Unlocking Smallholder Credit: Does Credit-Linked Agricultural Insurance Work?

Global Index Insurance Facility
MANAGED BY WORLD BANK GROUP
IFC International Finance Corporation WORLD BANK GROUP
IMPACT INSURANCE
ILO International Labour Organization

Photo Credits: World Bank Photo Library and Shutterstock

WHEN AND HOW SHOULD AGRICULTURAL INSURANCE BE SUBSIDIZED? ISSUES AND GOOD PRACTICES

Unlocking Smallholder Credit: Does Credit-Linked Agricultural Insurance Work?

Richard Meyer and Peter Hazell | independent consultants
Panos Varangis | Finance & Markets Global Practice |
World Bank Group.

Global Index Insurance Facility
MANAGED BY WORLD BANK GROUP
IFC International Finance Corporation WORLD BANK GROUP
IMPACT INSURANCE
ILO International Labour Organization

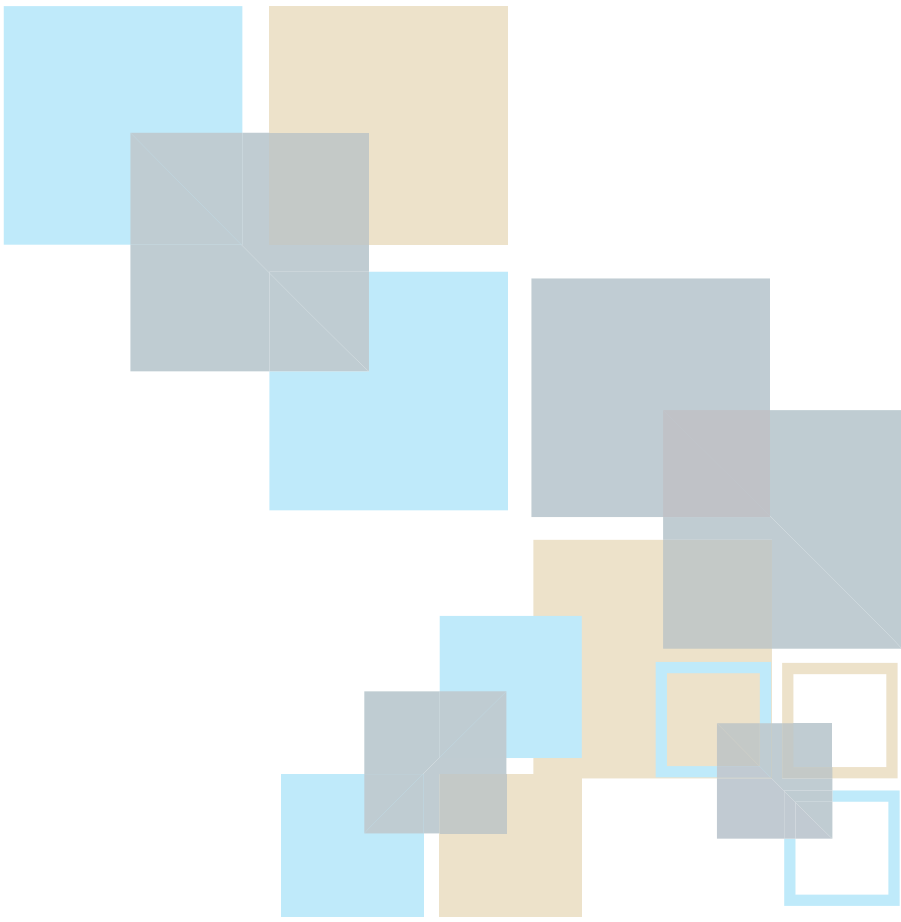
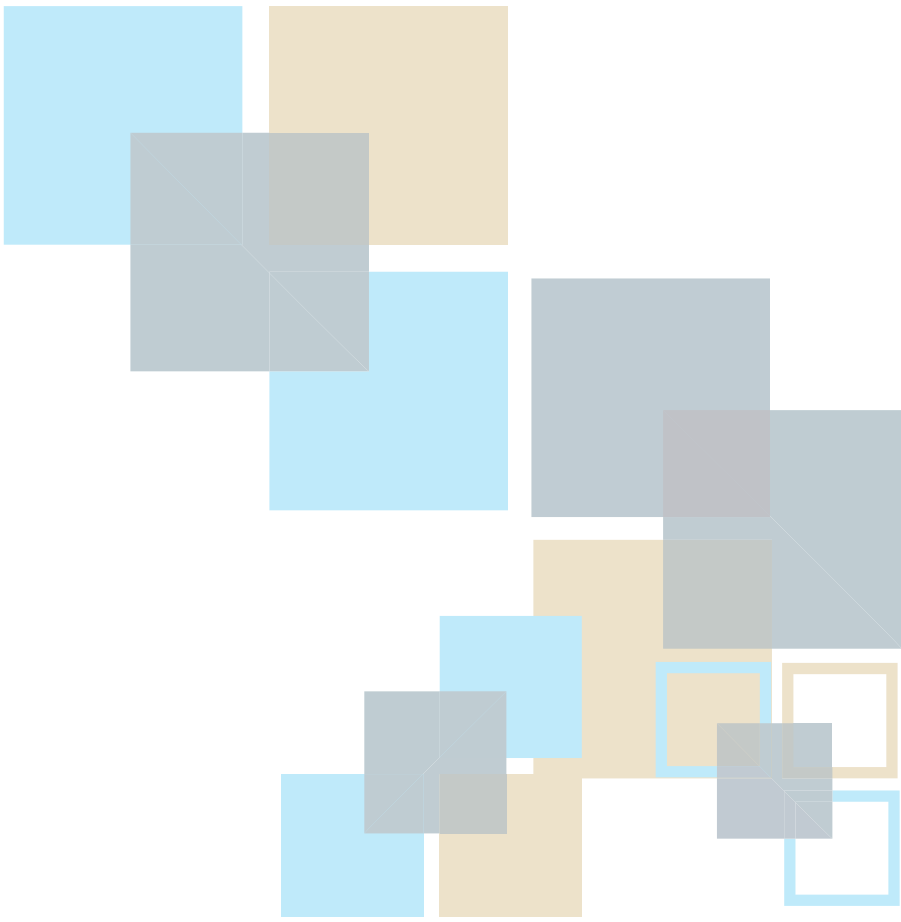


Table of Contents



Acknowledgements

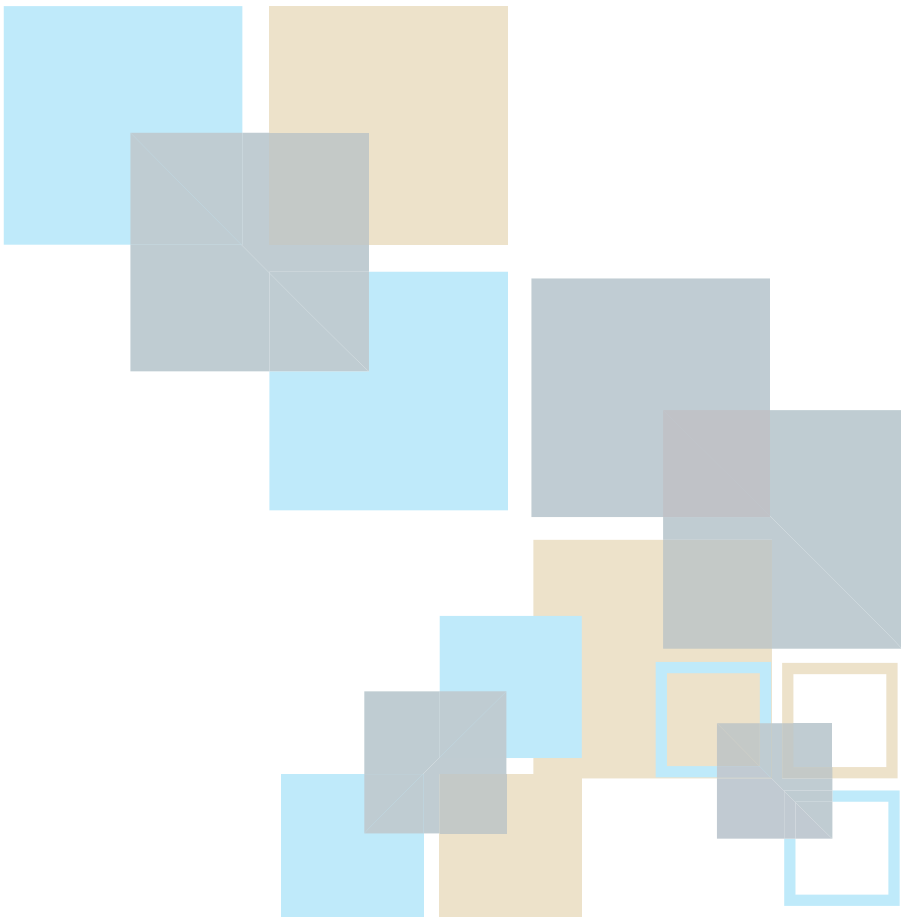
The authors acknowledge and appreciate the many useful comments received from Pranav Prashad, Mario Miranda, Carlos Cuevas, Michael Carter, and Xavier Giné. They are relieved from responsibility for the final product. Appreciation is also extended to Pavis Devahasadin and Joost Tijdink for coordinating the production process; and Aichin Lim Jones and Li Wen Quach for design and layout support.

Global Index Insurance Facility

The Global Index Insurance Facility (GIIF) is a multidonor program that supports the development and growth of local markets for indexed/catastrophic insurance in developing countries, primarily in Sub-Saharan Africa, Latin America and the Caribbean, and Asia Pacific. Funded by the European Union, Japan, Germany, and the Netherlands, the Global Index Insurance Facility is managed by the World Bank Group, as part of the Finance & Markets Global Practice.

Impact Insurance Facility

Housed at the International Labour Organization, the Impact Insurance Facility enables the insurance industry, governments, and their partners to realize the potential of insurance for social and economic development. The Facility was launched in 2008 with generous support from the Bill & Melinda Gates Foundation, and has received subsequent funding from several donors.



Executive Summary

Governments and donors have introduced many programs and policies designed to increase lending to the agricultural sector generally, and to small farmers specifically. In spite of these efforts, it is widely believed that the sector and smallholders continue to be credit constrained so they miss opportunities to adopt productivity-enhancing projects requiring greater cash outlays but offering the prospect of higher yields and farm incomes. This problem has sparked renewed interest in using agricultural insurance to reduce the risk for farmers of adopting new technologies and production practices and, thereby, reducing default risks for financial service providers (FSPs) so they will invest in developing sustainable methods to serve agriculture. Past experiences in using publicly supplied crop insurance to underwrite farm loans issued by specialized agricultural development banks were generally unsuccessful and financially expensive, but recent developments with privately provided agricultural insurance and index based insurance products have significantly improved the performance of agricultural insurance. This has opened up new possibilities for credit-linked insurance to serve as a win-win-win solution for farmers, FSPs, and insurers. In particular, it is hoped that private insurers will develop crop insurance products that smallholders will find attractive to purchase and apply any indemnities received to their loan commitments. If so, this should encourage both FSPs and informal lenders to unlock credit, leading to a greater adoption of productivity enhancing projects.

This paper reviews possibilities for, and experience with, credit-linked crop insurance, including different types of insurance and credit arrangements, ranging from insurance sold to individual farmers to meso insurance sold to FSPs to cover losses suffered by farmer borrowers. The paper describes the main methods of linkage that are being tested or proposed, identifies the critical features of each method, and discusses the advantages and limitations for the three parties - farmers, FSPs, and insurers. The key to understanding if insurance linkages really make an impact on credit involves comparing what is likely to happen in the credit market with and without insurance linkages, that is do insurance linkages make a difference.

Key lessons

There are situations where insurance may unlock credit, but linkage with insurance is far from being a silver bullet for the credit constraint problem. Several reasons might encourage FSPs to offer crop insurance including the possibility of reducing default risks, reducing the use of more costly and less efficient risk management techniques, reducing interest rates, raising profits, attracting more clients, reaching poorer smallholders, competing better with competitors, and generating fee income. But if the insurance is administered by the FSP as part of its loan process, these benefits have to be balanced against the cost and management challenges faced in training and monitoring loan officers and others who explain the product to smallholders, and the incentives needed for staff members who take on these additional tasks. If index insurance is used, the FSPs need to teach borrowers the complexity of basis risk, how payouts are made, handle their complaints when they experience losses but do not receive payouts, or experience insured losses and receive some payouts, but still owe balances on their loans.

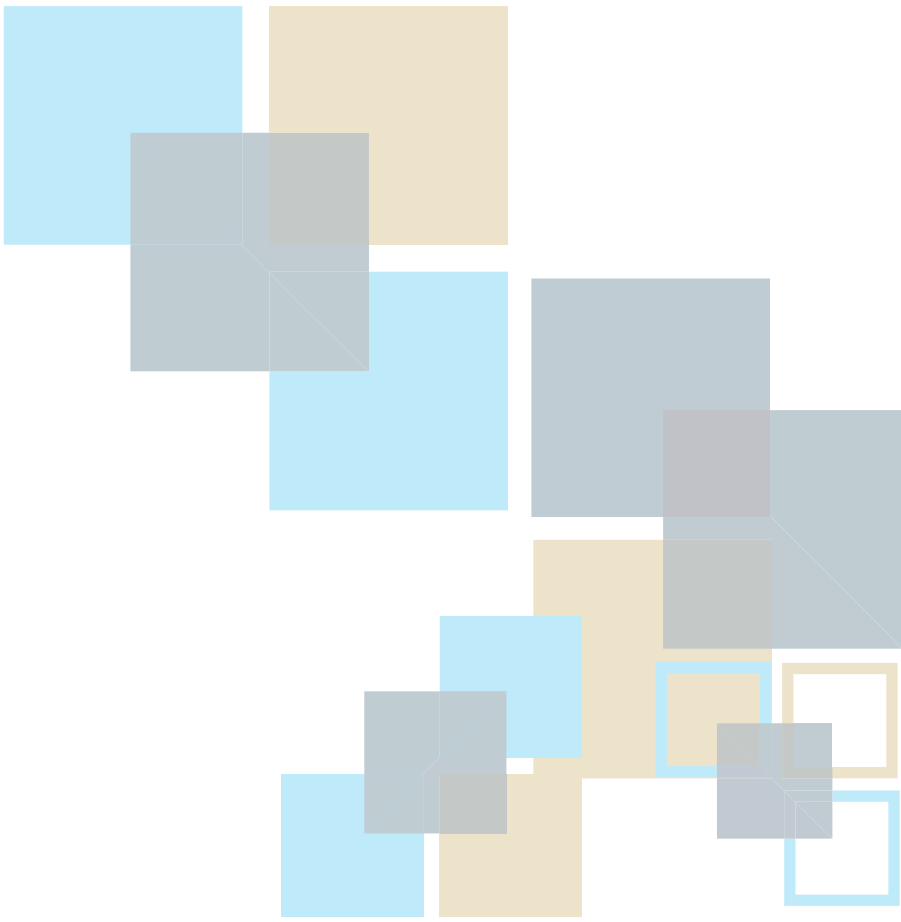
Agents within value chains (e.g. agri-businesses) have some advantage over FSPs in lending to farmers and bundling insurance with credit, but they also have additional methods of contract enforcement, particularly in tight value chains, so may have less interest in insurance (e.g., since they simultaneously operate in other markets, they may be able to exert market power over smallholders dependent on them for access to scare inputs or product markets). Some value chain agents are undercapitalized themselves and prefer to invest in their own businesses rather than make loans to farmers. Another limitation of agents is that they are only interested in fulfilling the financing needs of farmers related to the production of the main crop the agent handles. Therefore, farmers with other financial needs beyond specific production loans are not fully served by value chain finance.

