Facultad de Ciencias Económicas
Módulo II – Despacho 212
c/ Francisco Tomás y Valiente, 5
28049 - Madrid

UNIVERSIDAD AUTÓNOMA DE MADRID

RESEARCH PAPER

INTERNATIONAL MASTER IN MICROFINANCE FOR ENTREPRENEURSHIP
(IMME)
(7th Edition)

THE SPECIAL CHALLENGES OF AGRO-RURAL MICROFINANCE AND THE ROLE OF INSURANCE: THEORY AND PRACTICE

AUTHOR(s): Mercedes Gómez Herrera
Roberto Estellés Colom

TUTOR(s): M.Sc. Paloma Pérez Castañares
Ph.D. Claudio González-Vega

Presented in Partial Fulfillment of the Requirements for the Degree:
International Master in Microfinance for Entrepreneurship
from the Universidad Autónoma de Madrid

Madrid, May 3rd, 2016.

TABLE OF CONTENTS

1. INTRODUCTION 5

2. THE CHALLENGES OF FINANCIAL INCLUSION IN THE RURAL AREAS AND THE POTENTIAL ROLE OF MICROINSURANCE 9

2.1. THE IMPORTANCE OF FINANCIAL SERVICES IN PROMOTING RURAL DEVELOPMENT 12
2.2. BARRIERS TO FINANCIAL INCLUSION IN THE RURAL AREAS 15
2.3. THE POTENTIAL OF MICROINSURANCE IN RURAL FINANCIAL INCLUSION AND DEVELOPMENT 18
2.4. THE CHALLENGES OF MICROINSURANCE 21

3. INDEX INSURANCE AT THE MESO LEVEL AS AN INNOVATIVE TOOL TO OVERCOME RURAL FINANCIAL INCLUSION BARRIERS 25

3.1. INDEX INSURANCE AS A TOOL TO REDUCE TRANSACTION COSTS AND QUICKLY DISBURSE PAYMENTS 25
3.2. MESO-LEVEL INSURANCE AS A FRAMEWORK TO FOSTER NEW MARKETS AND GAIN SCALE 29
3.2.1. INDEX INSURANCE AT THE MICRO LEVEL 30
3.2.2. THE THEORETICAL POTENTIAL OF MESO-LEVEL INSURANCE 33
3.2.3. BARRIERS TO IMPLEMENTING MESO-LEVEL INSURANCE AND HOW TO OVERCOME THEM 37
3.2.4 LESSONS FROM MACRO-LEVEL INSURANCE ABOUT THE POTENTIAL AT THE MESO LEVEL: THE CASE OF CADENA 41
3.3. THE ROLE OF OTHER ACTORS IN MESO-LEVEL INSURANCE SCHEMES 44
3.3.1. THE ROLE OF THE STATE AND PUBLIC-PRIVATE PARTNERSHIPS 44
3.3.2. THE ROLE OF THE REINSURER 45

4. SOME LESSONS FROM PILOT EXPERIENCES FOR THE FUTURE 48

4.1. THE IMPORTANCE OF A WELL-BALANCED DISASTER RISK MANAGEMENT STRATEGY (R4 RURAL RESILIENCE INITIATIVE, ETHIOPIA AND SENEGAL) 49
4.2. THE ROLE OF VALUE CHAINS IN FINANCIAL DEEPENING (HORTIFRUTI CASE, CENTRAL AMERICA) 52
4.3. ENABLING SCALE BY PARTNERING WITH MOBILE NETWORK OPERATORS (ACRE, EX-KILIMO SALAMA CASE, EAST AFRICA) 55

CONCLUSIONS 59

REFERENCES 63

ABSTRACT

Rural financial deepening in developing countries faces several barriers, leading to imperfect or missing markets. These market failures hinder financial inclusion, rural development, climate change adaptation, and food security. One of the many barriers that explain missing or imperfect markets is related to the challenges of risk management. Indeed, natural catastrophes, such as a flood or a drought, can not only devastate an entire region, but they may also lead to the collapse of local financial institutions.

In this scenario, insurance appears as a tool that, by reducing the farmers' risk exposure, helps financial institutions in their risk management and diversification. This tool enables the institutions to reduce their operating costs and losses and, therefore, create new matches between the supply and demand of financial services. Traditional insurance does not seem, however, to be most appropriate to ensure this outcome, due to its high operating costs and its inability to cope with covariant risks. For this reason, index insurance, delivered at the meso level, emerges as a potential solution to both high costs and catastrophic risks. Index insurance, by relying on a predetermined index, compensates losses without requiring an assessment of damages in the field. In this way, the insurance institution can significantly reduce its operational costs and offer more affordable premiums to farmers and to financial intermediaries and other parties engaged in risky transactions with farmers. In turn, a supply at the meso level has the potential to allow the insurer to reach sustainability, as it helps institutions to reduce their costs, increase their pool of clients, and diversify their risks better.

While insurance appears as a convenient tool to increase financial deepening, a holistic approach is required to cope with the different challenges faced by rural farmers. Approaches that also take into account *ex ante* risk management activities, operating cost reductions, and value chain strengthening have to be considered while developing new schemes.

ACKNOWLEDGEMENTS

We would like to acknowledge everyone who has assisted us throughout the completion of our research paper.

We want to express our gratitude to Maricruz Lacalle, Professor and Academic Director of the International Master of Microfinance for Entrepreneurship at the Universidad Autónoma de Madrid, for being always available to us and for fostering this remarkable Master's program, where we have broadened our knowledge about microfinance.

We would also like to express our gratitude to Miguel Solana, from the International Labor Organization, for expanding our perception of the microinsurance challenges; to Paula Pagniez, from Swiss Re, who was very kind, to find a moment to enlighten us on the potential of reinsurance companies in the process of rural financial deepening; to Emilio Hernández, from FAO, for all the interesting readings, the latest and most important case studies and his recommendations; to Panos Varangis, from the International Finance Corporation (WBG), for sharing with us his views and challenges for the sector. Their guidance was greatly appreciated as we navigated through this process!

A very special recognition is due to Paloma Pérez, microinsurance specialist at the BBVA Microfinance Foundation and to Claudio González-Vega, Professor Emeritus at The Ohio State University, for agreeing to serve as our tutors. Paloma, on the weekends, and Claudio, through skype and email, have supported us during the entire process. We truly appreciate their constant assistance and valuable feedback, without which this dissertation would not have been possible.

We would also like to thank Alex and Ana for putting up with us during these months, when they could only see our forehead overpassing our laptop and where all the conversations where about microinsurance.

CHAPTER I
Introduction

Rural smallholders, as everyone else, adopt livelihood strategies that generate demands for several financial services. However, the role of these services in their lives is even greater than for others. Indeed, the lack of steady income flows, added to variable spending needs over time, generate strong seasonality and uncertainty in their financial management. All of this leads to the adoption of costly risk-coping strategies and makes their lives even more hazardous. Access to institutional financial services at a reasonable cost appears, therefore, as a valuable tool to help them to take control over their financial circumstances.

In order to be efficient, these financial services must show four main characteristics: a customer-driven design (high quality), at an affordable price (low cost), of a wide range of financial products (variety), such as money transfers and remittances, access to various types of credit, deposit facilities for keeping savings, and insurance, all of them provided in a sustainable fashion (reliability).

Although theirs are legitimate demands, several barriers hinder the access of rural farmers to the institutional supply of financial services. Among these barriers looms large the threat of systemic events, which increase credit risks beyond the incidence of idiosyncratic shocks. Index insurance, if made available to financial intermediaries at the meso level at a reasonable cost, may increase the supply of credit and reduce the farmers' exclusion from credit markets. Thus, index insurance could improve the household-farm's welfare indirectly, even if the farmer did not purchase insurance.

Similar barriers also impede financial institutions to answer to a legitimate demand for insurance, which would help farmers cope with adverse events. Index insurance may facilitate this task, but it will not be adequate because it does not sufficiently cover basis risk, derived from idiosyncratic events and

from the heterogeneity of farmers. Other types of insurance are thus also needed, but they encounter even more formidable difficulties, not addressed in this research paper. In summary, index insurance, in addition to its indirect impact through increased access to credit, it has the potential to directly improve the household-farm's welfare, but the impact may be modest (to the extent to which basis risk is left uncovered) and not well distributed (given the heterogeneity of the household-farm population).

From the perspective of the household-farm, the efficiency of the market matters a lot. Efficient credit markets reduce transaction costs, while efficient insurance markets reduce risks. Efficiency at this level means a favorable cost-benefit outcome from the available credit and insurance products and a valuable role of (index) insurance in an integrated, overall risk-management strategy at the household-farm level.

Assuring a more efficient overall risk-management strategy at the household=farm level would, in turn, encourage financial intermediaries to adopt a rural smallholder approach, awakening their interest in opening new markets and in achieving, for the institution, an optimum combination of outreach and sustainability. Their ability to increase the breadth and depth of their outreach is constrained, however, by the threat of systemic, catastrophic events. The supply of new types of insurance may allow them to overcome these barriers.

First, the availability of index insurance, at the meso level, may allow these financial institutions to expand their supply of credit and incorporate in their portfolios clients that would otherwise seem too risky, thus increasing the breadth and depth of their outreach. Second, the sustainability of the microfinance institution itself is also threatened by systemic events, through impacts on its portfolio and other assets. Index insurance would also improve the microfinance institution's risk-management strategy and, therefore, its capacity to open new markets and endure over time.

Rural financial deepening also depends on the engagement and role of private insurers. Their interest in participating may reflect their desire to expand their market share, diversify their risks, and earn profits. Innovations in various types of insurance products would allow them to achieve these goals. Index insurance is a promising innovation, but it still encounters major difficulties that must be overcome to offer its full potential. Its success will depend, in turn, on interactions and partnerships with a number of other actors, including governments, international donors and re-insurers. Much needs to be done for the construction and sustainability of these alliances.

Microinsurance, by reducing the small farmers' risks exposure, has the potential to create new matches between the supply and demand of credit and, therefore, open new financial markets. By doing so, microinsurance has an important social potential, as it can play a role in rural economic development as well as in climate change mitigation and adaptation and in national food-security policies.

This research paper aims to analyze the potential role of microinsurance in rural financial deepening. Several researchers have focused on the theoretical role of microinsurance, while others have tried to analyze pilot programmes in order to identify good practices for the future. Among those studies, attention has been drawn on how to reach scalability while staying customer-oriented. Conclusions have highlighted the limits of traditional insurance, too costly for sustainability, as well as the dangers of microinsurance at the micro level (where the policyholder is the farmer), because it does not protect from systemic events.

As previous approaches have failed to overcome the different barriers in microinsurance market development, this paper aims to focus on microinsurance at the meso level (where the policyholder is the risk aggregator). Specifically, this paper will try to shed light on the following question: what is the potential of index insurance at the meso level in rural financial inclusion?

We will analyze the challenges of financial inclusion in the rural areas, understanding which are the main barriers faced, and then we will consider the potential role of microinsurance in overcoming them (Chapter II). However, microinsurance market development has to tackle several barriers of its own. In this respect, index insurance at the meso level, despite its limitations, appears as an innovative scheme to overcome some of them and enhance rural financial inclusion (Chapter III). Rural financial deepening is a multidimensional challenge that requires several different answers, and insurance has to be a component of a holistic rural financial inclusion strategy. The last part of the paper will, therefore, explore different alternative services that must be bundled with microinsurance, in order to achieve the ultimate goal of rural financial deepening.

CHAPTER II

The challenges of financial inclusion in the rural areas and the potential role of microinsurance

> *"The availability and access to finance can be a crucial influence on the economic entitlements that economic agents are practically able to secure. This applies all the way from large enterprises […] to tiny establishments that are run on micro credit"* (Sen, 1999, p. *39*).

Some of the recent research that has attempted to evaluate the impact of microfinance on poor people using randomized control trials (RCTs) has failed to find a clear, statistically significant link between microcredit and poverty alleviation (Banerjee, Karlan and Zinman, 2015). Other studies have reported positive, if modest, impacts on the welfare of typical microfinance clients and even substantial impacts on particular segments of these clienteles, while no evidence of patterns of negative impacts has been found (Odell, 2015). Moreover, positive impacts seem to have been more frequently associated with access to deposit facilities (savings) and to other financial services (potentially insurance) than with access to just credit (García de la Cruz, 2008; Karlan, Ratan and Zinman, 2013). The methodological controversies associated with these inconclusive results are still raging and they cannot be resolved here (Deaton, 2015; Heckman, 2016).

However, what must be recognized, in any case, is that poverty is a complex process and that, as a result, the channels through which microfinance may have an influence on incomes and welfare (some potentially positive and others even negative) are numerous and complex (González-Vega, 1998). Despite these complexities, however, even if microfinance were not always a reliable path to bring many of the excluded out of poverty (defined in a narrow sense),

Roodman, (2012), among others, believes that access to financial services undoubtedly improves poor household options, thereby increasing their welfare. This should not be surprising; regardless of their income levels, both rich and poor people use financial services to meet the same needs: to transact, transfer purchasing power to relatives and others, invest, build assets, cope with risk, and smooth consumption.

We share Roodman's view of access to financial services as a tool that potentially contributes to development (defined here as increasing freedom and agency in one´s life). This perspective is based on the vision, developed by Nobel-winning economist Amartya Sen (1999), that access to financial services expands financial freedom and that it increases control over one's life.

In turn, this control can be translated into investments that improve welfare in the future, such as the acquisition of more efficient means of production or the adoption of innovations in better farming practices as well as investing in one´s children´s education and in better health, nutrition and housing. The returns from these investments may be mostly reaped by the next generation and, therefore, cannot be easily measured in the short term. In this sense, microfinance may mostly contribute to the alleviation of inter-generational poverty. More broadly, through these multiple channels, microfinance may cause economic growth and development in the long run.

