AGRICULTURE,
MICROINSURANCE,
AND RURAL DEVELOPMENT

A thematic paper by Silvia Müller, Gaby Ramm, and Roland Steinmann
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# TABLE OF CONTENTS

Acknowledgement .............................................................................................................. 4
Abstract ............................................................................................................................... 5

## INTRODUCTION

CROP INSURANCE FOR SMALLHOLDERS ........................................................................ 11
- Parametric crop insurance in brief .................................................................................. 11
- Implementation challenges ............................................................................................. 12
- Potential solutions .......................................................................................................... 13

THE CONTEXT OF SMALLHOLDER FARMING .................................................................. 17
- Mapping smallholders’ constraints ................................................................................. 17
- Constraints to improving smallholders’ livelihoods ........................................................ 22
  - Inadequate access to production means ........................................................................ 22
  - Lack of know-how ........................................................................................................ 23
  - Difficult access to markets and market information ..................................................... 23
  - Social and cultural barriers ........................................................................................... 24
  - Investment deterrents ................................................................................................... 25
- The potential role of agricultural insurance .................................................................... 27
AGRICULTURAL MICROINSURANCE AS A CATALYST

Combined approaches to increase the value proposition

A market with neither supplies nor demand?

Weather index insurance linked to risk reduction

Agricultural credit and weather index insurance

Index insurance combined with agricultural services

The case for microinsurance—preliminary insights

CONCLUSIONS

REFERENCES

LIST OF FIGURES

Figure 1: Smallholder farmer’s key constraints to increasing investment and revenue

Figure 2: Map of constraints in smallholder farming, with primary reasons behind constraints

Figure 3: Map of constraints in smallholder farming, with primary and secondary reasons behind constraints

Figure 4: Map of constraints in smallholder farming, highlighting pathway to impact of insurance intervention

Figure 5: Risk management matrix
ACKNOWLEDGEMENT

This paper was prepared by Silvia Müller, Gaby Ramm, and Roland Steinmann for the Microinsurance Network’s Agriculture Working Group. We are grateful for the generous funding from the German Federal Ministry for Economic Cooperation and Development (BMZ) and to the Microinsurance Network for commissioning this paper to us. We also extend gratitude to the team of reviewers and editors. The views expressed in this publication are those of the authors and do not necessarily reflect those of the Microinsurance Network.
ABSTRACT

Agriculture is a volatile business and the main source of income for large portions of the world’s population. Despite significant efforts by a variety of stakeholders to introduce and sustain agricultural insurance in low-income countries, results on the ground have been very mixed. After decades of expansion, many emerging economies have had to scale back their multi-peril crop insurance schemes due to their ever-increasing costs and high inefficiencies. Subsequently, many agricultural insurance experts focused on index insurance as a promising technique to overcome the practical challenges that beset multi-peril crop insurance—only to discover a whole new set of practical challenges with this approach.

Smallholders operate in a complex environment and face a number of constraints, which hold them back from developing their farm activities and ultimately improve their livelihoods. Typical constraints include inadequate access to means of production, limited farming know-how, difficulties in market access, cultural restrictions, significant production and price uncertainty, and a generally unfavourable investment climate. Agricultural insurance can help by relaxing two of these constraints: it can facilitate access to means of production and reduce income uncertainty. Insurance results directly in reduced uncertainty, while access to means of production depends on the existence of suppliers and their willingness to accept insurance as a form of collateral.

The smallholder constraint map, as well as documented evidence, suggests that only a broader risk management strategy, combining agricultural insurance with other tools and approaches, is likely to truly succeed when dealing with smallholders. To date, agricultural index insurance offered as a stand-alone product to individual smallholders has met with very limited demand. This is unlikely to change, even with improved parametric products through technical and design progress. Response from clients is much better if agricultural insurance is combined with additional services, such as credit, rural advisory services, or risk reduction measures. However, index insurance as a stand-alone product holds bigger potential when offered to risk aggregators or governments.
A large proportion of low-income people engage in farming. The International Fund for Agricultural Development (IFAD) estimates that there are about 500 million smallholder farms worldwide, supporting 2 billion people. In most emerging economies, GDP growth in the agricultural sector “is up to four times more effective in reducing poverty than growth generated by other sectors” (IFAD 2011). Consequently, improving conditions for smallholders is a very promising and sustainable approach to reducing poverty levels on a large scale.

A variety of approaches have been tried, with limited success so far, at bettering the fate of the rural population. Given the sheer number of people living in rural areas and their relative poverty compared to those living in cities, most governments of developing economies have resorted to a variety of interventions. In addition, many nongovernmental organisations (NGOs) and development organisations have designed programs focusing specifically on smallholder well-being. Typically, such programs include: the subsidisation of fertiliser, agricultural credit or crop insurance, the provision of extension services, investments into improved infrastructure (such as roads, warehouses, and market information), incentives for organising farmers in cooperatives, and incentives for adhering to fair trade standards.

Two major global concerns have contributed to increased interest in smallholder agriculture: food security and climate change. Recent price hikes for staple crops and increasing evidence of changing climate patterns helped to push rural development again towards the top of many agendas. At the same time, it became obvious that agricultural insurance alone is unlikely to make a significant change; more holistic approaches to disaster risk management in rural areas are required in order not to repeat past failures.

Rural development comes in many forms. Usually, rural development refers to processes of improvement in economic conditions and the general quality of life for people living outside large cities. According to the World Bank, 48% of the world’s population was considered rural in 2011, with significant regional differences: a low 21% for Latin America & Caribbean and a high 71% for the Least Developed Countries, according to UN classification.

Risk is a central theme in farming. Depending on the farming activity and location, pests and disease, bush fires, trampling by large animals, price fluctuations on the world markets, and other events add significantly to the level of uncertainty under which smallholders have to make investment decisions and, ultimately, survive. While returns on farm inputs can be substantial in good years, a number of constraints prevent smallholders from realising the full potential from their farming activity.

Weather risks often play a dominant role for many smallholders who engage in rain-fed agriculture. Currently, about 80% of global food production is rain-fed, contributing 58% to the global food basket (Wani et al. 2009). Of the many risks smallholders face, weather-related risk is insurable. Price risk, another major concern of smallholders, is normally not dealt with through insurance, but rather through financial hedging instruments.

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1 See http://data.worldbank.org/topic/agriculture-and-rural-development

2 Price risk is an important source of uncertainty for smallholders, who normally are unable to access financial hedging instruments. However, this risk is not dealt with extensively in this paper.
Insurance and especially agricultural microinsurance\(^3\) can impact rural communities in two distinct ways.

- Insurance can provide protection against setbacks due to crop losses. It helps farmers to get back on their feet after bad years. Timely insurance pay-outs should significantly help smallholders to smooth consumption and to prevent the sale of productive assets.

- Access to agricultural insurance could enable farmers to engage in riskier, but, on average, more lucrative farm activities: e.g., alternative or new crops, extended surface cultivation, or increased use of fertiliser and pesticides.

These are two powerful propositions motivating many development specialists to promote agricultural insurance. In other words, agricultural microinsurance can lead to (intended) behavioural change.

This paper focuses on index-based products that rely on weather data, which are measured on the ground or via satellites, and designed for smallholders or risk aggregators, but not governments or multinational bodies. Therefore, the use of parametric triggers in social protection schemes is touched upon only lightly. In this paper, the terms index insurance, parametric insurance, and weather index insurance are used synonymously. Also, while climate change and food security are, without a doubt, important topics, they are discussed only briefly. The nexus between climate change, smallholder farming, and food security would warrant a separate publication.

This paper explores the role insurance products could play within the landscape of constraints smallholders typically face. Smallholders engaged in crop production are the focal point of discussion. The constraints influencing smallholders’ business decisions are many, often highly context-specific and intricately intertwined. For example, smallholders engaged in rain-fed maize production in Africa face different challenges than their peers growing coffee in Latin America, or those growing rice in Southeast Asia. However, a set of typical challenges emerges:

- Uncertain weather conditions with direct impacts on harvest;
- Insecure land ownership, which limits farmers’ propensity to invest;
- Restricted access to working capital and key farm inputs;
- Unfavourable national and international trade policies that put an unnecessary burden on the shoulders of smallholders.

The remainder of this paper is organised as follows: Section 2 briefly reviews the basics of agriculture insurance, some challenges parametric insurance approaches face, and approaches currently tested to overcome these. Section 3 maps the constraints typically faced by smallholders. It discusses the main constraints, how these are related to each other, and potential intervention strategies. Based on this analysis, Section 4 describes the specific role agriculture microinsurance can play and under which conditions well-structured, valuable insurance may really make a significant contribution to enable smallholders stabilising their income and eventually increasing their production. Section 5 summarises the main findings and concludes.\(^4\)

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\(^3\) In this publication, the term "microinsurance" is used for insurance product that are designed to address the needs of low-income people and respond to their specific requirements regarding premium and claims payment, policy language, accessibility etc.