When FSPs and other lenders have the ability to enforce formal loan contracts through the use of collateral or collateral substitutes, they will likely be less interested in insurance. But their interest will likely be greater if they face pressures to lend or to forgive or restructure defaulted loans.

Making insurance compulsory has the advantage of simplifying administrative arrangements for the FSPs and reduces their lending risks, while avoiding adverse selection problems for the insurer. The drawback is that compulsory insurance may discourage farmers from seeking loans, thereby forgoing the benefits of investing in new projects to enhance productivity and income.

Insurance is likely to play a greater role in promoting FSP lending to smallholders in credit constrained environments where farmers have weak collateral to offer, and systemic risks are the main cause of loan defaults. Insurance will be less effective if the risks it covers are not a major cause of loan defaults. This will depend in part on the type of borrower. Better and/or well diversified commercial farmers that can post good collateral or have important nonfarm sources if income may need less insurance as a condition for credit. On the other hand, smallholder farmers who depend primarily on agricultural income and have weak collateral may need more insurance. Even where insurance is potentially useful to FSPs, it may not be attractive to borrowers if the insurance premium plus the interest charge on the loan exceeds the potential returns from a borrower's project investment.

The literature consulted on credit-linked insurance suggests there is relatively little that is really known about its effectiveness in overcoming credit constraints for smallholder farmers. A proper evaluation would need to show how insurance impacted FSP lending practices, and how this in turn impacted farmers' access to and use of credit and their on-farm investments, productivity and income. For sustainability, it would also be important to evaluate the impact on the insurer, and whether the insurance is profitable enough for them to continue to offer it to FSPs and/or farmers. Most studies provide limited information about the benefits to farmers and FSPs, and virtually none provide evidence about the value to insurers. There is a real need for more evaluations and impact assessments of credit-linked insurance, especially when public funds are invested in providing relevant public services and subsidies. Future evaluations will require implementation of more formal Monitoring and Evaluation (M&E) systems built into the design of credit-linked insurance programs and projects.



1. Introduction and Objectives

The lack of access to credit has long been identified as an important, if not the main, constraint for farmers in developing countries, especially smallholders. As a result, governments and donors have, over several decades, tried a variety of programs and policies designed to increase lending to the agricultural sector generally, and to small farmers specifically. In spite of these efforts, it is widely believed that the sector and smallholders often continue to be credit constrained. Financing from formal financial service providers (FSPs)[1] can be important for several reasons. Households may find formal finance provides important additional tools to aid in smoothing consumption over time. Surveys of recipients of microcredit often conclude that this is a major reason for borrowing small loans. More frequently, however, is the concern for additional financing for productive and investment purposes. For farmers, this may be important for the relatively simple process of adopting improved seed varieties more responsive to chemical fertilizers. Financing may also be needed for more complex changes such as becoming a contract farmer for new high quality commodities supplied to upscale international markets. There may also be a need for financing investments to make farming more resilient and adaptive to climate change. For simplicity, these productive purposes will be referred to as farm "projects" that have the common characteristic of requiring greater cash outlays than required for traditional smallholder livelihood strategies. Greater cash outlays may mean that smallholders cannot adopt them by using their own savings or traditional sources of informal finance. Therefore, they will forego opportunities to adopt productivity enhancing projects that require greater cash outlays but offer the promise of higher yields and farm incomes.[2]

[1] FSPs are defined here to include any kind of formal financial service provider that makes loans and may take savings and deposits. In rural areas, they include banks, microfinance institutions, financial NGOs, and various kinds of credit and savings groups including savings and credit cooperatives (SACCOs) that are weakly regulated. They do not include informal sources of loans and savings services such as small savings groups, traders, aggregators and other mechanisms that operate in value chains and provide finance linked to specific commodities. These informal sources can be important sources of finance and are discussed below.

[2] See Asfaw (2012) for one of many publications that report on the potential impact of improved technologies on rural household welfare and higher consumption expenditures that translate into lower poverty, higher food security and greater ability to withstand risk in Africa

Several reasons have been identified to explain the reluctance of FSPs to better serve agriculture. Clarke and Dercon (2009) efficiently clustered them into the four categories of: (i) information asymmetries (access to different information); (ii) transaction costs; (iii) enforcement constraints; and (iv) ambiguity aversion. Information asymmetries lead to moral hazard and adverse selection. Transaction costs are high as lenders must reach out to a large number of smallholders, each of whom borrows relatively small amounts, and because they must evaluate each borrower's reliability, capacity to repay and intentions to use borrowed funds wisely. Enforcement problems are created if borrowers attempt to engage in strategic default, and it is difficult and costly for lenders to distinguish between lack of willingness and lack of capacity to repay. The use of collateral to induce repayment is frequently restricted because poor borrowers have little collateral to offer, and the process of seizing and disposing of seized assets is often costly and inefficient. Ambiguity aversion refers to the preference of FSPs for serving familiar clients with known risks rather than learning the complexities and risks of serving agriculture due to its special spatial and risk characteristics (Binswanger and Rosenzweig, 1986). An additional reason for reluctance to lend is the existence of significant systemic risks, such as price and production risks, that can affect large numbers of farmer borrowers at the same time, and require the restructuring of many loans to avoid default. In the absence of ways to ameliorate such risks, FSPs will likely ration agricultural lending to limit their risk exposure.

Recent years have seen a renewed interest in using agricultural insurance to reduce the risk for farmers of adopting new technologies and production practices and, thereby, reduce default risks for FSPs so they become more willing to invest in learning how to sustainably serve agriculture. Past experiences in using publicly provided crop insurance to underwrite farm loans issued by specialized agricultural development banks were generally unsuccessful and financially expensive[3] (Hazell, Pomareda and Valdes, 1986; Seibel, 2000), but more recent developments with privately provided agricultural insurance and index based insurance products have led to significant improvements in the performance of agricultural insurance (Hess, Hazell and Kuhn 2016). As such, it is hoped that these improvements can also lead to new forms of credit-linked insurance that will be win-win-win for farmers, FSPs, and insurers. In particular, it is hoped that private insurers will develop crop insurance products that smallholders will find attractive to purchase and apply any indemnities received from insured losses to their loan commitments. It is hoped that this will encourage both FSPs and informal lenders to unlock credit for insured producers, leading to more widespread adoption of productivity enhancing projects.

The general terminology "credit-linked insurance" is used in this paper to include several different insurance and credit arrangements.[4] It includes a variety of arrangements in which insurance is sold directly to farmers, which they may voluntarily buy or be compelled to purchase to obtain a loan, as well as more formal linkage arrangements where the

[3] A particularly ruinous example was the use of the public agricultural insurer (ANAGSA) to insure the loans of the agricultural development bank (BANRURAL) in Mexico in the 1970s. Both institutions were heavily subsidized, but in ways that enabled BANRURAL to collect repayment of a large share of its loans each year from ANAGSA, even in the absence of any widespread losses from insured events (Hazell, 1992).

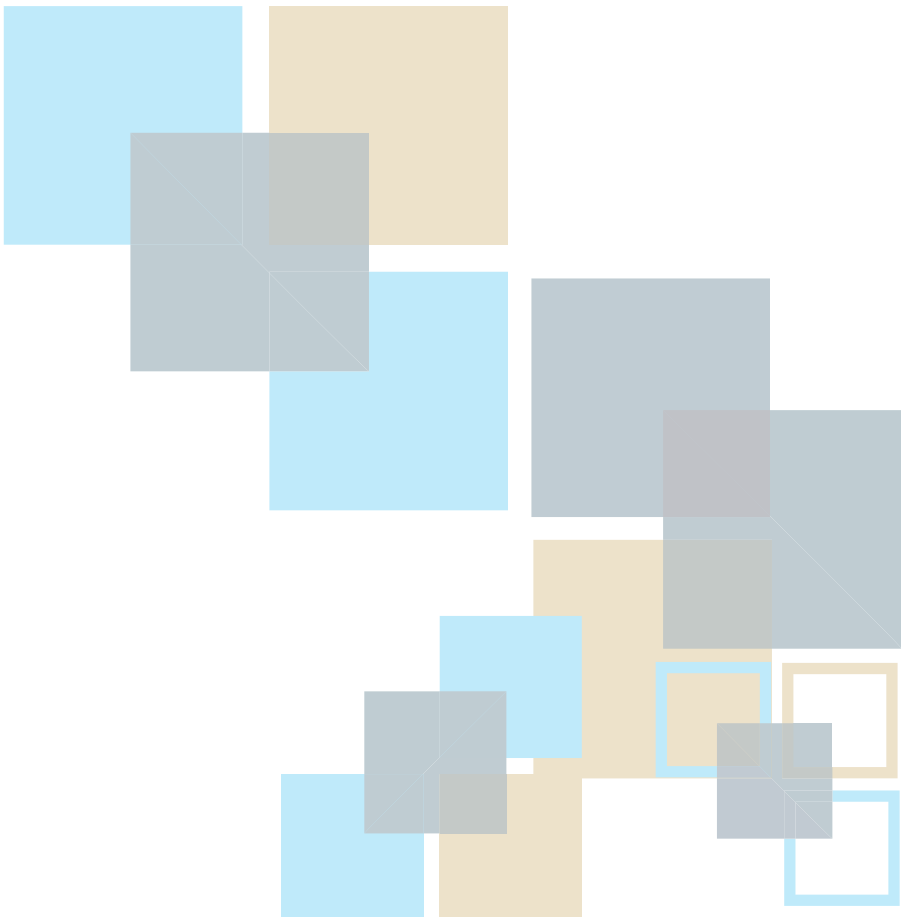
[4] See Prashad (2016) and Mukherjee et.al. (2017) for a discussion of the concept of bundling credit with other services, and a description of several examples of bundling insurance with credit.

insurance is bundled with credit and sold through an FSP. It also includes meso insurance products sold to an FSP to cover losses suffered by farmer borrowers. While financial institutions are the most common target for credit-linked insurance, other firms along value chains (e.g. input suppliers) may also find it useful as a way to reduce their risk exposure when lending to smallholder farmers.

The purpose of this paper is to describe various methods of linking insurance with credit that are being tested or proposed, identify the critical features of each method, and show the advantages and limitations for the three parties in these arrangements – farmers, FSPs, and insurers. Studies and cases are reviewed to identify how the fundamental problem is resolved of finding the intersection of interests between lenders, insurers, and smallholders who must choose and pay for the credit and insurance. The key to understanding if insurance linkages have an impact on credit conceptually involves determining what happens in the credit market with and without insurance linkages, that is do insurance linkages make a difference and, if so, how? As will be discussed, the issue can be more complex than just evaluating the amounts of credit lent and at what interest rates. To simplify, the analysis in this paper will be limited to crop insurance. Crop insurance was traditionally provided in the form of multi-peril crop insurance (MPCI), but due to its high costs and poor performance, crop insurance for small farms is often now offered in the form of yield or weather indices that are assessed at community or regional levels[5]. By crop insurance, we include indemnity based insurance, such as named peril or MPCI insurance, as well as area yield and weather index insurance in this paper.

The paper is organized as follows. The next section reviews the problems that agricultural risks create for farmers, FSPs and insurers, and which impact the provision of financial services for smallholder farmers. Section 3 then reviews the potential of credit-linked insurance to overcome some of these risk problems in order to unlock more credit for smallholder farmers in ways that are mutually beneficial to farmers, FSPs and insurers. Section 4 considers the alternative institutional mechanisms available for providing credit-linked insurance, while section 5 focuses on situations where credit-linked insurance would not be suitable. Section 6 reviews the potential impacts of credit-linked insurance on the provision of credit to smallholder farmers, and reviews available empirical studies. Section 7 identifies constraints that prevent the spontaneous development of credit-linked insurance in market economies, leading in Section 8 to a discussion of the roles of supportive agents and public policies and investments, including the potential role of subsidies, in helping to kick-start credit-linked insurance. Finally, section 9 contains our key lessons.

[5] Index insurance contracts are written against events defined and recorded at regional levels rather than at individual farm levels (e.g., a drought recorded at a local weather station, or a low official crop yield estimate for a district or county). To serve as agricultural insurance, the index should be defined against events that are highly correlated on the downside with regional agricultural production or income. All buyers in the same region are offered the same contract terms per unit of insurance coverage. That is, they pay the same premium rate and, once an event has triggered a payment, receive the same rate of payment, and their total payments and indemnities would be that rate multiplied by the value of the insurance coverage purchased.



2. Challenges Created by Farm Level Risks

For Farmers

Farmers in developing economies face many production, price and marketing risks that result in wide swings in farm household income and consumption. Given that smallholder farmers are typically risk averse in their behavior, in the absence of ready access to savings, insurance and credit markets, they rely on traditional methods of risk management. These include choosing diversified crop and livestock enterprises, avoiding high risk-high return agricultural activities, reducing investments in projects such as using improved seeds and fertilizers, and holding precautionary savings or physical assets that can be liquidated in emergencies. They may also participate in local informal saving groups and other informal financial methods that provide opportunities to save and borrow small amounts for investments or emergencies, and invest in informal village insurance arrangements. However, these informal methods of risk management have been shown to be incomplete and cannot effectively reduce the negative impact of large systemic shocks. Moreover, smallholders may practice internal credit rationing, and not demand formal credit from FSPs that require collateral and/or that engage in strong contract enforcement measures, including obligating borrowers to liquidate assets to repay loans in the event of systemic or idiosyncratic shocks.[6] Likewise, there is often little demand for formal credit by the poorest, while the richest may rely on savings or borrow from cheaper sources rather than from local FSPs that specialize in micro or small loans made at interest rates high enough to sustain their operations. This situation, therefore, locks smallholders into traditional low return-low risk farming technologies and diversified farm enterprises that have proven over time to sustain them except in major catastrophes, while richer farmers choose more specialized enterprises and more advanced technologies.

[6] Boucher et al. (2008) show how risk rationing can occur "when insurance markets are absent, and lenders, constrained by asymmetric information, shift so much contractual risk to the borrower that the borrower voluntarily withdraws from the credit market even when she has the collateral wealth needed to qualify for a loan contract " (p. 409).

For FSPs

Even in the absence of farm level risks, FSPs have many reasons to be reluctant to lend to small farms. These include government actions that discourage rather than encourage FSPs to engage in market oriented finance in rural areas, such as caps on interest rate or margins, or government pressure to forgive loans or postpone repayment in the event of adverse weather events or collapses in markets and prices. FSPs also may face limited demand for formal credit from smallholders, and those who do borrow are expensive to serve because they typically prefer to borrow only small amounts. Most have few if any assets to offer as collateral, and their assets may be difficult and expensive to liquidate.