In particular, the critical role of finance in the lives of the poor is clearly identified in the *Portfolios of the Poor.* As reported by the researchers: *"Money management is […] a key factor in determining the level of success that people enjoy in improving their own lives. Managing money well is not necessarily more important than being healthy or well educated or wealthy, but it is often fundamental to achieving those broader aims"* (Collins, Morduch, Rutherford, and Ruthven, 2009, p. *3*). The critical roles of finance in the lives of the poor have been further confirmed in the case of the rural population engaged in smallholder agriculture (Anderson and Ahmed, 2016).

A broad range of financial services matters. Among them, some form of insurance is critically important, as it protects people from bankruptcy and deprivation, in the face of unpredictable and volatile, frequently adverse, events. As a World Bank project conducted in 15 developing countries found: "health/death shocks and natural disasters" are the second-most common cause of falling into poverty (19.4 percent of the cases), after regional or national economic troubles (Narayan-Parker, Pritchett and Kapoor, 2009). Insurance can, therefore, be a major instrument in avoiding poverty traps and in fostering welfare improvements.

Recognizing its importance, already in the early 20th Century, Winston Churchill stated that *"If I had my way I would write the word "Insure" over the door of every cottage, and upon the blotting-book of every public man, because I am convinced that by sacrifices which are inconceivably small, which are all within the power of the very poorest man in regular work, families can be secured against catastrophes which otherwise would smash them up for ever"* (Churchill, 1909, p.*147*).

However, the provision to a developing country's entire population of the financial services they demand, in general, and of insurance, in particular, has faced major difficulties. In essence, this is due to the problem of producing financial transactions, particularly for poor populations, at reasonable costs and risks, given the high barriers encountered. These barriers explain the widespread occurrence of missing and imperfect markets and, as a result, large segments of the population are, totally or partially, excluded from access to institutional financial services.

In response to these deficiencies, microfinance has evolved as a set of new technologies and financial innovations that have shifted the supply of financial services, to more closely match the unsatisfied legitimate demands of these excluded populations. In particular, microfinance can be better understood as the provision of financial services when features of the transaction (small), the client (poor, vulnerable and informal) or its productive activity (heterogeneous projects) make the use of a traditional banking technology unfeasible,

unprofitable, or unsustainable (and therefore an adequate supply does not emerge), whereas the use of new financial technologies, which take into consideration these key features of the clientele, make these transactions possible. Microfinance is thus the set of these new technologies (González-Vega, 2013).

2.1. The importance of financial services in promoting rural development

> *"The season of plenty should then provide for the season of want; and the gains of summer be laid by for the rigors of winter. But it must be obvious, how difficult it is, for even the sober labourer to save up his money, when it is at hand to supply the wants that occur in his family"* (Wakefield, 1805).

Access to financial services, while important to the entire population, is especially vital for farmers. As reported by Priscilla Wakefield (1805), farmers do not have a steady income flow every month. On the contrary, their income is linked to biological cycles (*e.g.*, planting and harvesting) as well as dependent on price volatility, climate, and natural disasters. In this scenario of uncertainty and of flows of expenses and incomes that do not match over time, financial services (*i.e.*, credit, savings and deposit facilities, money transfers and remittances, leasing and insurance) must play a major role in smoothing consumption, building assets, and reducing and coping with risks.

Yet, the rural areas of developing countries represent a major challenge not only for traditional finance but even for microfinance. A low density of population and a dependence on economic activities linked to major risks (*e.g.*, market volatility, climate change and natural disasters) add to substantial transaction costs and risks resulting from inadequate physical and institutional infrastructures and cause missing and imperfect markets.

Financial exclusion in the rural areas is a worldwide major concern because of its dimensions. According to the World Bank, 48 percent of the world's population was considered rural in 2011. In Latin America and the Caribbean,

the proportion was one out of four people; a still significant enough number to attract our attention (World Bank, 2011). Especially concerning is the concentration of poverty in the rural areas (IFAD, 2011). A large proportion of this low-income population – up to 70 percent of the world's poor who live in rural areas – is engaged in agricultural activities as their main source of income and employment (World Bank, 2011). This reality explains why, in many emerging countries, the growth of GDP in the agricultural sector "is up to four times more effective in reducing poverty than growth generated by other sectors" (IFAD, 2011). In this sense, promoting financial inclusion in the rural world could be a major tool in order to help smallholders build assets that will help them improve their lives in a long-lasting and stable way.

Yet, economic growth and socioeconomic development are not the only issues that must be tackled. Two other major concerns have increased international interest in smallholder agriculture. On the one hand, a greater price volatility of staple crops has aroused caution over food security (Baffes and Dennis, 2013; Gouel, 2013). On the other hand, climate change poses an unquestionable challenge on smallholder agriculture and its survival (Müller, Ramm and Steinmann, 2014).

In order to improve the fate of the poor population, foster development, and reach the UN Sustainable Development Goal of poverty eradication by 2030, smallholder rural development has to be brought on top of the agenda and microfinance can be a major tool in achieving it (UNDP, 2015).

While rural financial exclusion represents one of the key challenges in developing countries, Latin America is not an exception. Households in the rural areas of Latin America are falling behind regarding access to institutional financial services, particularly those required for the development of their agricultural and livestock activities, which are intimately related to their main sources of income and employment (González-Vega, 2003; Hernández, 2016b).

The lack of supply or, in the best scenario, the insufficient provision of rural financial services is revealed through deficiencies in at least four dimensions of outreach (Schreiner, 1998; González-Vega, 2016): limited breadth (only a small proportion of the rural population has access to institutional financial services), negligible depth (due to greater barriers, mostly poor households are excluded), a narrow variety of financial services (usually, the only products offered are credit and, in some cases, savings and deposits), and a poor value for the clients (services not adapted to their circumstances provide low quality for the clients at a high cost).

Huge transaction costs and a deficient provision of tailor-made financial services results in a mismatch between demand and supply. While trying to increase their net income from agriculture, smallholders meet important constraints, such as limited access to quality means of production, fertilizers and high-yielding seeds, among others. Those constraints prevent them from substantially increasing their yields per area and therefore increasing their incomes (Müller, Ramm and Steinmann, 2014). Better access to financial services may give them the opportunity to release those constraints.

As a result, farming households demand a broad variety of financial services – not only credit, but also deposits, money transfers and insurance, among others – in order to cope with their daily challenges and implement their livelihood strategies. Increasing their access to a broader variety of efficient financial services would therefore be a tool for reducing and coping with risks, breaking out of poverty traps, improving the smallholders living standards, and through these channels foster economic growth, social development, and inclusion in the rural areas (González-Vega, 2016).

2.2. Barriers to financial inclusion in the rural areas

> *"Farmers often live in areas that are hard to reach with traditional financial services […] they face climatic and price risks, seasonal demand for products, and fluctuating labor and capital. Many of these risks […] are beyond the control of farmers…"* (Miller, 2013, p. *233*)

The insufficient provision of financial services in the rural areas is due to a number of barriers. These barriers hinder the provision of high-quality, well-adapted services at an affordable cost (interest plus transaction costs) for the rural smallholders, which would help them invest in more productive activities and thereby increase their incomes (González-Vega, 2013).

While thinking about rural smallholders, we need to acknowledge the importance of investment barriers triggered by the presence of economies of scale and asset indivisibilities. Economies of scale are unachievable, or at least negligible, for small property holders. Investing in indivisible assets, such as tractors and greenhouses, may be impossible without access to credit and other financial services (for example, deposit facilities that ease the self-financing of the investment or the accumulation of down payments needed for loans). The inability to enjoy economies of scale and the impossibility to acquire key productive inputs and assets, due to the lack of provision of adequate financial services, hold the rural households in poverty traps (Fafchamps and Pender, 1997; Dearcon, 1998; Parker, 2000; Dearcon and Christiaensen, 2011).

If, in addition, despite the higher promised yields, the risks of farming innovations threaten minimum consumption levels, the willingness to invest will be missing, unless financial instruments, such as insurance and deposit facilities, offer the household a precautionary cushion, in case something goes wrong (Guízar, González-Vega and Miranda, 2015). Financial services address, therefore, both the ability and the willingness to invest and innovate.

The lack of agro rural financial outreach is connected to several barriers, which are associated to two major obstacles, intrinsic to the rural reality: the rural idiosyncrasy (territorial and sectoral) and risk management. The rural areas are, by definition, far away from city centers. In Latin America, the average time spent by a farmer to reach the closest city center varies from 10 to 20 hours, depending on the country (FAO, 2015). Low density and population dispersion complete a territorial dimension of the rural areas, which represents a major challenge for the provision of financial services, due to prohibitive transaction costs, which make access unaffordable for the population (Adams and Nehman, 1979; González-Vega, 2003).

The sectorial reality poses yet another challenge for the provision of financial services. Crop and livestock activities are subject to their own seasonality, due to biological cycles: sowing and harvesting, as well as animal breeding, occur at a precise time of the year. The gestation period tends to be very long – *e.g.*, several months will pass between the sowing and harvesting period – which causes a low turnover of flows, creating a mismatch between the household expenses and income flows (González-Vega, 2016).

Some innovations have been introduced in the implementation of microfinance technologies, in order to mitigate this rural idiosyncrasy, especially concerning repayment flexibility – *e.g*.. instead of weekly installments, some microfinance institutions, such as PRODEM in Bolivia, have customized the repayment calendar in order to match it with the biological cycle (Binswanger and Deininger, 1995).

However, new financial services need to be put in place in order to mitigate another major challenge: risk management. A good risk management strategy needs to be employed in order to enhance the penetration of financial services in the rural areas (outreach) but also to ensure institutional sustainability and, therefore, permanent access to financial services for the client (González-Vega, 2013).

Distance and population dispersion, two idiosyncratic characteristics of the rural areas, help to explain part of the risk related to rural finance. Distance and dispersion make very expensive the establishment of a personal relationship with the clients (*i.e*., identification of potential clients, follow up on their activities, verification of project results, or evaluation of damages in the case of insurance) as well as the enforcement of contracts. These features of rurality increase information asymmetries between financial institutions and their clients and promote opportunistic attitudes that discourage institutions from providing financial services at acceptable prices for the poor (González-Vega, 2016).

Information asymmetries are intensified by the heterogeneity of rural smallholders. Farmers are fundamentally diverse in terms of their socio-demographic composition, income-generating activities, and land tenure – there are huge differences in terms of farm location, soil potential, human resources and technologies used – which prevent institutions to reduce their costs by standardizing processes and products (Hernández, Sam, González-Vega and Chen, 2012).

Another central dimension of rural risk is the covariance of farming activities. The seasonality of income-generating activities – all farmers sow the same product at the same time – generates a systemic risk scenario, where any natural catastrophe such as a flood or drought can devastate an entire region, inducing the economic collapse of any local financial institution (IFAD, 2011).

Since the seventies, microfinance in Latin America, through its supply of credit and deposits, has been contributing to the strengthening of financial inclusion. However, the reality of rural life highlights several barriers to the provision of financial services in rural areas. These are barriers that cannot be torn down through credit and deposits only. In that sense, microinsurance is emerging as another innovation, which has the potential to mitigate risk and overcome those barriers and thus increase the breadth and depth of outreach of rural financial inclusion.

2.3. The potential of microinsurance in rural financial inclusion and development

> *"[…] a natural experiment […] shows that insurance provision increases the insured crop production by 16 percent and raises borrowing by 29 percent. […] Furthermore, effects on production and saving persist over the long run, while effects on borrowing are significant in only the medium run. […] the policy is both welfare improving and cost effective"* (Cai, 2016, p. *44*).

In order to improve the fate of the rural population, a variety of approaches have been tried, with limited success so far. Typically, those are government programs that have attempted to tackle the central role of risk in farming by providing subsidized fertilizer, agricultural credit, and investments in improved infrastructure, among other incentives (Müller, Ramm and Steinmann, 2014). The problem with these tools is that they only partially tackle the challenge and frequently they are not the most cost-effective solution.

Pests and diseases, price fluctuations in world markets, and other events related to climate add significantly to the level of uncertainty and risk that farmers have to deal with. Among those, weather-related risks play a major role and can have a huge impact on food security, as 80 percent of global food production is rain-fed (Midmore, 2009). While most government programs seem inefficient in dealing with the challenges, weather-related risks are insurable. This brings insurance, as a key tool to foster rural development, to the forefront.

Insurance, as a tool to manage risk mitigation, can boost investment and consumption. The development of the insurance market may thus play a major role in fostering development, especially in countries where a high proportion of the population depends on agricultural activities and where their exposure to natural disaster losses, a steadily climbing phenomenon related to climate change, is huge (Hoppe, 2012).

By creating a safer environment for investment and innovation, insurance has an impact on economic growth at three different levels. First, at a micro-level, insurance stimulates farmers to take on riskier but more lucrative activities, which may, on the one hand, help them increase their incomes and, on the other hand, safeguard them from falling into poverty, after a natural disaster destroys their plot, house and assets (Keenan, 2016). In this way, a strong insurance culture may encourage households as well as small and microenterprises (SMEs) in mobilizing their savings – usually kept for managing disaster losses – toward productive activities that will enrich them.

At least three studies offer empirical support to this hypothesis, as they show the beneficial effects of insurance on farmer decisions. A study in Andhra Pradesh, where 750 farmers randomly obtained insurance and 750 farmers were used as control group, showed that the provision of insurance had a significant impact on planting decisions. In effect, insured farmers were 6 percentage points more likely to plant riskier but more profitable crops than those in the control group (Cole, 2015). Similar results were obtained in a study on rainfall insurance in the Indian state of Tamil Nadu, where insured farmers decided to plant riskier varieties of rice with higher expected returns (Mobarak and Rosenzweig, 2013).

Finally, a study in Ghana, which assessed the relative importance of access to capital versus better risk management in the farmers' investment decisions, found that insurance alone did increase agricultural investment by farmers, whereas cash grants alone did not have that effect (Karlan, 2014). These studies show that insurance has the potential not only to facilitate consumption smoothing but also, through investing in riskier but more profitable crops, increase income.

Second, on a larger (market) scale, the provision of insurance can play a major part in fostering financial inclusion. The transfer of credit risks from potentially defaulting farmers to third parties (insurers) can help in opening new financial markets where they may have been missing. A safer environment may, on the one hand, increase the financial institutions' appetite

to provide additional financial services. On the other hand, it may reduce transaction costs – particularly the risk premium incorporated in the interest rate – and, therefore, create new matches between supply and demand.

