

Growth  
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# Co-producing policy recommendations

Lessons from DEGRP project “A behavioural economic analysis of agricultural investment decisions in Uganda”

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## Foreword

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Steve Wiggins, Research Fellow, Overseas Development Institute

Research findings do not necessarily produce obvious policy recommendations.<sup>1</sup> The typical research result, that A leads to B, does not necessarily imply as policy, 'public provision of more of A'. At least two additional sets of screening questions need to be posed.

First, is the research finding applicable more widely than in the circumstances that were studied? This applies strongly for the social science of agricultural and rural development, where so many conditions both natural and human vary greatly from place to place. Furthermore, 'A' may have led to 'B' so far, but will that apply in the future? While often we may be confident that past processes are likely to apply in the future, in some situations new actors, laws, policies, changes in markets, etc. may imply that things will not necessarily play out as they have in the past.

Second, how best can more of A be provided? Is public provision feasible — technically, socially and politically? Does it promise to deliver sufficient social and economic returns to justify the public cost?

Much social science research either does not address these issues, or does so in brief discussion at the end of a report or published article. Sometimes researchers go further to distil their findings into policy guidance; producing more considered policy briefs that set out their findings and what the policy implications may be. The thinking behind the brief may incorporate the results of discussions with policy-makers, or may simply be deduced.

In this case, however, we have a rarity. The study used experimental economics to elicit farmer perceptions of risks in agricultural investment. The researchers next discussed their findings with farmers and field specialists in the locality where they carried out their studies to identify possible practical implications. Then they took those insights to a national dialogue with government, non-government, donor, academic and private stakeholders to consider what might be feasible and promising nationally. So unusual is this process that we asked the team to document in detail what they did.

To give you a taster of how this proceeded, the following table summarises the principal research findings, the local lessons derived from consultations in the district, and the recommendations arising from the national dialogue. As you can see, some research findings did not readily generate policy recommendations, while some prompted more than one.

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<sup>1</sup> For an interesting recent discussion of these issues, particularly as they apply to experimental or quasi-experimental research, see Basu, Kaushik, 2013. 'The Method of Randomization and the Role of Reasoned Intuition', Policy Research Working Paper 6722, Washington DC: World Bank.

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Research findings (F)	Local lessons (LL)	Recommendations (R)
<b>F1:</b> Low investment in the experiments is associated with low fertiliser use, but not with growing cash crops	<b>LL1:</b> The time is ripe for piloting forms of micro insurance <b>LL3:</b> Make fertiliser available in smaller quantities	<b>R1:</b> Bundle index insurance, credit and agricultural inputs as this may encourage farmers to take up the insurance product and invest <b>R5:</b> Make fertiliser available in smaller quantities. <b>R6:</b> Leverage modal behaviour on fertiliser use.
<b>F2:</b> Farmers who grow cash crops, unlike semi-subsistence farmers, downplay a small probability of investment failure.	<b>LL1:</b> The time is ripe for piloting forms of micro insurance	<b>R1:</b> Bundle index insurance, credit and agricultural inputs as this may encourage farmers to take up the insurance product and invest <b>R5:</b> Make fertiliser available in smaller quantities. <b>R6:</b> Leverage modal behaviour on fertiliser use.
<b>F3:</b> A priming task designed to induce learned helplessness reduces persistence in an investment task by about 20%.		
<b>F4:</b> People take more risks when risk-taking is naturally expected.		<b>R2:</b> Frame insurance as a clever way of saving, in pilot studies when index insurance is offered
<b>F5:</b> The social mode has a very strong pull on risk-taking.	<b>LL2:</b> Influence the social norm on fertiliser use.	<b>R6:</b> Leverage modal behaviour on fertiliser use.
<b>F6:</b> People take fewer risks when losses are shared.	<b>LL1:</b> The time is ripe for piloting forms of micro insurance	<b>R3:</b> Offer index insurance to risk-sharing groups, as this could increase uptake and encourage agricultural investment
<b>F7:</b> People take more risk when profits are shared.		
<b>F8:</b> Divergent risk attitudes are associated with interpersonal conflict.		<b>R4:</b> Promote inventory credit/warrantage at the community level

The process is not complete. Now the recommendations will be followed up with potential implementers, both public and private, to try out the most promising ideas.

# 1. Introduction

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**Project:** A Behavioural Economic Analysis of Agricultural Investment Decisions in Uganda

**Duration:** February 2012 – February 2015

**Investigators:** Arjan Verschoor (Principal Investigator), Ben D'Exelle (Co-Investigator), Joshua Balungira (Field Research Manager) and Borja Perez-Viana (Research Officer)

We report here on how we arrived at the policy recommendations presented in our final policy brief. As Steve Wiggins notes in his foreword, findings do not automatically lead to policy guidance. Encouraged by DEGRP's Evidence and Policy Group, we therefore decided to incorporate several stages of stakeholder engagement into our project in order to gain feedback about the relevance of our findings and so increase the applicability of our research when it came to writing up our policy recommendations.

The project combined economic experiments, a socioeconomic survey and a social tie survey in order to understand the risk-taking and risk-sharing habits that help to explain agricultural investment decisions. We used a representative sample of 1,803 farmers from Sironko District and Lower Bulambuli (together the former Sironko District).