Farm level risks add to these problems because FSPs have to devote more resources to assessing and managing the risk of default amongst individual borrowers. Also, FSPs face the systemic or covariate nature of many farm level risks, which can lead to many borrowers defaulting at the same time. In principle, an FSP can diversify its lending portfolio across geographies to reduce its exposure to systemic risk, but this is difficult for many small FSPs, such as microfinance institutions (MFIs), credit unions, and unit rural banks, that have few, if any, branches so their loan portfolios are geographically specialized. If FSPs mobilize savings as part of their financial services, they may also suffer liquidly management problems when many savers desire to withdraw savings at the same time that borrowers do not repay, as may happen, for example, in the event of a systemic shock like a regional drought. Systemic risks may force FSPs to ration credit and limit their exposure so defaults are not a large part of their loan portfolios. Exceptions may arise if they are funded by benevolent donors or lenders, who provide them recourse to emergency funds so they can more easily roll over overdue loans, stretch out repayment schedules, and make additional loans to delinquent borrowers so they can plant next season's crops. They may also need funds to cover provisions that regulators often require for problem loans. Larger commercial or development banks tend to have dispersed branches and a greater capacity to withstand localized systemic shocks, but their high operating costs make it difficult for them to profitably make small loans. They can reduce costs by utilizing agent networks but managing such networks is difficult. They may be able to reduce costs through mobile banking but their customers may lack access or know how to use this technology.

To limit the perceived riskiness in agricultural lending, FSPs engage in many practices to limit default risks. For example, they may impose high collateral requirements (high collateral/loan ratios). They may require collateral substitutes such as co-signors, joint liability group lending, or large savings in blocked savings accounts. In strong village societies they may require the signature of village chiefs. They may only lend to highly diversified smallholders with large amounts of non-farm income, or participate in government or donor-sponsored partial loan guarantee programs (but see section 8). They may ration credit by limiting the size of their total agricultural loan portfolio, or limit total lending per crop and geographic region. A survey of practices of several types of successful FSPs in Latin America that lend to agriculture included using: i) expert-based, information-intensive credit technologies; ii) diversification strategies (geographic, sectoral, commodity); iii) limiting agricultural credit portfolio exposure to reduce risk; and iv) excessive loan provisioning to absorb and internalize risks (Wenner, et.al. 2007)[7].

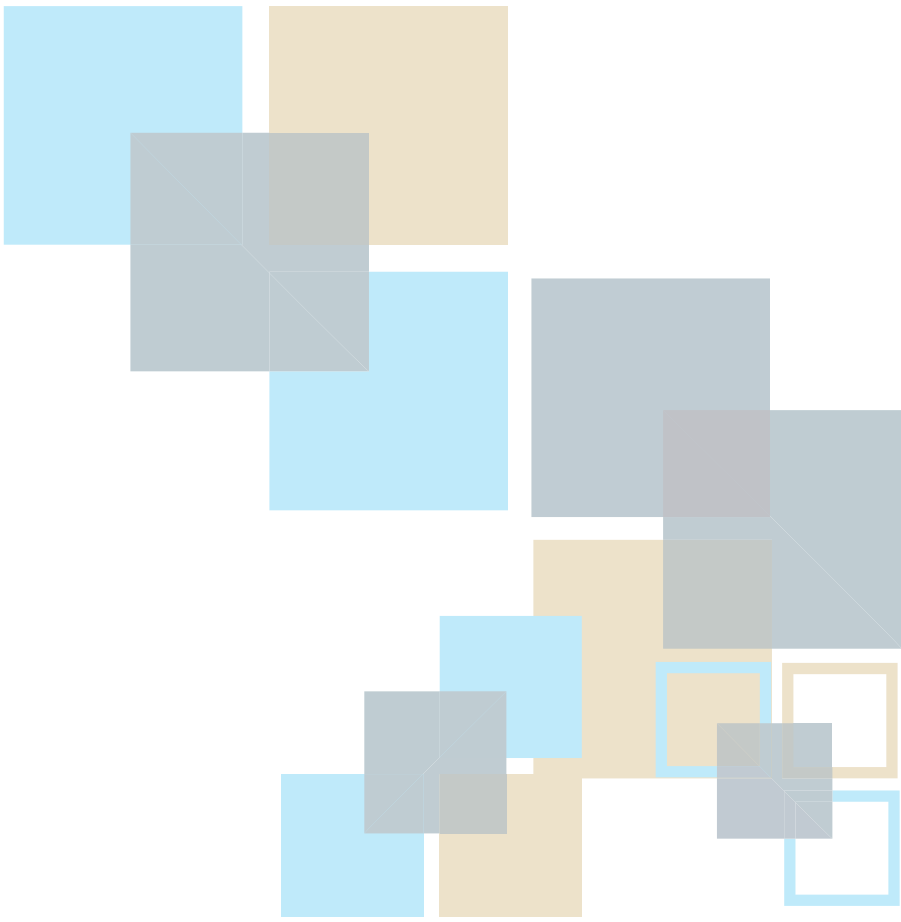
[7] A more recent publication specifically focuses on MFIs providing financial services in rural areas (IFC, 2014). It highlighted several of the same practices plus some additional ones.

These were mostly internal methods of managing credit risk, and few FSPs at that time used external methods such as insurance or guarantees. Moreover, insurance tends to be expensive relative to the returns farmers earn from their crops so FSPs may conclude that it is cheaper to limit their risk exposure through diversification than by offering insurance.

For Insurers

Agricultural insurers face many of the same problems as FSPs when they attempt to insure smallholders against crop production risks: small amounts of coverage sold per farmer, high transactions costs, asymmetric information about the likely 'moral hazard' behavior of smallholders once insured, poor data leading to uncertainties about the risks to be insured, and a limited rural network of branches through which they can offer insurance services. Like FSPs, they also face a systemic risk problem if their insurance portfolio is not sufficiently diversified across regions. Insurers also face limited demand for agricultural insurance products; the poorest smallholders who most need it often cannot afford to buy it, face liquidity constraints, or have limited understanding of the value of insurance, whereas larger smallholders who can afford to buy insurance often do not need it because they have alternative and less costly ways of managing risk (Binswanger-Mkhize, 2012).

Private insurers generally prefer to work with larger scale commercial farms and to insure higher value crops against named (rather than multiple) perils for which good data are available so risks and damage can be easily assessed. If they reach out to smallholders, it is often through contract farming arrangements where a processor or other aggregator includes the insurance within a package of inputs and access to an assured market outlet. Insurers also use aggregators to administer subsidized insurance when reaching out to broader populations of smallholders, as this can help reduce costs, improve access, and lead to sufficient scale to make the insurance worthwhile. A bank might serve as an aggregator by selling insurance with its loans. Other types of aggregators include borrowing groups, farmer associations/ cooperatives, input suppliers, and agro-processors. To serve large numbers of smallholders, insurers also prefer index-based products that do not require monitoring or assessing damage at individual farm levels. To handle the systemic risk associated with a smallholder portfolio, most insurers need reinsurance arrangements for at least part of their total risk exposure, or access to financial reserves through a donor or government agency.



3. How Might Credit-linked Insurance Resolve Some Problems that Farmers, FSPs, and Insurers Now Face?

For Farmers

Farmers will be encouraged to buy insurance and borrow to finance new projects if they believe their on-farm investment projects will meet their income and risk requirements, and if the terms and conditions for the credit and insurance seem fair and affordable. If the project produces the expected positive outcome, farmer borrowers will earn additional farm income to pay for insurance and repay the loan. On the other hand, if the project fails because of an insured loss, the farmer can choose to either pay the loan out of the indemnity funds received, or default and use the funds for consumption or other purposes. If the loan principle and interest are not fully paid, the farmer will normally be denied a new loan, and the FSP may engage in enforcement procedures and threaten to seize collateral in order to increase the borrower's willingness to pay. If the FSP is named as first claimant on the insurance indemnities, it will receive payment directly and any residual will be paid to the borrower. One attractive feature for the farmer of insurance embedded with credit is that the FSP may include the premium in the total loan, thereby avoiding the farmer's cash flow problem identified in some studies as an impediment to farmer demand for insurance (Hess, Hazell and Kuhn, 2016). A potential downside with credit insurance is that it may not pay off a farmer's loan if a loss occurs which is not covered by the insurance, or because of basis risk[8]. In this event the farmer may be worse off than if the loan were not insured because she will have to pay the insurance premium as well as repay the loan (Clark, 2011)

[8] Basis risk is the problem that arises with index insurance when an individual farmer suffers a loss but is not paid because the major event triggering a payment for the region has not occurred. For example, an individual farmer with rainfall insurance could lose her crop to drought, but not receive an indemnity if the drought is not widespread and recorded at the local weather station.

For the FSP

If the FSP believes that insurance will significantly improve the borrower's capacity to pay and the reduction in default risk will lead to higher profits, it may grant a loan, in the same or greater amount with the same or better terms and conditions compared to what it would have granted the farmer without the insurance. If the FSP sells the insurance product along with credit, it may realize economies of scope so it will be able to do so cheaper than if the insurer sold the insurance directly. If the FSP has already established a trusting relationship with the farmer or has a good reputation in the local market, it may be able to overcome some of the trust problems that insurers face when marketing a new product to a new customer. Moreover, the FSP may obligate the farmer to buy the insurance as a condition of the loan contract, and further reduce the potential for strategic default by requiring that it be named as the first claimant on the insurance indemnity. As discussed in Section 6, the value of credit-linked insurance to an FSP is likely greatest in environments where borrowers' risks are high and systemic, and where farmers have limited collateral to offer (Carter *et al*., 2016).

Although insurance linked to individual loans may, under certain conditions and done the right way (e.g. see Carter *et al.,* 2016), help reduce default risks and encourage FSPs to lend, it is no silver bullet because FSPs must deal with several issues in marketing insurance and managing indemnity payments. Some examples follow. Will loan officers be tasked with marketing insurance and will they need to be compensated for this additional work load? What training will be required so loan officers will understand how the insurance works and market it properly? [9] Should insurance be embedded in all agricultural credit contracts or should it be required only for those borrowers it considers most risky and cannot offer sufficient collateral or collateral substitutes? Would a problem of adverse selection be created if only riskier farmers without much collateral were required to buy insurance? If the insurance indemnities do not cover the insured borrower's full indebtedness, such as can happen with basis risk, should the FSP try to energetically recover the balance due or accept the loss and not make a new loan to the farmer? Will insurance paid write-offs contribute to an expectation among borrowers that there are few serious penalties for default and thereby affect future demand for insurance? If full loan recovery fails, the FSP will need to post higher provisions, which will reduce profits. What can it do to replace those lost profits? How will they manage internal liquidity problems in extending new loans to current and new borrowers while also meeting saver demand for withdrawals?

For the Insurer

When the insurance is formally tied to credit and the FSP serves as an aggregator and administers and markets the insurance, it could be attractive to the insurer by reducing its administrative costs, easing its access to a new network of clients, and creating a sufficiently large volume of premiums to make the insurance worthwhile. If the insurance is index based, the insurer can even avoid having to inspect farmers' fields and assess damage before making payments to the farmer or FSP. If, as is the most common case, credit-linked insurance for smallholders is subsidized by a government or donor, then the insurer may also benefit from

[9] The difficulties facing FSPs when marketing insurance are illustrated by Gine and colleagues in a study of the Basix program in India. They found that credit officers, despite facing a range of clientele with different needs, always sold the same combination of weather insurance schemes, without using insurance to hedge the risk that particular farmers faced. Indeed, during the period of study, livestock insurance grew far more rapidly that weather insurance, basically because it was easier to sell than weather insurance, which was poorly understood even by the credit officers who were supposed to sell it (Gine et al., 2012).

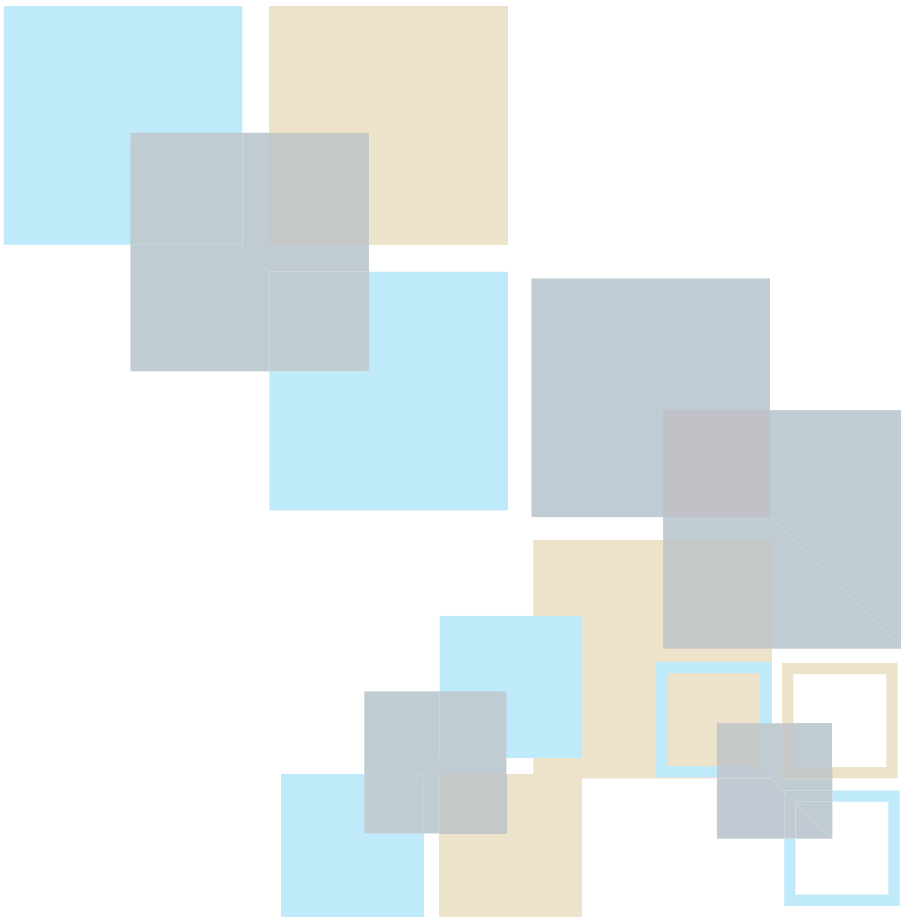
subsidies that help cover administration and risk loading costs, and sometimes even by obtaining portfolio reinsurance on favorable terms. In the case of meso insurance where the FSP purchases insurance to cover its own aggregate portfolio risk (see section 4), the insurer can benefit from selling at scale to a large client base rather than underwriting contracts for many individual borrowers. Moreover, if the insurance is based on spatially defined yield or weather indices, the level of portfolio aggregation involved may be sufficient to avoid any significant basis risk.

Major Unknowns

There are major unknowns about the necessary conditions under which some form of credit-linked insurance will be accepted and make a positive impact on unlocking credit. Several factors affect the supply of credit and insurance. One concerns the type of environment – agricultural, financial, and policy – in which the three parties to this type of arrangement will find it of interest to resolve some of their challenges. A second may be the financial rules and regulations that promote or constrain agricultural credit and insurance such as interest rate controls, lending quotas, loan targeting, and regulations affecting how delinquencies and defaults must be handled. Third will be the type and capacity of FSPs that are already making or aspire to make agricultural loans. A fourth important factor is the nature and effectiveness of the collateral and collateral substitutes including loan guarantees that are in effect to offset loan losses.

In principle, FSPs may prefer collateral and credit guarantees to insurance because they are available to cover default losses regardless of cause. While collateral and credit guarantees do not directly reduce the probability of loan defaults, they do reduce the loss to the FSP when a default occurs. But from the borrowers' perspective, insurance may be preferable because in the event of a negative shock, they could either lose their collateral or, if they default, lose their credit rating and hence access to future loans. However, there are examples in which credit guarantees may substitute for, and/or supplement insurance, and we consider these options in Section 8.