Even though the impact of insurance on interest rates has not been widely analyzed yet, Mongolia´s index-based livestock insurance project (IBLIP) offers some hope. Developed by the Government with the support of the World Bank, IBLIP is an index-based mortality livestock insurance aiming to protect cattle breeders from significant livestock losses. Recent studies have reported a link between insurance and a reduction of the loan interest rate as it has been documented that banks have offered lower loan interest rates to insured farmers (Luxbacher and Goodland, 2011).

The rural areas in developing countries face, in the best of cases, a limited access to capital and insurance. Tools that protect the banks' portfolios may increase the breadth and depth of outreach of financial services (Keenan, 2016). Having access to those services may, in turn, give farmers the ability to use their resources in a more efficient way, which may have the potential of augmenting their production capacity.

Finally, on a macro level, a safer environment nationwide may stimulate other actors to more fully participate in the process of development. A safer environment may unblock public funds – previously retained to deal with disasters – which can be invested in funding infrastructure as well as other socio-economic projects. An insurance culture, as it mitigates risks, has also a stabilizing effect on financial markets and therefore on the economy. This new environment of safety and development may, in time, arise international interest and attract international investments (Wyman, 2013).

In summary, developing the microinsurance market has the potential to enhance socio-economic development. While creating new markets for financial services and thus expanding financial inclusion and natural disaster mitigation, microinsurance can play an important role in protecting sources of income, alleviating poverty, creating new economic opportunities, helping to

mobilize long-term savings, and promoting development – freeing people to invest in better opportunities, such as education, health, and a better quality of life, rather than in unproductive precautionary reserves.

Another potential dimension of the benefits from microinsurance is that it can also be a valuable tool in order to provide incentives for loss-prevention activities, as the insurer can offer lower premiums as a reward for risk-reducing behaviors. In that sense, microinsurance can also bring an answer to the poorly-efficient post-disaster national and international aid, which are an *ad hoc* relief that is slowly disbursed, inadequately targeted, and often inadequate (United Nations, 2007).

It seems that there is a strong correlation between insurance market development and economic growth (Outreville, 2013). No matter which level we focus on – micro, meso or macro – microinsurance affects people, institutions and government decisions in ways that can enhance economic development. For that reason, we understand that microinsurance has to play an important part in rural finance, in order to achieve financial inclusion and, as a consequence, economic growth.

2.4. The challenges of microinsurance

Agricultural Insurance emerged over 200 years ago in Germany, where it offered protection against the risk of livestock mortality and climate risks – specifically hail risks. Since the late 1700s until the 1930s, several schemes were implemented in Europe through small cooperative structures first, then through public and private companies. During the past few decades there has been some microinsurance market expansion due, in large part, to government support – premium subsidies and reinsurance provision – which has helped the sector in reaching more than 260 million people worldwide. Nevertheless, market penetration is still very limited, due to a wide spectrum of unresolved problems (Hazell, 2010).

There are problems on both the demand and the supply side of the market, which make it difficult to reach scale and develop the market. On the one hand, the demand for microinsurance has been quite low, due to several circumstances, such as insufficient financial literacy, lack of trust in the institution delivering the product, and the existence of informal networks of risk sharing amongst individuals (Fling, Pradhan and Schmit, 2014).

Sociocultural factors indeed play an important part in inhibiting the demand for microinsurance. As many contributions have stated, even risk-averse households are usually less likely to purchase microinsurance. This might be related to a lack of understanding of the features of the product itself as well as of its benefits. Further, the intrinsic intangibility of insurance – paying in advance for a service that you may or may not receive in an unknown future – contributes to this lack of trust. Behavioral finance experts have more recently focused on the prevalence of several anomalies, including myopia or present bias as well as time inconsistencies in behavior (Frederick, Loewenstein and O'Donoghue, 2002).

In turn, informal risk-sharing networks that are able to address the trust (incentives) and knowledge (information) issues are substitutes of formal insurance in local environments, causing a smaller demand of microinsurance. These networks are most vulnerable, however, to the covariant shocks that, if it were available, would trigger the compensations from an index insurance scheme. In the end, the demand for microinsurance reflects considerations about (perceived) costs and benefits from purchasing it, compared to alternative mechanisms for risk management and coping with adverse outcomes.

Other than those issues, key economic factors have to be taken into account. First, the premium (price) is statistically significant in the demand for microinsurance. If a premium is perceived to be too high, the demand will be low. Another economic factor is related to the wealth of the policyholder. Wealth provides a higher level of liquidity and, therefore, the opportunity to acquire credit bundled with insurance (Cole, 2013).

Levels of wealth may influence, however, not just the ability to purchase insurance but also the willingness to acquire it. As a result, the wealth elasticity of the demand for insurance is influenced by wealth levels. Very rich people may not need insurance protection, although some authors consider it as a luxury good, while very poor people may have a limited demand because they operate under severe budget constraints (Beenstock, Dickinson, and Khajuria, 1986).

On the other hand, on the supply side of the market the main issue is intrinsically related to the concept of insurability. According to Berliner *"to be insurable in actuarial terms, risks must be independent and estimated reliably so the law of large numbers must apply"* (Berliner, 1982, p. *35*). Rural microinsurance presents various challenges to the fulfillment of these prerequisites, in reflection of high transaction costs (in the verification of actual damages), risk correlation (covariance), and the difficulties of risk assessment, given the absence or the high costs of the relevant data required (Biener and Eling, 2012).

The lack of data on clients, the scarce information on potential risks, and the dependence of risks (covariance) – especially in agricultural activities – create severe problems for risk assessment. In addition, another major characteristic of rural microinsurance is that the risks of natural disasters affect large areas at the same time, disabling the capacity to dilute, disseminate and diversify risks and violating the assumption of statistical independence that makes the law of large numbers applicable (Dlugolecki, 2008).

Overcoming the challenges to the insurability of rural smallholders is a needed step forward in order to increase outreach, cope with increasing disaster risks and, therefore, expand financial inclusion. In order to do so, new innovations are needed. New schemes, such as index insurance, must be considered, as they have the potential to reduce costs and create new markets. New actors have to get involved – for instance, governments, reinsurance companies, data providers – in order to create a larger pool of

actors for the assessment and sharing of risk. This implies a need to expand the insurance scheme from a local level to a broader one. Developing such products will benefit the entire society, as it will foster economic growth, it will secure food sources, and it will help the rural population – 25 percent of the entire population in Latin America – to cope with climate-related issues.

CHAPTER III

Index insurance at the meso level as an innovative tool to overcome rural financial inclusion barriers

Innovations in microfinance, in particular, and in rural finance have resulted in considerable improvements in the management of the idiosyncratic risks associated with their clients, but lending institutions still face a big unresolved challenge in order to overcome systemic risks. While this threat represents an important barrier to rural financial development, at the same time it has created incentive for the emergence of new forms of insurance.

These new forms of insurance, to cover catastrophic risks, must have a different configuration than conventional insurance products. In this context, index insurance has emerged as a promising tool to more efficiently manage these risks. Given the current limitations of index insurance, however, new schemes must be designed and tested, in order to increase its usefulness. This section examines the advantages presented when packaging insurance at the meso level and those associated with different types of index insurance. In addition, since the context where these insurance schemes are implemented is a significant factor in their effectiveness, the coordination among the actors involved in the insurance structures is highly important.

3.1. Index insurance as a tool to reduce transaction costs and quickly disburse payments

Traditional crop insurance has suffered from several weaknesses, including its difficulties in coping with the systemic risks experienced by poor agricultural producers. The main drawbacks have been prices sufficiently high to discourage demand, related to the high transaction costs from actuarially assessing risks and selling and managing the policies as well as the significant costs of assessing the actual losses suffered by dispersed and hard-to-reach clients, which involves a time-consuming claim process (Skees *et al*., 2007). During the past two decades, attention has then shifted to

different forms of insurance that address these limitations. Among the variety of new technologies proposed, index insurance has been most popular, due to its several advantages over traditional crop insurance (Miranda and Farrin, 2011).

According to the Global Index Insurance Facility, “index insurance is a relatively new but innovative approach to insurance provision that pays out benefits on the basis of a pre-determined index (*e.g*., rainfall level, seismic activity, livestock mortality rates) for loss of assets and investments, primarily working capital, resulting from weather and catastrophic events, without requiring the traditional services of insurance claims assessors” (IFC, 2013)

Index insurance makes quicker and objective claim processes possible, as it allows agile payments by avoiding the loss verification field visit to a probably difficult-to-access area. All that needs to be verified is the value of the index at a particular predetermined date. Further, since index insurance indemnities depend on the value of a specified random index, its introduction can be seen as a chance to reintegrate systemic risk into the private insurance market, as it gives an answer to the information problems and unaligned incentives typical of traditional insurance. In effect, index insurance reduces, if not eliminates, the problems of adverse selection and moral hazard that strongly affect traditional insurance. Indeed, it is unlikely that the farmers would have the chance to influence the payouts, as typically the data on the index are public and come, for example, from local weather stations or satellites (Bie *et al*., 2005).

What makes this type of insurance valuable is that the index is a random variable that is known to be highly correlated to the losses of the insured, without a need to verify those losses in the field and without having to wait for the observation of the index and the payment of indemnities until after the end of the harvest. These features make it even harder to manipulate the claim of benefits and make the contract (almost) free of moral hazard, because the trigger for the payments is independent of the behavior of the farmers, who would continue to have an interest in diligently protecting their investments. In

contrast to traditional insurance, which suffers from diminished beneficiary diligence and other forms of opportunistic behavior, index insurance does not leave room for these sources of market failure.

The standardized index insurance contract makes it simpler to implement. The insurer does not need to visit client by client to identify each client's (risk) type, design different contracts for different types, in order to avoid adverse selection, and verify losses, as the payments of compensations are triggered by patterns in the index, making the scheme less expensive to administer. This also facilitates reinsurance, as it eases the transfer of part of the risk to international markets (ALIDE, 2015).

In summary, index insurance has the potential to reduce costs, compared to traditional schemes of crop insurance, and open the insurance market to previously underserved producers, eventually enabling more affordable insurance products for poor farmers.

Skepticism regarding index insurance is, however, well warranted. There are some preconditions that index insurance must fulfill in order to achieve its promise: sufficient data, adequate correlation between the index and the probable losses, and objectivity and transparency of the index (Sandmark *et al*., 2013).

If the index is not well correlated with expected losses and if the data are not accurate in establishing the correlation, basis risks will emerge. Basis risk refers to the mismatching of the indemnities paid and the actual losses. Farmers may receive a payout even when their crops are not affected (including idiosyncratic differences across farmers) or they may experience losses when a payout is not triggered (Skees *et al*., 2007). This may occur because the index threshold value is not met in a particular year. Thus, for an index insurance project to be successful, the triggering formula must be robustly designed and the index correlated with the targeted risk (Greatex *et al*., 2014). For this reason, strong investment in the knowledge of specialists is required, in order to relate the index to the variables that most accurately

reflect the actual risks faced. This raises another issue: since weather index insurance is easy to copy, as it uses publicly available information, the incentives for the private sector to efficiently develop products of this nature are reduced. The presence of this externality may justify some form of public intervention.

Special attention should be paid to the limited accessibility and efficiency in distribution of the policies. As usually countries that could benefit from microinsurance lack the necessary infrastructure, the initial infrastructure and transaction costs may be huge (Müller, Ramm and Steinmann, 2014). For this reason, in order to gain scale and reduce costs, established agricultural marketing channels are used just to distribute the insurance products (Miranda and Farrin, 2012).

Furthermore, if the scheme is implemented in isolation and with a limited geographic scope, it may turn out to be extremely expensive, and in most cases it will be too dependent on subsidies, which will threaten its sustainability. One important example in Latin America of these difficulties was the program developed by USAID in Peru in 2004, with the aim of addressing the losses from the torrential rains and catastrophic flooding caused by El Niño in northwest Peru. The objective of the program was to improve credit access in the rural areas. However, due to its high costs, it was dependent on subsidies. In 2006, the Government of Peru started to subsidize traditional agricultural insurance, which impeded the success of the index insurance program. Even though there were two microfinance institutions interested in the product during the development stages (Caja Piura and Caja Sullana), no policies were sold (Miranda, 2015). Another issue related to subsidization is that the indemnities might be misused or that the subsidy could encourage defaults (Miranda, 2015).

Besides this, index insurance, if not subsidized, may face other problems, related to limited demand. A number of factors determine each farmer's decision to buy insurance (Bie *et al*., 2005). In particular, demand will positively depend on the level of risk aversion of each farmer. Similarly, the

farmer's expectations are important. The insurance policy may be priced according to historical data on damages, but if the farmer's perception differs from this, the farmer may perceive the actuarially fair premium to be too low or too high. Further, for a number of reasons, including present bias, farmers may undervalue protection against low-frequency events.

The availability of other tools to cope with risk, apart from insurance, will also influence the decision of purchasing this product. As index insurance is a more complex product, farmers may find it even more distant to them, and may prefer to use other instruments, such as remittances or the accumulation of savings, as precautionary tools. Finally, other factors, such as cash availability on the day of insurance sales or how basis risk may affect the farmer i will affect the demand for insurance.

A promising answer to some of these challenges is the development of meso-level insurance schemes, which has been attracting interest in some of the latest proposals from the theoretical and empirical actors in the last few years.

3.2. Meso-level insurance as a framework to foster new markets and gain scale

According to who the policyholder is, we may identify three different levels at which insurance, and in this case index insurance, can be categorized. Those are the micro, meso and macro levels (IFAD, 2011).

In micro-level schemes, the policyholders are individual farmers or households. They purchase insurance to protect themselves from potential losses caused by adverse weather events. Insurance policies at the micro level may be distributed by various types of organizations, such as microfinance institutions, farmer associations, input suppliers or output processors, in addition to the insurance companies themselves. These intermediaries usually pursue their own interests; for example, a microfinance institution may use insurance purchased by its clients to reduce its own risk of default by farmers or as a means to facilitate access to an additional product,

which may complete the range of services offered to its clients and contribute to the development of long-term relationships. In this case, however, the policyholder is still the farmer and the organizations role is only the distribution of the policies.

