FARM RISK MANAGEMENT for AFRICA PROJECT (FaRMAf)

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Linking crop insurance and rural credit

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1. Introduction

In many developing countries, farmers' access to credit provided by banks or special rural credit institutions has hardly been established or have fallen in disarray. Problems arise on both the demand side and the supply side.

Risk-averse poor families might decide not to borrow to invest in profitable activities if there is a reasonable chance that they will be unable to repay the loan. Farm households with little or risky cash income often fall into this category. The severe financial repercussions such households face will hamper demand (Clarke and Dercon 2009).

On the supply side, the administrative burden will hamper banks in developing countries from providing credit to farmers. Banks usually incur non-negligible administrative costs to manage a client account, regardless of how small the sums of money involved. Cost of processing loans, of any size, include the assessment of potential borrowers, their repayment prospects and security; administration of outstanding loans, collecting from delinquent borrowers and so on. There is a break-even point in providing small loans below which banks are reluctant to engage in a transaction. Poor farm households usually fall below this threshold. Moreover, the extremely poor collection efficiency of various credit lines has created a culture of non-repayment by farmers and this has become a major obstacle to commercial lending. Credit provision to agriculture has always been hampered by the large variation in revenues in farming, thus making it less (commercially) attractive to lend to this sector. A further constraint on such lending is the limited amount of collateral to securitize the repayment of the loan. Most poor people have few assets that can be secured by a bank as collateral. For the agricultural sector the most used collateral are land titles. Even if farm households happen to own land (which is

not always the case), they may not have effective title to it. This means that the bank will have little recourse against defaulting borrowers. Legal systems in many countries make it difficult to use land or real estate as collateral for agricultural loans and, even where this is possible, a bank may have difficulty enforcing its rights in case of default (e.g., homestead provisions in many countries' laws make it impossible for a bank to take possession of a farmer's principal home). Banks may also be reluctant to call in a loan because farm families would have to end their business and sending them into severe poverty.

Financial engineering techniques can help by shifting the risk of lending from the farmer (a credit risk: will the farmer pay?) to the crop (a performance risk: will the crop be produced?). African farmers are exposed to a high degree of weather-related risks, especially drought, that severely affect crop yields and destabilizes their farm income. The chance of adverse weather events such as severe drought varies between 1/20 and 1/5 in semi-arid climate zones. In the event of a major covariant shock, lenders might well anticipate political pressure and forgive outstanding debt rather than cause farmland to be reposed (Carter 2012). Note that in a rural setting, demand for credit typically coincides with adverse weather conditions. The lending bodies therefore face high demand for credit at such time, as well as high risks of defaulting on earlier loans. Such shocks may well threaten the viability of the agricultural banks and rural credit operations. Covariant shocks are less of a concern for lenders which have a more diversified portfolio across regions and sectors.

Smallholder farmers in Africa have, till now, limited options in managing these crop risks because of severely underdeveloped insurance markets. Insurance is an ex-ante measure to cope with crop losses by smoothening farm income. The risk of a loss is transferred from one entity to another, in exchange for a premium, and can be thought of as a guaranteed small loss (i.e. paying a premium) to prevent a large loss (e.g. loss of harvest).

The goal of this paper is to provide more insight into the impact of linking crop insurance and credit. First, relevant literature of the theory and an overview of the empirical findings is elaborated on. Second, the impact of two cases, namely a credit-based insurance in Zambia and a weather index based insurance in Burkina Faso, is explored.

2. Theory of the impact of linking crop insurance and credit

2.1 Theory of linking crop insurance and credit

Insurance arrangements complement on-farm efforts to mitigate yield risks (Kleindorfer and Kunreuther 1999). Insurance adoption can be rationalized in the face of an uncertain future whereby risk averse individuals will place a value to transfer adverse outcomes (Smith 1968). This impact is referred to as first order insurance effect (Figure 1). Adopting crop insurance may affect the mix of crops facilitating specialisation as farmers' need for self-insurance declines (referred to as second order insurance effect in Figure 1). Since the production plan may change, the merit of insurance cannot be assessed without considering the potential impact on the risk-efficiency of net returns from the whole portfolio of farm-specific risky prospects.

Financial constraints potentially play a key role in insurance participation decisions. On the one hand, credit-constrained households may value the reduction in income volatility provided by insurance more highly, because they have less ability to smooth consumption ex post (i.e. after adverse weather event). On the other hand, at the start of the production season, when insurance purchase decisions are made, credit-constrained rural households may have limited funds available with which to purchase seeds, fertilizers, and other input materials. Even if such households are risk averse and would benefit from insurance, the shadow value of liquid assets may be extremely high at such times, making the purchase of insurance unattractive (Clarke and Dercon 2009). Moreover, high-return economic activities typically require significant up-front investments. This factor alone increases the risk exposure of the family as a drought year means negative, not just zero, net income (Carter 2012).

Credit can also be an important tool to smooth income (Anderson 2003). First, in a direct way: farm households can borrow money to purchase food or other basic necessities when they lack the income and repay once they harvest and sell their crops (referred to as first order credit effect in Figure 1). Second, in a more indirect way: farm household often use credit to purchase inputs needed for farming (such as seeds, fertilizer, equipment) to enhance income from farming. Again, after the harvest they can repay their debts (referred to as second order credit effect in Figure 1).