Many factors can affect the demand for credit and insurance including the nature of the idiosyncratic and systemic risks faced by farmers and their frequency, severity and geographic distribution, and the poverty levels of the smallholders and the effectiveness of their traditional forms of risk management. The impacts of climate changes on the frequency and intensity of catastrophic shocks, and government and donor responses to them, will affect interest in testing insurance as an ex ante solution. Another consideration affecting demand is whether the insurable risks are the really important ones faced by farmers in terms of default risks or income shortfalls. There is also the problem of determining the major constraint faced by specific farmers in their decision to adopt new products. Is it credit, is it insurance, or is it some of both? Or is the problem one of accessing markets and modern inputs that requires a value chain approach to resolve?



4. Alternative Institutional Mechanisms for Providing Credit-linked Insurance

There are three basic models for linking insurance and credit for smallholders. They are summarized in Table 1. One involves the insurer selling insurance directly to farmers, who can then offer the insurance as a form of loan collateral to FSPs. Another model involves directly bundling the insurance with loans, which are administered by an FSP or other aggregator. A third, referred to as meso insurance, involves directly insuring part of an FSP's aggregate loan portfolio against systemic loan defaults. In addition to these three basic models, insurance linked credit may also play a role in promoting value chain financing. We discuss each in turn.

Direct Farmer Insurance

In this model, the insurer sells insurance directly to farmers, collects the premiums, and makes claim payments directly to them. Smart phones and internet banking have opened up new opportunities for insurers to work directly with smallholders in this way, at least for index based insurance products (Hess, Hazell and Kuhn 2016). A variant of this approach is Kilimo Salama, a specialized weather index crop insurance product embedded with credit, and sold directly to Kenyan farmers to insure purchased inputs for wheat and maize (Box 1).

When farmers buy insurance directly and voluntarily, the link to credit arises only if the farmer informs the FSP of the insurance and offers it as proof of reduced risk exposure. It allows the farmers to buy the insurance coverage desired and utilize the indemnities as they choose. For the FSP making a loan, the problem is that even if the insured borrower is considered less risky, there is no way to compel the farmer to use claim payments toward loan repayment. This would require a side contract with the FSP in which the farmer offers the insurance as collateral and empowers the FSP to collect claim payments for debt repayment directly from the insurer. Without such an agreement, the borrower may be tempted to engage in strategic default and deliberatively not repay, concluding that defaulting and being denied access to a new loan is more

Box 1: The Kilimo Salama Program in Kenya

The program, a partnership between Syngenta Foundation for Sustainable Agriculture, UAP Insurance, and telecom operator Safaricom, offers cover for financial losses due to drought or excess rainfall. It covers the inputs the farmer buys, not the harvests. It uses mobile phone technology to make enrollment quick and easy and reduces administrative costs. Farmers visit a certified agro-dealer, who offers insurance to cover the cost of inputs purchased. When the farmer buys the inputs, the value is entered using a phone application. The dealer is informed of the premium owed and the farmer pays for the goods and premium. The dealer registers the farmer's details on his mobile phone and the farmer receives a text message with the policy number and coverage details. If there is a payout, the farmers receive a M-PESA payment on their mobile phones for the value of the seed purchased (Matul and Dalal, 2014).

valuable to him/her than repaying and maintaining access to formal credit in the future. The insurance-credit relationship becomes more formal in cases where FSPs require farmers to buy insurance in order to obtain loans.

Credit-linked Insurance

The need for a closer contractual arrangement between insurer and FSP underpins the more conventional form of credit-linked insurance in which the insurer uses the FSP as an aggregator to bundle insurance with loans, essentially marketing and administering the insurance for the insurers. Two forms of credit-linked insurance are shown in Table 1. They differ only in whether the insurance covers just the amount of the loan (model A), or whether there is also an insurance component that provides the farmer with some cash for own consumption purposes (model B). Either of these forms of linkage is beneficial to the insurer because all the administration is handled by the FSP through its local branches, so it is relatively easy to scale up sales. The insurer has to design and develop the insurance products, and ensure they are relevant for insuring the FSP's loans while also creating value for smallholder borrowers. This is why model B may be more attractive than A for smallholders because when they incur a loss they receive at least some cash payment that can be used for household consumption until the next harvest. The farmer must evaluate if the extra costs of borrowing to buy the insurance, and paying the additional interest charges, is a superior way of obtaining protection compared to accumulating savings for this purpose.

In the literature, a distinction is sometimes made between 'contingent credit' in which the insurance pays the lender, and 'bundled credit-insurance' in which the insurer pays the borrower (Farrin and Miranda, 2015). But if the lender is administering all the transactions, then the two will seem the same to the borrower unless, as in model B, there is some claim payment left after the loan has been paid down.

When insurance is directly linked with credit, the FSP has the choice of making the insurance compulsory for its borrowers, or allowing them to offer an alternative form of collateral. Making the insurance compulsory has the advantages of simplifying administrative arrangements for the FSP, reducing its lending risks, and avoiding adverse selection problems for the insurer. Its drawback is that for farmers who have other less costly ways of managing their risk, or who face basis risk when the insurance is index based, the insurance simply adds to the cost of the loan without adding commensurate benefits, making the loan less attractive. If the FSP

actively markets insurance, it needs to explain the events in which farmers will have to repay the loan fully, partially or not at all depending on the size of the insurance payout.

When the credit and/or insurance is subsidized by governments, the insurance is typically made compulsory for all borrowers in selected FSPs. The largest compulsory bundled crop insurance program is the Weather-Based Crop Insurance Scheme (WBCIS) in India. For specified crops in preselected locations established by state governments, the scheme is mandatory for commercial bank loans. It is also open to non-borrowers who can purchase the insurance from a network of banks, insurance intermediaries and authorized representatives of the insurance companies, but the majority of sales are made to farmers with bank loans. The scheme is heavily subsidized. The WBCIS is priced at actual actuarial rates, but with the gap between premiums paid by the farmers and actual premiums being met by the central and state governments. The total premium subsidy can be as high as 75 percent. The program covers over 25 million farmers and the government has now increased the subsidies for borrowers and non borrowers to 98% under the new scheme - PMFBY (Prime Minister Fasal Bima Yojana) - effective the 2016 monsoon season (Prashad, 2016).[10]

Non-bank companies, including agrodealers, agricultural coops and other value chain agents, can also offer credit-linked insurance. Two examples are given in Box 2.

[10] A compulsory scheme is also used for cattle loans. IFFCO-Tokio, a cooperative insurer in India, offers credit-linked cattle insurance through cooperative banks which farmers are required to purchase for their cattle loans to protect the banks from default risk in the case of cattle deaths. The introduction of radio frequency identification chips accelerated claims processing which improved product viability and value for the farmer borrowers (Matul and Dalal, 2014).

Box 2: Examples of Non-bank FSPs: PlaNet Guarantee in Burkina Faso and the Zambia Lima Credit Scheme

A Burkina Faso index-based insurance scheme issued by PlaNet Guarantee, covers drought risks for maize. The insurance is provided by Allianz Africa and reinsured by Swiss Re. The system involves several MFIs. Although the insurance is optional, credit agencies are becoming more stringent in requesting it and insured farmers without credit are rare. The payouts for the index insurance are triggered by an index of evapotranspiration[11] and are made via the credit agency but are withheld if the credit is not repaid. The pilot was launched with 194 producers during the 2011 season and grew to 2,072 producers by 2013/2014. In 2013 the scheme was extended to cotton production, and 446 producers adopted it. No data were reported about the impact of the scheme on the MFIs or the insurer.

The Zambia Lima Credit Scheme (LCS) is a quite complicated indemnity-based crop insurance program. Maize was the only crop eligible for the scheme in the beginning. Farmers participating in the scheme are members of the Zambia National Farmers' Union (ZNFU). One of ZNFU's objectives was to provide access to finance to 10% of its members (i.e. 35.000 farmers) by 2015. It provides smallholders without collateral access to commercial agricultural credit based on a group savings and loans approach. Loans are provided by the National Commercial Bank Limited (known as ZANACO). The District Farmers Associations (DFA) have to co-guarantee the loans. The Agrisure policy issued by the Zambia State Insurance Company (ZSIC) is mandatory. The program targets farmers who organize themselves into groups of 10-20 farmers based on mutual trust, reputation and commodity focus. A smallholder deposits 50% of the value of his/her total input requirements in a fixed term collateral account. Perils covered include crop damage or destruction caused by natural events such as drought, lightning, flood, hailstorm and fire, and the insurance indemnifies the cost of inputs for which credit was obtained. The insurance company performs pre-harvest assessments and the farmer is informed of the improved farming practices to be followed. In case of a claim, an inspector checks if the recommendations were implemented and declares the claim ineligible if they were not followed. Launched in the 2008/2009 crop season, the number of farmers granted credit by the 2013/2014 season had increased to 16,780 cultivating 36,700 hectares. The scheme has recorded almost a 100% recovery rate on loans. The interest rate started at 26%, soon declined to 21% and then to 14%. But these rate changes seem to be driven mostly by a pricing formula in which the bank adds 2% to the base rate determined by the Central Bank. ZNFU pays for all support needed to make this scheme functional and has been exploring ways to make it self-sustainable. The variety of ways that the lender is protected against default suggests that it is extremely cautious regarding lending to farmers (Van Asseldonk, et. al. 2013, 2015).

[11] Evapotranspiration is the process by which liquid water becomes water vapor.

A potential downside with embedding insurance and credit is that the lender may not be given any discretion about how to handle individual loan delinquencies, especially if banking regulations stipulate how they should be used. Normally, if an insured farmer is entitled to an indemnity payment, those funds must be used by the FSP to write down her loan. This can be a problem if there is basis risk so the claim payments are not highly correlated with the actual losses experienced by individual farmers. The loan might sometimes be paid off with an indemnity even if the farmer has not experienced a loss and is capable of repaying her loan. The opposite can also happen; the farmer may incur a loss but the insurance does not pay out, in which case the farmer still has to repay the loan plus the insurance premium. This result stemming from the basic nature of basis risk in index insurance may cause farmers to doubt the integrity of the payout process and contribute to lack of voluntary uptake.[12]

"Meso" Insurance

The third type of linkage between credit and insurance is called "meso" insurance. It breaks the link between insurance and individual farm loans, and instead insures FSP loan portfolios at a more aggregate level. Agricultural intermediaries can be any institution, not just FSPs, along the agricultural value chain that is exposed to agricultural risks, including agricultural input suppliers, producer organizations, or agricultural traders. The insurance is used as an internal risk management tool to cover default risks arising from large and systemic agricultural shocks. This might take the form of a single insurance policy that pays the policyholder a lump sum when an insured event occurs, such as a regional drought index or an El Nino type of massive flood. The insurance premium is paid by the FSP, which may recover all or part of this cost by charging its borrowers higher interest rates. An interesting aspect of meso insurance is that the lender has full discretion about what to do with any insurance indemnities received, subject to the rules of regulatory authorities. By removing some of the systemic weather risk in the lending portfolio, meso insurance may enable the lender to take on more risk and expand its lending to smallholders. A unique feature is that the lender may be induced to expand its lending, even though little is done to insure the risks of individual farmers. Another attractive feature is that by insuring a lending portfolio at a regional level, there is less basis risk associated with an insurance contract used to manage portfolio risk. Meso-index insurance products can be more complex than micro-products, allowing indemnity schedules to be designed to more precisely capture the complex relationship between weather and policyholder losses (Miranda and Farrin, 2012).

Many ideas about meso insurance are being developed and tested based on El Nino weather events and their impact on FSPs in Peru. They focus on how FSPs react to extreme weather events with and without insurance. Collier and Skees (2012) showed that the marginal cost of insuring against extreme weather events in Peru would be lower than strengthening other risk management practices so that insured FSPs could re-optimize their risk management strategies by using insurance as a substitute. Improved efficiency could translate into better financial performance, expansion of banking services, lower interest rates, and reduced volatility in access to credit. In another study, Collier and

[12] The DHAN Foundation, a development organization in India, improved transparency by providing members with information about how claim payments are made for its index crop insurance product. Data from rainfall gauges are available to the insured daily, and consolidated data are also sent to village information centers. This enables clients to check whether the claims payments received are consistent with the rainfall data (Matul and Dalal, 2014).

Table 1. Types of Insurance-credit Linkage Arrangements and Their Characteristics

Characteristic	Type credit insurance			
	Direct Farmer Purchase	Credit-linked A (Loan Only)	Credit-linked B (Loan Plus)	Meso Insurance
Who pays for the insurance	Farmer pays premium directly to insurer	Farmer typically pays premium through FSP	Farmer typically pays premium through FSP	FSPs, aggregators pay insurer directly, but farmer pays through higher interest rate
Who administers the insurance	Insurer	FSP	FSP	Insurer
What is insured	Some share of production	Only the loan	Loan plus some cash	Some share of loan portfolio
Who gets the claim payments	Farmer	FSP or farmer depending on regulations and agreements between FSP and farmer	FSP plus farmer gets residual cash	FSP
How is the premium collected	Farmer pays insurer	Added to loan amount	Added to loan amount	FSP pays
Voluntary component	Farmer chooses what to insure and how much	Insures value of loan plus interest plus premium May be compulsory	Insures value of loan plus interest plus premium plus some cash amount for farmer May be compulsory but not cash part	FSP chooses level of coverage and what risks to cover
Who bears administration costs of the insurance	Insurer	FSP but possibly shared with insurer	FSP but possibly shared with insurer	Insurer
Advantages	Protects overall debt repayment capacity of the farmer Direct insurance can reduce admin costs if the product can be sold through the FSP sales channel	No liquidity problem for farmer. Administration costs reduced by bundling with credit	No liquidity problem for farmer. Administration costs reduced by bundling with credit	Leaves FSP with discretion about how to handle individual loan delinquencies No basis risk Low administration costs for the insurer
Potential Challenges	Basis risk for farmers for index insurance. Potential liquidity problem for farmer High cost (to insurer) of administering the insurance	Basis risk for farmers for index insurance FSPs not given any discretion about how to handle individual loan delinquencies	Basis risk for farmers for index insurance FSPs not given any discretion about how to handle individual loan delinquencies	Farmers may still retain risks (affecting their demand) and uncertainty of what happens if they cannot repay Demand for meso level insurance depends on FSP diversification

De Los Rios (N.D.)[13] argued there are two benefits of designing index insurance to be sold to lenders. First, designing insurance products for lenders tends to reduce some aspects of basis risk. Second, portfolio insurance can help manage credit risk that will translate into increased investment and economic growth in vulnerable economies.

Collier, Miranda, and Skees (2013) utilized a model to test lender management of equity capital, and applied it to a micro-finance institution (MFI) vulnerable to El Nino related flooding in Peru. The results showed that disasters lead to large loan losses causing lenders to contract credit after the event, thereby slowing recovery for the affected economy. An insurance-like mechanism was introduced to transfer part of the MFI's disaster risk. A key result showed that insurance prevents the contraction of credit during the period following the disaster. It not only reduced its current vulnerability, but the MFI plans to increase financial inclusion in this vulnerable region. In another model tested with Peruvian MFIs, Collier (N.D.) argued that disasters may influence lending through three channels by changing: demand, the willingness of lenders to lend, and/or the capacity of lenders to lend (due to capital or liquidity constraints). His model results showed that lenders with the lowest pre-disaster capital ratios significantly reduce lending in the year a disaster occurs and in the following year. Through the use of borrower grace periods, some lenders may be able to delay loan write-downs and restructuring, so the full effect of capital losses due to disasters may be delayed until the following year. Transferring disaster risk for the FSP through the modeling of purchased El Nino insurance produced results showing an increase in credit supply during non-disaster conditions and reduced credit contraction following disasters.