In meso-level schemes, the policyholders are various types of risk aggregators, such as farmer associations, exporting conglomerates, input suppliers, microfinance institutions or banks. These entities purchase insurance to protect their own exposure to the risks covered by the policy. Although the policy is issued to the organization, the payout could, either directly or indirectly, benefit the individual farmers who are clients or have contracts with these organizations.

Finally, in macro-level schemes, the policyholders are governments, development agencies or non-governmental organizations. In this case, index insurance contracts are designed to help these actors in protecting their development iniciatives and in disaster management during widespread catastrophes.

3.2.1. Index insurance at the micro level

Early programs envisioned index insurance as a micro-level insurance product, oriented to protect individual smallholders from systemic risks. In this type of schemes, the smallholder pays the insurance premium and receives any indemnity that might be paid in case the index reaches a predetermined value. When it goes to the field, this approach requires considerable investments in reaching and educating the farmers. In spite of the barriers that arise when index insurance is applied at the micro level, it may still offer the greatest potential to help the farmers directly, particularly if the products are tailor-made. When this is the case, insurance at the micro level may promote investment and increases in smallholder incomes.

A number of issues arise when insurance is offered at the micro or meso levels with the involvement of a financial institution or other intermediary. The

potential costs and benefits of the program, and how these are shared by the various participants, may strongly depend on how these issues are resolved. One of these issues is if the purchase of the insurance product should be voluntary or if the institution may decide to make the purchase compulsory, as a precondition for the supply of its primary services. While the compulsory purchase of the insurance may assist the institution in the management of its own portfolio risk, the mandatory nature of the purchase may encourage the opportunistic behavior of the borrowers (increasing the threat of moral hazard for the bank) and it may eventually increase the probability of default.

Another issue is if the purchase of the insurance policy should be subsidized or not. While the subsidy may encourage demand (and thereby make it possible to develop the market, even in the presence of externalities and other instances of market failure), the subsidy may also result in lower levels of client diligence and encourage other types of opportunistic behavior. As in the previous case, there is little empirical evidence about how these decisions in the design of the insurance contract may influence the clients' behavior.

The first weather insurance initiative, launched in India in 2003, was the rainfall insurance introduced by BASIX. This was the first farmer-level weather insurance offered in the developing world, and it was not subsidized. In collaboration with ICICI Lombard, and with technical assistance from the Commodity Risk Management Group (CRMG) of the World Bank, during the 2005 monsoon season BASIX sold 7,685 policies to 6,703 customers in 36 locations in six states. This product insures the farmers against the possibility of crop loss in moisture stress conditions, thereby lowering risk and ensuring sustenance (ci:grasp, 2016).

The BASIX program was an excellent example of an effective delivery system, but as Bie *et al.* (2005) state, "even though BASIX Livelihood Service Advisers (LSAs) offer both loans and insurance, they do not offer a bundled product where loan repayment is linked to rainfall. In fact, the BASIX credit and insurance departments operate different administrative software systems. According to BASIX management, a bundled product is not offered because

of concerns that a poor understanding of the insurance component could undermine the culture of repayment. In other words, farmers may default on their loan obligations while claiming that the insurance policy should have paid out the loan but it did not" (Cole *et al*., 2013, p. 108). Despite the good experience, there were difficulties in dealing with client understanding and satisfaction, an issue that showed the limitations of this micro-level scheme in achieving all of its theoretical value.

Apart from this case, there have been several other pilot trials of micro-level index insurance projects implemented in the developing world, but they have not been as successful as the BASIX initiative. Due to the challenges already discussed, most of these projects are not reaching the scale and sustainability required to go beyond pilot experiments.

For example, one potential weakness becomes clear when farmer trust is undermined due to basis risk. This is what happened in Kenya. In 2010, the International Livestock Research Institute (ILRI) initiated an index-based livestock insurance (IBLI) project, supported by Financial Sector Deepening Kenya (FSD), the US Agency for International Development (USAID), and the World Bank (Greatex *et al*., 2014).. When three sales periods were completed, the demand for the product began to progressively decrease. In the last sales period, only 500 policies were sold. In the opening sales period, the critical value of the index was triggered and indemnities were paid but, as in the second period this was not the case, the clients became increasingly reluctant to purchase this product. This lack of trust and impatience among the producers might be overcome with farmer training and education.

To be successful on the supply side, index insurance needs to gain scale and sustainability. With this objective in mind, the development of markets, supply chains, and logistical support systems is required, but working at the micro level is highly costly (Greatex *et al*., 2014). In this context, index insurance at the meso level stands out as a promising solution.

3.2.2. The theoretical potential of meso-level insurance

Insurance offered at the meso level is a recent concept (Miranda and Gonzalez-Vega, 2011). This option has been tested in some projects, but its potential remains to be proven in the field. We will conceptually analyze here why current trends, especially in the agro-rural sector, are emphasizing on this innovation.

Many countries are highly exposed to natural disasters, such as floods, hurricanes and earthquakes. Due to the resulting covariant risks, their financial institutions and their clients are particularly vulnerable. Thus, special attention needs to be focused on them, especially on those with fewer resources, such as small farmers or low-income households.

Although, by its own nature, any bank assumes some risk by extending loans to individual borrowers, the specific shocks they experience are idiosyncratic and they can be faced by the bank through portfolio diversification. This is, indeed, what microfinance organizations have been very successful at accomplishing. Nevertheless, the situation is different, for example, in the case of the agricultural banks, as they assume not only the usual idiosyncratic risks but also systemic risks, in the form of exposure to adverse weather or fluctuating output prices. These shocks simultaneously affect a large number of borrowers and, thereby, the bank's portfolio and solvency (Miranda, 2015).

Indeed, the solvency of organizations oriented to serve or deal with the rural poor, such as microfinance institutions or agricultural banks, input suppliers, output processors, and cooperatives is threatened by systemic shocks. In response, they need to recoup the losses incurred (for example, by rescheduling or refinancing loans, overcoming potential price fluctuations by hedging and futures contracts and the like). These measures increase the cost or reduce the quality of the services provided to their clients (Churchill *et al*., 2012).

There are two types of meso-level index insurance, depending on how aware the client is about its presence: portfolio insurance and group-based insurance. Portfolio insurance is the most commonly used practice of meso-level insurance, where financial institutions or agribusinesses are the policyholders and the policies cover their portfolios from systemic events. The cost of the insurance is only implicitly incorporated in the cost of their services, so the client is unaware of the existence of the insurance. In this case, index insurance becomes a risk-managing tool for risk aggregators, and the value for the client is related to the greater availability of financial or other services encouraged by the use of this tool by the risk aggregator.

In turn, group-based insurance takes place when the policyholders are financial institutions or agribusinesses that cover losses of their portfolio with the policy and therefore receive any potential indemnity, but where the cost of the insurance is explicit for the client, in whose name the institution purchases the insurance. That is, the cost of the insurance is explicitly added to the charges paid by the client when acquiring the institution's primary product. Thus, in the group-based meso-level insurance, the clients are aware that they are being offered a bundled product, which includes insurance in addition to the primary product they are acquiring (credit, inputs and the like).

Rather than being the direct beneficiaries of the indemnities, however, the clients either endorse the insurance payments to the bank or other type of intermediary, to be applied first to the payment of the loans or other obligations the clients may have with the institution, or the intermediary obtains the insurance policy but makes the clients pay for it as part of their contracts. Thus, the farmers again only indirectly benefit, from the expanded supply of the primary service, as a result of the more efficient management of risk by the aggregator. In this case, the clients are aware of the existence of the insurance policy as a tool to increase fulfillment of their contracts.

The earlier approaches to meso-level insurance emerged when exploring its potential as a sustainable solution to systemic-risk management for rural financial providers. Instead of having these institutions suffer losses in the

event of systemic shocks, the main objective has been to aggregate and cover their risks in a way that they do not suffer the impact of such catastrophes and, thereby, they do not have to transmit the cost of their expected losses to their clients. In this way, these institutions would be covering their portfolio from loan delinquency and contract performance failures in the case of systemic shocks (Miranda and Farrin, 2012).

When a financial institution insures its portfolio, the final policyholder is the financial institution itself. The institution protects itself against extreme losses during catastrophic events. This protection allows the institution to serve a clientele that would otherwise be excluded from its services, because of its riskiness. The primary purpose of this insurance structure is to protect the institution's income, insuring against volatility (loan losses and non-performing loans), and insuring against liquidity crunches following major catastrophes. This, in turn, increases the institution's willingness to serve a particular segment of the market, specially exposed to some systemic risk.

As loans are repaid on time (through the application of the index insurance indemnity to the outstanding loan, if necessary), the farmer's credit history is not tainted. Thus. the farmers keep a good relationship with the bank and receive new credit in the next season. This allows the bank to reduce the stock of its non-performing loans to the minimum and it stabilizes its lending business over time. Reducing the portfolio at risk of rural and agricultural lenders is a solution to ease the constraints to greater and more efficient rural financial services (Skees *et al*., 2007).

Further, "individual farmers may [also] benefit from such arrangement directly, for example if they get insurance attached to an agricultural loan or other agricultural input product. It may also reduce insurance premiums. Indirect benefits are, however, equally valuable, as it could allow lenders to increase their agricultural portfolio without being too exposed to large agricultural shocks. In turn, this […mechanism] could support farmer investments in agricultural productivity, such as fertilizer or improved seeds" (Sandmark, Debar and Tatin-Jaleran, 2013, p 23).

Additionally, on the demand side, meso-level insurance solves the constraint of the limited affordability to farmers in the purchase of micro-level insurance, by lowering the administrative costs of the insurer and pooling its risks, so cheaper policies may be offered. On the supply side, the presence of aggregators may offer many opportunities for growth of the insurance market. Among other things, it provides the infrastructure needed for microinsurance to be offered directly to primary producers: adjusters, actuaries, specialist services, data collectors, etc. The access to such infrastructure and networks in turn helps in reducing the initial costs for new insurers to enter the market.

Further, these gains are made possible by the lowering of administrative costs in comparison with the individual insurance schemes offered at the micro level, as the aggregators are in charge of collecting premiums and redistributing claims, tasks that are very costly in the case of large numbers of individual small clients. In many cases, the transaction costs associated with providing insurance services to smallholder households can be prohibitive but, with this scheme, as the policies are sold as group contracts, significant sales volumes should be quicker to achieve (Sandmark, Debar and Tatin-Jaleran, 2013).

Furthermore, the meso-level schemes may drastically reduce the problem of adverse selection, which emerges from a pool of diverse applicants that look similar (pooling equilibrium) and from the threat of the quality of the pool worsening if insurance premiums are increased. Developing products to insure a microfinance institution or agribusiness portfolio implies setting some distance between the risk appetite of the individual clients (whose risk type is unknown to the insurer) and the calculation of the premium. This is achieved by rising a level up and avoiding the holding of an insured portfolio with a high concentration of riskier clients, as the enrollment in the program is linked to considerations different from the client's risk appetite (such as the creditworthiness evaluated by the financial institution which, therefore, reduces the information asymmetry faced by the insurer). This characteristic should lead the meso-level insurance products to a sound difference in price (Miranda, 2015).

Last but not least, with meso-level index insurance schemes, the difficulty and high costs of client training and awareness are reduced. The product features need to be explained to the aggregator's management levels, which are concentrated in central offices or branches, drastically reducing the reaching costs. Their higher educational levels make it easier for them to understand such a complicated product and reduce the insurer's marketing and handling costs (Sandmark, Debar and Tatin-Jaleran, 2013).

So, conceptually, without taking into account other market frictions, insurance at the meso level should improve financial inclusion and allow a win-win outcome for both the institution and its clients (and also for the insurance company). This result may be reached because the scaling up of the product would reduce its costs while increasing its supply. As a result of these economies, at the client level, hypothetically, the premium should be lower. Nevertheless, when implementing index insurance at the meso level, some important barriers may still arise.

Thus, while meso-level index insurance emerged mostly as a tool to avoid solvency problems for financial institutions when systemic risks occur and default rates increase, there are not many practical cases where the implementation of index insurance at the meso level has actually induced the institutions to lower their interest rates.

3.2.3. Barriers to implementing meso-level insurance and how to overcome them

While meso-level products avoid many of the problems that emerge when index insurance is offered at the micro level, other issues remain unsolved and new barriers and limitations may arise.

One key pending issue is the distribution of benefits between the insured risk aggregator and its clients. When an MFI is insuring its own portfolio, this scheme may compensate the institution for its loan write-offs, but the benefits for the farmers may be limited, as they may still have to deal with the

consequences of loan default or the costs of rescheduling. At the micro level, instead, the benefits from insurance accrue directly to the farmers, as they are the ones who purchase the product, benefit from any educational efforts, and receive the indemnities. This leads them to make better financial choices and it notably increases investment (Dalal *et al*., 2014). In meso-level schemes, instead, direct benefits primarily accrue to the risk aggregator.

The issue here is the extent to which the benefits obtained by the financial intermediaries and other meso-level actors may also reach the producers and, furthermore, if an expansion of the supply of services to the poorest will be achieved as a result. Since the risk aggregator has the responsibility of designing and implementing the insurance product, it then has to retail any benefits that would accrue from it to the farmers. The distribution of the indemnity amongst the farmers is then an issue that needs to be addressed when designing the product (Müller, Ramm, and Steinmann, 2012).

As it is not easy to establish official legal or regulatory standards to ensure that businesses will pass insurance benefits along to the poor, it is possible that households will fail to get those insurance benefits. More research is needed to create legal and regulatory arrangements that protect smallholders in this scenario (Skees *et al*., 2007).