\(^4\) This publication is complimentary to "The Emergence and Development of Agriculture Microinsurance", published in 2013 by the Microinsurance Network and written by Thérèse Sandmark, Jean-Christophe Debar and Clémence Tatin-Jaleran.
What is new in agricultural insurance? Traditional crop insurance products are now complemented by a multitude of parametric insurance techniques. Traditional crop insurance, in the form of single peril crop insurance (typically against hail), and multi-peril crop insurance requires on-site inspections to assess losses. Parametric insurance does not require such visits at all, or, in case of area yield insurance involving crop-cutting experiments, is limited to a relatively small sample size only.

Traditional crop insurance schemes, especially public sector multi-peril crop insurance, grew substantially after World War II. However, they have largely proven too expensive for governments in low- and middle-income countries to be sustained over time (Mahul and Stutley 2010). Generally high administrative costs compared with the benefits reaching the farmers, moral hazard, and outright fraud contributed to the disappointing results of these schemes. In the late 1980s, actions taken by low- and middle-income countries included scaling them back, stopping them altogether, or involving the private sector through public private partnerships. Agricultural insurance was in crisis and its role in promoting agricultural development in low- and middle-income countries heavily debated (Collier, Barnett, and Skees 2010; Hazell, Pomareda, and Valdés 1986).

Beginning in the late 1990s, the development community got more and more interested in parametric insurance solutions, widely known as index insurance. Starting with relatively simple indices based on cumulative rainfall data obtained from automated weather stations, more complex products were soon created. Combining rainfall with temperature, multiple index periods within one crop cycle, and remotely sensed data are just a few examples.

Parametric insurance products are usually classified into two broad categories (Collier, Barnett, and Skees 2010; World Bank 2011): those that rely on aggregate yield or loss data for a specific area (or on a representative sample), and those relying on weather parameters as a proxy for yield, e.g., rainfall or soil moisture. The first group is usually named area yield insurance, while the second group is commonly called weather index insurance. Another way to classify index insurance products follows the level of directly targeted customers (e.g., Hazell et al. 2010, Dick et al. 2011):

- **Micro-level**: The policyholders are farmers, households, or small business owners, who purchase insurance to protect themselves from potential losses caused by adverse weather events. By doing so, households may better manage low-to-medium-frequency co-variate risks such as drought or excess rainfall. In this setting, crop insurance may facilitate access to credit, encourage investment in higher-quality inputs, and help smallholders who took out a loan to avoid default and...
restart production (e.g., by using the insurance pay-out to purchase new seeds) in the case of severe weather events.

- Meso-level: the insurance product is sold to risk aggregators such as farmers’ associations, input suppliers, MFIs or banks, for protecting their members, assets, or loan portfolio. Here, index insurance may help the targeted organisations to expand their business, opening access to a new client segment and helping to manage mass defaults caused by weather shocks. It may also create new market opportunities by developing innovative linkages along the supply chain (e.g., contract farming, packaging of credit and inputs). In most cases, direct benefits will primarily accrue to the aggregator, but can also be extended to its members. However, this requires specific contractual arrangements and great care has to be taken not to expose the aggregator to substantial risk (e.g., through covering basis risk).

- Macro-level: weather index insurance can help governments and relief agencies in development and disaster management without allocating unforeseen funds from the fiscal budget. It allows government or relief agencies to plan ahead of crises, knowing that funds will be available when they need them.

The principal intention of offering index insurance at all three levels, which will also inform its design and characteristics, may be to promote rural development or to assist in disaster risk management (Hellmuth et al. 2009). In its development variant, index insurance intends to promote higher investments into agriculture, resulting in an average increase in smallholders’ income, while still protecting them against severe set-backs. This may be achieved at the micro- or meso-level. In the context of disaster risk management, index insurance would primarily operate at the meso- or macro-level, allowing involved stakeholders to rely on secured and timely pay-outs for relief work.

IMPLEMENTATION CHALLENGES

In spite of the many advantages of index insurance, this product also faces a number of challenges. After well over ten years of significant research support, experimenting and pilot testing various products in diverse settings, only a few projects have reached commercial scale or are on a clear path towards it (World Bank 2011). This has led to some disillusionment among the development community, as well as to a reassessment of the real potential of parametric insurance.

The most relevant challenges index insurance currently faces are, according to Murphy et al. (2011):

- Difficult replicability of index products. In other words, while the concept may remain the same, each setting requires significant developmental work for creating an index insurance product. This heavily impacts the economics of such products.

- Data availability is often suboptimal. Data requirements for constructing a good index, i.e. one that accurately tracks farmer’s yield on the field, are very high and can often not be met.

- Basis risk\(^6\) is often significant. High levels of basis risk imply poor value for smallholders and limited potential for scaling up.

- Specialist knowledge. Designing index insurance products requires specific knowledge, which is most often not available in countries where the products would be sold. In addition, these markets are often too small to sustain

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\(^6\) The fact that indices often do not perfectly mirror the loss experience of individual clients is called “basis risk.” Basis risk can work both ways: the insurance product could pay more or less than what clients lost in a given year.
a domestic index insurance industry, which makes capacity-building efforts questionable.

- Stakeholders are not familiar with the concept of index insurance. While many smallholders are new to the concept of insurance per se, explaining index insurance is often reported as even more difficult. Other potential stakeholders, such as rural banks, insurers, regulators, and other government bodies are often unfamiliar with index insurance as well.

- Accessibility and efficiency in distribution. In many communities that could potentially benefit from index insurance, reliable and efficient distribution infrastructure is missing, increasing the transaction costs.

- Limited demand. As with other insurance products offering protection against natural catastrophes, most households are reluctant to buy them for a variety of reasons, including low levels of trust and the perception that protection against low-frequency events is not very valuable.

The index insurance community has been very creative in the past to constantly rethink approaches and try new avenues to overcome challenges in the field. Low demand, for example has multiple reasons. On one hand, theory would indicate that parametric insurance should cover relatively low-frequency, but high severity events in order to minimize basis risk. On the other hand, farmers want to test the product and only gain trust into such instruments if they experience swift pay-outs, ideally the very first year they buy the product. However, insurance with frequent pay-outs is generally too expensive for smallholders. Another reason for low demand is unfamiliarity with the product and low levels of trust into the provider.

Despite all these challenges, many practitioners and researchers feel that more effort and careful thinking are needed to establish under which conditions and for whom index insurance can be a useful product. The hurdles are still high, but the sector has evolved rapidly and, given the implications at stake, it seems premature to give up.

POTENTIAL SOLUTIONS

One approach to boost demand is to bundle index insurance with other farming-related services, so that the customer sees a direct benefit even in normal and good years without insurance pay-outs. This could include weather forecast, extension services, and quality inputs. Another approach is to skillfully design nonlinear payoff structures (Carter 2012): the contract would be triggered with high frequency, but payments are small unless the catastrophe is substantial. Such triggers would allow farmers to experience the claims payment mechanism even in normal years without substantially increasing the cost for the product.

Another example is data: limited availability of ground-measured weather data may pose less of a problem if satellite data can be calibrated and used as a substitute or complement. The 12 Millennium Development Villages across Africa make use of satellite data to blend with ground-measured ones (Hellmuth et al. 2009). PlaNet Guarantee currently implements satellite-based index insurance in several West African countries, while Allianz Re explores the use of a new satellite image technology to track rice production in Southeast Asia (www.riice.org).

Basis risk tends to be less of an issue if first, index insurance products are designed to cover low-frequency / high-severity risks only (Murphy et al. 2011). But, this goes directly against demand, as discussed above. Second, products sold to risk aggregators or governments tend to be less problematic regarding basis risk, because these entities have more capacity to absorb and deal with some residual basis risk. Finally, basis risk can also be reduced by breaking up the insurance period into multiple plant-development stages such as germination, growth, flowering, and maturing, each requiring different levels of water.
Index insurance is still a fairly recent technique and quickly evolving. A lot of experimenting is going on to find creative solutions to overcome the various challenges. In addition, an increasing number of experts are advocating for a more holistic approach to managing smallholders’ risk, which may well include index insurance and evaluating pilot projects thoroughly and quickly (Murphy et al. 2011, World Bank 2011, Cole, Bastian, et al. 2012).