Food insecurity and harvest failure are common in the area: 66% of the farmers reported that the harvest failed at least once in the past five years (in the sense of a sharp negative income shock resulting from a poor harvest) and 35% said that they 'very often' or 'nearly always' struggle to meet food needs. At the same time, promising investment opportunities are available, especially using fertiliser and growing cash crops with the recommended inputs. These are much more profitable than conventional agriculture (that is, maize intercropped with beans with a minimal reliance on purchased inputs), but carry a larger risk of failure (Verschoor et al., 2015).

Understanding the conditions under which farmers would prudently take advantage of these opportunities is therefore crucial for identifying policies that may promote food security and poverty reduction.

To turn our findings into recommendations, we extensively consulted stakeholders, both at the local level (in the study area) and at the national level, in Kampala, Uganda's capital. We describe our approach in the next section. A brief overview of our methods and key findings, followed by a fairly detailed description of how stakeholder feedback on these findings led to the formulation of policy lessons and recommendations, are given in Sections 3 and 4. We show how a systematic and sustained engagement with stakeholders pays dividends: our final recommendations are much more sophisticated and realistic than our initial policy lessons.

At the same time, the final recommendations are still rather general; it is not yet clear which concrete measures need to be taken as their constituent parts. Our next steps are to identify these measures and corresponding key policy actors; and then see what can be done to convey the key messages deep into the policy-making process.

## 2. Stakeholder engagement: the process

The graphic below summarises when the various phases of engagement took place, and how they influenced different aspects of the project:



### Local

March-June 2012

An initial consultation was held in 2012 at the start of the project, to obtain a detailed overview of promising agricultural investment opportunities in the study area.

We spoke with the district agricultural officers of the two districts that comprise our study area, agricultural extensionists, an agro-input dealer, a district commercial officer, and a handful of leaders and prominent members of farmers' fora – 27 individuals in total. The promising investment opportunities they identified were:

1. purchasing inorganic fertiliser, which can be combined with conventional agriculture; and
2. growing cash crops such as coffee, cabbages and tomatoes using the inputs recommended by agronomists.

Based on historical price and yield data, we found these opportunities to be both more profitable and more risky than semi-subsistence agriculture – that is, growing maize intercropped with beans, using hardly any bought inputs.

July-September 2014

After the research had been conducted, we produced a four-page overview of our findings, written in accessible language, which we took back to the local stakeholders. We invited reflection on policy implications in lengthy interviews with two or three individuals at a time, summarised what we learnt and invited feedback in three workshops with the same individuals gathered together. This process, which took place during the summer months of 2014, led to the drafting in September 2014 of our 'locally informed policy brief', containing provisional policy lessons.

These policy lessons relate to inventory credit, fertiliser promotion, agricultural extension and index insurance – areas in which we had no particular prior expertise. In preparation for the national stakeholder consultation exercise, we reviewed Uganda's previous experience, as well as the international experience, in these areas. We also benefited considerably from DEGRP Agriculture Lead Steve Wiggins' detailed comments and suggestions.

### National

October 2014-June 2015

In the period October 2014 to June 2015, we consulted in Kampala with 90 senior representatives from:

- **government**, including the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) and the Ministry of Finance, Planning and Economic Development (MFPED);
- **the private sector**, especially insurance companies and banks interested in offering index insurance to farmers;
- **development agencies** such as USAID/Feed the Future;
- **academia**, including researchers from Makerere University and other institutes;

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- **NGOs and civil society organisations**, such as the Uganda National Farmers' Federation, with an interest in agriculture.

Of these representatives, 23 were first interviewed individually and a synthesis of their views incorporated into our policy brief.

### March-June 2015

Participants from the first stage of national consultation were invited to attend a workshop in Kampala on 11 June 2015. DEGRP's agriculture lead Steve Wiggins presented the wider context of our findings and policy lessons, and Louise Shaxson, Programme Manager of DEGRP's Evidence & Policy Group, devised and administered a clever procedure for an efficient and systematic reflection on these.

We discussed the main policy lessons that emerged from:

- our findings;
- local consultation as to the meaning of these findings;
- a review of the Ugandan and international experience, and;
- national consultation prior to the workshop.

These policy lessons are described in the next section, as well as how we arrived at them.



### 3. Key findings

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For the project, we investigated risk preferences and the anticipated consequences of risk-sharing as possible causes of underinvestment. Risk preferences considered include risk aversion and specific variants of it in the form of putting safety first, learned helplessness, habitual caution and following the social mode. The sharing of profits and losses, as well as potentially ensuing conflict, are the channels we examined through which anticipated risk-sharing may affect investment.

At the heart of the research are 'lab-in-the-field' experiments, in which participating farmers take risky decisions in a stylised environment, using money we endowed them with (about two days' wages). The investment decision typically involved a 50/50 chance of tripling or losing the portion of the endowment allocated to a risky asset (at other times there was an 80/20 chance of doubling or losing, or a much larger range of systematically varied probabilities of three outcomes). Experimental conditions are varied to capture the risk-taking and risk-sharing habits of interest.