In the case of group insurance, it is likely that groups with lack of trust among the members or groups whose leaders do not have the desirable incentives would fail to access the services or appropriately retail their benefits (Sandmark, Debar, and Tatin-Jaleran, 2013). As the farmers' role at the meso level is very limited, and the education efforts are focused on the lenders or the agricultural services providers, it is not uncommon that the final producers do not even know what services they are purchasing, especially in those cases when the acquisition of the product is compulsory for the clients of the risk aggregator. To avoid this problem, while creating a culture of insurance, clear information and assessment needs must be provided, to ensure that the farmers understand the benefits of the product and how it can

address the needs and preferences of the target market (Churchill, Dalal, and Ling, 2012).

Another disadvantage of insurance products offered at the meso level is the lack of a tailor-made solution at the client level. Instead, a uniform product is offered to all individual farmers (leading to a pooling equilibrium). When purchase of the product is also compulsory, the program would be treating equally clients that are usually characterized by their diversity. Therefore, for some clients this tool is going to be redundant, while in other cases it will be insufficient. As this leads to a pooling equilibrium, it introducesall the incentive problems experienced in this case.

Since the product or bundle of products offered do not match their actual circumstances, some clients may shift their demand to other entities, which do not offer this compulsory insurance, and they may therefore be able to obtain a cheaper or more satisfactory product. To overcome this issue, the ideal solution would be either that the compulsory product generates sufficient value to the client, while the farmers are better aware of the advantages of insurance, or that voluntary options are offered, allowing the farmers to exercise their true demand. If they really understand that they are paying for a product that is protecting them from systemic risks, they will not decide to shift to other entities or drop from the program. Thus, the value proposition needs to be clearly transmitted to the client (Miranda and Farrin, 2012)

While index insurance may be offered at the meso level to address systemic events, farmers and the financial intermediary still have to face basis risk (associated with their idiosyncratic circumstances). Moving from micro to meso-level schemes does not eliminate basis risk; it just transfers it to another level (Solana, 2016). Indeed, there will be situations where there is no portfolio payout from the insurance, but losses have occurred at the micro level which may be translated into non-performing loans. To overcome this challenge, a better access to accurate data will be needed, to link the index in a proper way (*i.e*., to find an index that is closely correlated with losses).

This kind of data may not exist in many cases, however. To address this issue, public-private partnerships might offer an interesting solution, as we will describe in section 3.3. Additionally, educating the farmers so that they understand what is covered by the index insurance and what is not may be of interest for the institution as well as combining meso-level insurance with micro products that cover idiosyncratic risks.

A further limitation linked to meso-level schemes would be the need to convince donors and international agencies of their potential to generate benefits for farmers (Miranda and Farrin, 2012). Apart from the possibilities to increase financial opportunities to previously underserved farmers, it is likely that the premiums with meso-level index insurance products will be lower, thus making a reduction of the interest rates charged by financial institutions or agribusinesses possible, as these risks are managed more efficiently through catastrophic insurance. In the end, this solution may derive in a reduction of the vulnerability to systemic shocks for both farmers and risk aggregators, improving the environment for long-term economic stability.

Another problem emerges from the internal information sharing practices. Especially in developing countries, lenders may be reluctant to share data on their internal cash flows with experts and index specialists; therefore, efforts to develop lender portfolio risk management strategies that incorporate index insurance can encounter hindrances (Miranda and Farrin, 2012). To overcome this issue, trust among the partners must be generated and, despite the time that it may consume, signing confidentiality agreements seems a good practice.

Last but not least, and despite the numerous barriers analyzed for the implementation of meso-level index insurance schemes, we find that the main reason why meso-level approaches have not been adopted to promote rural financial inclusion has been that it is too expensive for the institutions and that they do not have the incentives to do it (Hernández, 2016a).

The idea of covering catastrophic and weather risks is much related to macro-level schemes, and the benefit of paying a premium to insure their portfolio does not seem to be appealing to intermediary institutions or offer them tangible benefits. Access to public or private guarantee funds reduces the need to use a market mechanism, such as index insurance developed at the meso level, for this purpose. Instead, these institutions rather prefer to insure their portfolio by bundling insurance to their credit contracts. Yet, this is essentially a micro-level practice, not a meso level intervention. Nevertheless, the answer to why this might not seem appealing to intermediary institutions may change from country to country (Hernández, 2016a).

To address these limitations, a combined insurance structure, at the macro and meso levels might be successful. As an interesting case regarding a meso-macro scheme we find the CADENA program in Mexico, which will be analyzed in the next section.

3.2.4 Lessons from macro-level insurance about the potential at the meso level: the case of CADENA

Macro and meso-level schemes show many similarities, which supports the idea of learning from the macro experience when putting into practice meso-level schemes. In both cases, the insurance policy is not held by the final client (farmer), but rather by the government, a public agency, some non-governmental organization or a financial institution. In the macro-level case, a regional government aggregates the risk geographically, buying insurance for specific areas of the territory. There is evidence that developing this product based on one region's catastrophic risk has been a successful practice, so this supports the potential of meso-level insurance (Hernández, 2016c).

CADENA has had a long experience, after 13 years of implementation. Launched in 2003, it was one of the first programs that used macro-level climate catastrophic agricultural index products as a social safety net for the poorest, for whom commercial insurance mechanisms are too expensive (World Bank, 2013).

Actually, Mexico has adopted several government strategies to promote the mitigation of climate risks in the agricultural sector, such as FONDEN (Mexico's Natural Disaster Fund). This is a mechanism established in the 1990s to support the rapid rehabilitation of federal and state infrastructure affected by adverse natural events. It tackles two dimensions, reconstruction and prevention (World Bank, 2012). Other public initiative is the SPSA (*Programa de Subsidio a la Prima del Seguro Agropecuario*, in Spanish), which is a subsidy program that aims to encourage the purchase of agro rural insurance at the smallholder level. CADENA, under the Ministry of Agriculture, Livestock and Fisheries (SAGARPA), is the most important program in Mexico in facing catastrophic events, in terms of budget and breadth and depth of outreach.

CADENA contributes to the fulfillment of the National Development Plan 2013-2018, through the endorsement of the Integrated Risk Management program, as a policy implemented at the federal and municipal level with the participation of public and private actors and through the promotion of studies and mechanisms to transfer risk (Martínez *et al.*, 2014). The central role of CADENA is the design and implementation of a comprehensive insurance mechanism to tackle climate and market risks, comprising the different actors involved in the value chain, from production to marketing, promoting financial inclusion and efficient risk management.

CADENA has supported a unique model of public-private partnerships to provide catastrophic agricultural insurance products throughout the national territory, which have been used as a tool to implement a specific program of social protection for poor farmers (Hernández, 2016c). A major achievement of this program has been to combine insurance at the micro, meso and macro levels. Index insurance policies are issued by the public reinsurer Agroasemex and three private insurance companies, all of which in turn are reinsured by international reinsurance companies (The World Bank, 2013). State governments buy insurance in order to cover their relief efforts after catastrophic events in the state, using federal premium subsidies.

This program uses two different support interventions and two contracting mechanisms to maximize protection nationwide: catastrophic insurance and direct assistance. By prioritizing catastrophic insurance coverage over direct assistance, CADENA represents a substantial transfer of risk from the federal and state governments to the private insurance and reinsurance markets, which is a major accomplishment. A key dimension of success of this program has been the use of smart subsidies: the Federal Government subsidizes ex-ante catastrophic insurance by 90 percent of the premiums and the state government pays the rest. In contrast, for ex-post interventions, the Federal Government subsidizes its direct assistance by 50 percent, while the beneficiary pays the rest.

To get involved with the private insurance industry, CADENA has developed an operational guideline, with specific risks and beneficiaries covered, apart from training efforts to help the states understand the process involved. Therefore, as soon as a catastrophic event occurs, the state governments issue a list of the beneficiaries covered by the insurance and the agricultural agencies provide payouts to the farmers. As benefits are fixed per farmer, local officials only need to verify which ones are the damaged areas elegible for the indemnities. Once the insurer approves a state's claim for payment, the state coordinates with local officials the distribution of the benefits (Solana, 2015).

This scheme has not only made it possible to overcome many barriers associated with traditional insurance, such as of the level of operationalcosts, the difficulties of risks assessment, and the existence of asymmetric information, but it has also made it possible to scale up index insurance.

Another factor that has contributed to the success of this program has been the presence of government support, not only when it comes to regulation but also by supporting research: *e.g.*, by creating units for collecting and analyzing data in various government entities related to agriculture and climate monitoring (Hernandez, 2016c).

To conclude, this program has shown the effectiveness of index insurance when a proper design of the scheme is carried out. Evaluating the impact of such programs and sharing results is desirable, in order for them to be replicated. Nevertheless, to implement these schemes, a robust regulatory framework as well as a strategic approach from the private and public sectors are needed.

3.3. The role of other actors in these schemes

Contributions from a number of different public and private actors will be required to address the complexity of the challenges and the multiplicity of barriers that must be overcome.

3.3.1. The role of the State and public-private partnerships

The State could play a fundamental role in promoting the implementation of meso-level index insurance schemes. Its main role should be to create an appropriate regulation framework, which encourages the development of the insurance sector. Similarly, the State should also be responsible for catalyzing data collection and research and for supporting the development of schemes oriented to poor agricultural smallholders.

With no doubt, the role of subsidies is very controversial. Since the major limitation to the implementation of successful programs is the lack of knowledge and of empirical evidence obtained through pilot programs, subsidizing this development of schemes and research has demonstrated to be a successful practice (Hernández, 2016a). However, when operation costs or producer premiums are subsidized in order to stimulate supply or demand, the sustainability of the program may be threatened. Moreover, agricultural subsidies may be regressive, as the higher the credit amounts, the larger the subsidies, which actually favors the richer farmers (Gonzalez-Vega, 2003; Miranda and Gonzalez-Vega, 2011; Jessop *et al*., 2012).

In particular, the State can play an active role in the availability of data, due to its public good nature. Lack of databases is a main problem when designing indexes, so access to public databases can contribute to good pricing techniques and product development. A good example regarding this issue is the Indian Government, which in 2010 opened up the area yield insurance market to private insurers.

The creation of public-private partnerships is going to be pivotal to facilitate a good performance of these contributions from the State and to foster project implementation (Solana, 2016). In order to achieve successful partnerships, good governance and monitoring mechanisms are key factors. With this purpose, the alignment of interests is required, which may be difficult, depending on the country's politic climate (Fonseca and Dalal, 2014).

3.3.2. The role of the reinsurer

The role of the reinsurer is to insure insurance companies. Therefore, the reinsurer holds and helps to diversify the portfolio at risk of these companies, contributing to their sustainability and their capital reserve requirements. This is a way for insurance companies to transfer their risks and, thereby, decrease the costs in which they are incurring. The role of reinsurance is pivotal for schemes that protect against natural disasters, due to the covariant nature of these risks and the high probability of large losses. Insurance companies that may not the incentives to hold them can transfer these risks to the reinsurer (Pagniez, 2016).

The nature of the reinsurer can be public or private. Nevertheless, the potential for private insurers and reinsurers to manage these catastrophic risks might be even higher than for the State (Sandmark, Debar, and Tatin-Jaleran, 2013). An example of this is the case of Mongolia. A World Bank program was implemented to develop an Index-Based Livestock Insurance, with the government acting as the reinsurer. Initially, it was sustainable, but it ended up being too risky for the government and, finally, international reinsurers became involved (Fonseca and Dalal, 2014).

Similarly, when it comes to catastrophic and climate risks, the role of reinsurers can also be to open new markets. They analyze the risks that final clients may be facing and invite insurance companies to mitigate them. This can be helpful for financial institutions, as they will be able to reduce their interest rates without incurring in a loss of sustainability in the case of catastrophic events, while at the same time having the greatest impact on the final clients (Pagniez, 2016). Index insurance can facilitate this role, as it would rely on a parametric index that makes the transfer of risk to the reinsurer easier.

A good example of the impact of a reinsurer would be the case of Bangladesh, with the Index-based Flood Insurance scheme that was launched in 2013. This insurance product was developed by Oxfam, in collaboration with the Institute for Water Management (IWM), Pragati Insurance Ltd., Swiss Re and Manab Mukti Sangstha (MMS), which is a local NGO. The risk is ultimately covered by Swiss Re through a reinsurance contract signed with Pragati Insurance, according to which Swiss Re would calculate the claims at the end of the cover period using the data shared by IWM. MMS is the main actor insured and it routes the claims for the final beneficiaries, who are all poor and extremely poor households under the MMS program in the 14 target villages. At the end of the cover period, the reinsurer provides the details of the claim amounts to Pragmati insurance. Swiss Re's share of risk is 80 percent, while 20 percent is Pragati Insurance's risk retention (Desai, 2013). Thanks to this reinsurance scheme, the product has been affordable for poor families and more than 700 households have been able to benefit from this (Quayyum, 2014).

Due to the large amount of tasks that are involved when it comes to reinsurance, the supply is very limited and there are significant barriers to entry. Nonetheless, the reinsurance role is very important when it comes to tackling financial inclusion (Sandmark, Debar, and Tatin-Jaleran, 2013).

In summary, index insurance should not be seen as the panacea to combat systemic risks, but as a useful tool that, in specific country contexts, can be properly designed and combined with other tools to achieve this goal. In this regard, it should also be taken into account that the advantages of index insurance can be strengthened at the meso level, as this helps to reduce the basis risk derived from idiosyncratic events and from the heterogeneity of farmers. Because of the meso-level potential of offering index insurance at a reasonable cost, the supply of services to the final clients is increased and this creates financial inclusion while being sustainable for the institutions

CHAPTER IV

Some lessons from pilot experiences for the future

Microinsurance is a means to a specific end. As we have seen throughout the paper, microinsurance has, by transferring the risk from the farmer to a third party, the potential to increase rural financial inclusion. Microinsurance contributes to risk mitigation, as it reduces the farmer's exposure to systemic risks, such as drought and flood. By doing so, microinsurance enables the creation of new financial markets.

As we have analyzed, index insurance at the meso level appears as a potential market enabler, as it brings an answer to several barriers in rural financial inclusion. First, index insurance, in comparison with traditional insurance, helps to reduce operational costs significantly. Second, by insuring the risk aggregator's portfolio it contributes to solving the risk correlation barrier – as the risk pool increases and gets diversified among regions – and to reduce the costs of credit – insured farmers are less riskier and, therefore, the risk premium, included in the interest rate, should decrease.