If too limited collateral is present, banks might require crop insurance to securitize the repayment of the loan. In this sense crop insurance facilitates credit to enhance income (i.e. interaction effect in Figure 1). Moreover, a common problem for banks with geographically limited loan portfolios is the threat of correlated risks that hinder the provision of credit. The presence of correlated risk poses a dual problem for lenders: (a) a disaster event implies the potential for much higher default rates among agricultural clients; and (b) additional liquidity problems as clients simultaneously draw down savings and increase demand for borrowing to cope with the disaster (Skees and Barnett 2006;

Skees, Hartell et al. 2007). The presence of crop insurance will therefor ease the credit constraints for rural lenders.

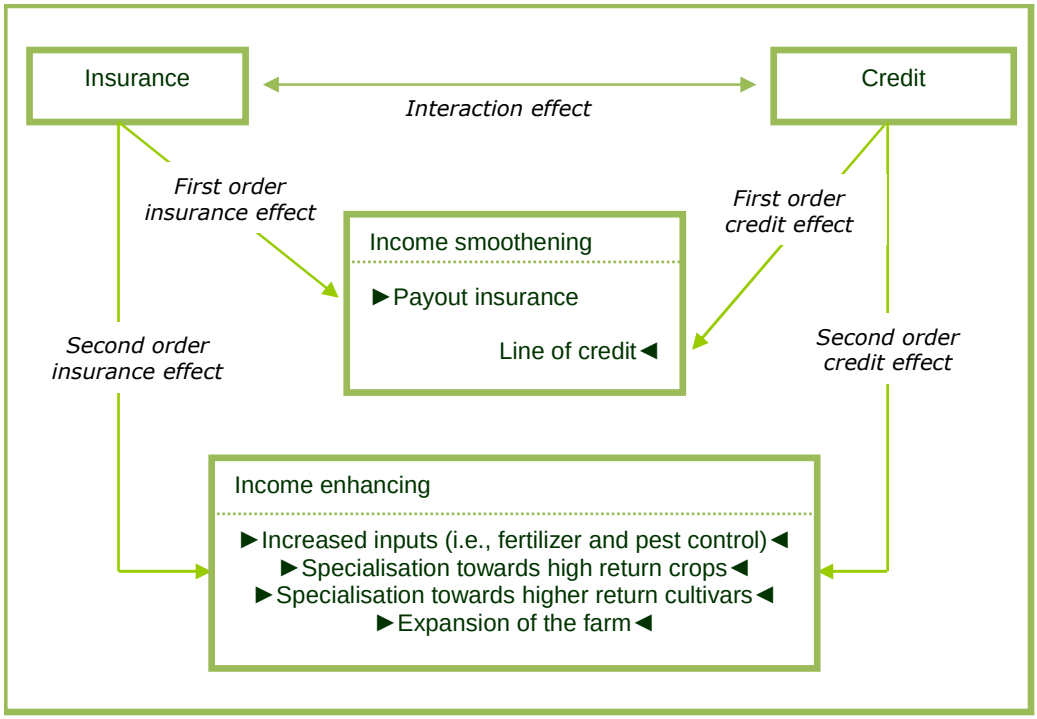

Figure 1: Impact of interlinking crop insurance and rural credit

Although credit and insurance have similar first order effects, they complement each other. Insurance specifically addresses risks occurring seldom but causing substantial losses, while self-insurance by using savings or credit addresses risks occurring more frequently but causing relative minor losses. Thus both insurance and credit are important tools for smoothening and enhancing income and will manifest themselves as high-return economic activities (i.e., increased input and specialization) and farm expansion.

Because the insurance market is under developed, farmers in Africa usually rely on traditional self-insurance strategies that are a combination of ex ante risk mitigation strategies and ex post coping strategies. For example, they may maintain reserves of inventories and financial assets to get through hard times. These strategies not only provide limited protection against severe negative shocks, but quite often also leave remunerative but risky economic opportunities unexploited. Risk is therefore a development problem precisely because it forces small-scale farmers into self-insurance strategies (Carter 2012). Furthermore these risks hamper the development of rural financial markets in development countries. Limited access to credit makes it harder for small-scale farmers to capitalise on and move forward with new technologies and market opportunities, compounding the adoption problems for liquidity-constrained farm households (Carter 2012). On the other hand credit has costs

and also the leverage effects magnifies risk. Even quite poor people can save to build up reserves for a rainy day or for investment. A secure banking system that offers a reasonable return on savings may be all that is needed.

While compelling on their own, the linking of credit and insurance potentially offers important advantages. In general, if insurance provision is planned where credit operations are present, linking these contracts will be beneficial for the sustainability of the credit schemes. Firstly, the provision of crop insurance protects farmers, at least to some extent, against the down-side financial risk of crop failure, preventing default of the farm. Subsequently, if the security is sufficient to repay the loan in the event of a crop failure, the lender bears lesser credit risk. Secondly, a possible mutual interest exists by optimally internalizing the different incentive, monitoring and enforcement problems (Clarke and Dercon 2009). This cost efficiency argument also holds for marketing the products. However, any resulting market power would require careful regulation, offering a crucial role for regulatory bodies for microfinance activities (Clarke and Dercon 2009).

Neither credit nor insurance markets are likely to emerge independently in low-collateral environments, and agriculture technologies and income are likely to stagnate (Carter 2012). Even if lenders are willing to grant loans with a no or low level of security, they will need to charge higher interest rates in order to price in the default risk as a result of harvest failure (Carter 2012).