Credit-linked Insurance in Value Chain Financing

In addition to the three types of insurance-credit linkages arrangements summarized in Table 1, there are also possibilities for linking insurance and credit in value chain financing. In recent years, the value chain financing approach has emergedas an additional way to reduce the barriers for agricultural finance. Agricultural value chain finance includes both the informal financial flows among actors within a value chain and the formal financial flows from outside the chains to agents within the chains (Miller and Jones, 2010; Quirós, 2010). These financial arrangements parallel the emergence of tightly organized agricultural supply chains created in response to higher quality standards demanded by domestic supermarkets and export markets. The success of these chains is often due in part to the efforts of agents or promoting organizations that train and mobilize farmers to participate, supply the necessary inputs, and ensure that quality standards are met. They also help organize and coordinate the services supplied by other actors within the chain located between farmers and consumers.

Credit-linked insurance can play a role in value chain financing for farmers in two basic ways. One way is for it to encourage financing between agents within the chain, such as contract farming and other schemes in which input suppliers offer in-kind and cash credit to producers, and buyers provide pre-harvest loans to secure output from growers. The agents can be cooperatives and farmer associations, agribusinesses, and lead firms in the chain. Various arrangements can be used such as tripartite agreements between FSPs, anchor firms and farmers. Anchor firms could provide some partial first loss guarantees to FSPs, and FSPs can

[13] The two undated papers authored or coauthored by Collier cited in this section are under review so the results summarized here may be revised in the final publications.

grant credit only to farmers whose loan payments are deducted from the value of the products they deliver to the firms. Loans made for value chain purposes are generally limited to amounts equal to the total value of the services and goods provided by the value chain lender with nothing left over to assist the borrowers' non-value chain needs. The second way is through loans from FSPs outside the chains to farmers participating in the chains. FSPs may react especially favorably to credit-linked insurance offered as part of a package of inputs supplied to farmers along with assured access to markets. Adding credit-linked insurance to the value chain financing system can then be viewed as yet another way to reduce credit risks.

A good example of using insurance within a value chain approach is a contract farming program offered by PepsiCo in India that is insured by the ICICI Lombard General Insurance Company (Box 3).

Box 3: Insurance in a Contract Farming Setting: PepsiCo's Program in India

PepsiCo in India offers voluntary index insurance to farmers participating in its potato program. The insurance is based on humidity levels and temperature[14] and is sold through the ICICI Lombard General Insurance Company, the largest private sector, general insurance company, and managed by Weather Risk Management Services (WRMS), a private broker and weather station operator. PepsiCo added voluntary weather index insurance to its farming package to limit farmers' weather risk, establish long-term relationships with farmers and limit the risk in its supply chain. Insurance plays an important role in a package of services and information for smallholders that includes: high quality potato seed; access to fertilizers, pesticides, and other chemicals; technical advice on production practices; fixed purchase price and incentives from the beginning of the season; weather information and advisories via mobile phone Short Message Service (SMS); and insurance. It sets a base buy-back price for its contract farmers at the beginning of the season and offers incremental price incentives according to: (i) quality of the potatoes; (ii) use of fertilizers and pesticides; and (iii) purchase of index insurance. The main drivers influencing a farmer to purchase index insurance include an assured buy-back price from PepsiCo, ability to finance the premium and other production costs through a loan, trust in the various actors involved in the supply chain, demonstration of timely payouts in previous seasons, and perceived need to mitigate the risk of losing the significant upfront costs of production, in part to cover the production costs for the following season. PepsiCo also encourages the purchase of index insurance through client education. Among the 24,000 PepsiCo contract farmers across nine state locations, around 50–60 percent elected to purchase index insurance — a high proportion driven in part by price incentives and conditions on state bank loans that require insurance. By 2013, the contract farming program was expected to reach 30,000 farmers. The program has provided claim payouts in almost all state locations over the last 5 years, with farmer retention rates in excess of 90 percent (IFC, 2012).

[14] Insurance is especially important because of the risk of potato blight, which totally destroys the crop for processing purposes when it occurs. The blight is induced by warm humid weather, so the nature of the insurance index and the value of forecast information on temperature and humidity conditions are important design features for blight.

There are limitations, however, to how far the objective of creating competitive and comprehensive rural financial systems will be served if FSPs limit loans to only those farmers who participate in value chains. First, only a relatively small share of smallholders currently participates in tight value chains and they are often the more commercially oriented farmers that are more credit worthy.[15] Second, there are doubts about how much smallholders actually gain financially from participating in such chains relative to other agents within the chains. Third, value chain finance focuses on the relatively narrow investment and working capital requirements of producers rather than the broader financial needs of farm households. For these reasons credit-linked insurance offered as part of a value chain financing system may be important for the success of farmers in the chain, but will likely have limited spillover effects outside this relatively narrow market niche.

[15]It is estimated that only 35 million of the world's 500 million smallholder farmers participate in tight value chains, meaning that they are generally less poor, operate at least two hectares of land and take a more business-like approach to farming than other smallholders. See Christen and Anderson (2013).

5. What situations May not be Well Suited for Credit-linked Insurance?

Like most innovations, credit-linked insurance is not a universal silver bullet to use for improving smallholder access to formal finance. Some examples of potential limitations follow. One of the important discoveries of microfinance was that, contrary to the hype, most market-oriented MFIs do not reach the poorest with microcredit, and perhaps they should not try to do so. Some households are so poor that they are best aided first with a transfer of assets, often coupled with training, technical assistance and conditional cash transfers, so they can make investments, generate income and eventually develop the capacity to repay high interest rate MFI loans. CGAP and the Ford Foundation conducted several field experiments that produced guidelines for implementing subsidized programs for the extreme poor prior to lending to them (de Montesquiou, et. al., 2014). This idea is closely related to the recognition that poor smallholders earn income from multiple sources, and often the income earned from crop and livestock enterprises is a relatively small share of total household net cash income.[16] Therefore, subsidies spent on increasing their agricultural income may be used more productively if invested in other interventions.

Many poor smallholders living in poor-resource areas may earn low rates of return on their resources and may not have access to better projects, so are not able to pay the high interest rates charged by sustainable FSPs. Some live in such risky environments (e.g. flood plains or drought prone areas) that actuarially fair insurance will be extremely expensive without huge subsidies. Even new agricultural projects may generate comparatively low rates of return in these environments so other forms of social assistance may be far more cost effective than crop insurance programs.

A broader, largely ignored, issue concerns the role of savings in financing agricultural projects. Just as access to credit, especially for consumption

[16] For a sample of smallholder families, the median proportion of household net cash income (i.e. revenue less any associated expenses, such as stock purchases for side businesses) from nonagricultural production sources was 93 percent in Mozambique, 74 percent in Tanzania, and 58 percent in Pakistan (Anderson and Ahmed, 2016).

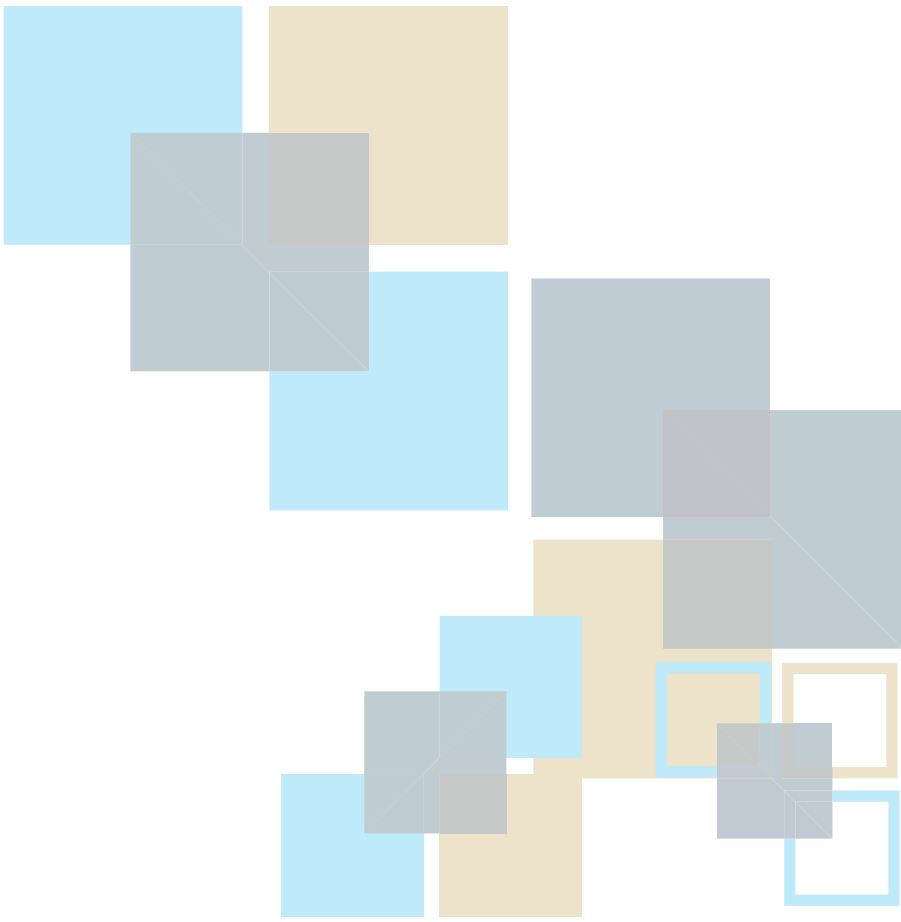
smoothing, serves as an insurance substitute, savings can also be a substitute for insurance (Farris and Miranda, 2015). If FSPs provided smallholders with better savings options, they could build up a financial reserve enabling them to avoid default in bad years. Savings would be less costly than insurance, though not necessarily as effective, because a) poor farmers might not be able to afford to build up a sufficient reserve to cover their loans, and b) unlike insurance, their reserve would not be large enough in the early years to pay off a loan or to repay in the event of a serious loss, or back to back losses.

Savings to self-finance projects is far less risky for the poor than borrowing, since savings can be used to offset any losses and not just those that arise from insurable risks. Savings may be less costly to subsidize than is insurance so it may be a far better source of project financing for some of the poorest compared to a credit dependent strategy. Some recent evidence on the role of savings for financing agricultural projects is emerging. For example, Brune et. al. (2016) found in a Malawi study that commitment savings accounts for smallholder cash crop farmers had substantial impacts on savings prior to the next planting season and on agricultural inputs used in the next planting season. FSPs are generally eager to attract new savings customers but the literature is filled with explanations about the factors that affect the ability of poor people to accumulate savings in large enough sums to self-finance major projects, or to simply accumulate for self-insurance purposes.

In another recent study, Carter et.al. (2016) conducted a randomized experiment in Mozambique exploring the interaction between subsidies for technology (mostly fertilizer subsidies) and savings interventions. It tested the theory that combining temporary technology subsidies with savings interventions could either promote technology adoption (dynamic enhancement), or reduce adoption by encouraging savings accumulation for self-insurance and other purposes (dynamic substitution). Recipients that received only fertilizer subsidies increased fertilizer use in the subsidized season and in two subsequent unsubsidized seasons. Consumption rose but they also experienced higher consumption risk. When the subsidies were paired with savings interventions (mainly financial education and matched savings), the subsidy impact on fertilizer use disappeared.

Instead the households accumulated bank savings which lowered the price of self-insurance so the insurance price effect dominated the input price effect. Interventions that alleviate savings constraints could lead to the dynamic enhancement of subsidies and higher persistent use of fertilizer once temporary subsidies end.

Creative ways of bundling savings with insurance may create value for both clients and providers. For example, evidence from MicroEnsure in Ghana shows that bundling savings and life insurance can increase insurance penetration and stimulate savings. Depositors who held minimum balances of US$60 each month were granted free life insurance with benefits up to US$180. Five months after product launch, bank deposits had increased by 19 per cent and deposits from clients with balances below US$60 increased by 207 per cent. Although the reasons are not entirely clear, anecdotal evidence from interviews suggested that many customers saved more because of the free insurance (Matul and Dalal, 2014). Similar attempts to bundle savings with agricultural insurance have yet to be reported, but would seem worth exploring.



6. Impacts of Credit-linked Insurance on Credit Markets

The three most obvious positive changes in formal agricultural credit that advocates for credit-linked insurance hope for are 1) increases in the amount lent to farmers in the market segments already being served, 2) expansion of credit to farmers currently excluded or underserved, and 3) improvements in the terms and conditions for credit granted to all market segments. These changes are expected due to the possible decline in loan default rates that could be associated with insurance indemnity payments. However, there could be several other changes, some of them more subtle, in the terms of credit offered and/or how it is delivered. Some could directly benefit the FSPs, while others might have greater benefit for the borrowers and thereby stimulate a greater demand for loans. Little evidence has been reported to demonstrate that these changes are actually occurring, but they need to be recognized as possibilities in future impact analyses. Otherwise, the benefits of credit-linked insurance might be underestimated.

Some examples of other potential benefits of credit-linked insurance include the following. Some FSPs that hesitate to lend to agriculture might be induced to begin to do so because of insurance. Some FSPs might increase average loan sizes (average loan/asset ratios). Others might reduce the amount of physical collateral required and/or begin to accept more collateral substitutes for loans. Some might expand beyond joint liability group lending and begin to offer more individual loans granted with repayments scheduled according to the borrower's projected cash flow. They might also offer longer-term loan maturities and more loans with fewer payments and/or more one-time balloon payments. With insurance as back up for repayment of delinquent loans, FSPs might introduce more flexibility in managing delinquencies with the hope that more delinquent borrowers would eventually repay.

The fact that many changes that occur in FSP products and procedures could be attributed to credit-linked insurance makes it difficult to demonstrate that any one change was especially critical or represents clear evidence of impact. Many things can happen simultaneously in credit markets over time so it is difficult to assess the impact of any particular one.

Most empirical case studies of credit-linked insurance fail to address these issues and simply describe the primary characteristics of the scheme, the major agents involved, and perhaps the number of smallholders that participate. Normally, only a small amount of information is provided about the financial environment such as the ability to utilize collateral or collateral substitutes to enforce loan contracts. A further limitation of most studies is that they provide only limited information about the benefits to farmers and FSPs, and virtually none provide evidence about the value to insurers.

The insurance literature has identified the limited demand by small farmers for insurance products unless heavily subsidized (e.g., Binswanger-Mkhize 2012), so it should not be surprising if they are also less than enthusiastic about having to purchase similar types of insurance bundled with their loans. What might make a difference is if the loan is attached to an investment project that gives borrowers access to a game changing technology or marketing package that raises their expected income by far more than the value of the risk reducing aspects of the insurance (Hess, Hazell and Kuhn, 2016; Carter, Cheng and Sarris, 2016). A review of available studies provided mixed results regarding the impact of credit-linked insurance on the use of or supply of credit[17]. For example, in an early Indian study, Mishra (1994) found there was a significant increase in the flow of credit to insured farmers after the introduction of the Comprehensive Crop Insurance Scheme. But Gine and Yang (2009) found that farmer demand for credit actually fell when bundled with insurance in a random control trial in Malawi. There was suggestive evidence that reduced uptake of insured loans was due to farmers already having implicit insurance through the limited liability clause in their loan contracts.