By lowering costs and mitigating risks, microinsurance creates new matches between the supply and demand of financial services, increasing financial deepening in previously underserved areas. Enabling farmers to access different financial services not only helps to smooth consumption but also to invest in more productive crops, new technologies and larger growing areas. This will increase the farmer's revenues, allowing him to invest in education, health and assets. Thus, in regions where the rural population represents more than 25 percent of the inhabitants, this can have an important impact on economic growth.

The potential of microinsurance is not just limited, however, to rural and economic development. While mitigating systemic risks, microinsurance plays an important role in mitigating the impact of climate change on the

population. Another important aspect is that, by giving the possibility to farmers to invest in more productive crops, the adoption of new technologies and larger growing areas, microinsurance is helping to ensure food security in the country.

However, microinsurance is only one – even if very important – solution to the rural financial deepening issue. In this last part of the paper, the goal is to claim that rural financial deepening is a multidimensional issue that requires several different answers, and insurance has to be a component of a holistic rural financial inclusion strategy. In order to expand the frontier of financial services in rural areas, it is noteworthy to acknowledge some features displayed in different programs around the world. Disaster risk management strategies have to be developed in order to mitigate risk exposure, and value chains have the potential to become agents of change for rural financial inclusion. Finally, innovation has the potential to enable scale and, therefore, financial deepening.

4.1. The importance of a well-balanced disaster risk management strategy (R4 Rural Resilience Initiative, Ethiopia and Senegal)

Pests and diseases, price fluctuations in world markets, and other events related to climate add significantly to the level of uncertainty and risk that farmers have to deal with (Midmore, 2009). Microinsurance has the potential not only to insure some of those risks – especially those related to climate – but also, to a certain extent, to provide incentives for loss-prevention activities, as the insurer can offer lower premiums as a reward for risk-reducing behaviors. However, microinsurance is a tool designed to cope with disasters once they have already occurred. Given the complexity of the environment where farmers operate, no single strategy will likely bring an answer to all the barriers that hinder rural financial deepening. In that sense, insurance cannot be used as a stand-alone product but located in a more comprehensive risk management strategy.

R4 Rural Resilience Initiative (R4) in Ethiopia and Senegal brings an appealing approach to the management of ex-ante and ex-post risk for rural households, in an attempt to overcome those barriers.

The R4 emerged as a UN World Food Programme and Oxfam America initiative in 2009. Initially called the Horn of Africa Risk Transfer for Adaptation (HARITA), R4 stands for risk reduction, risk reserves, risk transfer and prudent risk taking. It is a holistic risk management approach for farmers organized around four risk mitigating strategies, where insurance only plays one of the roles. From 2009 to 2014, R4 had reached 24,133 farmers in 82 villages in Ethiopia and 1,989 farmers in Senegal (Greatrex *et al*., 2014).

Both “risk transfer” and “prudent risk taking” are present in a microinsurance scheme, where farmers transfer risks to third parties (insurers), which helps them mitigate risks. By doing so, new financial markets emerge, as insurance reduces the reluctance of financial institutions to offer credit to farmers. Prudent risk taking, the fourth “R”, deals with microcredit access through microinsurance. Even though farmer participation in the programme has declined, R4 seems to have been particularly successful in designing the insurance policy, as they offer a voluntary insurance which has reached a relatively large 29 percent of the target population on average, a number that rises up to 38 percent in some villages (Madajewicz, Tsegay and Norton, 2013). R4 has also reached the goal of increasing financial inclusion, as the data show that insured rural smallholders increased both the number of loans and amounts borrowed in comparison to uninsured smallholders (Madajewicz, Tsegay and Norton, 2013).

An important part of its success is based on a farmer-driven design of the microinsurance. Profound knowledge of the farmer needs, obtained through through discussions, has indeed reported large benefits to index design and uptake of the R4 insurance (Norton *et al*., 2014). Even if it is costly – it takes an entire year to design, educate beneficiaries, and test it – since this approach helps to test different products and learn from the farmer’s preferences, it eases product commercialization, especially on voluntary

bases. By delivering high value financial products to farmers, this scheme allows, in time, rural financial deepening.

Risk reduction refers to the access to improved climate risk management strategies. Climate change, a steadily climbing phenomenon, poses an undeniable challenge on smallholder agriculture and its survival. Even if insurance helps to mitigate losses from the catastrophes, improving loss-prevention activities is key for farmer survival. Irrigation systems, greenhouses, more resistant seeds are a few risk-management strategies that are helping farmers cope with climate related catastrophes (Greatrex *et al*., 2014).

Last but not least, risk reserves involve access to deposit facilities, which offers farmers a precautionary cushion to handle unexpected shocks. But savings is not only a cushion in case of need, it is also a way to build assets or smooth consumption when needed (Guízar, González-Vega and Miranda, 2015). R4 allowed farmers to significantly increase their deposits as studies show that, on average, insured farmers saved up to 123 percent more compared to uninsured farmers. Insured farmers tripled their savings and increased their herd by 25 percent (Norton *et al*., 2014).

R4 rural resilience initiative represents a successful story of rural financial deepening that should be taken into consideration while developing new schemes. The need for a holistic approach such as R4, which takes into account microinsurance but also access to other financial services such as credit, savings and deposits, and helps farmers build ex-ante risk management strategies, represents a noteworthy programme to increase rural financial inclusion. Especially when, as results from research indicate, farmers showed increased demand for insurance if it was linked to other financial services and other risk management strategies (Norton *et al*., 2014).

4.2. The role of value chains in financial deepening (Hortifruti case, Central America)

The concept of value chain covers the entire range of activities and contributors involved in a full process of production and marketing. In the agricultural case, it goes from the farmer's field to the consumer's house. In recent years, consumers have set a higher standard for food quality and safety, changing completely the traditional agricultural value chain. In order to cope with an increasing competitiveness, farmers must constantly invest in more productive seeds, new machinery and design more efficient processes (Reardon, 2005).

Investing in modern agriculture requires access to financial services – as self-financing of greenhouses or irrigation systems is usually unaffordable for small and medium farmers – but, today, due to several barriers, financial intermediaries have little outreach in the rural areas, which can hinder rural modernization and growth (González-Vega, 2006).

Yet, market competitiveness has also enhanced cooperation among the different links of the value chain, facilitating innovative opportunities for the development of rural financial deepening (González-Vega, Chalmers, Quirós, and Rodriguez-Meza, 2006; Coon, Campion and Wenner, 2010).

As the Hortifruti case study shows, value chains have the potential to promote rural financial inclusion, as those interconnections generate a series of virtuous circles which, in time, improve the income of its links and pave the farmer's transition to modern agriculture (González-Vega, Chalmers, Quirós, and Rodriguez-Meza, 2006). For farmers, contractual relationships increase their creditworthiness, help them invest in better production means, and reduce risk exposure to markets. For the chain itself, strengthening its links helps it become more competitive and expand its activity. For financial institutions, it facilitates transactions as it helps identify potential clients and diversify risks which, in time, allow them to generate economies of scale and

expand the rural financial market (González-Vega, 2006; Chalmers, 2006; González-Vega, 2016). This situation enables a modernization of agriculture, which promotes economic growth, but also climate change mitigation and food security.

Farmers face multiple constraints and risks. Among them, catastrophic risk and market volatility are the ones of greatest concern for rural smallholders. However, while weather-related risks can be mitigated through insurance, price volatility cannot. As price takers, farmers are fully exposed to price volatility, which endangers their source of income and hinders their capacity to smooth consumption (Wenner, 2014). While creating contractual agreements with other actors of the value chain, farmers guarantee their market thereby alleviating their exposure to price volatility. This situation translates into greater stability, helping farmers to smooth consumption (González-Vega, 2006; González-Vega, 2016; Chalmers, 2016).

Additionally, a value chain provides two other tools to mitigate risks. First, expecting high quality standards and a constant flow of product stimulates investments in production means, such as irrigation systems or greenhouses, which reduces the exposure to weather related risks (Miller, 2011). Second, as supermarkets in those value chains handle an exceptionally wide array of products, farmers can diversify their productive activities and mitigate their exposure (González-Vega, 2006).

The buyer, or institutional consolidator, in this case Hortifruti, plays the role of "signal" in rural financial deepening. Creditworthiness depends on the ability to repay as much as on the willingness to do it – which depends on the honesty of the borrower and the contract incentives faced –, characteristics that are also valuable for any commercial partner. Hortifruti, therefore, screens and monitors potential producers in order to sign long-term arrangements with them. This triggers a "signal" that the farmer is a "trustworthy partner" and, therefore, creditworthy client for the financial institution. In other terms, potential lenders are implicitly delegating part of the

screening and monitoring tasks to Hortifruti (Gonzalez-Vega, 2006; Shwedel, 2006).

The agreement between Hortifruti and Banco de San José created an innovative approach to increase rural financial inclusion. In order to reduce information asymmetry, providers of financial services need to be close to their clients, to know them and build trust with them (Hernández, Sam, González-Vega and Chen, 2012). However, the proximity with the client increases the risk exposure of the institution's portfolio, making it vulnerable to systemic risks (IFAD, 2011).

How to manage the information and systemic risks issues? Here is where the Hortifruti-Banco de San José partnership acquires its value. In order to be competitive, institutional consolidators need to assess the worthiness of their suppliers (farmers). This is an expensive but fundamental activity, in order to build strong value chains. That is one of the reasons why those institutions prefer to build stable relationships with their suppliers. The financial institution then uses the proximity built between the institutional consolidator and the farmer in order to assess creditworthiness. Through this kind of arrangements, financial institutions can geographically diversify their portfolio without losing the information on the client. It is a win-win situation as Hortifruti, on its side, obtains a stronger value chain as its suppliers invest their loan funds in modernizing their agricultural practices (Cavallini, 2006; González-Vega, Chalmers, Quirós, and Rodriguez-Meza, 2006).

Entering a value chain can be out of reach for some rural smallholders. However this innovative structure offers financial deepening and as more farmers (medium-scale producers) enter different value chains, new farmers gain access to financial services. In time, those new market opportunities will trickle down to segments that were never served before. In that sense, the value chain approach appears as a complementary method to microinsurance in expanding rural financial inclusion.

4.3. Enabling scale by partnering with mobile network operators (ACRE, ex-Kilimo Salama case, East Africa)

During the last decade, a wave of new technologies has vastly increased access to financial services for rural clients. New information and communication technologies are often designated as the "new microfinance revolution" for their capacity to reduce administrative costs and reach scale. Mobile technology in Africa, with the paradigmatic M-Pesa program, is facilitating microfinance breadth and depth of outreach. In Latin America, where the insurance market is evolving into "mass" insurance, wireless transactions have the potential to play a major role. This approach, that not only targets the poorest but is also expanding to less vulnerable people, can increase scalability and develop, once and for all, the insurance market.

In Africa, the cradle of the most relevant mobile banking revolution, telephone companies have carried out most mobile banking projects. However, financial institutions have recently started to develop these schemes (Jessop *et al*., 2012). Insurers find the use of mobile phone structures appealing for two main reasons: to increase efficiency and to reach scale. Since one of the major challenges faced by insurers when implementing index insurance is to partner with suitable distribution channels, mobile banking introduces a high potential to be used by the insurance industry (Prashad, Saunders and Dalal, 2013).

In order to use this technology, both the front office (mobile phones) and the back office need to be involved, to develop a more efficient management of the operations (McCord and Biese, 2015). From the demand side, it is a fact that insurance products are hard to trust and understand by clients, especially microfinance clients. To reduce client reluctance, insurance products have to be offered through an already trusted brand, such as mobile network operators. In many cases, institutions also offer free insurance trials or they bundle insurance with other value-added services, such as weather alerts, in order to increase client takeover (Matul, 2015). In both cases (as a branding

trustworthy intermediary or as an instrument to increase scale), mobile phones have the potential to transform the insurance market.

The distribution of insurance policies via mobile phones is an emerging practice that needs to be regulated, and in some countries this approach is not yet permitted (Ramm, 2001). This is a consequence of the fast development of innovative and complex products, which is introducing challenges for insurance supervisors. Enhanced supervisory capacity is required in order to ensure that supervisors are equipped to deal with market changes in order to guarantee the customer's safety (Azcan *et al*., 2015).

Kilimo Salama, a noteworthy program, was born in 2009 with the objective to implement an index-based agricultural insurance product targeting rural farmers in Kenya. As its name indicates, "Safe Agriculture", it aimed, with successful results, to protect the farmer's harvest against risk from drought or excessive rainfall.

This program was operated by Safaricom, Syngenta Foundation (a Foundation established by agribusinesses) and UAP Insurance. Since Safaricom is Kenya's largest mobile operator, this system provided a remarkable network for reaching small-scale farmers. In fact, probably Kilimo Salama would not have been as successful as it is without the participation of its partnerships (International Finance Corporation, 2013). Weather-based index insurance was another success factor of the scheme. The Kilimo Salama system included weather stations to provide climate information in each agricultural region. It was a very efficient instrument as, once the index was triggered, payments were automatically sent to insured customers through Safaricom's money service: M-Pesa. This feature helped farmers cope with risks and smooth consumption, as the payment was immediate, a problem faced by many other schemes where disbursement takes up to three months and farmers find themselves defenseless even when covered by the insurance policy (The Climate Impacts: Global and Regional Adaptation Support Platform, 2016).

In June 2014, Kilimo Salama became a corporation: Agriculture and Climate Risk Enterprise Ltd. ACRE, which turned a highly successful insurance initiative into a new business. ACRE will keep on mitigating the burden of weather and other risks for small farmers (Grameen Credit Agricole, 2016). As its predecessor, ACRE rests on three keystones: first, the availability of several data sources; second, its role as intermediary between insurance companies, reinsurers and distribution channels and aggregators (such us microfinance institutions and inputs suppliers); and third, its link with the mobile money market, especially M-Pesa (Greatrex *et al*., 2014).