2.2 Review of empirical analysis impact crop insurance

The ultimate impact of insurance and/or credit uptake can thus be measured in terms of reduced volatility (i.e. first order) and enhanced income (i.e. second order). Note that both insurance and credit have costs and the 'first-order' effect of both is to shift the income distribution downwardly. The benefits in terms of higher income combined with a shorter negative tail should be sufficient to compensate for these immediate costs. The attribution of the changes in indicators can be assessed as well (e.g. increment yield-enhancing inputs or level of specialisation).

The ideal approach would be to measure the impact by means of a randomized controlled trial so that eventual differences between groups can be attributed to the intervention. However the bulk of empirical studies are based a post-test-only design using basis of a cross-sectional data. Moreover, research has focussed mainly on determinants of adoption rather than the impacts on adopters.

In the paper by Coble et al. the farmer's net worth (wealth) showed a significant impact on whether or not to purchase crop insurance (Coble, Knight et al. 1996). Sherrick et al. found that the size, age, off-farm income and debt-to-asset ratio were also significant determinants (Sherrick, Barry et al. 2004). In the study by Mishra et al., purchased crop revenue insurance coverage was correlated

with the value of production, soil productivity, farm diversification, hedging contracts and age (Mishra, Nimon et al. 2005). Smith and Goodwin found that crop insurance purchase was correlated with use of chemical inputs, relative risk aversion and debt-to-asset ratio (Smith and Goodwin 1996). Mishra and Goodwin (2003) showed that a purchase of crop insurance coverage was caused by education level of the farmer, age, debt-to-asset ratio, participation in government programs, value of production, soil productivity, off-farm income, indemnity, hedging contracts and type of ownership. Net farm income had a negative impact on the probability that a farmer would purchase crop insurance, implying that they would prefer to accumulate their core profits to self-insure instead of spending it on insurance (Ogurtsov, Van Asseldonk et al. 2009).

Longitudinal crop insurance studies that measure the within farm performances over a long time horizon are limited. For example, O'Donoghue et al. (2009) estimate how much enterprise diversification changed in response to crop insurance uptake. Their analysis exploits farm-level panel census data to compare farm-specific changes in enterprise diversification over time. By examining diversification decisions of the same farms over time, the time-invariant unobserved individual heterogeneity was controlled. Crop insurance uptake caused a modest increase in enterprise specialisation and production efficiency. However, estimated efficiency gains were far less than the subsidies provided (O'Donoghue, Roberts et al. 2009).

Empirical studies addressing the interaction between crop insurance and credit focus mainly on the correlation between insurance uptake and debt-to-asset ratio. The correlation found between these two variables does not automatically imply that insurance uptake causes more credit taken, it could also be that banks require insurance. Moreover, a pair-wise statistical relationship, based on cross-sectional or longitudinal data, is too limited to evaluate the joint effect of insurance and credit.

3. Case studies impact insurance and credit

3.1. Credit-based crop insurance in Zambia

The case focuses on the Agrisure policy issued by the Zambia State Insurance Company (ZSIC). Although the cover is marketed via different channels we will restrict ourselves to the mainstream which is sold by the Zambia National Farmers' Union (ZNFU). Approximately 350,000 smallholder farmers are member of ZNFU, which represents 30% of all small-scale farming households in Zambia. The farmers have to pay an equivalent of US$ 10 as membership fee, therefore only farmers who are able to market their produce and are willing to pay for ZNFU's services (such as market information) will join ZNFU. One of ZNFU's objectives is that, by 2015 10% of their members (i.e. 35.000 farmers) should have access to finance.

3.1.1. Coverage and deductible

Up to season 2011/2012 only maize was amenable for insurance. Maize is the dominant food crop as well as cash crop in Zambia. More than 80% of Zambia's total maize output was produced at a substantial lower cost per unit than the Food Reserve Agency (FRA) buying price per unit (FSRP/ACF and MACO, 2011).

Peril covered by the Agrisure policy include damage or destruction of crops caused by natural events such as drought, lightning, flood, hailstorm and fire. In case of calamities ZSIC indemnifies the cost of inputs for which credit was obtained. The insurance company carries out pre-harvest assessments (4 per district). The agricultural inspector will write down the recommendations he has given to farmers with regards to improve farming practices. In case of a claim, the inspector will check the recommendations were implemented. The claim is not eligible if the agricultural recommendations are not followed.

3.1.2. Premium

In 2008 the insurance started with a premium set at 5% of the insured amount. Currently, the premium has been reduced to 4%. Premium differentiation to discriminate between exposure units more or less at risk is absent. Currently ZNFU pays for all support they provide to make this scheme functional and they are discussing how best to make this scheme self-sustainable.

3.1.3. Link with credit

The Agrisure policy is linked with the Lima credit scheme of the National Commercial Bank Limited (known as ZANACO) of which Rabobank has a share of 49%. The Lima credit scheme is developed for smallholder farmers. The Lima credit scheme is demand driven having originated as a need for financial services demanded by ZNFU smallholder farmers participating under the "Core Support Program" and funded by the Governments of Finland, Sweden and Netherlands. The objectives of the Lima scheme is to provide smallholder farmers without collateral with commercial agricultural credit services based on Group Savings and Loans (GSL) approach.

The Lima credit scheme targets smallholder farmers average loan sizes of US$600 –US$700, who are able to produce for the market (beyond subsistence) and practice farming as a business, or have the potential to practice farming as a business. The program target farmers, organizing themselves into groups of 10-20 farmers based on mutual trust, reputation and commodity focus.