Another random control trial conducted in Ghana by Karlan et. al. (2011) found insurance made no difference to the demand for credit. One explanation for this result could be that the observed high rates of loan default may indicate that the FSPs already effectively had in place a flexible "loan forgiveness" program, so that additional indemnification had little impact on farmer behavior. Mishra et. al. (2017) found some evidence among rural banks in Ghana that insured loans have a significant impact on loan applications, especially increasing the likelihood of loan applications among female farmers. Basis risk can also undermine farmer perceptions about the value of the insurance and debt repayment discipline[18]. As Clark (2011) has shown, farmers can even be made worse off buying insurance if there is basis risk, since there may be years when they experience bad losses but do not get indemnified, yet have to repay the loan plus the insurance premium.

The impact of credit-linked insurance on FSPs can also be ambiguous. A simulation model analysis by Miranda and Gonzalez-Vega (2011) found that mandatory, unsubsidized index insurance for individual farmers can diminish a bank's internal rate of return because the high costs borrowers must pay for unsubsidized insurance discourages

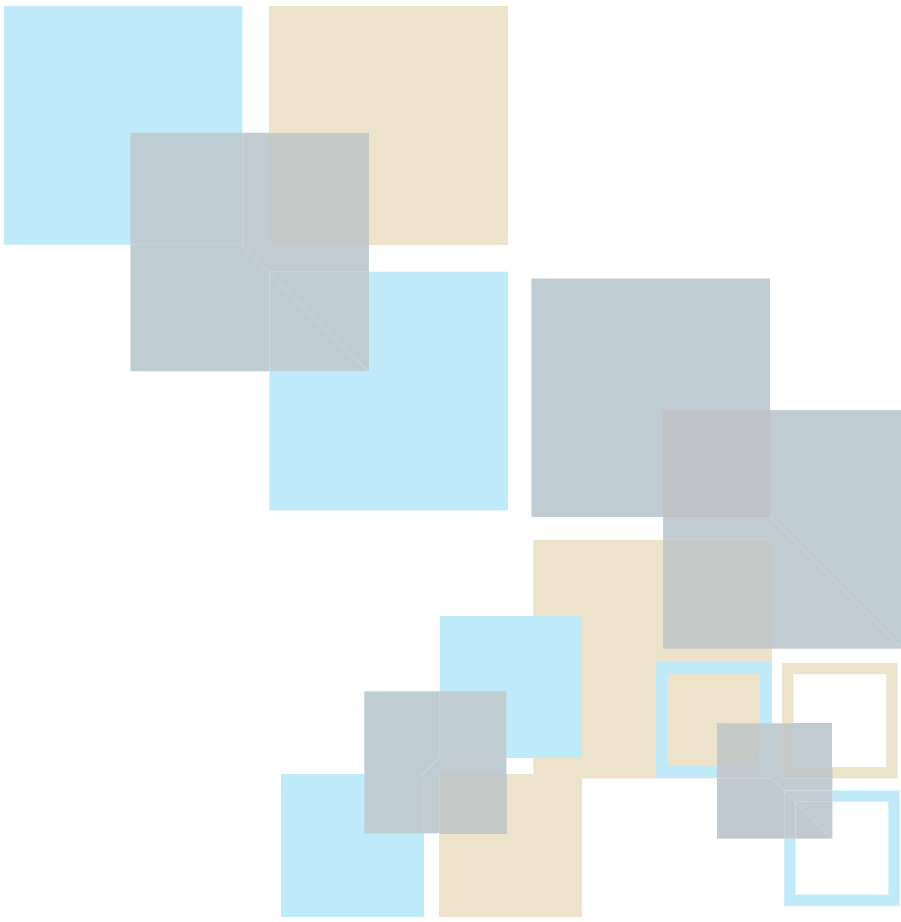
[17] A recent review (Marr, 2016) concluded that limited empirical research had been conducted on the impact of bundled credit products. The authors asserted that it is unknown to what extent credit suppliers would react to the insured status of farmers or what the preferences of farmers are when it comes to a mix of financial products.

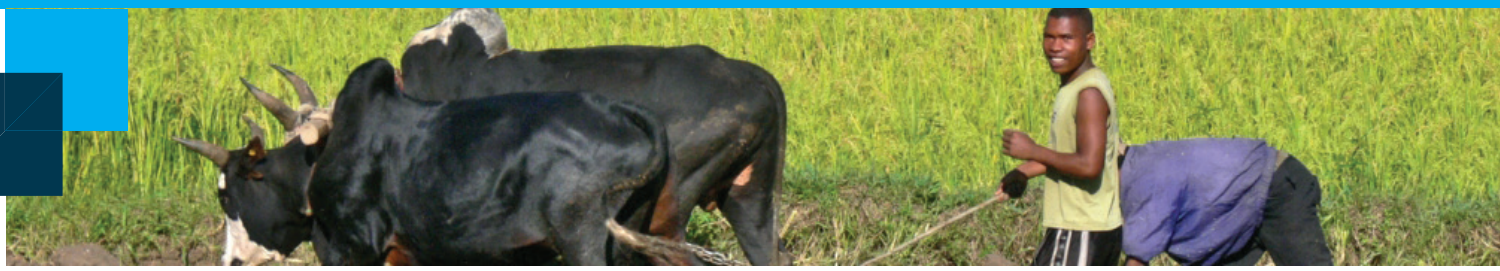
[18] One case was found in India concerning the bundling of microfinance with health insurance. A large (16 percent) of the borrowers were willing to give up microfinance to avoid purchasing the health insurance, and the majority of these clients ended up losing access to microfinance altogether (Banerjee, et.al. 2014).

them from repaying loans[20]. In a later simulation model, Farris and Miranda (2015) showed that banks earn higher profits through lower default rates when they utilize contingent insurance contracts in which insurance premiums are deducted from the borrower's loan and the indemnities are paid directly to the bank in the event of losses. Carter, Cheng and Sarris (2016) developed inter-linked theoretical models of farmers' demand for credit to adopt an improved technology, and of the willingness of lenders to supply it. They find that there are reasonable circumstances under which yield or weather index insurance formally linked with credit may lead to additional farm lending and hence technology uptake, whereas stand-alone insurance may have little impact. The impact of credit-linked insurance is greatest in environments where risk is high and largely covariate, and where farmers have limited collateral.

Based on the paucity and weakness of available impact studies, it is hard to draw firm conclusions about the effectiveness of credit-linked insurance in achieving its stated objectives. What can be concluded is that there is a real need for more comprehensive evaluation studies and which ought to be built into the design of future credit-linked insurance programs or projects.

[19] In their paper, contingent credit refers to a loan coupled with an index insurance contract that covers the value of the loan upon maturity. The premium is deducted from the loan value before it is disbursed. The bank is the insured agent but passes on the insurance costs to the borrower through a higher interest rate on credit. The bank receives any indemnities from the index insurance contract, which allows it to forgive the borrower's debts when adverse weather conditions occur (Miranda and Gonzalez-Vega (2011), p. 200).





7. Constraints on the Development of Credit-linked Insurance

If credit-linked insurance is seen by many as a win-win-win arrangement that is mutually attractive to farmers, FSPs and insurers, then why is it not developing spontaneously and more rapidly in many market-driven developing countries? An obvious reason is that farmers may be skeptical about the merits of their investment "projects" unless undertaken within a tight value chain that provides training and reliable access to inputs and markets, without which insurance alone will not ensure success. Another reason is that coordination and market failure problems may constrain the parallel and complementary development of agricultural credit and insurance markets. Both FSPs and insurers face set up challenges when launching new business models for smallholders. This is because of asymmetric information about smallholder problems and their likely debt repayment behavior, uncertain knowledge about the risks that smallholders face and which can be insured, few local branches to market and administer credit or insurance, high transaction costs serving smallholders, and systemic risk that requires building up a sufficiently large and diversified lending or insurance portfolio. There may also be coordination problems between insurance and credit. Lenders will be reluctant to lend to smallholders unless there is insurance, but getting insurers up to speed may take much longer and require public sector support in the form of investments in weather stations and data systems, farmer education, and even temporary subsidies to overcome some of the initial market failure problems (Hazell, Sberro-Kessler, and Varangis, 2017).

The initial set up costs for credit-linked insurance can be considerable for both FSPs and insurers. The costly process and subsidies involved in setting up and operating greenfield banks in Sub-Saharan Africa to serve clients generally ignored by existing banks provides insights into the high operating costs faced by large banks in developing countries (Earne, et.al. 2014). The complex process of transforming urban-oriented MFIs to successfully make agricultural loans has also been discussed (Meyer, 2013). This process frequently involves switching from the highly standardized group lending model used with urban clients to individual lending so credit terms and conditions can be adapted to the cash flow needs and capabilities of smallholder households. Hiring specialized loan officers with agricultural backgrounds and modifying management information

systems (MIS) are also key changes. Acceptable collateral substitutes need to be identified, and then alternative credit-linked insurance arrangements need to be tested for their impact on smallholder uptake and loan recovery rates.

The set up costs for insurers include things such as: a) cost of researching and designing insurance contracts that are attractive and affordable to farmers, b) cost of setting up and testing delivery systems, c) uncertainties about the risks to be insured, especially when there are limited weather stations and records (insurers handle this problem by adding a risk load to the premium, which hopefully goes down over time as they learn about the real probabilities), and d) the costs of obtaining some form of reinsurance, which can be difficult to obtain until the insurers have an established track record for a new product and related delivery system.

Even when all these supply side constraints to credit and insurance can be overcome, insurers face potentially low smallholder demand for their products (Binswanger-Mkhize 2012). Developing credit-linked insurance may then require that insurance be made compulsory, or else heavily subsidized, at least in the early stages until costs can be brought down.

Left to market processes alone, there are cases in which neither credit nor insurance may develop at a sufficient pace and scale to meet most farmer or societal needs, and there may be openings for proactive agencies and public policies and investments to help kick start the process.

8. The Role of Supportive Agents and Government Policies

Overcoming the constraints discussed above requires proactive agencies and supporting public investments and policies to help kick start the development and growth of credit-linked insurance. Of course, any public interventions should be guided by good ex ante evaluations demonstrating that the programs to be promoted are a worthwhile way to spend public funds for addressing small farm problems.

Supportive Agencies

Besides the FSPs and insurers that are directly involved in the design, testing and implementation of credit-linked insurance systems, there are many agents and organizations that can encourage or constrain success and help overcome coordination problems. First, as noted earlier, there is the important role played by value chain promoters. They may be unsubsidized such as private sector lead firms, cooperatives and farmer associations, and agribusinesses. But they may also be subsidized sources such as government extension workers, NGOs, and other providers of public goods helpful to farmers, FSPs, and insurers. In many of the case studies reviewed for this study, credit-linked insurance was initiated by third party agents, including international development agencies, donors, and foundations.

Public Investments and Services

Public investments play a key role in helping to establish an enabling environment for credit-linked insurance, and in overcoming some set up problems. For insurers, some key areas of public spending include: building and maintaining weather station infrastructure and data systems; supporting agro-meteorological research leading to product design; and educating farmers about the value of insurance. Private insurers are willing to make some of these investments themselves, but there is an inherent problem in that they may not be able to recoup their investment costs given the ease with which competitors can use the same knowledge and services once established. This is a classic 'public goods' problem that inevitably leads to insufficient private investment, and hence a need for complementary public spending.

Similarly, important sector-wide public goods investments are needed to improve the financial infrastructure in many countries that will aid FSPs to reduce credit risks and lending costs. For example, several Sub-Saharan African countries have recently created collateral registries and credit bureaus, and have strengthened warehouse receipts systems. Some countries are attempting to formalize land titles so they have more value and can be more easily transferred, even though it is recognized that land reforms, such as in Kenya, have not yet made a major impact on using land as collateral for loans (Meyer, 2015).[20]

Regulations

There is need for an enabling regulatory environment for finance and insurance if credit-linked insurance is to prosper. A fundamental requirement is the establishment of a legal and regulatory environment for enforcing contracts that both buyer and seller can trust. For example, farmers and FSPs need to know that insurers will fulfill their obligations to pay all claims due when an insured event has occurred. Additionally, laws and regulations need to be consistent with international standards to improve the chances of insurers gaining access to global markets for risk transfer. Unfortunately, in many countries, regulations are simply not in place to accommodate the development and use of index insurance products that are often key to credit-linked insurance for smallholders. Worse, in some countries regulatory agencies are re-imposing interest rate caps that will discourage FSPs from serving high-cost, high-risk smallholders. Human capacity building and technical assistance are often essential for preparing the legal and regulatory environment to govern credit-linked insurance and related products.

Subsidies

Temporary subsidies can sometimes play an important role in helping to launch or speed up the development of credit-linked insurance. For example, temporary subsidies might be justified when farmers, FSPs or insurers are initially uncertain about a new type of credit linked insurance product because they have insufficient knowledge to assess its real risks and benefits. In such cases, a premium subsidy might encourage farmers to purchase and experiment with a new insurance product about which they have no prior experience, much as seed companies sometimes give out free trial seed packets. Another example is when an insurer initially charges a high-risk loading for a new line of insurance because it has inadequate data to properly assess the actuarial risks, and the risk loading is expected to fall once the insurer has acquired additional data over time. In this case the government might want to subsidize part of the risk loading cost, or offer subsidized reinsurance during an initial learning phase (Carter et.al, 2016).

Subsidies might also be warranted when credit-linked insurance enables poor farm households to access credit and game changing technologies that can lift them out of poverty. In this case the underlying problem is often an inability of many poor farmers to bear the initial risk of adopting such innovations without subsidized insurance, and/or an inability to access credit without insurance because they are perceived to be high-risk borrowers by financial institutions. It is usually hoped that once they have successfully adopted the new technology and achieved a higher and sustained income, the subsidy can be phased out. However, for many of the poorest smallholders, this may be a forlorn

[20] Boucher et. Al. (2008) argue that risk rationing is an important reason for the limited impacts of land titling programs on investment and credit market participation in Latin America.

hope and the subsidy may have to be sustained over longer periods of time[21].

Care is needed in the design and implementation of subsidies to avoid inadvertently creating disincentive problems that lead to significant economic costs and inefficiencies (Hazell, Sberro-Kessler and Varangis, 2017). Considerable thought has been given to how best to design subsidies for extending financial and insurance services into rural areas and to serve more smallholders.[22] A key starting point is to select capable partner institutions for implementing the subsidized credit and/or insurance. Adding a subsidy to an already badly performing insurance, credit, or NGO program or project may make things worse, not better. Moreover, if the subsidy is intended to give a segment of poor farmers access to credit-linked insurance for the purpose of adopting game changing technologies and modern inputs, then the insurance should be channeled through credible institutions that can a) link the insurance to credit, b) ensure that access to credit also means access to complementary inputs, and c) can identify and efficiently reach the intended target group of farmers. All credit and insurance subsidies should be carefully rationalized with key policy makers, and the subsidies either need to be time-bound with explicit exit strategies, or there should be a longer-term plan in place for containing and financing the subsidy. Too often, subsidies lead to a political dynamic that makes their removal very difficult in practice, even when they have accomplished their initial objectives. To ensure subsidies are achieving their intended purpose, it is important to establish good monitoring and evaluation (M&E) systems, and undertake periodic evaluations.

Beyond these general recommendations, specific recommendations for subsidizing financial services include:

- Reduce distortions by subsidizing the institution and not the borrower;
- When subsidizing institutions, consider the interest rates to be charged relative to competing institutions so that competition is not undermined;
- Subsidies that create public goods to benefit the entire financial sector may generate higher returns than subsidies for specific institutions;
- Subsidies for institution-building are easier to justify if there is a natural positive spillover to other institutions in the same network or to nonsubsidized institutions; and
- Indirect subsidies that benefit many borrowers may generate more total benefits than direct interest-rate subsidies to borrowers.