Apart from further exploration to reduce basis risk for micro-level index products another approach to overcoming both demand and basis risk issues is working at the meso-level. If, for example, the management of a farmer cooperative can be trained and convinced of the advantages, then a parametric insurance solution can protect the aggregate output of the cooperative against severe losses. All cooperative members would directly benefit and minor, individual losses could be dealt with at the level of the community, not through formal insurance. Theory and several studies have shown that basis risk is less of a problem with catastrophic covers compared to high-frequency covers. Meso-level insurance could also allow agro dealers to offer a complementary service, cooperatives to stabilise their members, and agricultural lenders to increase their exposure and, thus, support higher investments in fertiliser, improved seeds, and new technologies by the farming community (Clarke, Mahul, Rao, and Verma 2012).
Production conditions for smallholders in developing countries are very diverse and often precarious. Among the most important constraints to increased net income from agriculture are:

- Access to quality means of production
- Linkages to fair and stable markets
- Vagaries of the weather
- Economic and trade policies
- Cultural factors and tradition
- Land ownership

The degree of these constraints varies greatly between countries and so do opportunities when they are addressed.

Many smallholders would have the potential to increase their production per area substantially. Reasons for not realising this potential include the lack or inadequacy of irrigation and fertilisers, inappropriate soil management, lack of means and know-how to control pests, or lack of high-yield seed quality. Remoteness and inadequate infrastructure add barriers to solutions for these issues.

Many farmers are willing to develop their own strategies to tackle some of the challenges, by joining producer organisations to increase their bargaining power and gain advantages from the economies of scale. Farmers can and should play an active role in the process. However, some constraints are dependent on local or national policies or other players of the market such as suppliers of financial or extension services. Further there are natural conditions and regularly or irregularly occurring natural disasters, which cannot be influenced by humans. Yet, there are different strategies to adapt to a certain degree to such disasters or mitigate their effect.

Smallholders all over the world operate under constraints. These constraints and the reasons behind them are often interrelated, which quickly leads to a confusing web of influencing factors. In order to better appreciate the graphic representation of the constraints and their relations to each other, a map of these constraints is developed in several stages. Figure 1 shows the farmer’s key constraints contributing to his underinvestment and/or depressed revenue. Figure 2 and Figure 3 add to Figure 1 to show the primary and secondary reasons behind these constraints, building up to a map of constraints in smallholder farming, and showing the complex web of factors leading to a smallholder farmer’s condition of underinvestment and/or depressed revenue.
FIGURE 1

SMALLHOLDER FARMER’S KEY CONSTRAINTS TO INCREASING INVESTMENT AND REVENUE

Investment deterents

No access to means of production

Farmer underinvestment and/or depressed revenue

Lack of know-how/ R&D

Social or cultural barriers

No access to market or information

FIGURE 2

MAP OF CONSTRAINTS IN SMALLHOLDER FARMING, WITH PRIMARY REASONS BEHIND CONSTRAINTS

Unfavorable investment climate

Inadequate infrastructure

No access to market or information

Farmer underinvestment and/or depressed revenue

Social or cultural barriers

Missing labour

No access to finance

Losses from catastrophic events (Nat Cat & P&D)

Market volatility: price, demand

Transaction costs too high

Insecure land title

No credit institutions / No savings possibility

Unfavorable investment climate

Market volatility: price, demand

Transaction costs too high

Insecure land title

No credit institutions / No savings possibility
FIGURE 3

MAP OF CONSTRAINTS IN SMALLHOLDER FARMING, WITH PRIMARY AND SECONDARY REASONS BEHIND CONSTRAINTS

- **Key issue**
- **Farmer’s key constraint**
- **Primary reason behind constraint**
- **Secondary reason behind constraint**

- **Losses from catastrophic events (Nat Cat & P&D)**
- **Health issues**
- **Business considered as too risky**
- **Transaction costs too high**
- **No access to means of production**
- **No access to market or information**
- **Inadequate infrastructure**
- **No access to finance**
- **Not credit worthy**
- **Insecure land title**
- **Missing labour**
- **Market volatility: price, demand**
- **Social or cultural barriers**
- **Lack of know-how/R&D**
- **Transaction costs too high**
- **No access to means of production**
- **No access to market or information**
- **Unfavorable investment climate**
- **Farmer underinvestment and/or depressed revenue**
- **Investment deterents**
The following example illustrates how this map of constraints and the relationship of these constraints to each other can be read (Figures 1 to 4): The farmer does not exploit her full production potential because she has no access to credit, which would be required to buy more inputs such as seeds and fertiliser. There is a rural bank in her area, but the bank doesn’t provide her with a loan because she is considered not credit worthy. In the absence of a formal land title, she has no collateral to offer and the bank considers her business as too risky. The bank names two reasons: 1) market prices and demand for her produce are very volatile and 2) her activity is heavily exposed to natural calamities. In terms of potential solutions, insurance against the natural calamities would directly reduce the risk of her default and hence should allow the bank to review her credit assessment.

In the centre of Figures 1 to 4 lies the smallholder who cannot develop her full potential:

- Key constraints (blue) limit her investment behaviour and revenue situation. Her underperformance results from: difficult access to means of production, difficult access to market, lack of know-how, little entrepreneurial incentives because of the many risks she faces and culturally conditioned constraints.

- The various reasons behind the constraints are shown in red. For example, the difficulty in accessing means of production may be a result of her not being able to access credit, which again may have multiple reasons behind. The red areas form the constraints landscape.

- Outside this landscape are a few approaches to solve or ease the constraints: Who would need to do what to overcome a certain problem? In pink those that typically require public involvement, in green those that could be initiated by the farmers themselves and in orange those by private market players (Figure 4).

Insurance is one of the approaches to solving the farmers’ problems. However, in most situations, insurance alone may not be enough to lift farmers out of poverty. If a farmer’s main concern is that it takes him two days on a dirt track to get to the next market where prices for his harvest depend largely on a middleman, buying crop insurance may not be the farmer’s first priority. He would rather have better access to market and market information.

The map of constraints demonstrates that insurance can only serve as a missing link within a complex system of various limiting factors. This means insurance can never be a stand-alone solution to the complex problems of a smallholder. Insurance needs to be part of a number of combined measures aimed at sustainably improving the smallholders’ livelihood, from public policy to market structures to the farmer himself.

Smallholders all over the world operate under a variety of constraints. The interrelation maps (Figures 3 and 4) illustrate this, though a few points are important to note: first, speaking of ‘the smallholder’ is a gross simplification. A subsistence farming household in rural Burkina Faso is likely to have a completely different set of constraints and development routes than a small coffee grower in the Peruvian Andes or a paddy farmer in Cambodia. Second, the same applies in consequence to the interrelation map: it is hugely simplified and does by no means try to explain the situation of a specific rural community. What it aims at, however, is to serve as a reminder that smallholders do not only face constraints due to the vagaries of the weather, which could be insured and transferred away.
FIGURE 4

MAP OF CONSTRAINTS IN SMALLHOLDER FARMING, HIGHLIGHTING PATHWAY TO IMPACT OF INSURANCE INTERVENTION

- Farmer’s organisation
- Change of public policy / Public investment
- Inadequate infrastructure
- No access to market or information
- Social or cultural barriers
- Lack of know-how / R&D
- Unfavorable investment climate
- No access to means of production
- Transaction costs too high
- No credit institutions / No savings possibility
- Farmer underinvestment and/or depressed revenue
- Losses from catastrophic events (Nat Cat & P&D)
- Investment deterrants
- Market volatility: price, demand
- Business considered as too risky
- Missing labour
- Not credit worthy
- Health issues
- Insecure land title
- Migration
- Investment in education / Extension services / R&D
- Farmer’s organisation
- Risk reduction, mitigation, coping strategies
- Discrete relief / Aid
- Insurance
- Farmer

Transaction costs too high
Such a map of key constraints, the reasons behind them, and potential solutions capture the most important elements when studying the causes for limited progress in rural development. For practical application in a specific rural community it will have to be contextualised, which may add additional layers of complexity. The map also intends to lay a foundation for the identification of those approaches that hold the biggest potential to positively impact smallholder communities.

CONSTRANTS TO IMPROVING SMALLHOLDERS’ LIVELIHOODS

The following paragraphs will try to describe some of the main reasons for underinvestment and depressed revenue as depicted in Figures 2 and 3. Each section starts with a description of the constraint as it is felt by the farmer, followed by a short explanation of some of the underlying reasons and some common ways to approach the described challenges.