A smallholder farmer deposits 50% (of the full supply of his input requirements) in a fixed term collateral account. Interest payments on his deposit amounts 4%, which is lower than inflation. In

addition, the ZSIC Agrisure policy is mandatory and the District Farmers Associations (DFA) has to co-guarantee the loan. Input suppliers deliver on order from ZNFU to respective destinations where the DFAs management is responsible for distribution to farmers. ZANACO pays the invoice of the input supplier on confirmation of successful completion of the contract by ZNFU. When the Lima credit scheme first started, the interest rate was 26%, soon reduced to 21% and now stands at 11% (best interest rate for loan in Zambian Kwacha is currently 16%). According to the evaluators of the Lima Credit Scheme (2012) the mutual financing structure and the 50% cash collateral offered by farmers makes it much more attractive to banks to lend to smallholder farmers.

The Lima credit scheme funds farmers up to 5 hectares. Nine ZNFU field facilitators are responsible to provide extension support and ensure that farmers who have received the Lima credit correctly apply the farm inputs.

3.1.4. Market uptake

Started in 2008/2009 season the granted credit and thus exposure by ZSIC was US$ 64,790 in two DFAs, while in 2011 this was increased to US$ 3.98 million (Table 1). Approximately 10.300 hectare has been insured in 25 DFAs. Benefiting farmers have increased from 600 to 4,723 over the same period (Figure 2). The Lima scheme has recorded a 100% recovery rate, a feature not common with agricultural loans especially among small-scale farmers (Lima Credit review, 2012). ZNFU envisages to reach 10.000 farmers in the 2012/2013 agricultural season and ultimately reaching 35.000 farmers.

Table 1: Key characteristics of Lima credit and insurance scheme for maize

Year	Lima credit and insurance scheme				
	Credit (US$)	Number of farmers	Hectares	DFA	Yield (ton/ha)
2008/2009	64,790	600	600	2	1.75
2009/2010	643,290	1,334	2,229	15	2.50
2010/2011	1,067,258	1,511	3,320	18	3.20
2011/2012	3,983,871	4,723	10,300	25	
2012/2013		10,000			
2015/2016		35,000		40-50	

Figure 2: Lima members per region in Zambia (% of total Lima members)

3.1.5. Outlook and contribution of FaRMAf

The success of the Lima credit scheme hinges on functioning of the markets. Initially Lima only focusse on maize production, and many farmers were selling their maize to the FRA. FRA offers high market prices, but there were problems with late payments by the FRA. Problem with these late payments by the FRA is that farmers do not have a commercial contract with them, which stipulates the payment date and penalties in case payment comes late. Yet the farmers have to pay the interest rates for their Lima loan, a fine if they reimburse late, and he may not have funds to prepare for next season. Therefore, ZNFU proposed for more flexibility in the Lima credit scheme.

ZNFU has received funding from the Finnish embassy for a four year expansion program (starting in 2012) during which it will:

1 • Expand the scheme from the current 25 DFAs to 40-50 DFAs. This will lead to increase in small-scale farmers accessing Lima credit to 35,000 (at least 35 % female farmers).

2 • Incorporate into the Lima other field crops, livestock, vegetables and asset finance.

3 • Create more competitive financial service packages for small-scale farmers that not only provide access to seasonal credit but also provide access to short, medium & long term inputs & asset finance.

4 • Enhance the ZNFU Lima development and management capacity through establishment of Lima development at ZNFU HQ level and strengthening Lima support capacities at DFA and IC levels.

5 • Leverage the 50% Lima farmer deposit (US $ 1.8 million in the current 2011/12 season) for more competitive Lima loan provision by the private sector financing institutions, to expand the number of Lima financial services partners beyond ZANACO.

The FaRMAf team supports the Lima scheme and the aforementioned expansion plans. The FaRMAf budget can be targeted to the following specific elements (the high-level description is ordered from research activities to more capacity building activities):

Action 1 • Reviewing the risk-adjusted cost of borrowing to determine the true cost of Lima credit with the insurance option, so ZNFU and other farmers' organisations have an objective basis for negotiating with the banks and insurance companies. A more competitive Lima loan provision by the private sector financing institutions might not only manifest itself in lower interest rates but also lower cash deposits requests.

Action 2 • Quantifying the impact of the Lima scheme and modalities of it. As the Lima scheme is to be rolled out to another 15-25 DFA's starting this year, it provides opportunities to monitor & evaluate the impact that access to the comprehensive Lima scheme has. To this end, implementation in the new DFA's could be done with randomized assignment of the Lima scheme to DFAs within the eligible regions. This provides for 'treatment' and 'control' groups.

In addition, and subject to discussion with the Lima-organizers, the modalities of the scheme can be modified so as to test their effectiveness. Hence, the intervention is multi-dimensional and any assessment of it should account for this. The Lima credit and insurance scheme can be decomposed into at least five elements of which the financial contracts for obtaining credit and insurance are the most prominent ones (Figure 3). However, the scheme also collectively negotiates and supplies seed and fertilizers to its participants. Moreover, agricultural inspectors recommend participants to optimise their farming practices. Finally the scheme is a group-based model thereby reducing transaction costs and utilised peer pressure in order to maximise loan recovery.

Quantifying the attribution of the individual elements is even more challenging than quantifying the overall impact of the scheme. A full-factorial design to determine the additive and interactive effects would require 2^5 =32 experiments. The evaluation of all possible profiles by experiments would be an extensive task, if possible at all. Since the insurance decision is not a voluntary option within the ZNFU scheme, we propose to evaluate the option of providing pre-harvest assessment without Lima (Figure 3). Other suggestions to design a set-up in which the farmer is insured without the link to credit, or the farmer can take Lima-credit without the link with insurance are difficult to implement since the market (i.e. farmers and banks) will be reluctant to participate.