Specific recommendations for insurance subsidies include:

- Wherever possible, avoid using the subsidy to lower the cost of insurance to farmers below the actuarially fair (pure risk) premium rate. If the insurance is targeted at commercial farmers, then

[21] A similar problem arose with subsidies to help launch microcredit for the poor. It was initially thought that poor borrowers who demanded credit had the willingness and capacity to repay high interest rate loans, and temporary subsidies were needed only to assist with start-up costs. Once the MFIs demonstrated their sustainability, commercial capital was expected to largely finance the sector (Cull, et.al. (2009). A recent analysis now casts doubts on that proposition. The study utilized proprietary data on 1,335 MFIs between 2005 and 2009 serving 80.1 million borrowers to calculate the costs of microfinance and the subsidies received by the MFIs (Cull, et. al. 2016). The results revealed that subsidies continue to be important in microfinance, even for older institutions. Unfortunately, the results were not calculated separately for rural/urban or agricultural/nonagricultural borrowers, but the general suggestion is that subsidization may be a permanent rather than a transitory feature for an industry dedicated to reaching poorer market segments. This implication needs further analysis but it is sobering for those who hoped that the spread of unsubsidized MFIs would eventually reach many smallholders.

[22] See the general discussion of subsidies and grants for agricultural finance in Meyer (2011) and more specific information regarding supporting agricultural and rural finance in Sub-Saharan Africa in Meyer (2015). See also a recent review paper by Hazell, Sberro-Kessler and Varangis (2017) on the rationale and guidelines for subsidizing agricultural insurance.

it is best if the subsidy is limited to the insurer's administration and development costs, including any high-risk loadings due to inadequate data about the risks involved. As such, the subsidy could be paid directly to the insurer rather than used to subsidize premium rates, or, if the aim is to subsidize high-risk loadings, offer the insurer subsidized reinsurance. If the insurance is targeted at a specific segment of poor farmers, then the subsidy will likely have to cover part, if not all, of the pure risk premium.

- Wherever the subsidy does include part of the pure risk cost, then practices should be adopted to reduce disincentive problems. These include restricting the amount of subsidized insurance farmers can buy for each insured crop, and structuring the subsidy in ways that respect the relative risk levels across insured activities. When the insurance is targeted at poor farmers, they could be asked to pay an in-kind premium by working on community projects that build resilience.
- Wherever possible, and especially for subsidized insurance intended for commercial farmers, the subsidy should be used in ways that crowd in private insurers and encourage competition among them.
- To avoid adverse distributional outcomes, cap the amount of subsidized insurance available to each farmer.

Alternative Policies

As with all public interventions, some thought should be given to alternative ways of achieving the same objectives, and whether those alternatives might be easier or more cost effective. We note that there has been little comparative work on how well credit-linked insurance stacks up against alternative policy instruments for achieving the same purposes of reducing borrowing risks for smallholders and FSP risks for lending to them. One alternative approach is the use of credit guarantees. Guarantees and insurance face some common challenges but they also have some different advantages so, depending on the situation, they can be complements or substitutes.

Just as insurance can be designed to cover specific enterprises for specific risks, credit guarantees can be designed to cover different types, purposes, and sizes of loans for specific categories of borrowers and regions. But guarantees have an advantage in that they can cover a wide variety of reasons for borrower inability to repay while insurance covers only specific insurable events. Both can be tied to individual loans, as with credit-linked insurance, or they can be tied to an FSP's aggregate loan portfolio, like meso insurance.

Both face potential moral hazard problems and can dampen borrower willingness to pay when they know their loan is coved by insurance or a guarantee. For this reason, lenders have to decide if they are going to inform borrowers that their loan is included in an insurance or guarantee package. Both must be designed so they are cheap enough to encourage borrowers and FSPs to use them but not so cheap that they will be abused. For example, it is often recommended that for guarantees, a substantial portion of the credit risk should remain with the FSP, often recommended at 50 percent, to avoid moral hazard and to incentivize the build-up of good credit practices (Zander, et. al., 2013).

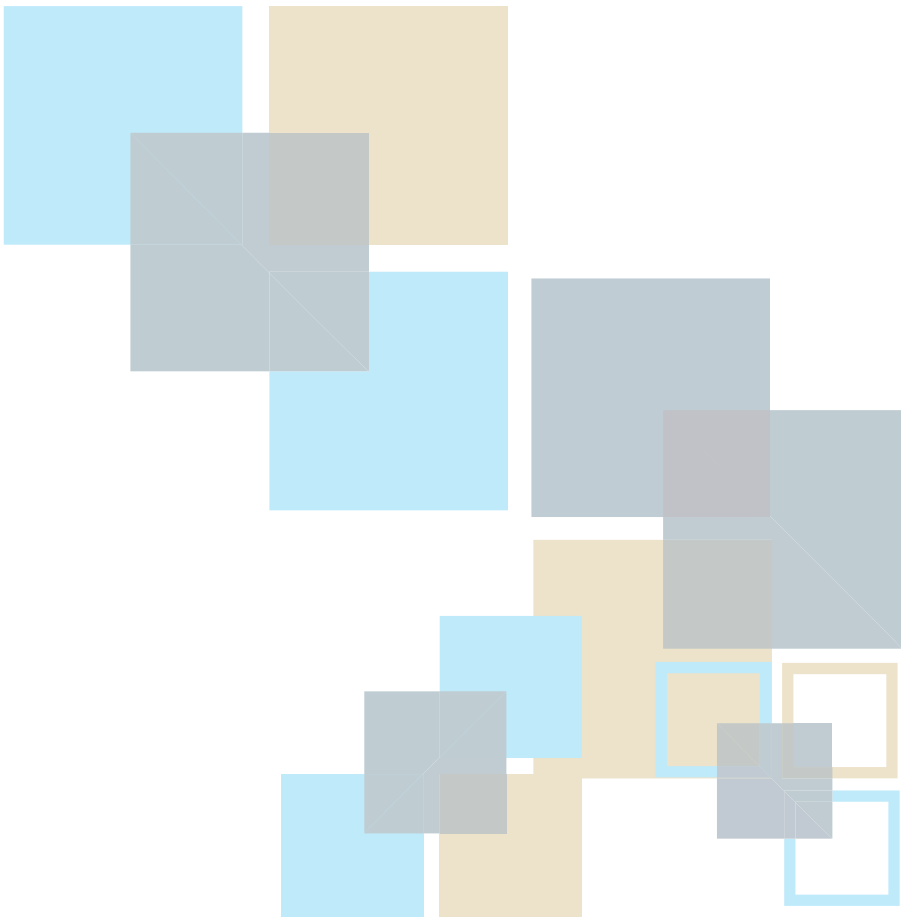
Some reviews of guarantee schemes have arrived at negative conclusions, especially about their cost-effectiveness and impact on additionality in lending. In the past, many guarantees have been poorly designed and managed, and as a result have not been sustainable without large subsidies. Large losses encourage guarantee administrators to drag their feet and delay payments to FSPs for losses, but this undermines credibility and discourages participation. Moreover, many impact evaluations of guarantees have been too poorly designed to

clearly demonstrate whether or not there was any additionality in lending, and this has helped feed a cynical view that guarantee schemes have often been developed as part of a show of political support for borrowers or FSPs without giving much attention to designing the guarantee in ways that promotes efficiency and sustainability (Honohan, 2010; Meyer, 2011).

On the other hand, many guarantee schemes have operated successfully for years. For example, an FAO study reviewed credit guarantee schemes for small and medium sized enterprises (SMEs) and farmers in India, Nigeria, Estonia, and Mexico. The analysis of these four countries (plus 13 other shorter case studies) led to the conclusion that they are "neither the panacea nor the preferred option for development finance that bankers tend to portray them as; however, neither are they doomed to fail, as their critics would suggest when referring to the disadvantages of the public funding and start-up subsidies that are usually involved" (page viii, Zander, et. al., 2013). Design and implementation arrangements matter for guarantees, and need to be adapted on a case by case basis.[23]

A combination of insurance and partial credit guarantees might be a preferred alternative when agriculture is subject to large exogenous shocks and loan portfolios are concentrated in small geographical areas. In such situations, guarantee funds may be too exposed if they protect FSPs from all sources of default, especially defaults due to systemic risks like regional droughts or floods. Either the guarantee fund needs to have some form of reinsurance or guarantee of its own, or the FSPs need to back up the guarantee by purchasing insurance of their own or ask its borrowers to buy their own insurance against such systemic risks. For example, in Sri Lanka, under the "New Comprehensive Rural Credit Scheme" or NCRCS, FSPs are backed by a guarantee in case of default by farmers. However, if a borrower experiences difficulty repaying a loan because of crop damage caused by a natural calamity such as a flood or drought, then the defaulter is classified as a "non-willful" defaulter and the FSP is expected to reschedule the loan rather than start legal action and claim the guarantee. In this situation, FSPs can benefit from a combination of guarantee and insurance, where the insurance covers loan losses due to natural calamities. Also, borrowers may have their own incentive to purchase insurance since this could help them avoid defaulting in the face of a natural calamity and having to restructure their loan, which may have negative effects on their future credit rating. The Central Bank of Sri Lanka provides credit guarantees under the NCRCS "… as a facilitation for the liquidity shortages that arise due to the non-payment of the expected loan repayment installments…". The arrangements of how guarantees are handled for willful and unwillful defaulters are described in the Operating Instructions manual for the New Comprehensive Rural Credit Scheme of the Regional Development Department, Central Bank of Sri Lanka.

[23] The World Bank and FIRST Initiative established a set of 16 Principles for Public Credit Guarantee Schemes for SMEs in 2015 to guide the design and operation of guarantees (World Bank, 2015).



9. Key Lessons

The literature consulted does not provide enough detail about similar cases in different circumstances to permit the development of a simple list of conclusions and good practice recommendations. There is a great deal of information about the limited uptake of crop insurance and the reasons for it. Several models have been created to show how FSP might benefit from credit-linked insurance but little data is available about what actually happens in practice. There are data about insurance costs and subsidies but little about the profits of insurers, the costly process of creating and testing products, building relations between FSPs and insurers, and the minimum scale of insurance required for viability. The literature does provide us with insights about issues facing the three parties so we offer here some preliminary conclusions or working hypotheses. What is clear is that the design of any scheme has to deal simultaneously with the interests of smallholders, financial service providers and insurers. Subsidies seem to be necessary at least to help cover startup costs, but the limited uptake by smallholder farmers may suggest the need for permanent insurance subsidies which raises the logical question, is this likely to produce the best return on scare resources?

Value to FSPs in offering credit-linked insurance. Obviously, the key reasons for FSPs to offer crop insurance is to reduce default risks, reduce the use of costlier and less efficient risk management techniques, reduce interest rates, raise profits, attract more clients, reach poorer smallholders, compete better with competitors, etc. Insurance helps credit in environments where the main default risks are due to specific systemic risks (e.g. weather), insurance contracts can be accurately designed and implemented to cover such losses, and borrowers lack other means of posting acceptable collateral for FSPs (Carter et al., 2016). Marketing insurance for insurers may also generate fee income. But if the FSPs administer the insurance as part of their loan process, they will also have to train and monitor loan officers or others who explain and market the product to smallholders, and provide incentives to staff members who take on additional tasks related to insurance.[24] If the FSP already sells

[24] Zimmerman, et. al., (2016) report the results of a study on the impact of different approaches used by a MFI to sell insurance.

or requires other types of insurance, say credit life, it will have to spend much more time educating smallholders about this more complicated and expensive product. If index insurance is used, it will have to explain the concept of basis risk, and effectively handle complaints from smallholders who experience losses but do not receive payouts. And it will have to deal with the potential defaults by those borrowers. An alternative to linking individual loans with insurance is for the FSP to purchase meso insurance for portfolio coverage to hedge its exposure against systemic risks that can cause many of its clients to default. The FSP would not need to cover each and every loan with such insurance (or hedge), the insurance would be cheaper (no need to retail it and does not cover every loan), and would have the discretion to use the insurance compensation as need be. Two main caveats exist. One is that we do not have yet many experiences in such meso-level insurance schemes to understand how well they might work. Second, is that the individual borrower could still default or have his/her loan restructured which may have negative impacts on the borrower's good credit standing and/or the borrower may still lose his/her collateral.

Use of insurance payouts by FSPs. If smallholders voluntarily buy insurance, then indemnities should be paid directly to them unless they have an agreement that the FSP should be the first claimant. Otherwise the smallholders would be reluctant to buy and to pay for it. If the insurance is embedded with the credit, then the FSP has more flexibility is deciding how to use the indemnities, subject to limitations established by banking regulations. If the FSP buys meso insurance, it should have more flexibility to manage problem cases, to decide which loans to forgive or write down without eroding clients' loan repayment culture, and to manage customers most affected by basis risks for index insurance.

Credit offered by FSPs versus by agents within value chains. Agents within value chains have some advantage over FSPs in lending to farmers and this may make them less interested in selling insurance. First, they gain information from operating in another market (e.g. as input suppliers or purchasing output from smallholders) that is useful for credit screening and evaluating the creditworthiness of smallholders, while FSPs have to engage in costly methods of acquiring and evaluating such information. Second, since they simultaneously operate in other markets, they may be able to exert market power and enforce loan contracts with smallholders dependent on them for access to scare inputs or product markets. However, there are limits to such power as competition grows with the entry of new firms, which can lead to side selling by producers. Third, agents have a more holistic relation with farmers as they deal with both physical purchases and financial transactions, which enables them to reduce costs and risks. Insurance can be part of a holistic package of access to markets, credit, inputs, and technical assistance that raises the level of technology, productivity and income. Insurance being part of such package (e.g. contract farming) offers significant advantages to both agents (e.g. agribusinesses) and farmers. However, such schemes are often limited to farmers within specific value chains and their scalability and replication may be limited. Fourth, compared to FSPs, agents are active in the field and are better able to closely monitor their farmer borrowers.

A problem faced by some value chain agents is that they are undercapitalized themselves and prefer to invest in their own businesses rather than make loans to farmers. Therefore, traders or buyers may enter into formal purchasing contracts with smallholders, which can serve as collateral substitutes for smallholders to use in obtaining FSP loans. Another limitation of agents is that they are primarily interested in fulfilling the financing needs of farmers related to producing the main crop the

agent handles. Farmers, on the other hand, have other financial needs beyond production loans that agents do not fulfill. Input suppliers that make loans to farmers would probably be less interested in credit-linked insurance unless they sell large amounts of inputs used in just one type of enterprise in a small geographic area. Large product buyers or agribusinesses, however, that process and sell large amounts of production, and have contracts to fulfill, would likely be more interested in requiring their borrowers to purchase insurance because their entire businesses can be impacted by a widespread shock affecting their sources of supply. Likewise, a large FSP with a large portfolio of loans concentrated in one or a few commodities might be more interested than a small MFI with a few loans to highly diversified smallholders.