INADEQUATE ACCESS TO PRODUCTION MEANS

Inadequate access to production means is a combination of scarce physical and human capital and missing financial service. Inputs such as quality seeds, fertiliser, pesticides, veterinary drugs, adequate tools, or machinery may not be accessible for many smallholders. Either such means of production are locally unavailable7, or the farmer is not able to invest in improved inputs at the time needed.

No access to credit. It seems that access to production means could be improved if access to financial services—in particular credit—was improved for smallholders. However, there are many factors that hinder access to credit. First of all there might not be any credit institutions at all. Especially in many parts of rural Africa, not even microcredit institutions reach remote areas. Lending money is restricted to family, friends, and informal moneylenders. The latter option tends to be very expensive and risky.

Not credit worthy. Where there are rural banks, small farmers may be considered unworthy of credit because of the high-risk nature of their business, including income volatility, missing collaterals, and high transaction costs. Additionally, microcredit institutions may have the same problem as the farmers themselves—they do not have enough money at the time needed. Further, some banks do not give credit to farmers until they are sure that the conditions are favourable for the already growing crops in order to avoid risk, a lending strategy highly unsuitable for smallholders that need credit to buy inputs at the time of planting or sowing (Dubreuil 2012).

Land tenure. Land may not be formally secured therefore not acceptable as collateral (Salami, Kamara, and Brixiova 2010). In order to improve the farmer’s credit worthiness, it is usually necessary to mitigate some of the risks for defaulting on credit. Customary land tenure might have to be formalised and agricultural risks mitigated. Sophisticated irrigation technology might lessen the risk of failure of rain fed crops. Diversification and integrated pest management may smooth income. Formal crop insurance might lower the risk of defaulting on credit due to weather related crop failure.

7 Additional to logistical supply problems there is a general lack of quality inputs. In many rural areas, especially in African countries, high-yield seeds adapted to local conditions are simply not existing, as agricultural research and development is chronically underfunded (FAO 2012).
Lack of saving. The farmer has money to spend after the harvest is sold. However, at this time, fertiliser, for instance, may not be available. This means the farmer has to be able to save his money to buy fertiliser when it is available. Without access to formal saving possibilities, saving money becomes more challenging and may never happen as other pressing consumption needs may arise before the need for fertiliser and the savings spent (Banerjee and Duflo 2011). Innovative approaches such as mobile banking technology promise improved saving possibilities in many remote areas.

Missing labour. Another means of production that might be scarce is labour. If a family member falls ill and is no longer able to work on the land, productivity may be seriously impaired. Hired labour as replacement might not be available or affordable and is usually less efficient. Especially in regions heavily affected by HIV/AIDS, missing labour has become a problem resulting in reduced productivity and reduced consumption (Chaminuka et al. 2006). Another reason for lack of labour may be migration to cities or international emigration in search of alternative income. While household income may increase due to remittances, agricultural productivity might fall at least in the medium term because of missing labour (Jokisch 2002).8

**LACK OF KNOW-HOW**

Smallholders may not only lack quality inputs, but also up-to-date knowledge of sustainable agricultural practices. Traditional knowledge of sustainable agricultural practices may have been lost due to migration and conflict situations. Also deteriorating social and economic conditions may impede sustainable practices. Farmers, for instance, might no longer be able to afford to keep animals and, therefore, organic fertiliser is scarce and thus soil fertility decreases (FAO 2012). Additionally, traditional knowledge may disregard new technologies and changing environmental conditions e.g., climate change or increased pressure on the arable land. In many areas, climate change is deteriorating conditions for agriculture. Higher frequency of drought or severe flooding may critically affect smallholders. Adaptation strategies for farmers need to be found (Altieri and Koohafkan 2008). Keep in mind, know-how adapted to local conditions may not only be missing on the level of the farmer, but in many rural areas (especially in African countries) high-yield seeds adapted to local conditions simply do not exist as agricultural research and development is chronically underfunded (FAO 2012).

Sustainability may also be impaired due to intensified approaches such as the “Green revolution” in Asia. While in the short-term productivity is substantially increased, there are many negative long-term effects resulting in soil degradation, salinization and accumulation of toxic substances, and severe water shortages (IFAD 2011).

Investment in research and development and the promotion of sustainable agricultural practices by extension services could improve this situation. However, in many developing countries there is a severe lack of public investment in agricultural research and development, as well as extension services for smallholders (FAO 2012). In place of publicly funded research and development, big international agrochemical companies might dominate these activities. Independent research beyond genetic engineering and agrochemicals might be neglected (Luig 2013).

**DIFFICULT ACCESS TO MARKETS AND MARKET INFORMATION**

Even if crop production is technologically up-to-date and sustainable, smallholders may still have difficulties in making reasonable profit out of their cash crop due to difficult market access. Everything beyond subsistence would have

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8 Migration may also have another effect. Migrant workers use their income to purchase more land to either increase agricultural production or use it as asset without significantly increasing productivity (Jokisch 2002).
to be sold on a market—locally or on an export market. However, in many developing countries, public spending to improve rural infrastructure such as roads or power supply is low (Fan and Rao 2003). Consequently, it might be difficult and expensive to transport a cash crop to the market so profit for the farmer remains very small.

Additionally, access to market information might be restricted as modern communication means or, more often, reliable information aggregators may be rare or missing. There may be little knowledge available about current demand and prices, which makes it difficult for the farmer to act according to demand. Also, farmers may depend on unreliable intermediaries, further impairing the farmers’ profit. However, this situation is rapidly changing due to the increased availability of mobile phone technologies and related infrastructure even in remote areas.

Another problem arises with inadequate or in-existent storage facilities, which lead to substantial post-harvest losses. Mold and various pests may affect harvest. Easily perishable products, such as dairy products or certain fruit and vegetables, require cold storage. If cold storage is not available, the products have to be sold immediately after harvest, usually the time when prices are lowest. In case of disastrous events, such as storm and excessive rain, the whole harvest can be lost (Onumah 2002).

**Producer organisations** may mitigate such problems. Economies of scale lower the transaction costs and facilitate stable cooperation with larger traders, substantially increasing the smallholders’ bargaining power. Intermediaries that buy produce at farm gate at low prices can be better avoided. Market information becomes easily available and the better informed farmers gain more market power. Producer organisations may also engage in processing and other value-adding activities (Shepherd 2007). Additionally, insurance solutions might be more easily available for farmer groups than for individual farmers.

Producer organisations range from informal farmer groups to well-organised and formalised cooperatives. Their involvement may be restricted to particular parts of the value chain, such as crop production, post-harvest treatment, or marketing. Alternatively, their role is to improve conditions for the farmers within the value chain as a whole (IFAD 2011).

**SOCIAL AND CULTURAL BARRIERS**

Sometimes socio-cultural factors and traditions may be responsible for potential underperformance of smallholders. For instance, cultural barriers may prevent adopting new agricultural techniques. And, in some places, the formation of producer organisations that might increase the smallholders bargaining power and lower their transaction costs may be difficult because of cultural reasons.

Further, there are gender-related inefficiencies. In many developing countries, especially in Africa, women farmers are responsible for a high percentage of agricultural work (up to 90%). However, mostly due to cultural reasons, they have restricted access to land rights, formal credit, and technology. Also, African women are highly underrepresented in education programs.9 Low education is one of the important factors that suppress productivity in agriculture (Chan and Barrientos 2010).

In traditional societies, there might be a strict selection of crops that are grown, both for subsistence and for the market. Sometimes household income might substantially increase if new crops were cultivated (especially for the export market). However, as the selection of crops might be deeply embedded into local culture, switching to promising new varieties might be difficult.

Cultural factors are not easily changed. However, development programs increasingly take gender inequalities into account. Many projects already focus on facilitating access to education or credit for women, in particular.

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INVESTMENT DETERRENTS

Smallholders face a tremendous amount of risk and income fluctuation. Depending on region and crop, catastrophic weather events, such as storms, excessive rain, landslides, or drought may threaten yield and infrastructure. Disastrous levels of pest or disease may lead to severe crop failure. Volatility in the prices of cash crops and insecure land titles add to the list of risks.

Farmers, without secure land titles, risk losing their land at any time, and so invest significantly less money and time. The problem of insecure land titles is immense. In Africa, by far the majority of the smallholder farmers have only customary rights to their land. Also, in India or Latin America, a high percentage of the poor farmers rely on customary land tenure. This means property rights are not secured beyond their own community. Farmers may live with the constant threat of losing their land to the state (Wily 2012).