The impact of group credit could be an interesting option as a case of collective action (in this way this part of the FaRMAf project will be linked with the efforts being made to develop and/or evaluate the other systems in another part of the FaRMAf project).

For efficiency reasons the control group comprising farmers without Lima uptake are also the control group to evaluate the other systems in another part of the FaRMAf project.

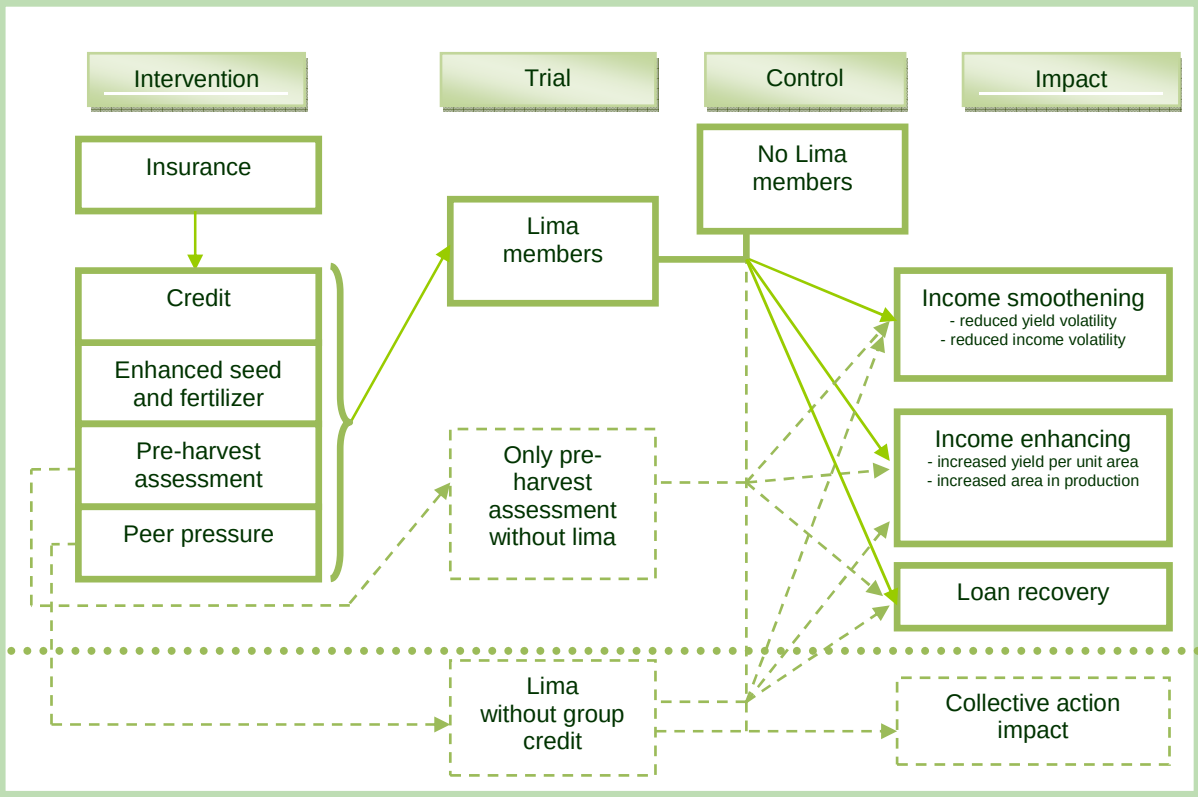

Figure 3: Impact assessment of Lima credit and insurance scheme in Zambia (dashed trials are optional)

Action 3 • The Lima Scheme is currently facilitating the production of maize. This implies that if the government exits the grain market with its substantial price support the economics of participation in the scheme may change. This means there is need to pursue the options to expand to include other commodities, namely soybean and other beans (which is already being considered). Moreover the access to innovative marketing systems should be promoted such as the WRS and exchange (in this way this part of the FaRMAf project will be linked with the efforts being made to develop the two systems in another part of the FaRMAf project).

Action 4 • Besides budget to monitor the impact of Lima, also capacity building activities need to be pursued. The ZNFU Lima development and management capacity could be enhanced through establishment of a “Lima development Office” at ZNFU HQ level. The “Lima development

Office" should handle all credit and insurance issues in close contact with banks and insurance companies. Since ZNFU should be flexible to expand the number of Lima financial services partners beyond ZSIC and ZANACO it is essential that ZNFU has this capacity in-house. Moreover, Lima support capacities of extension officers at DFA's could be strengthened.

Action 5 • Strengthening farm lobby by ZNFU with respect to a wide range of agricultural policies which ultimately improve access to credit (possible linked with insurance).

3.2. Index-based insurance in Burkina Faso

PlaNet Guarantee initiated a project to develop index based insurance in four WAEMU countries, including Burkina Faso. PlaNet Guarantee is setting up the first regional management platform dedicated to index-based insurance, which is based in Senegal with satellite branches in other countries in West Africa. The project will establish partnerships with local insurance companies and international reinsurers. In the short term, the project aims to contribute to improved access to finance for farmers and in the long term to improve food security. An index based insurance contract can present a significant economic efficiency in Burkina Faso (Berg, Quirion et al. 2009).

The technical partners are Allianz Africa for insurance, CVECA and MECAP for credit, EARS for satellite tracking indices and Swiss Re for reinsurance. In Burkina Faso, 6 micro finance institutions market the PlaNet Guarantee cover in 2011/2012.

