. Paper at the 101th EAAE Seminar “Management of Climate Risk in Agriculture”, Berlin
- Santos P. and C. B. Barrett (2006). Informal Insurances in the presence of Poverty traps: Evidence from Southern Ethiopia. Paper at the 26th Conference of the IAAE, Gold Coast, Australia
- Sawada, Y. (2006) The Impact of Natural and Manmade Disasters on Household Welfare. Plenary paper at the 26th Conference of the IAAE, Gold Coast, Australia
- Sckokai, P. and Moro, D. (2006). Modeling the reforms of the Common Agricultural Policy for arable crops under uncertainty. American Journal of Agricultural Economics vol 88: 43–56.
- Skees J. R., P. Hazell and M. J. Miranda (1999) “New Approaches to Crop Yield Insurance in developing Countries”. EPTD Discussion Paper n. 55. Environment and Production Technology Division, IFPRI, Washington, D.C.
- Skees J. R. and Hess U. (2003) Evaluating India’s Crop failure Policy. Focus on the Indian Crop Insurance program. delivered to the South Asia regiona of the world bank
- Skees J. R., J. Hartell and J. Hao (2006) Weather and Index Insurances for developing Countries: experiences and possibilities , Chapter 13 of Sarris, A. and D. Hallam (eds). Agricultural Commodity Marktes and Trade, Rome, FAO
- Skees J. R., J. Hartell and A. J. Murphy (2007). “Using Index-Based Risk Transfer Products to Facilitate Micro Lending in Peru and Vietnam. American Journal of Agricultural Economics 89 (5)
- Stoppa A. and U. Hess (2003) Design and Use of Weather Derivatives in Agricultural Policies: the Case of Rainfall Index Insurance in Morocco. Contributed paper at the International Conference Agricultural policy reform and the WTO: where are we heading? Capri (Italy), June 23-26, 2003
- Tran N.-A. and T. S. Yun (2004) TYM’s Mutual Assistance Fund – Vietnam. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 3. Geneva, International Labour Office
- U Ahmed, M., S. Khairul Islam, Md. A. Quashem, and N. Ahmed (2005) Health Microinsurance. A Comparative Study of Three Examples in Bangladesh. CGAP Working Group on Microinsurance. Good and Bad Practices. Case Study No. 13. Geneva, International Labour Office
- Young C. E. and P. C. Westcott (2000) How Decoupled Is U.S. Agricultural Support for Major Crops? American Journal of Agricultural Economics 82: 762–767
- Varangis P., and B. Lewin (2006). Approaches to managing coffee price risks. Chapter 12 of Sarris, A. and D. Hallam (eds). Agricultural Commodity Marktes and Trade, Rome, FAO

World Bank (2005). “Managing Agricultural Production Risk. Innovations in Developing Countries”. Washington D.C.

World Bank (2008). World Development Report 2008: Agriculture for Development. Washington D.C.