Huge areas of land are being acquired by foreign states, private investors, or national elites in order to mainly cultivate biofuels, food crops, or forestry products (Anseeuw et al. 2012). Governments often approve of such large-scale land deals welcoming the investment and technological or organisational improvement. Often, when these many smallholders are displaced, it is with little or no compensation for the land they cultivated and considered their own (Landesa Rural Development Institute 2012). In order to improve this situation, governments and private actors need to acknowledge that usually there is no "unused" land. Customary land tenure needs to be recognised to promote individual rights and to acknowledge collectively used commons (Anseeuw et al. 2012).

Farmers use various strategies to avoid or mitigate their risks. Their strategies may reach from diversification of cultivated crops, niche products such as fair trade and organic, switching partly to non-agricultural sources of income, the accumulation of assets that can be sold in case of need, to crop insurance solutions (IFAD 2011).

However, far too often smallholders face those risks without adequate remedy. Thus, farmers may not be willing to take further risks of entrepreneurship, such as taking out a loan to invest into infrastructure technology or farm inputs. He might be afraid to default on the credit and be even worse off. Therefore, smallholders may prefer lower but safer income options (Hoogerven 2000).

According to the FAO, public investment in agriculture has high economic and social returns and proves to be an efficient strategy in reducing poverty and, at the same time, promoting sustainability. Investment in roads, education or agricultural research, and development seems to have higher benefits than subsidising farm inputs. Bad governance, macroeconomic instability, obscure or unstable trade policies, and uncertain property rights sum up to create an unfavourable investment climate (FAO 2012). Heavy taxation of agricultural production and obstructive import and export policies create difficulties for smallholders trying to compete on the local or the export market. Heavily subsidised products from OECD countries are another factor hindering investment in agriculture (Wiggins 2009).

Despite the hindrances, farmers themselves invest in their agricultural business because they lack other alternatives. There is strong evidence that they put more resources into their farming business and tend to be more successful in a climate conducive to investment (FAO 2012). However in a climate conducive to investment, large-scale private investors are attracted as well. Smallholders may not benefit from large-scale agricultural projects. In the worst case, they might lose their land due to missing formal land title. More inclusive projects offer contracts to small farmers to produce, under certain conditions, for a large market player. The outcomes of such contracts are diverse, but unfortunately not always beneficial to the smallholders (Vermeulen and Cotula 2010).
RISK MANAGEMENT MATRIX

<table>
<thead>
<tr>
<th>RMS</th>
<th>Informal</th>
<th>Private (market-based)</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention &amp; Reduction</td>
<td>Drought prevention (e.g., improving soil moisture retention; planting nitrogen-fixing plants to promote soil regeneration and water conservation)</td>
<td>Infrastructure (e.g., storage facilities, upgrading of warehouses)</td>
<td>Infrastructure (e.g., irrigation, roads &amp; transport systems, electricity, storage facilities; afforestation measures)</td>
</tr>
<tr>
<td></td>
<td>Watershed management (e.g., small-scale water harvesting structures), avoid cutting trees</td>
<td>Provision to agricultural inputs (e.g., appropriate seeds, fertilisers, pesticides); technology, ICT, etc.</td>
<td>Early warning systems (e.g., precipitation and other weather forecasts)</td>
</tr>
<tr>
<td></td>
<td>Proper agricultural practices (e.g., use of drought-resistant seeds, pesticides, fertilisers)</td>
<td>Training on agricultural practices; investment in research</td>
<td>Improved agricultural extension services; training in small business management; support agricultural research</td>
</tr>
<tr>
<td></td>
<td>Job diversification; settling in less drought-prone regions</td>
<td>Access to markets (e.g., contract farming, fair-trade label, links to local traders, setting up processing plants)</td>
<td>Government disaster management strategies incl. improving data availability; landscape planning</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Investment in social networks (e.g., farmers cooperatives, self-help groups, microfinance &amp; insurance groups)</td>
<td>Insurance (at micro-, meso- and macro-level)</td>
<td>Social protection policies (e.g., subsidised loans &amp; insurance as social assistance, payment of insurance through public work)</td>
</tr>
<tr>
<td></td>
<td>Informal savings, community risk pools</td>
<td>Access to credit and savings (banks), loan guarantees by agro-business for contract-farmers</td>
<td>General policy measures (e.g., inclusive growth policies, agricultural policies, land title policies &amp; enforcement)</td>
</tr>
<tr>
<td></td>
<td>Joint purchase and/or management of machine-ries, community irrigation, storage facilities</td>
<td>Access to markets (e.g., contract farming, branding of products like fair-trade, setting up collection centres, processing facilities)</td>
<td>Support creating market and small business promotion facilities</td>
</tr>
<tr>
<td></td>
<td>Collection of agricultural products and marketing</td>
<td></td>
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<tr>
<td></td>
<td>Building assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>Borrowing from friends</td>
<td>Borrowing from banks, selling assets</td>
<td>Public works programs after severe droughts; drought relief programs</td>
</tr>
</tbody>
</table>

Source: adapted by the authors from the analysis framework of the OECD (2009) and the World Bank (2011)
THE POTENTIAL ROLE OF AGRICULTURAL INSURANCE

Insurance is a means to an end. It is only one component of a well-balanced disaster risk management strategy. Prevention and adaptation is, in most circumstances, more cost-effective than insuring unsustainable conditions. However, once disaster risk has been reduced, insurance is still meaningful to protect investments made. And, until all these different measures are put in place and complement each other, humanitarian aid interventions may be required to quickly respond to immediate events. A holistic approach to sustainable risk management solutions is thus required, calling for the right mix of disaster risk reduction measures, humanitarian relief approaches, and catastrophe insurance solutions.

A widely used framework to structure the potential elements of a comprehensive intervention strategy is presented in Figure 4. The situation depicted is when drought is the key weather factor impacting smallholders. The matrix shows the complexity of approaches and could be developed for any other weather-related event.

Given the complexity of the environment in which smallholders operate, it is quite obvious that no single intervention is likely to bring about significant change. Instead, it appears a holistic approach to smallholder development is indicated, combining a couple of key measures after careful analysis of a context-specific map of the constraints. Despite all the other constraints, price volatility and unpredictable weather may turn out to be the biggest concerns to many smallholders. Price risk is usually not included in agricultural insurance coverage while weather risk typically is.

Given the various constraints that impact smallholders, the diversity of support for rural development is not surprising. The multitude and complexity of these constraints call for a systematic and thorough assessment before designing any agricultural insurance program. Once the key constraints are identified for a given farming community or sector, these constraints are binding should be assessed and then addressed in order of severity.

Such a process could work along the following four steps:

1. Identify the key constraints of the farming community. The constraints map presented could serve as a starting point. Assessing the importance of the individual constraints and understanding the relation between them requires an intimate knowledge of the specific situation.

2. List potential interventions and measures regarding risk prevention, reduction, mitigation, and coping. Such a list forms the basis of a comprehensive risk management approach and should include informal, private, and public tools. Figure 5 provides an example.

3. Identify the appropriate insurance approach (e.g., weather index, area yield, etc.), the optimal level to introduce such insurance products (micro-, meso-, or macro-level) and assess whether required preconditions (e.g., legal and regulatory environment, efficient delivery mechanism, sufficient and high quality data, etc.) to introduce such products are provided.

4. Explore how best to combine insurance with additional risk management components in order to create synergies and increase chances for success.

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10 According to Mark Wenner (IADB), price volatility has historically always polled as the number one perceived problem farmers face, while yield risk ranks second or third. Farmers typically feel completely exposed to prices, as they are price takers on the input and output side (personal communication, August 12 2013).
Looking at the constraints map, it becomes clear that insurance can work on two of the five identified constraint clusters: investment deterrents, and access to production means. These two constraints may be important and easier to address than cultural habits. Though both constraints can be addressed through insurance, the mechanisms are different: insurance would directly reduce uncertainty, but only indirectly facilitate access to production means.

These two pathways are highlighted in Figure 4.

If uncertainty, related to harvest, is the main constraint factor holding back a smallholder community from increased investment, then crop insurance should have the potential to rapidly change the picture. However, if the farming community is primarily held back by a lack of production means, crop insurance has a less direct impact and needs to be closely integrated into the supply chain of agricultural credit and inputs.

Together, access to credit and agricultural inputs form a constraint cluster that can be significantly changed by offering reliable insurance. However, this requires the buy-in and combined effort of all relevant stakeholders. If, in addition, better farming know-how can be provided to the smallholders, chances are high that some positive development will set in. Ideally, there will be organisations and effective structures in place to provide extension services and market quality inputs to the target population.

In most cases, farmer communities will have to rely on formal lending institutions to significantly increase their investments. Hence, such institutions have to be present in the community and be willing to extend agricultural credit in a timely manner and at affordable prices once they can insure parts of their portfolio risk through parametric solutions. The latter often requires significant involvement of the banks right from the start to avoid misconceptions about the product and ensure buy-in and features that truly appeal to them.