The main activities focus on (1) coordination with financial and technical partners, (2) engineering design of the tool insurance, (3) training organization, and (4) supporting insurance uptake. This experience is financially supported by OXFAM (2011-2015), the World Bank via the Global Index Insurance Facility (GIIF), a program of the International Finance Corporation (IFC) launched in 2009 (2011-2015) and the foundation AGRA (2009-2012). GIIF is funded by the European Commission, the ACP Secretariat, and the Japan Ministry of Finance.

3.2.1. Coverage and deductible

The pilot scheme covers drought risks in maize. Maize is selected since it requires relative high amounts of inputs and output is more volatile than for example millet and sorghum which are more resistant to drought. The system works by a combination of crop insurance and a rural credit facility. Pay-outs are triggered on basis of satellite information. The satellite index was used since because ground information with respect to rainfall was sparse in Burkina Faso. The grid size is 3 km by 3 km.

Weather index insurance is a potential tool for reducing weather risk in agriculture. The payouts for index insurance relate to specific weather events which is in Burkina Faso the decadal relative evapotranspiration. The index value is indirectly assessed by remote sensing (EARS method). Triggers below which payments are made correspond to percentile 5% of historical long-running decadal relative evapotranspirations data. Threshold for full payment is adjusted depending of areas and crop development period. Yet payouts are dependent on three specific periods mimicking the different stages of maize production (contract of 2012). The first stage covers 30 days after seeding (1st of July), the second stage comprises 20 days and the last stage 40 days (in total 100 days). Payouts proportionally to the total covered amount for the three subsequent stages are 30%, 100% and 100% respectively.

3.2.2. Premium

Producers pay a premium of 10.80% of the loan amount requested for 2011/2012, while premium for 2010/2011 amounted 9.40%. This includes an insurance tax of 8%. The premium is not differentiated between covered zones and regions, but each zone and region has its specific threshold level (and thus actuary fair). This implies that protection levels are better in the South.

3.2.3. Link with credit

The credit agency insures their portfolio of loans whereby the lenders sign in addition to the loan contract an accompany insurance contract. The payouts are made via the credit agency but is withhold if the credit is not returned. It is important to note that there is still basis risk under this linked contract (Carter 2012). Although the insurance contract is optional the credit agency are becoming more stringent in requesting this cover. Insured farmers without credit are rare in Burkina Faso, only one individual experience has been reported.

3.2.4. Market uptake

It was launched by a pilot with 194 maize producers during the 2010/2011 season by PlanetGuarantee. For the next seasons, Planet Guarantee seeks to extend the experiment conducted among 10,000 producers (Table 2 and Figure 4). To do this, the organization associated with the CPF as a new partner, so as to serve as a distribution channel, particularly through FEPAB which provides its network of Planet Guarantee endogenous facilitators. For subsequent seasons, Planet Guarantee aims to further expand the experience, with more producers, including new products (cotton, peanuts), by using indices yields for cotton (partnership with SOFITEX update provision of an on-going historical returns), and the inclusion of new technical partners (Coris Ecobank and Africa Re).

Table 2: Key characteristics of rural credit and insurance scheme in Burkina Faso for maize

Year	Credit and insurance scheme
	Number of farmers
2010/2011	194
2011/2012	1,471
After 2012	10,000

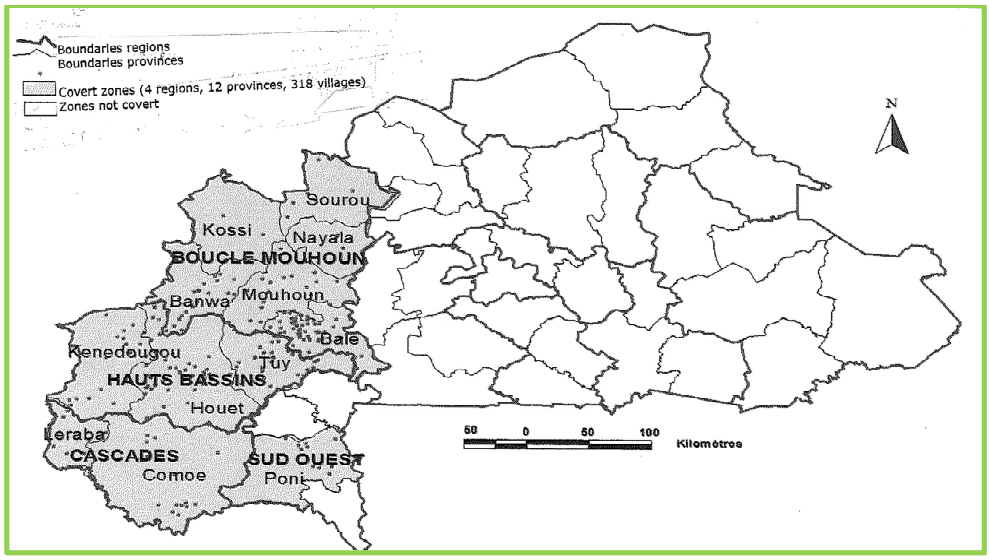

Figure 4: Villages expected to participate participating in 2012 in the PlanetGarantee scheme in Burkina Faso

The Burkina Faso project is part of a larger project whose objective is to develop parametric agricultural insurance systems in four WAEMU countries, including Senegal, Mali and Burkina Faso. This facility should cover at least 60 000 people by the end of 2015 and raise awareness to more than 165 000 farmers on agricultural insurance.