ACRE index insurance is delivered at the micro level, as the product is offered directly to smallholders. However, it shares some features from meso-level schemes, such as the distribution method, premium collection, pre-financing by the contract farming operation and the payment of claims.

These schemes make it possible to scale up, as they offer a holistic solution to mitigate catastrophic risks where insurance in just one component. The customer-design view has been a pivotal feature. While, at the beginning, the scale reached was explained by its bundling with other products, which provided client value, as time goes on, mobile banking companies are tackling insurance as a stand-alone business opportunity (Prashad *et al*., 2013).

In order to be an efficient tool to foster rural financial deepening, microinsurance has to be bundled with other components that will both create value for customers and help institutions to reach sustainability. This chapter has presented three interesting initiatives in order to pave this path.

The case of R4 underlines the importance of a holistic approach where insurance is bundled to access other financial services as well as to ex-ante instruments that help mitigating risks. The case of Hortifruti shows that existing mechanisms, such as value chains, have the potential to be game changers both for smallholders and financial institutions. Finally, microfinance is about innovation and schemes such as ACRE have to be taken into account in order to become more efficient, reaching more clients at

reasonable cost both for the institution and the customer. Only by learning and adapting from all those dimensions, microinsurance can really become a cornerstone in rural financial inclusion.

CHAPTER V
Conclusions

In efforts to close the gap between the supply and demand of financial services, microfinance comprises a set of new credit and deposit mobilization technologies and other financial innovations that have shifted the supply of financial services to more closely match the unsatisfied legitimate demands from excluded populations. While microfinance has entailed a step forward in this direction, however, the gap remains undesirably large. Many barriers hinder, in particular, rural financial deepening, as farming households in developing countries are exposed to more frequent and severe risks of adverse shocks, due to their location and the nature of their core activities, than their urban counterparts. In particular, weather and catastrophic risks are critical for them, as they directly influence the outcomes from their core activities.

In a world where 48 percent of the population is considered rural and where the rural areas suffer from a concentration of poverty, increasing rural financial inclusion must be set as a high priority. Access to financial services helps smallholders to build assets, which should allow them to improve their lives in a long-lasting and more stable way. The influence of financial deepening on rural development matters for poverty alleviation; indeed, increasing GDP in the rural areas is up to four times more effective in reducing poverty than in the urban areas.

Moreover, greater breadth and depth of rural financial outreach not only fosters economic development. It may also, on the one hand, be a grounding foundation to a climate change national strategy as, through its impact on asset building and insurance, it can help to mitigate climate related risk. On the other hand, through access to credit, deposit facilities and insurance, famers may also modernize and diversify agriculture, establishing the ground floor of a food security program. Moreover, as Amartya Sen has suggested, access to finance and insurance has the potential to expand freedom, as it

increases the farming households control over their own lives and, in time, it allows them to invest in human capital, through their children's education and better health and thereby increase inter-generational welfare.

Microinsurance could play a major role in rural financial inclusion, as it could tackle some of the main barriers that hinder financial market development. Insurance has the potential to mitigate risk exposure both on the demand (farmers) and the supply (financial institutions) side of the financial market. In time, the operational costs of insurance programs should decline and, therefore, a more efficient provision of insurance services should benefit both sides of the financial market.

Many obstacles arise, however, when catastrophic risks must be tackled. This is due to the intrinsic covariance, which makes it difficult to reduce their impact with only conventional insurance. For this reason, attention has shifted to new types of insurance. Among these, index insurance is the most promising. This alternative allows more efficient and simple processes, as index insurance indemnities depend only on the value of a pre-established random index and the contracts are standardized.

Nevertheless, index insurance applied directly at the individual farming household level is highly costly and it faces several problems, such as uncovered basis risk or lack of data availability. Thus, index insurance should not be used as an isolated tool for the management of systemic risks. In this respect, we believe that the potential of applying index insurance at the meso level is a path toward reaching scale more rapidly, as it makes possible the supply of insurance at a reasonable cost and, therefore, it increases its potential of contributing to financial inclusion.

Unfortunately, there have only been a few aborted or incomplete efforts to implement index insurance at the meso level. The most ambitious attempt was in Peru, but even this was not ultimately successful, due to a change of donor incentives and a limited domestic demand, at the high cost of the policies that resulted.

For these reasons, we can neither provide definitive conclusions on the practical applications nor assess the actual impact of the schemes that have been attempted. There is still a long path ahead of us and more attempts to implement index insurance at the meso level must beput into effect, in order to reach a more conclusive answer. We hope, however, that this paper will contribute a conceptual framework to guiding future projects and research focused on the impact of insurance on rural financial deepening.

We have also highlighted the advantages of combining insurance at different levels and across different types of insurance. In fact, to create a scheme of this type, to involve different actors and combine various features is always desirable. CADENA has been a remarkable case in this respect. Nevertheless, a favorable context is required in order to establish these schemes. The role of the State should be to support investigation and research and to promote a favorable framework for competition. With this purpose, the creation of public-private-partnerships is beneficial in improving data availability and reducing basis risk.

Several pilot projects show customer interest in buying insurance when the product is correctly fitted and clearly understood. As there are hundreds of millions of under-insured potential clients, deepening the customer relationship looks like a fundamental step forward to generate rural financial deepening.

Branchless (mobile) networks may be one of the major upcoming opportunities for the sector. The market penetration of mobile phones is enormous and thus, they seem to be an interesting channel of distribution to allow the insurance industry to reach scale and broad outreach.

Many opportunities and challenges for microinsurance appear in the mid-term. We would like to suggest three key challenges for the future. First, cost-efficient financial education appears as a means to achieve better client awareness of insurance products, translated into higher demand. Second, customer-based product design, even if expensive, has to be developed in

order to fit the farmer's needs. The insurance market will only reach scale and foster rural financial inclusion if it proposes a valuable service for its clients (independently of if it is voluntary or compulsory).

Finally, governments have an important role to play. Instead of subsidizing schemes or discouraging the emergence of an insurance tradition (government relief aid discourages people from getting insured, as they see that, in case of need, the government will take care of them), the government has to provide an attractive environment for insurance market development. Among the main aspects needed, the government may subsidize research for implementing customer-based insurance products, be a facilitator of data in order to strengthen new insurance schemes, and provide a regulatory framework that both encourages market development and protects customers.

REFERENCES

- **Adams, D. W and Nehman, G. I.** (1979). Borrowing costs and the demand for rural credit. *Journal of Development Studies*, No. 15: 165-176.

- **ALIDE** (2015). Seguros agropecuarios catastróficos para bancos de desarrollo. *Revista ALIDE*, octubre-diciembre, pp.20-23.

- **Anderson, J. and Ahmed, W.** (2016). Smallholder diaries: building the evidence base with farming families in Mozambique, Tanzania and Pakistan. PERSPECTIVES No. 2. Consultative Group to Assist the Poor (CGAP), [online] Available at: http://www.cgap.org/sites/default/files/CGAP_Persp2_full.pdf. [Accessed 30 Apr. 2016].

- **Azcan, O., Pelanda, T., Grant, H., Wiedmaier-Pfister, M., Voss, J.** (2015). How are regulators and supervisors supporting inclusive insurance markets across the globe? In *The state of microinsurance, the insider's guide to understanding the sector*. The microinsurance network.

- **Baffes, J. and Dennis, A.** (2013). Long-term drivers of food prices. The World Bank policy research working paper No. 6455.

- **Banerjee, A., Karlan, D. and Zinman, J.** (2015). Six randomized evaluations of microcredit: introduction and further steps. *American Economic Journal: Applied Economics*, [online] 7(1): 1–21. Available at: http://pubs.aeaweb.org/doi/pdfplus/10.1257/app.20140287 [Accessed 29 Apr. 2016].

- **Beenstock, M., Dickinson, G., and Khajuria, S.** (1986). The determination of life premiums: an international cross-section analysis, 1970–1981. *Insurance: Mathematics and Economics*, 5: 261–270

- **Bie L., Giné, X. Townsend R. and Vickery, J.** (2005). Weather insurance in semi-arid India. Washington, DC: Commodity Risk Management Group, Agricultural and Rural Development Department, The World Bank. . Available at: http://siteresources.worldbank.org/DEC/Resources/WeatherInsuranceInSemiAridIndia.pdf [Accessed 29 Apr. 2016].

- **Biener, C. and Eling, M.** (2012). Insurability in microinsurance markets: an analysis of problems and potential solutions. *The Geneva Papers on Risk and Insurance – Issues and Practice,* No. 37: 77-107.

- **Binswanger, H. P. and Deininger, K.** (1995). Towards a political economy of agriculture and agrarian relations. Unpublished paper. The World Bank.

- **Berliner, B.** (1982). *Limits of insurability of risks*, Englewood Cliffs, NJ: Prentice-Hall.

- **Cai, J.** (2016). The impact of insurance provision on household production and financial decisions. *American Economic Journal: Economic Policy*, No. 8(2): 44-88.

- **Cavallini, J.** (2006). Models of agricultural value chain financing: Hortifruit case study. In Quirós, R. (Editor) *Agricultural value chain finance*, pp.67-73, Costa Rica: Academia de Centroamérica.

- **Chalmers, G.** (2006). Lessons learned in agricultural value chain financing, In Quirós, R. (Editor) *Agricultural value chain finance*, pp.29-35, San José, Costa Rica: Academia de Centroamérica.

- **Churchill, W.** (2007). *Liberalism and the social problem*. Rockville, MD: Arc Manor.

- **Churchill, C., Dalal, A., and Ling, J.** (2012). Pathways towards greater impact: better microinsurance models, products and processes for MFIs. *International Labour Organization*. Paper, No. 18

- **The Climate impacts: global and regional adaptation support platform**, **ci: grasp (2016).** ICICI-BASIX weather indexed insurance Lombard general insurance company limited ci:grasp. [online] Available at: http://cigrasp.pik-potsdam.de/adaptations/icici-basix-weather-indexed-insurance [Accessed 1 May 2016]

- **Cole, S., Giné, X., Tobacman, J., Topalova, P., Townsend, R., and Vickery, J.** (2013). Barriers to household risk management: evidence from India, *American Economic Journal: Applied Economics*, No. 5(1): 104-135.

- **Cole, S.** (2015). Overcoming barriers to microinsurance adoption: evidence from the field. *The Geneva Papers on Risk and Insurance – Issues and Practice*, No. 40(4): 720-740.

- **Collins, D., Morduch, J., Rutherford, S., Ruthven, O.** (2009). *Portfolios of the poor*. Princeton: Princeton University Press.

- **Coon, J., Campion, A. and Wenner, M.** (2010). Financing agriculture value chains in Central America. *Inter-american Development Bank*, [online] TECHNICAL NOTES No. IDB-TN-146. Available at: http://www.iadb.org/wmsfiles/products/publications/documents/35243971.pdf [Accessed 29 Apr. 2016].

- **Dalal, A., Zimmerman, E., Magnoni, B., Matul, M**. (2014). Is there value in microinsurance? International Labour Organization's Microinsurance Innovation Facility and the Microinsurance Centre. Client value series No. 1.

- **Deaton, A.** (2015) in his interview with Timothy Odgen, to be reported in a chapter in Odgen, T. (2016) *Experimental conversations*, MIT Press, forthcoming 2016. Available at: https://medium.com/@timothyogden/experimental-conversations-angus-deaton-b2f768dffd57#.8on6h04kn [Accessed 30 Apr. 2016].

- **Deblon, Y., and Loewe Craig, M.** (2012). The potential of microinsurance for social protection. In Churchill, C., and Matul, M. (2012). *Protecting the poor: a microinsurance compendium* Volume II. International Labour Organization (ILO).

- **Dercon, S.** (1998). Wealth, risk and activity choice: cattle in Western Tanzania. *Journal of Development Economics*, vol. 55, No. 1: 1-42.

- **Dercon, S. and Christiaensen, L.** (2011). Consumption risk, technology adoption and poverty traps: evidence from Ethiopia. *Journal of Development Economics*, No. 96: 159-173. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/7417/wps4257.pdf?sequenc e=1&isAllowed=y [Accessed 17 Apr. 2016].

- **Desai, K.** (2013). Meso-level flood index insurance pilot in Sirajganj, Bangladesh, The process note. Centre for Insurance and Risk Management (CIRM) Advisory Services.

- **Dlugolecki, A.** (2008), Climate change and the insurance sector. *The Geneva Papers on Risk and Insurance – Issues and Practice*, No. 33: 71-90.

- **FAO** (2015). *The state of food and agriculture - Social protection and agriculture: breaking the cycle of rural poverty*. Online Publication.

- **Fafchamps, M. and Pender, J.** (1997). Precautionary saving, credit constraints, and irreversible investment: Theory and evidence from semi-

arid India. *Journal of Business and Economic Statistics*, vol. 15(2): 180-194. Available at: http://web.stanford.edu/~fafchamp/irrevc.pdf). [Accessed 17 Apr. 2016].

- **Eling, M., Pradhan, S., Schmit, J. T.** (2014). The determinants of microinsurance demand. *The Geneva Papers on Risk and Insurance – Issues and Practice*, No. 39: 224-263.

- **Fonseca, C., and Dala, A.** (2014). Creating an enabling environment to improve client value. *ILO's Microinsurance Innovation Facility and the Microinsurance Center*. Client value series, No. 3.

- **Frederick, S., Loewenstein, G., and O'Donoghue, T.** (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature,* 40: 351-401.

- **Fuchs, A. and Wolff, H.** (2016)**.** Drought and retribution: evidence from a large-scale rainfall-indexed, insurance program in Mexico. *World Bank Group Poverty and Equity Global Practice Group.*

- **García de la Cruz, M.** (2008). *Impact of access to formal deposit facilities and loans on schooling*. Master´s thesis. The Ohio State University, Columbus, Ohio.

- **González-Vega, C.** (1998). Do financial institutions have a role in assisting the poor? In Mwangi S. Kimenyi, Robert C. Weiland, and J.D. Von Pischke (eds.), *Strategic issues in microfinance*, Aldershot, England: Ashgate

- **González-Vega, C.** (2003). Deepening rural financial markets: macroeconomic, policy and political decisions. Paper presented at the international conference on paving the way forward for rural finance, Washington, D.C.