In addition, convenient, low-cost access to market information and quality storage facilities may often significantly increase the profit smallholders can get out of their harvest. Of course, index insurance projects should not wait until all these preconditions are met and then start developing parametric solutions. Rather, the projects should begin with the relevant stakeholders developing the key missing elements in advance or in parallel. For example, storage facilities are important from a food security perspective and constitute a lasting value, even for farmers who don’t benefit from index insurance schemes.

For many interventions, functioning structures of farmer organisations greatly facilitate the task: introducing new technologies, extending trainings, bundling input purchases, and marketing the produce. All benefit from farmer organisations that are rooted in the community. If farmer cooperatives are well-structured and well-run, they can also buy parametric insurance on behalf of their members and absorb some level of basis risk.

In summary, to improve smallholder livelihoods, a combination of integrated risk management, investments in infrastructure, access to knowledge and markets is warranted. In the words of Dick et al. (2011): “WII [Weather Index Insurance] can support agricultural development when it is part of an integrated approach— being one element in an overall risk management or market development strategy.” Typically, such an integrated approach would address constraints at the micro-level (individual farmer), meso-level (farmer groups, cooperatives, lenders, agriculture input dealers, value chain stakeholders, etc.), and macro-level (government). Macro-level interventions can take the form of public private partnerships or social security schemes and could thus provide a complement to initiatives at the micro-level.
AGRICULTURAL MICROINSURANCE AS A CATALYST

Smallholders face some constraints that could be significantly reduced through appropriate insurance services, as discussed above. However, providing valuable agricultural insurance in a sustainable manner to smallholders has proven notoriously difficult. Part of this difficulty results from the generally low demand for insurance services, including agricultural insurance. In consequence, there is little empirical evidence on the growth-supporting effects agricultural insurance may have on smallholder communities. Theory suggests that insurance should play an important role within a comprehensive risk management framework, as outlined in Figure 4. This theoretical case provides the motivation to constantly innovate, refine approaches, and rethink how rural communities could better manage their risks.

In order to demonstrate the value of agricultural insurance to smallholders and to facilitate rural development, various approaches have been designed and are being tested. After a short discussion of the demand issue, three key avenues, all which combine agricultural insurance with additional services, are discussed below: investments into risk reduction, facilitation of agricultural credit, and rural advisory services.

COMBINED APPROACHES TO INCREASE THE VALUE PROPOSITION

A MARKET WITH NEITHER SUPPLIES NOR DEMAND?

In most cases where index-based microinsurance has been developed and offered as a stand-alone product, demand from smallholders has been disappointing. The obvious explanation would be that smallholders do not see much value in such products, calling into question the efforts to develop the products in the first place. Notable exceptions are reported from northern Ghana11 (Karlan et al. 2012) and Ethiopia (HARTA/R4 project), where clients buy agricultural insurance on a voluntary basis.

The key drivers behind the generally low demand for index insurance products at the level of individual smallholders are not yet fully understood. In India—currently the largest market for parametric insurance targeting smallholders—about 90% of the policies are sold on a mandatory basis and tied to agriculture loans, despite the fact that only about 40% of all smallholders have a loan (Singh 2013). This raises at least two important questions: how do Indian smallholders perceive the value of mandatory index insurance and how could farmers that do not avail of a loan be reached with insurance?

Many practitioners tend to suggest that demand could be boosted if people would better understand index insurance, if basis risk were less of a concern, and if such products were offered in combination with other value-added services (Hellmuth et al. 2009, Hazell and Hess 2010, Murphy et al. 2011). However, careful exami-

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11 Note that this project currently serves mainly research purposes and is not yet running at a commercial scale.
nation of meaningful combinations is required here, too. Karlan et al. (2012) note that, in their experiments, farmers were able to independently find the required resources for increased investments into their crop production once they got insured. This, consequently, suggests that the “obvious” choice of bundling index insurance into agricultural loans may not always be the optimal choice.

WEATHER INDEX INSURANCE LINKED TO RISK REDUCTION

Reducing exposure to risk is central to any risk management approach and often appears cheaper than insurance in the long run. In agriculture, this is evident and clearly necessary, given the frequent practice of planting crops that are not optimally adapted to a specific location, as well as, increased concerns about the impact of climate change. A comprehensive strategy for risk reduction and adaptation in the agricultural sector could, for example, include adapted crop varieties, sustainable irrigation schemes, rainwater harvesting, and improved soil conservation practices, to name but a few techniques. Nevertheless, most farmers can benefit from insurance even when exploiting all available risk management techniques.

The current debate, in the context of climate change adaptation, is about the extent to which insurance can effectively promote risk-reducing investments. While, in theory, insurance can send price signals to the customer, and thus incentivise protective measures, this is unlikely to be an effective strategy with smallholders, as they typically lack the financial and technological resources to act upon such signals. Risk reducing and protective measures in the face of climate change usually require government involvement. Two recent examples of projects that seek to couple index insurance with risk reduction give hope to further developments in this area: El Niño forecast insurance in Peru and the R4-initiative in Ethiopia.

El Niño forecast insurance in Peru. This insurance product specifically targets risk aggregators such as banks involved in rural lending, agricultural input companies, or food processing factories. It provides cover against business interruption “to compensate for lost profits or extra costs likely to occur as a result of the catastrophic floods as predicted by a specific indicator of El Niño: indemnities are based on sea surface temperatures measured in November and December, which are taken as a forecast of flood losses that would occur in February to April” (Skees 2010). The idea behind this novel approach to insurance is to trigger pay-outs well before the actual loss event happens. This will allow clients to take preventive measures to reduce their exposure and losses, e.g., by investing in related infrastructure such as road repairs, cleaning of drainage canals, etc.

HARITA/R4 Rural Resilience Initiative in Ethiopia. The R4 initiative has grown out of the HARITA project in Ethiopia and intends to replicate the same approach now in Senegal and two other African countries. R4 takes a broad approach to sustainably improving the livelihoods of smallholders they work with. R4 stands for risk reduction, risk transfer, risk reserves, and prudent risk taking. It emphasises the full spectrum of risk management measures: risk reduction through prevention; soil improvements and small-scale infrastructure improvements, such as water retention basins; risk transfer through formal insurance; risk reserves through the promotion of formal savings; and prudent risk taking through responsible agricultural credit to finance increased investments in farm activities. Under the food-and-cash-for work component, farmers engage in labour intensive risk reducing work, such as the construction of small water retention basins and afforestation (http://www.oxfamamerica.org/issues/insurance). HARITA is embedded in Ethiopia’s Productive Safety Net Program. It integrates insurance with various risk management measures and allows the extreme poor and vulnerable farmers to pay their premiums through labour on risk reducing projects, such

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12 Current climate change scenarios predict an increase in both frequency and severity of extreme weather events for many parts of the world. If so, related insurance would have to become more and more expensive over the years. With risk reducing measures implemented, the price for insurance would, however, remain stable or even go down.
as water retention infrastructure, planting trees for protection against wind, and/or making compost. Thus farmers benefit even when there is no insurance pay-out because these risk-reducing activities help to minimise vulnerability to drought and improve yields.

In a more straight-forward approach, CLIMBS (Philippines) works together with the national alarm system, which aims at informing communities of imminent natural disasters, such as typhoons, allowing them to better prepare themselves. Sometimes, simple and cheap measures can make a big difference. Suarez and Linnerooth-Bayer (2011) suggest that, if farmers store their harvest in open granaries on floodplains, the “distribution of empty grain bags before the floods would allow families to quickly put their grains in bags and store their food in elevated sites to avoid losses.” All this suggests a large potential for cleverly using the weather data collected for calculating the index—way beyond the index product itself.

**AGRICULTURAL CREDIT AND WEATHER INDEX INSURANCE**

Especially in disaster-prone regions, creditors like banks are unlikely to lend to farmers if the shocks might result in widespread loan defaults, even if loans can be paid back easily in most years. This lack of access to credit restricts farmers’ access to agricultural inputs and technologies. When lenders know that borrowers are covered by insurance, they may be more likely to extend credit to them. Farmers may then choose to make investments that may raise their productivity (Hellmuth et al. 2009).

The collective experience of some key organisations such as Kilimo Salama, MicroEnsure, and PlanNet Guarantee—all currently involved in developing and selling index insurance to smallholders—has been that farmers’ main motivation for purchasing weather insurance is to unlock rural credit. In some instances, index insurance serves the purpose of collateral. However, MicroEnsure also contends that “…there has been minimal success in selling weather insurance as stand-alone products” (Leftley 2009). This suggests that clients would not buy index insurance as a separate product and take it to a rural lender who, in turn, would become willing to extend credit to an insured smallholder. Instead, the smallholders are offered a bundle of rural credit and index insurance.