3.2.5. Outlook and contribution of FaRMAf

The FaRMAf team supports credit schemes and insurance schemes that could facilitate credit uptake. The FaRMAf budget can be targeted to the following specific elements (the high-level description is ordered from research activities to more capacity building activities):

Action 1 • Collaboration with an on-going project run by Planet Guarantee to enhance farmers access to credit. The contract for 2012 is refined in comparison to the contract in 2011, and it is of

interest to explore further refinements. High correlation between weather index shortfalls and farm yield shortfalls is an important precondition for introducing a successful weather-based index insurance to reduce farmers' crop yield risk. An important limitation of index insurance is that policyholders are exposed to basis risk, which refers to the imperfect correlation between the index and the losses experienced by the policyholder (Barnett and Mahul, 2007). A discrepancy is that the weather variable used to drive the index may not accurately reflect the measure of the weather variable at the farm (spatial basis risk). A bias might be introduced because of intercropping of trees with maize production, affecting the evapotranspiration measured by the satellite. The analysis of rain and production data is foreseen to decrease the basis risks. Moreover, the probability of payouts is equal for all zones, although the northern regions are more drought prone that the southern zones. This implies that even with insurance the northern province are still riskier. Specific studies are foreseen to homogenize the level of protection between northern and southern zones: this could be achieved by the implementation of different premium levels (the differences in premiums could be paid by producers themselves or by public subsidies). Therefore, the CIRAD-WUR research team in line with CPF recommends to research the possibility of refining the index used in the PlanetGuarantee project. Implementing and thus designing index based contracts to cover other crops (e.g., rice, peanuts, sorghum and millet) is not yet foreseen.

Action 2 • A review of risk-adjusted cost of borrowing can determine the true cost of credit with the insurance option, so farmers have an objective basis for negotiating with the banks. A more competitive loan provision by the private sector financing institutions might not only manifest itself in lower interest rates but also lower cash deposits requests. This could be investigated by the WUR research team and the results could serve as an output for CPF when negotiating better conditions with micro-finance institutions and banks. Another research element is to assess the option to change the functioning of the insurance scheme by directly insuring the credit global amount at IMF level. The latter implies that the insurance is automatically linked to credit provision and that the IMF is confronted with the basis risk.

Action 3 • Quantifying the impact of credit and insurance. The credit and insurance scheme can be decomposed into two separate financial contracts (Figure 5). A full-factorial design would require 2^2 =4 experiments. The insurance decision is a voluntary option linked with credit. The option of crop insurance without credit is seldom applied and therefore not investigated. The team there proposes to randomly select zones where the insurance will be offered and to monitor farm households in these zones as well in other, control, zones. The monitoring in the targeted zones also provides an opportunity to gauge the index and assess the basis risk that is inherent in this index-system. There could also be opportunities to differentiate the modalities of the schemes over

various zones, but this has not yet been worked out. As for now, the test is for yes/no access to index-based insurance.

One of the difficulties when assessing the impact of indexed insurance on producers' income is linked to the fact that the insurance decision is fully linked with credit in Burkina. Thus, one foreseen activity by the CIRAD-WUR research team is to rely on a stratified sample and compare three distinct groups: a control group of producers with no access to credit (and thus no insurance), a treatment group of producers with access to credit and insurance, and a group of producers with access to credit only.

The impact of group credit could be an interesting option as a case of collective action (in this way this part of the FaRMAf project will be linked with the efforts being made to develop and/or evaluate the other systems in another part of the FaRMAf project).