Ability to enforce formal loan contracts. The environment within which FSPs operate can make a difference to their interest in insurance. If FSPs operate where correlated risks are significant, they need substantial collateral to mitigate credit risks, and where other forms of collateral are not available, insurance might serve as a useful substitute. When there are attractive opportunities to raise smallholder productivity, insurance may encourage farmers to borrow and adopt higher yielding technologies, and insurance may give the FSPs an additional nudge to lend to them. When the FSP can effectively and efficiently enforce loan contracts through the use of collateral or collateral substitutes, it will likely be less interested in credit-linked insurance than one operating in an environment that does not meet these conditions. Likewise, a FSP that is under government pressure to lend, to be lax about loan recovery, or to participate in loan forgiveness programs will likely be interested in obligatory credit-linked insurance if it has the authority to utilize indemnities as it chooses to do. However, using it to selectively write off defaulted loans could destroy incentives for borrowers to repay.

Mandatory versus voluntary insurance coverage. When insurance is directly linked with credit, the FSP has the choice of making the insurance compulsory for its borrowers, or allowing them to offer an alternative form of collateral. Making the insurance compulsory has the advantages of simplifying FSP administrative arrangements, reducing lending risks, and avoiding adverse selection problems for the insurer. Its drawback is that it may discourage farmers from seeking loans. This could happen for example with farmers who have other less costly ways of managing their risk, or who face basis risk when the insurance is index based, or who simply cannot afford insurance. In all cases the insurance might well be perceived by farmers as adding to the cost of their loan without offering any commensurate benefits. Another key difference between mandatory versus voluntary insurance coverage is how it may affect farmer behavior. When farmers must purchase insurance to get credit, they may be less aware of it and may behave as if they are not insured.

Investments and costs for the insurers. The insurers that participate in a credit-linked program have to develop an insurance product that will stimulate high borrower uptake, train the FSP to effectively market it, educate smallholders about its value, and perhaps pay the FSP an incentive because credit bundled with insurance will add to its workload and costs. Unless it is an index product, the insurer will have to monitor smallholder behavior to reduce moral hazard, assess damages, and determine the amounts of compensation to be paid to the insured. Some of these costs might be covered in a subsidized insurance program if it was evaluated as meeting a social objective.

Impact of credit-linked insurance. In reviewing the available literature and evidence on credit-linked insurance, we are struck by how little is really known about its effectiveness in overcoming credit constraints for smallholder farmers. A proper

evaluation would need to show how the insurance impacted the lending practices of FSPs, and how this in turn impacted farmers' access to and use of credit and the consequent impacts on their on-farm investments, productivity and income. For sustainability, it would also be important to evaluate the impact on the insurer, and whether the insurance is profitable enough for them to continue to offer it to FSPs and/or farmers. As discussed in Section 6, there are many dimensions to assessing the impacts of credit-linked insurance on credit markets and the provision of credit to smallholder farmers, and which are not adequately addressed in the available empirical case studies of credit-linked insurance. This leads us to one general recommendation: there is a real need for more evaluations and impact assessments of credit-linked insurance, especially when public funds are to be invested in providing relevant public services and subsidies. Such evaluations will require implementation of more formal Monitoring and Evaluation (M&E) systems built into the design of some credit-linked insurance programs and projects.

References

Anderson, Jamie, and Wajiha Ahmed. 2016. "Smallholder Diaries: Building the Evidence Base with Farming Families in Mozambique, Tanzania, and Pakistan." Perspectives 2, CGAP, Washington, DC.

Asfaw, Solomon, Bekele Shiferaw, Franklin Simtowe, and Leslie Lipper. 2012. "Impact of Modern Agricultural Technologies on Smallholder Welfare: Evidence from Tanzania and Ethiopia." Food Policy 37: 283–295.

Banerjee, Abhijit, Esther Duflo, and Richard Hornbeck. 2014. "Bundling Health Insurance and Microfinance in India: There Cannot be Adverse Selection if There Is No Demand." The American Economic Review 104 (5): 291-297. Papers and Proceedings of One Hundred Twenty-Sixth Annual Meeting of the American Economic Association.

Binswanger-Mkhize, Hans P. 2012. "Is There Too Much Hype about Index-based Agricultural Insurance?" Journal of Development Studies 48 (2): 187–200.

Binswanger, Hans P. and Mark R. Rosenzweig. 1986. "Behavioural and Material Determinants of Production Relations in Agriculture." The Journal of Development Studies 2 (3): 503–39.

Boucher, Stephen R., Michael R. Carter, and Catherine Guirkinger. 2008. "Risk Rationing and Wealth Effects in Credit Markets: Theory and Implications for Agricultural Development." American Journal of Agricultural Economics 90 (2): 409–423.

Brune, L., X. Gine, J. Goldberg, and D. Yang. 2016. "Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi." Economic Development and Cultural Change 64 (2): 187-220.

Calice, Pietro. 2016. "Assessing Implementation of the Principles for Public Guarantees for SMEs: A Global Survey." Policy Research Working Paper 7753, World Bank, Washington, DC.

Carter, Michael R., Rachid Laajaj, and Dean Yang. 2016. "Subsidies, Savings and Sustainable Technology Adoption: Field Experimental Evidence from Mozambique." Working paper, Innovations for Poverty Action, New Haven, CT.

Carter, Michael, Lan Cheng, and Alexandros Sarris. 2016. "Where and How Index Insurance can Boost the Adoption of Improved Agricultural Technologies." Journal of Development Economics 118: 59-71.

Christen R., and J. Anderson. 2013. "Segmentation of Smallholder Households: Meeting the Range of Financial Needs in Agricultural Families." Focus Note 85, CGAP, Washington, DC.

Clarke, D. J. 2011. "A Theory of Rational Demand for Index Insurance." Economics Series Working Papers 572, Department of Economics, University of Oxford, Oxford, U.K.

Clarke, Daniel, and Stefan Dercon. 2009. "Insurance, Credit and Safety Nets for the Poor in a World of Risk." DESA Working Paper 81, United Nations Department of Economic and Social Affairs, New York, N.Y. ST/ESA/2009/DWP/81.

Carlos and L. De Los Rios. n.d. "Enhancing Production through Credit and Insurance in Disaster-Prone Regions." Working paper.

Collier, Benjamin, and Jerry Skees. 2012. "Increasing the Resilience of Financial Intermediaries through Portfolio-Level Insurance against Natural Disasters." Natural Hazards 64: 55–72. DOI 10.1007/s11069-012-0227-0

Collier, Benjamin L., Mario J. Miranda, and Jerry R. Skees. 2013. "Natural Disasters and Credit Supply Shocks in Developing and Emerging Economies." Working Paper 2013-03, Risk Management and Decision Processes Center, The Wharton School, University of Pennsylvania, Philadelphia, PA.

Cull, Robert, Asli Demirgüç-Kunt, and Jonathan Morduch. 2009. "Microfinance Meets the Market." Journal of Economic Perspectives 23 (1): 167-192.

Cull, Robert, Asli Demirgüç-Kunt, and Jonathan Morduch. 2016. "The Microfinance Business Model: Enduring Subsidy and Modest Profit. "Policy Research Working Paper 7786, World Bank, Washington, DC.

de Montesquiou, Aude, Tony Sheldon, with Frank F. DeGiovanni and Syed M. Hashemi. 2014. "From Extreme Poverty to Sustainable Livelihoods: A Technical Guide to the Graduation Approach." CGAP and Ford Foundation, Washington, DC.

Earne, J. et al. 2014. "Greenfield MFIs in Sub-Saharan Africa: a Business Model for Advancing Access to Finance." Forum, CGAP and IFC, Washington, DC. www.ifc.org/wps/wcm/connect/b9813e8042e3dcce80a3ec384c61d9f7/CGAP-IFC+Forum%238+GF+Study.pdf?MOD=AJPERES

Farrin, Katie, and Mario J. Miranda. 2015. "A Heterogeneous Agent Model of Credit-Linked IndexIinsurance and Farm Technology Adoption." Journal of Development Economics 116: 199–211.

Gine, Xavier, and Dean Yang. 2009. "Insurance, Credit, and Technology Adoption: Field Experimental Evidence from Malawi." Journal of Development Economics 89: 1–11.

Gine, X, L. Menand, R. Townsend, and J. Vickery. 2012. "Microinsurance: A Case Study of the Indian Rainfall Index Insurance Market." In Handbook of the Indian Economy, edited by Chaten Ghate. Oxford, U.K.: Oxford University Press.

Harper, Malcolm. 2010. Inclusive Value Chains: A Pathway Out of Poverty. Economic Development and Growth Series, Vol. 4. Hackensack, N.J.: World Scientific.

Hazell, Peter, Rachel Sberro-Kessler, and Panos Varangis. 2017. "When and How Should Agricultural Insurance be Subsidized? Issues and Best Practices." World Bank/ILO working paper. Washington, DC. http://documents.worldbank.org/curated/en/330501498850168402/pdf/P162945-06-30-2017-1498850163245.pdf

Hazell, P. 1992. "The Appropriate Role of Agricultural Insurance in Developing Countries." Journal of International Development 4 (6): 567-581.

Hess, U., P. Hazell, and S. Kuhn. 2016. Innovations and Emerging Trends in Agricultural Insurance. Bonn and Eschborn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) https://lnkd.in/eVsH4xh

Honohan, Patrick. 2010. "Partial Credit Guarantees: Principles andPpractice." Journal of Financial Stability 6: 1–9.

International Finance Corporation. 2014. "Access to Finance for Smallholder Farmers." Washington, DC: International Finance Corporation. https://openknowledge.worldbank.org/handle/10986/21679 License: CC BY 3.0 IGO.

International Finance Corporation (IFC). 2012. "Innovative Agricultural SME Finance Models." Washington, DC: International Finance Corporation.

Karlan, Dean, Ed Kutsoati, Margaret McMillan, and Chris Udry. 2011. "Crop price Indemnified Loans for Farmers: a Pilot Experiment in Rural Ghana." Journal of Risk and Insurance 78 (1): 37–55.

Karlan, Dean, Robert Osei, Isaac Osei-Akoto, and Christopher Udry. 2014. "Agricultural Decisions After Relaxing Credit and Risk Constraints." The Quarterly Journal of Economics: 597–652.

Marr, Ana, Anne Winkel, Marcel van Asseldonk, Robert Lensink, and Erwin Bulte. 2016. "Adoption and Impact of Index-Insurance and Credit for Smallholder Farmers in Developing Countries: A Systematic Review." Agricultural Finance Review 76 (1): 94– 18. DOIhttp://dx.doi.org.proxy.lib.ohio-state.edu/10.1108/AFR-11-2015-0050

Matul, Michal, and Aparna Dalal. 2014. "Creating Client Value: Ten Blueprints for Microinsurance Providers." Creating Client Value Series, Brief 2, Microinsurance Learning and Knowledge. Microinsurance Information Facility, International Labour Office, Geneva.

McIntosh, Craig, Alexander Sarris, and Fotis Papadopoulos. 2013. "Productivity, Credit, Risk, and the Demand for Weather Index Insurance in Smallholder Agriculture in Ethiopia." Agricultural Economics 44: 399–417.

Meyer, Richard L. 2011. Subsidies as an Instrument in Agriculture Finance: A Review. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/12696 License: CC BY 3.0 Unported.

Meyer, Richard L. 2013. "Microcredit and Agriculture: Challenges, Successes and Prospects." In Microfinance in Developing Countries: Issues, Polices and Performance Evaluation, edited by Jean-Pierre Gueyie, Ronny Manos, and Jacob Yaron, 199-226. New York: Palgrave Macmillan.

Meyer, Richard L. 2015. "Financing Agriculture and Rural Areas in Sub-Saharan Africa: Progress, Challenges and the Way Forward." IIED Working Paper, IIED, London, U.K. http://pubs.iied.org/14652IIED.html

Miller, Calvin, and Linda Jones. 2010. Agricultural Value Chain Finance: Tools and Lessons. Warwickshire, U.K: Practical Action Publishing.

Miranda, Mario J., and Katie Farrin. 2012. "Index Insurance for Developing Countries." Applied Economic Perspectives and Policy 34 (3): 391–427. doi:10.1093/aepp/pps031

Miranda, Mario J., and Claudio Gonzalez-Vega. 2011. "Systemic Risk, Index Insurance, and Optimal Management of Agricultural Loan Portfolios in Developing Countries." American Journal of Agricultural Economics 93 (2): 399–406.

Mishra, Khushbu, Richard Gallenstein, Abdoul G. Sam, Mario J. Miranda, Patricia Toledo, and Francis Mulangu. 2017. "You are Approved! Insured Loans Improve Credit Access and Technology Adoption of Ghanaian Farmers." Working paper, Ohio State University. Written for presentation at the Annual

Bank Conference on Africa: "The Challenges of Transforming African Agriculture," June 1-2, 2017, Berkeley, CA.

Mishra, Pramod K. 1994. "Crop Insurance and Crop Credit: Impact of the Comprehensive Crop Insurance Scheme on Cooperative Credit in Gujarat." Journal of International Development 6 (5): 529-568.

Mukherjee, Premasis, Manoj Pandey, and Pranav Prashad. 2017. "Bundling to Make Agriculture Insurance Work." Paper 47, International Labour Office, Geneva. http://www.impactinsurance.org/sites/default/files/MP47.pdf

Prashad, Pranav. 2016. "Building Scale in Agriculture Insurance through Bundling with Financial and Non-financial services." The State of Microinsurance: The Insider's Guide to Understanding The Sector 2: 36-41 Microinsurance Network.

Quirós, Rodolfo (ed.). 2011. "Agricultural Value Chain Finance." Proceedings of the Academia de Centroamerica conference, "Agricultural Value Chain Finance," Costa Rica, February 22-24, 2010.

Seibel, Hans Dieter. 2000. "Agricultural Development Banks: Close Them or Reform Them?" Finance and Development 37 (2): 45–48.

Van Asseldonk, Marcel, Issoufou Porgo, Coillard Hamusimbi, Godwin Mumba, John Banda, Elodie Maitre d'Hotel, Tristan le Cotty, Kees Burger, and Gideon Onumah. 2015. "Is there Evidence of Linking Crop Insurance and Rural credit and its Potential Benefits?" FARMAF Policy Brief 1. www.farmaf.org.

Van Asseldonk, M, C. Burger, E. Maitre d'Hotel, B. Muller, T. Le Cotty, and G.W. Meijerink. 2013. "Linking Crop Insurance and Rural Credit." LEI Research report, Wageningen University and Research Center, the Hague, the Netherlands. http://library.wur.nl/WebQuery/wurpubs/fulltext/293554

Wenner, Mark, Sergio Navajas, Carolina Trivelli, and Alvaro Tarazona. 2007. "Managing Credit Risk in Rural Financial Institutions in Latin America." Inter-American Development Bank, Washington, DC.

World Bank. 2015. Principles for public credit guarantee schemes for SMEs. Washington, DC: World Bank Group. http://documents.worldbank.org/curated/en/576961468197998372/Principles-for-public-credit-guarantee-schemes-for-SMEs

Zander, Rauno, Calvin Miller, and Nomathemba Mhlanga. 2013. "Credit Guarantee Systems for Agriculture and Rural Enterprise Development." Food and Agriculture Organization of the United Nations. Rome.

Zimmerman, Emily, Jonathan Bauchet, Barbara Magnoni, and Vance Larsen. 2016. "Responsible Bundling of Microfinance Services A Mixed Method Evaluation of the Impact of Timing, Pressure, and Information." Working Paper, CGAP, Washington, DC.

www.indexinsuranceforum.org
LinkedIn Group: Global Index Insurance Forum

Global Index Insurance Facility
MANAGED BY WORLD BANK GROUP

IFC International Finance Corporation
WORLD BANK GROUP

www.ilo.org/impactinsurance
impactinsurance@ilo.org

IMPACT INSURANCE
International Labour Organization