Some examples of index insurance sold either as stand-alone products or packaged into a rural loan may illustrate the practical challenges, advantages, and successes. They are also a testament to the observation and recommendation by Murphy et al. (2011) that introducing parametric insurance at the meso-level has several advantages compared to dealing with individual smallholders, including a reduced exposure to basis risk and lower transaction costs:

- In **Malawi**, Opportunity International Bank of Malawi and Malawi Rural Finance Corporation offered a loan and microinsurance package to farmers groups organised by the National Smallholder Farmers. This in an attempt to offer smallholders much needed credit to invest in the seeds and other inputs necessary for higher-yield crops, while still being protected against defaults resulting from the frequent weather shocks (Suarez and Linnerooth-Bayer 2011). First trials with groundnut farmers had a negative turnout for the banks involved, as they found it difficult to enforce loan repayments despite the insurance. In subsequent years, they turned to the tobacco sector, as these farmers were better integrated into the value chain and had more enforceable contracts (Hellmuth et al. 2009). These examples show both the challenges with index insurance at the micro-level and the interest from risk aggregators, such as banks and rural MFIs, for instruments securing their loan portfolio.

- In **Vietnam**, the financial strain on farmers from early flooding often translates into loan repayment difficulties. As a result, the Vietnam Bank of Agricultural and Rural Development is exposed to significant direct and opportunity costs, or “business interruption loss.” The index insurance is designed to offset these early flood-induced business interruption losses. It is underwritten against recorded water levels using river gauge data as a proxy for flood damage.
In the Philippines, Munich Re offers parametric insurance to protect loan portfolios of cooperatives from events such as hurricanes and typhoons. Currently, this product is offered through CLIMBS Life and General Insurance Cooperative. The CLIMBS Weather Protect product operates on a national level in the Philippines - with CLIMBS acting as primary insurer for the local cooperatives and Munich Re reinsuring the product. The cooperatives receive a predefined percentage of their loan portfolio as pay-out if a parametric trigger for rainfall or wind speed is reached. The cooperatives then can use insurance pay-outs for rebuilding work or replacing livestock or other assets (Hellmuth et al. 2009).

Index insurance combined with agricultural services

Smallholders, who face a variety of risks and productivity constraints in addition to weather risks, may see index insurance as an unnecessary cost if it is offered as a stand-alone product. However, as in other fields of microinsurance, index insurance can become more appealing when offered in combination with other services. In agriculture, many possibilities exist: weather forecasts through text messages, extension services, and full-contract farming packages are some examples. Such combinations can address a range of constraints simultaneously and offer smallholders a better potential for sustained growth in their income and improvements in their quality of life.

As a consequence, farmers can benefit from such combined, mutually reinforcing, and complementing initiatives immediately and do not have to wait until an extreme weather event triggers the index. This makes for a much more appealing value proposition. Whether in the end farmers truly value the index insurance component or whether it is simply a precondition for involved parties to provide the other services remains to be studied in detail, and may turn out a second tier of questions.

Currently, the most common combination is the provision of weather forecast and extension services. As weather index insurance relies on accurate weather data, and a relatively extensive data history is a precondition for establishing the index in the first place, sharing this knowledge with the target population is a natural step. Weather forecast services are often considered highly valuable to smallholders, especially if coupled with basic agricultural advice such as optimal planting dates for crops, etc. This is exactly what clients of the Kilimo Salama project in Kenya receive on a regular basis through text messages.

In addition, weather forecasts and early warning systems can also help farmers plan ahead. Suarez and Linnerooth-Bayer (2011) suggest that, “If a seasonal precipitation forecast indicates that a drought is likely or unlikely to strike a certain area, this information can help farmers choose a drought-resistant crop variety or engage in high-yield (and high-risk) farming practices, respectively.” Obviously, such information is only effective if farmers can be reached in time through a trusted channel and if they have a real choice to take action: timely access to credit and quality farm inputs, for example, are considered key constraints by Mathieu Dubreuil, team leader of PlaNet Guarantee’s index insurance project in Western Africa (personal communication 2013).

Probably the highest degree of integration is reached if index insurance is part of a comprehensive service package under outgrower schemes. One such example well-documented in the literature is PepsiCo’s potato contract farming scheme in India (Hazell et al. 2010). Under this scheme, farmers are provided with key inputs (e.g., potato seeds, fertiliser, pesticides), including credit, if required, farming advice, and guaranteed purchase if quality meets certain standards. Index insurance is offered on an optional basis and demand is reported as satisfactory, despite significant levels of basis risk in early years of implementation.

The potential for combinations in this field, however, looks far from being exploited. Farmer cooperatives could play a much more active role, also by smoothing out basis risk, as suggested by Carter (2012) and others. Another, currently debated idea is to link actors along the agricultural value chain. This could include not only agro dealers, but also labelling organisations, and socially responsible traders.
THE CASE FOR MICROINSURANCE—PRELIMINARY INSIGHTS

Despite all the uncertainties and constraints smallholders face, it is also important to remember that these communities have survived for centuries and often have developed adaptive strategies. These traits make them more robust than they appear to outsiders. However, some developments, such as the green revolution in Asia, forced migration, conflict situations, structural reforms imposed by multilateral organisations in the context of debt restructuring, and climate change have taken their toll (IFAD 2011). And, while these communities manage to survive, they struggle to move above a subsistence level.

Insurable risks are clearly one class of constraints that hinder many rural communities to prosper. Agricultural microinsurance can potentially develop two mechanisms to stabilise rural communities and promote local development: either as it provides protection or as a necessary condition for larger investments. In the first case, microinsurance prevents farming households from suffering long-term impacts in the case of harvest failure. Studies of the impact of droughts on Ethiopian farmers have revealed that selling productive assets due to weather shocks may throw these households back by several years (Dercon 2011).

With traditional, indemnity-based crop insurance being too inefficient and hence costly to reach significant proportions of smallholders, hopes were high that parametric approaches would provide a valuable alternative. However, until now this concept has not yet delivered on its promises. While a considerable number of pilot projects have been funded, only the minority of them have been able to expand beyond an initial pilot area. Encouragingly, there are also examples that yield promising results regarding uptake. These are, however, clearly not enough to say anything solid about impact of index insurance on farming communities.

At this stage most practitioners seem to agree that index insurance designed as protection, offered to individual households without further services is unlikely to succeed. Murphy et al. (2011), note, that “generally speaking, household demand for insurance against catastrophic natural risks is low. People tend to underestimate the likelihood of a catastrophic event and thus are likely to undervalue the insurance.” The best way to combine index insurance with other services in order to create a valuable package will heavily depend on local circumstances. Kartlan et al. (2012) warn against an indiscriminate bundling with farm credit: even though this may appear the “obvious” package, it is not always required, as farmers may well be in a position to mobilise resources by themselves once they have appropriate insurance.

A substantial amount of the debate surrounding index insurance still concentrates on technical issues in the larger sense: the optimal design of indices, approaches to minimise basis risk, the way how future clients are sensitised and educated about index insurance, or at which level index insurance should be introduced, to name but a few. This focus on technical elements may partly explain why surprisingly little information on the direct and indirect benefits of index insurance for smallholders is available. The glaring absence of impact studies has been noted in the literature (Hazell and Hess 2010; Murphy et al. 2011; Cole, Bastian, et al. 2012) recently.

Without a better understanding of how smallholders behave once they have access to insurance it is impossible to judge the value of these products. From a broader development perspective, the ultimate goal must be to improve and stabilise smallholder’s livelihoods, not to insure them for the sake of being insured. Judging by the variety of severe constraints listed in the constraints map (Figure 3), it may well be that index insurance is, in many contexts, not yet the key missing input required to kick-start rural development, at least not as a stand-alone measure.

In order to assess client value and impact of currently offered agricultural microinsurance products properly, relatively long time series of data are required, which are rarely available today. Cole, Giné, and Vickery (2012) performed a “systematic search of published and unpublished material relevant to take-up and impact
of index-based microinsurance.” The research team identified 13 studies and found “mixed evidence of the impact of insurance cover on input usage.” However, the authors strongly caution to generalise their findings, pointing towards the insufficient sample size to say anything conclusive. The little available evidence on farmers’ behavioural change under index insurance is mostly inconclusive. This is not surprising, as the number of data points is very small and the contexts likely substantially different:

- **India:** Shawn Cole, Xavier Giné, and James Vickery reported little change in total farm investment by Indian farmers covered by rainfall insurance policies, which are not designed to protect specific crops. What they observe, however, is “significant evidence of substitution between different production activities.” These farmers shifted investments towards cash crops, which are more sensitive to rainfall deficit but for which expected returns are higher. The results of this study suggest that the effect of being insured is highest among those farmers “that are close to indifferent between investing or not investing in cash crops, but small among households with large cash crop investments.” Further, this study found a weak bias towards wealthier households, which are more likely to change investment behaviour once insured.