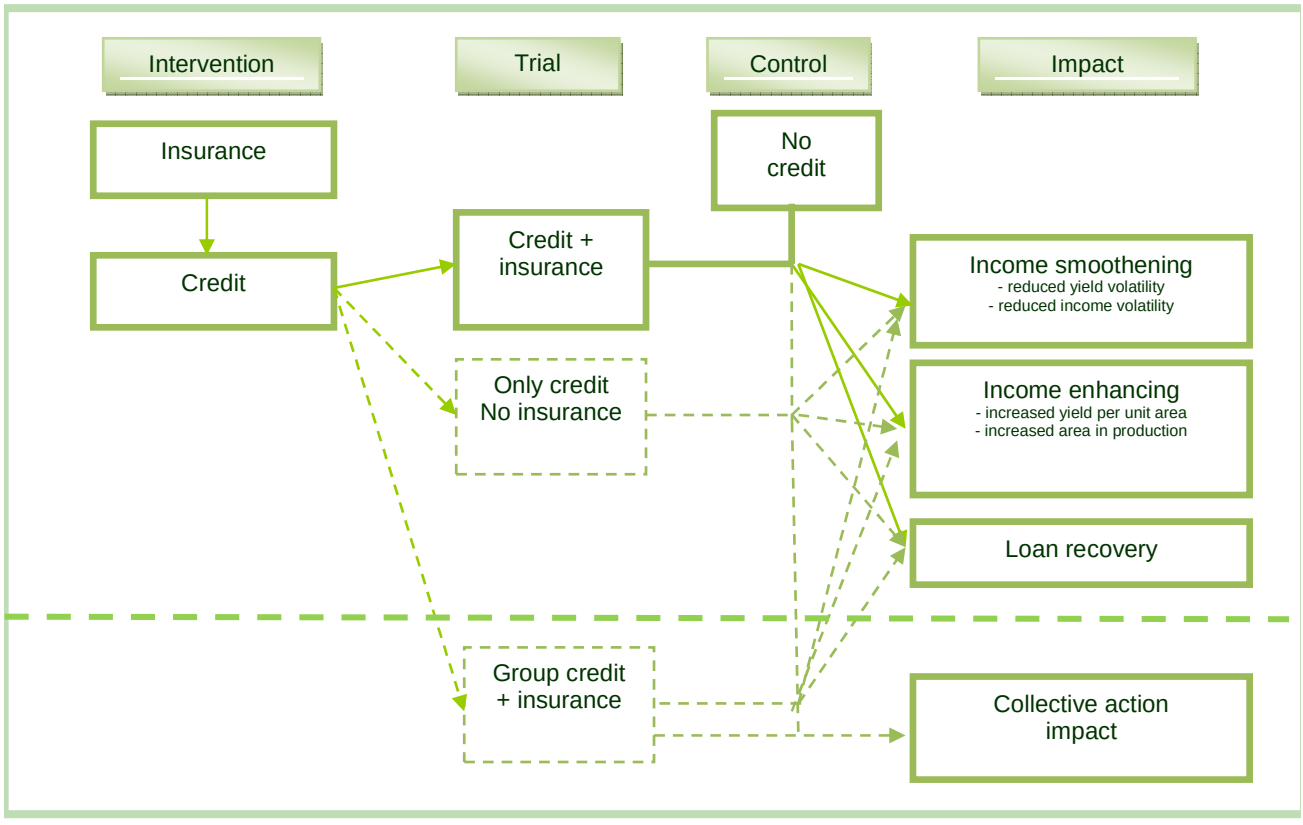

Figure 5: Impact assessment of credit and insurance scheme in Burkina Faso (dashed trials are optional)

For efficiency reasons the control group comprising farmers without the Planet Guarantee uptake corresponds also to the control group to evaluate the other systems in another part of the FaRMAf project (for example WRS). To conduct the impact assessment studies of both insurance and warehouse receipt systems, two administrative areas have been selected by CPF and CIRAD: the

Tuy province and the Mouhoun province. Both provinces are located in the west of the country and exhibit similar agro-pedo-climatic characteristics, cotton and maize being the main agricultural production, and maize showing a rapid production growth, with a annual average growth rate of 12,4% in the last 5 years. In those two areas, baseline and follow up surveys are foreseen.

Action 4 • Moreover, support capacities of CPF extension officers could be strengthened. By means of training workshops in the villages the CPF extension officers will provide information to farmers about the functioning of the index based insurance system, and about its relative advantages and shortcomings (i.e., explain the inherent basis risk). An instruction document will be accompanying this dissemination task and different communication tools could be used, as illustrated documents, videos and radio programs. Specific actions could be carried out to monitor and evaluate the level of knowledge and control of the stakeholders in the insurance scheme (i.e., farmers, micro-finance institutions, and insurance companies). This work should be led by CPF, in close relationship with the WUR-CIRAD team and PlanetGuarantee.

Action 5 • Strengthening farm lobby by CPF with respect to a wide range of agricultural policies which ultimately improve access to credit (possibly linked with insurance). For example, insured farmers have to pay insurance tax. Lobbing towards abolishing insurance tax is of interest for farmers since insurance tax increases the cost of insurance. Another issue of interest in this lobbying activity is the possibility of subsidizing premiums paid by farmers, either by Burkinabe government or by a regional institution (CILSS, UEMOA, CEDEAO). This lobbying activity could be led by CPF and benefit from a collaboration with PlanetGuarantee.

4. General consideration impact measurement in Zambia and Burkina Faso

The two countries both offer unique opportunities for testing the impact that crop insurance and credit has on farm households. For both cases the following three elements are important to consider 1) what is measured?; 2) how often is measured?, and how many samples?

Farm structure (e.g., farm size and crops cultivated) as well as financial structure (e.g., credit amount, insurance adoption and collateral) could be elicited by means of a questionnaire. This also holds for technical variables of the farm operation (input used and yield). Moreover less tangible elements should be elicited too (e.g., motivations, risk perception and risk aversion).

The measures that are collected will naturally depend on the conditions prevailing in the years to come. The need for credit (and other elements of packages) will therefore differ from year to year and from one household to the other. It might be that the insurance actually will pay-out in one of

these years. For the evaluation of the impact of the schemes, it would be wise to monitor households on an annual basis, so as to take advantage of the then prevailing situations and be able to correct for changes in the need for the insurance and credit.

To avoid high costs, a compromise can be to sample a rather large group of households in the base year (2012) and in the final year (2015), and a smaller sample out of these in the intermediate years and for a limited number of variables only. Alternatively in the intermediate years only the most essential variables could be elicited (i.e. yield), while maintaining the original sample size. It is important to aim partly for a difference-in-difference approach which requires that households are monitored (in all areas: both the treatment and the control) before the implementation of the tool and after some years of implementation. In addition and because of practical reasons, a subset of the treatment group could consist out of households which already implement the tool in the on-going cropping year. Suggestion is to sample 250 up to 500 households in each group and country. The sample size in the impact study is based on the expense of data collection, and the need to have sufficient statistical power.

5. Conclusion and extensions emerging from Zambia and Burkina Faso

While compelling on their own, the linking of crop insurance with rural credit potentially offers important advantages. As in above, any innovative guarantee funds scheme that reduces overall cost of borrowing as well as increase resources available to the farmers for acquiring inputs will be good for farmers to smoothen and enhance their income. The Zambia and Burkina Faso model provides a unique opportunity to test amendments of the credit-insurance-input-extension model and see how the (successful) scheme can be adapted and replicated in other countries.

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