González-Vega, C. (2006). Modern value chains: towards the creation and strengthening of creditworthiness. In Quirós, R. (Editor) *Agricultural value chain finance*, Rome, FAO and San José, Costa Rica: Academia de Centroamérica, pp.45-66.

- **González-Vega, C.** (2013), Innovation in the design of formal financial services for greater inclusion. *The Mastercard Foundation Symposium on Financial Inclusion*, Turin, Italy, July.

- **González-Vega, C.** (2016). Las barreras al financiamiento agropecuario y el surgimiento de nuevos modelos de intermediación financiera para el sector. In Hernández, E. (Editor). *Estrategias innovadoras de gestión de riesgos en mercados financieros rurales y agropecuarios: experiencias en América Latina*. [online] Rome: FAO Economic and Social Development Department, San José: Academia de Centroamérica, pp. 13-27. Available at: http://www.fao.org/publications/card/es/c/436af4df-a73b-4ba1-8cf7-698300707911/ [Accessed 25 Apr. 2016].

- **González-Vega, C., Chalmers, G., Quirós, R. and Rodriguez-Meza, J.** (2006). Hortifruti in Central America: A case study about the influence of supermarkets on the development and evolution of creditworthiness among small and medium agricultural producers. United States Agency for International Development (USAID), microREPORT No.57.

- **Gouel, C.** (2013). Food price volatility and domestic stabilization policies in developing countries. *The World Bank policy research,* working paper No. 6393.

- **Grameen Credit Agricole** (2016). Focus social business: ACRE (Kenya). *Grameen Credit Agricole Foundation*. [online] Available at: http://www.grameen-credit-agricole.org/en/content/focus-social-business-acre-kenya [Accessed 25 Apr. 2016].

- **Greatrex, H., Hansen, J., Garvin, S., Diro, R., Blakeley, S., Le Guen, M., Rao, K., and Osgood, D.** (2014). Scaling up index insurance for smallholder farmers: recent evidence and insights. *Research program on climate change, agriculture and food security (CCAFS)*, No. 14.

- **Guízar, I., González-Vega, C. and Miranda, M.** (2015). Uneven influence of credit and savings deposits on the dynamics of technology decisions and poverty traps. *Fourth European Research Conference on Microfinance*, University of Geneva.

- **Hazell P.,** (2010). The Potential for scale and sustainability in weather index insurance for agriculture and rural livelihood, *International Fund for Agricultural Development (IFAD)*, Rome: WFP/IFAD.

- **Heckman, J.** (2016). Facts, evidence and the state of econometrics. EconTalk, episode hosted by Russ Roberts, *Library of Economics and Liberty*. January 25, 2016. Available at: http://www.econtalk.org/archives/2016/01/james_heckman_o.html [Accessed 30 Apr. 2016].

- **Hernández, E**. (2016a). Interviewed by Roberto Estellés and Mercedes Gómez, 27 April.

  Hernández. E., ed. (2016b). *Estrategias innovadoras de gestión de riesgos en mercados financieros rurales y agropecuarios. Experiencias en América Latina.* Rome and San José: United Nations Organizations for Food and Agriculture and Academia de Centroamérica.

- **Hernández, E.** (2016c). La gestión de riesgos climáticos catastróficos en el sector agropecuario: aplicación de los seguros agropecuarios en programas de protección social dirigidos a productores de escasos recursos en México. *In* Hernández, E. (Editor). *Estrategias innovadoras de*

gestión de riesgos en mercados financieros rurales y agropecuarios: Experiencias en América Latina. [online] Rome: FAO Economic and Social Development Department, San José: Academia de Centroamérica, pp.p.103-128. Available at: http://www.fao.org/publications/card/es/c/436af4df-a73b-4ba1-8cf7-698300707911/ [Accessed 25 Apr. 2016].

- **Hernández E., Sam, A., González-Vega, C y Chen, J.** (2012). Does the insurance effect of public and private transfers favor financial deepening? Evidence from rural Nicaragua. *Review of Development Finance*, vol. 2(1): 9-21. Available at: http://ac.els-cdn.com/S1879933712000061/1-s2.0S1879933712000061-main.pdf?_tid=9c6f7c82-d1dc-11e5-8d7e-00000aacb35f&acdnat=1455318295_9e0c53283a9fe95a869b95a3a3468260 [Accessed 17 Apr. 2016].

- **Hoppe, K.** (2012). The value of insurance to society. *Risk Management, Geneva Association*, [online] vol. 51. Available at: https://www.genevaassociation.org/media/185156/ga2012-rm51-hoppe.pdf [Accessed 17 Apr. 2016].

- **IFAD** (2011). Weather index-based insurance in agricultural development a technical guide. International fund for agricultural development (IFAD)

- **Jessop R., Diallo. B., Duursma, M., Mallek, A., Harms, J. and Manen B.** (2012). Creating access to agricultural finance based on a horizontal study of Cambodia, Mali, Senegal, Tanzania, Thailand and Tunisia*. A savoir.*

- **Karlan, D., Knight, R. and Udry, C.** (2014) Consulting and capital experiments with microenterprise tailors in Ghana, Journal of Economic Behavior and Organization, No. 118: 281-302.

- **Karlan, D., Ratan, A. and Zinman, J.** (2013). Savings by and for the poor: a research review and agenda. *Review of Income and Wealth*, No. 60(1): 36-78.

- **Kedir, A.** (2003). Rural poverty report 2001: the challenge of ending rural poverty. Edited by the International Fund for Agricultural Development (IFAD). *Journal of International Development*, No. 15(5): 667-668.

- **Keenan, A.** (2016). *The state of microinsurance*. [online] Microinsurancenetwork.org. Available at: http://www.microinsurancenetwork.org/groups/state-microinsurance [Accessed 17 Apr. 2016].

- **Ledgerwood, J., Earne, J. and Nelson, C.** (2013). *The new microfinance handbook*. The World Bank, Washington, DC.

- **Luxbacher K and Goodland A.** (2011). World resources report case study. Building resilience to extreme weather: index-based livestock insurance in Mongolia*. World resources report*. Available at: http://www.wri.org/sites/default/files/wrr_case_study_index_based_livestock_insurance_mongolia_.pdf [Accessed 19 Apr. 2016].

- **Madajewicz M, Tsegay AH, Norton M.** (2013). Managing risks to agricultural livelihoods: Impact evaluation of the HARITA program in Tigray, Ethiopia, 2009–2012*. Oxfam America papers* [online] Available at: http://www.oxfamamerica.org/static/media/files/Oxfam_America_Impact_Evaluation_of_HARITA_2009-2012_English.pdf [Accessed 29 Apr. 2016].

- **Matul, M.,** (2015). The complexity of increasing demand and what we can do about it. *In*, *The state of microinsurance, the insider's guide to understanding the sector*. The Microinsurance Network.

- **Martínez, E., Osornio Sánchez, A., Celaya del Toro, V.M., Urquía Fernández, N., Hernández, E., Fermín Cabestany Noriega, J.** (2014). La gestión de riesgos climáticos catastróficos para el sector agropecuario en México: caso del componente para la atención a desastres naturales para el sector agropecuario. FAO Economic and Social Development Department, Academia de Centroamérica.

- **McCord, M. and Biese, K.,** (2015). The global landscape of microinsurance. *In*, *The state of microinsurance, the insider's guide to understanding the sector*. The microinsurance network.

- **Midmore, D.** (2009). Rainfed agriculture: unlocking the potential. Comprehensive assessment of water management in agriculture, series 7. *Experimental Agriculture*, No. 46(1): 115.

- **Miller, C.** (2011). Agricultural value chain finance strategy and design, *FAO technical notes*, Rome.

- **Miranda, M.** (2012). Innovative institutional risk management strategies for promoting smallholder agricultural credit in Latin America. The Ohio State University.

- **Miranda, M. J., and Farrin, K.,** (2012). Index insurance for developing countries. The Ohio State University.

- **Miranda, M.J. and Gonzalez-Vega, C**. (2011). Systemic risk, index insurance, and the optimal management of agricultural loan portfolios in developing countries. *American Journal of Agricultural Economics*, Vol. 93(2): 399-406.

- **Mobarak, A.M. and Rosenzweig, M.R.** (2013). Informal risk sharing, index insurance, and risk taking in developing countries. *The American Economic Review,* No. 103(3): 375–380.

- **Mookerjee, A.** (2015). Barriers to scaling-up agriculture insurance and Meso-level products. *Microinsurance conference*, Casablanca, World Bank group.

- **Müller, S., Ramm, G. and Steinmann, R**. (2014). Agriculture, microinsurance, and rural development. *Microinsurance Network* [online]

- **Narayan-Parker, D., Pritchett, L. and Kapoor, S.** (2009). *Moving out of poverty*. The World Bank, Washington, D.C.

- **Norton, M., Osgood, D.E., Madajewicz, M., Holthaus, E., Peterson, N., Diro, R., Mullally, C., The, T., Gebremichael, M.** (2014). Evidence of demand for index insurance: experimental games and commercial transactions in Ethiopia. *The Journal of Development Studies,* No. 50(5).

- **Odell, K.** (2015). Measuring the impact of microfinance: looking for the future. *Grameen Foundation publication series*, [online] Paper No. 3 in measuring the impact of microfinance. Available at: http://www.grameenfoundation.org/resource/measuring-impact-microfinance-looking-future [Accessed 30 Apr. 2016].

- **Outreville, J.-F.** (2013). The relationship between insurance and economic development: 85 empirical papers for a review of the literature. *Risk Management and Insurance Review*. No.16(1): 71–122.

- **Pagniez, P.** (2016). Interviewed by Roberto Estellés and Mercedes Gómez, 15 April

- **Parker, S. C.** (2000). Saving to overcome borrowing constraints: implications for small business entry and exit. *Small Business Economics*, No. 15: 223-232.

- **Prashad, P., Saunders, D., and Dalal, A.** (2013). Mobile phones and microinsurance. *International Labour Organization.*

- **Quayyum. A.** (2014). Flood victims in Bangladesh benefit from first insurance payout, Oxfam.

- **Ramm, G.** (2001). Public private partnerships in microinsurance. *Microinsurance Network*.

- **Reardon, T.** (2005). Customizing market development strategies: new paths to rural development in Central America. Department of Agricultural Economics, Michigan State University. Staff paper Nº 2005-01.

- **Roodman, D.** (2012). *Due diligence*. Washington: Center for Global Development.

- **Sandmark, T., Debar, J. and Tatin-Jaleran, C.** (2013). The emergence and development of agriculture microinsurance. *Microinsurance Network* [online]

- **Sen, A.** (1999). *Development as freedom*. New York: Knopf.

- **Skees, J., Murphy, A., Collier, B., McCord M.J., Roth, J.** (2007). Scaling up index insurance: what is needed for the next big step forward. *Microinsurance Centre, LLC, Global Ag Risk*.

- **Schreiner, M.** (1998). Aspects of outreach: A framework for the discussion of the social benefits of microfinance. *Journal of International Development*, No. 14: 1-13.

- **Shwedel, K.** (2006). Value chain financing: a strategy for an orderly, competitive, integrated market. In Quirós, R. (Editor) *Agricultural value chain finance*, Costa Rica: Academia de Centroamerica, pp.11-28.

- **Solana, M.** (2015). Making public-private partnerships work in insurance. International Labour Organization. Paper No. 40

- **Solana, M**. (2016). Interviewed by Roberto Estellés and Mercedes Gómez, 13 April

- **SwissRe** (2016). Bangladesh flood victims benefit from first index insurance payout. [online] Available at: http://www.swissre.com/global_partnerships/Bangladesh_flood_victims_benefit_from_first_index_insurance_payout.html [Accessed 17 Apr. 2016].

- **The International Labour Organization's Impact Insurance Facility** (2016) Annual report 2015. International Labour Organization. [online] Available at: http://www.impactinsurance.org/ckfinder/userfiles/files/Annual_Report_2015_EN.pdf [Accessed 3 May 2016].

- **United Nations,** (2007). Trade and development aspects of insurance services and regulatory frameworks. United Nations conference on trade and development. [online] New York: United Nations. Available at: http://unctad.org/en/Docs/ditctncd20074_en.pdf [Accessed 25 Apr. 2016].

- **United Nations Development Programme (UNDP),** (2015). *Sustainable development goals: introducing the 2030 agenda for sustainable development*. New York: United Nations. Available at: https://sustainabledevelopment.un.org/?menu=1300 [Accessed 25 Apr. 2016].

- **Wakefield P.**, "Extract from an account of a female benefit club, at Tottenham", in *Reports of the society for bettering the condition and increasing the comforts of the poor.* Vol. 3, cited by Roodman (2012), p. *15*.

- **Wenner, M.** (2014), personal communication, august 12 2013. *In* Müller, S., Ramm, G. and Steinmann, R. (2014). Agriculture, microinsurance, and rural development. Microinsurance Network.

- **World Bank,** (2011). Weather index insurance for agriculture: guidance for development practitioners. [online] Documents.worldbank.org. Available at: http://documents.worldbank.org/curated/en/2011/11/15643352/weather-index-insurance-agriculture-guidance-development-practitioners [Accessed 17 Apr. 2016].

- **World Bank**, (2012). FONDEN Mexico's natural disaster fund – A review. The international bank for reconstruction and development, [online] The World Bank. Available at: http://documents.worldbank.org/curated/en/2012/05/17291287/fonden-mexicos-natural-disaster-fund-review [Accessed 01 May 2016].

- **World Bank,** (2013). CADENA catastrophe insurance: A social safety net for small-scale farmers in Mexico. [online] The World Bank. Available at: http://documents.worldbank.org/curated/en/2013/10/19538377/cadena-catastrophe-insurance-social-safety-net-small-scale-farmers-mexico [Accessed 01 May 2016].

- **Wyman, O.** (2013). Funding the future: insurers' role as institutional investors. [online] http://www.insuranceeurope.eu/. Available at: http://www.insuranceeurope.eu/sites/default/files/attachments/Funding%20the%20future.pdf [Accessed 17 Apr. 2016].