- **Ghana:** Dean Karlan, Robert Darko Osei, Isaac Osei-Akoto, and Christopher Udry, in 2012, found a significant increase in total farm investment among farmers that are protected by rainfall insurance. Here, insured farmers not only made higher cash investments, but also increased the area under cultivation and labour inputs. Interestingly, the significantly higher investments have been triggered by the insurance coverage alone, as it was not bundled into a credit arrangement. This finding leads the authors conclude that index insurance does not necessarily have to be attached to a farm credit, as at least these farmers were able to mobilise additional resources once insured. The ultimate effect of insurance on the total value of farm outputs, however, is less evident and potentially only positive if farm labour is factored in at zero cost.

- **Kenya:** the Kilimo Salama project did a formal evaluation of farmer’s behaviour for the first time in 2012 (personal communication with Nila Uthayakumar). The results point towards an increase in investment by insured farmers of 19% compared to their uninsured peers. Gross revenue from farming is 16% higher for insured farmers than for uninsured counterparts. A large effect of this increase in income is likely due to the fact that insured farmers substituted maize with beans. Though both crops are similar in terms of required input costs and water needs, beans tend to yield a higher return. In other words: farmers could also shift towards the cultivation of beans without insurance, but as the Kilimo Salama insurance comes together with farm advice and weather forecast, insured farmers may be more likely to realise this potential.

- **Ethiopia:** the HARITA/R4 project observes encouraging trends (personal communication with Nils Balzers): farmers tend to renew their policies on a voluntary basis, buy larger coverage and increase the area under cultivation.

Despite substantial support to develop parametric insurance solutions for smallholders, coupled with limited success, disillusionment has affected the index insurance community. Some institutions that promoted index insurance and were involved in many pilot schemes have started to caution against an overly enthusiastic view of parametric insurance as a solution for promoting rural development.

Two recent publications (Murphy et al. 2011; World Bank 2011) summarise the current state of knowledge and conclude with a list of recommendations for the future. Highlighted recommendations include project evaluation and project management from day one by Cole, Bastian, et al. (2012) and Hazell and Hess (2010). Regarding market development, Murphy et al. (2011) recommend significant investments into local capacity building and strengthening of institutional frameworks, which in turn, would support market development in the long run.

As for product design, three key elements stand out: first, a clear focus on meso-level products, i.e. those that target risk aggregators. Second,
products that are not crop specific, as such products can be sold to a larger client base than crop specific insurance and third products that provide protection against catastrophic events rather than more frequent pay-outs. The argument on this third point is two-fold: under catastrophic events, the issue of basis risk becomes less important and risk aggregators should be able to absorb more frequent events by themselves without insurance.

The World Bank report (2011) presents a set of circumstances where parametric insurance has potential to play a significant role. These are essentially:

- Social protection schemes. Index insurance could be a powerful financing tool to provide social protection schemes with required funds in a timely manner when a crisis hits. Insurance pay-outs would then go to the government to channel them through its social protection schemes to the affected population.

- Large-scale commercial farmers. They have a clearly identifiable exposure, the financial resources to absorb basis risk and potentially the required volume to take their business directly to international reinsurance companies, circumventing the constraints of local insurance markets.

- Portfolio risk management at the meso-level: insuring risk aggregators. While this is promising at first sight, the authors also warn of practical and ethical issues. Practical, as farmers that are aware of their counterparts being insured may become more likely to default and ethical as banks, who receive an insurance pay-out may still seek to recover the outstanding loan from the farmers.

- Sovereign risk transfer. Macro-level insurance to protect a government’s balance sheet against contingent weather risks,

- Contingent finance. Similar to macro-level insurance, but with the twist that the index would trigger a credit line only, not a claims payment.

It is notable that the World Bank report sees the highest potential for parametric insurance at the macro-level (followed by the meso-level): social protection schemes, sovereign risk transfer, and contingent loans. The common denominator of these reports is to shift the focus from micro-level index insurance products towards meso- and macro-level, to invest into evaluation of all ongoing and future projects and to review product design.

Agricultural insurance is clearly required in order to secure significant investments into agriculture. Farming is too volatile and would benefit from efficient risk transfer mechanisms. All the while, smallholders face a variety of constraints and therefore require more than insurance. When addressing smallholders perhaps a convincing service package may include insurance, access to better production means, extension services, access to markets and preventive measures. At a meso- and macro-level, the service package may well be reduced and could in many cases consist of insurance alone. Consequently, this is also the area where quick wins are possible.
CONCLUSIONS

The constraints map illustrates that in most cases, farmers face multiple constraints holding them back from investing, disproving the bottleneck model in this context. However, once a coherent set of minimal, but key elements, including insurance is in place, smallholders will be able to steadily improve their yields and potentially expand their production. Whether they increase the area under cultivation, diversify into high-yield/higher-risk crops, or invest into better or more farms farmers will benefit with higher and secured net incomes. This should be easier to evaluate than the benefits of protection (in the sense that farmers don’t have to sell off productive assets in the aftermath of severe weather crises), which will only materialise infrequently.

Index insurance is still a field of constant innovation, evolving to provide reliability and value to clients. Technical aspects of index insurance are just one part of the problem to solve. The other, equally important, side is the analysis of the constraint and opportunity landscape within which the smallholders exist. “Too often, weather index insurance projects focus almost exclusively on product design without paying sufficient attention to broader market development challenges” (Murphy et al. 2011). Once the key constraints and main opportunities are understood, tailored interventions can be designed, implemented, and monitored.

In most circumstances that smallholders operate in, offering index insurance to individual farmers as stand-alone solution is not an appealing value proposition and, hence, is set to fail. Smallholder farming is complex and insurance is just one component of a comprehensive risk management strategy. The limited empirical evidence of the outcome and impact of agricultural insurance on smallholder economies suggests that parametric insurance solutions work best where they are integrated into a broader program for development and disaster risk management. The prime example here is the HARITA/R4 program, as it is a fairly comprehensive agricultural risk management project that includes insurance.

In order to allow index insurance to develop its full short-term potential in the context of smallholder farming, a set of preconditions has to be in place. Typically, these preconditions would be the credit institutions extending agricultural credit, availability of quality farm inputs and relevant farming know-how. Ideally, formal savings opportunities would also available, which then would allow individuals to gradually build up assets and a financial buffer. A long-term development plan for smallholders will likely also have to address issues with land property rights, national and international trade policies, the provision of quality health care, and improved infrastructure to allow smallholders store their harvest and bring it to markets at times when prices are high.

While insurance at the micro, meso, and macro level ideally complement each other, the “quick win” is often likely to be achieved through meso- and macro-level insurance. This may, however, involve the strengthening of farmer organisations, as well as developing mechanisms to extend the benefits of macro-level insurance to the population in need. Organising smallholders in efficient groups, cooperatives, or associations has many advantages beyond making them better clients for insurance—extension services, produce marketing and the collective buying of inputs are just some example of the additional benefits.

Sustainably improving the livelihoods of smallholders is a huge challenge, but one worth being taken up. Integrating agricultural insurance into a broad development strategy has the potential to significantly expand the range of development options. At what point agricultural insurance is required to enable further development and in combination with which other interventions, depends on the context.


Murphy, A. et al. 2011. State of knowledge report (3)—Market development for weather index insurance—Key considerations for sustainability and scale up. Lexington, KY: GlobalAgRisk, Inc.


Onumah, G. 2002. Facilitating smallholder access to warehouse receipt system in Zambia: Review of options. Faculty report prepared for the Zambian Agricultural Commodity Agency Ltd. at the Natural Resources Institute, University of Greenwich, UK.


The Microinsurance Network is a member-based network of organisations and individuals active in microinsurance. The mission of the Network is to promote the development and proliferation of good-value insurance products for low-income persons by providing a platform for information sharing and stakeholder coordination.

The Agriculture Working Group of the Microinsurance Network seeks to promote the wider use of agricultural insurance, particularly crop and livestock insurance, as a modern financial risk management instrument in developing countries.

For more information on the Microinsurance Network visit www.microinsurancenetwork.org

Any feedback or comments can be sent to info@microinsurancenetwork.org

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