Several weeks prior to the experiments a socioeconomic survey was administered so that we could link real-life and experimental investment behaviour, as well as control for other important determinants of investment such as wealth and access to credit.

In addition, we administered a social tie survey, to know how participants are placed in their social setting: with whom they share risk, with whom they collaborate; from whom they borrow; to whom they lend; and so forth. We made use of these social ties in the analysis of the experimental data.

As to reasons for underinvestment, our findings - which the local informants, mentioned in the previous section, helped us to interpret - are as follows:

#### **Finding 1: Low investment in the experiments is associated with low fertiliser use, but not with growing cash crops**

*Risk aversion*, as conventionally measured, explains the former but not the latter. We interpret this as pointing to the essential similarity of fertiliser purchase and investing in the experiments: both are straightforward, one-dimensional investment decisions (Verschoor et al., 2015). To explain the growing of cash crops, more complex risk preferences may be at work, such as that captured in the next finding.

#### **Finding 2: Farmers who grow cash crops, unlike semi-subsistence farmers, downplay a small probability of investment failure**

We discovered this through use of so-called common consequence ladders, in which the probability of a good, medium and bad investment outcome are systematically varied across a series of 10 investment decisions. This points to the presence of a 'safety first' principle guiding those who shun investing in cash crops, even when these are lucrative: a small probability of the investment going wrong could be intolerable when farmers' income could fall below the subsistence threshold and they lack an asset buffer to absorb shocks (Verschoor and D'Exelle, 2015).

#### **Finding 3: A priming task designed to induce *learned helplessness* reduces persistence in an investment task by about 20%**

In real life, many factors interfere with the relationship between effort and investment success (the weather, pests and diseases, prices and so forth). As a result, this relationship may be obscure to

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decision-makers and some may fall prone to learned helplessness, i.e. some farmers in a “noisy” decision-making environment tend to underestimate how much influence they could have in achieving a successful outcome and therefore do not try.

We obtained experimental evidence for the plausibility that small-scale farmers operating in hazardous environments would acquire such a tendency. Naturally, this would affect their response to promising investment opportunities that require diligent application for their success (Munro et al., forthcoming).

### **Finding 4: People take more risks when risk-taking is naturally expected**

In some treatments, we subtly suggested investment decisions for farmers. The farmers had two baskets in front of them, one ‘safe’, the other ‘risky’. Coins placed in the safe basket would be theirs to keep, whatever happened; the coins in the risky basket would be doubled with a likelihood of 80% and vanish with a likelihood of 20%. In one treatment we first placed almost all of the coins – the money the farmers were endowed with – in the safe basket; in another treatment, we placed them in the risky basket: farmers were next free to move as many coins as they wanted from one basket to the other.

In reality, the safe and risky treatments represent exactly the same investment decision. However, when coins were already placed in the risky basket, farmers invested 28% more (about 64% instead of 50% of their endowment). When new investment opportunities are introduced, risk-taking is not (yet) naturally expected; *habitual caution* may help explain inertia in uptake.

### **Finding 5: The social mode has a very strong pull on risk-taking**

In the experimental set-up just described, when we gave information about the most popular option in other experimental sessions, people quickly adjusted their risky choice towards what they now understood as the most popular choice, so much so that the effect of our initial framing practically vanished (Clist et al., 2015).

### **Finding 6: People take fewer risks when losses are shared**

We investigated whether anticipated risk-sharing affects investment behaviour: loss-sharing in one’s social network works as informal insurance, whereas profit-sharing could dampen incentives to invest. In certain variations of the risky choice experiments, we therefore allowed participating farmers to share profits and/or losses of their risky investment in a design that allowed us to disentangle their effects. For example, in one particular experimental treatment, two farmers would be matched and one of them would be invited to state beforehand what proportion of the losses s/he would be willing to share in case the other’s investment went wrong.

One might expect this to act as an informal insurance mechanism, so that investment would increase, but paradoxically, when losses may be shared, investment goes down – it was as if investors didn’t want to burden others with the consequences of their own risk-taking.

This effect was especially strong if matched participants are close in real life; we interpret this as limiting the effects on others of risk-taking investment, either because one cares about these others (‘directed altruism’), or to avoid others having a legitimate claim to future assistance (‘anticipated reciprocity’).

### **Finding 7: People take more risk when *profits are shared***

Mirroring Finding 6, people do not reduce their investments when others may benefit from investment success but increase them; this effect is particularly strong when the paired other is socially close (e.g. a friend). The same behavioural motives are plausibly responsible: directed altruism would lead to generosity and anticipated reciprocity to increasing the assistance that may be sought from the person one is paired with in the experiment (D'Exelle and Verschoor, 2015).

### **Finding 8: Divergent risk attitudes are associated with interpersonal conflict**

In a social tie survey we collected data on the nature of the social links between those individuals in our sample who live in the same village. As is known from previous ethnographic research, interpersonal conflict is common in this part of Uganda, often over land; 21.5% of the 917 ties we investigated are conflictual. Strikingly, when risk attitudes differ between connected individuals, they are more likely to be in conflict; a simulation analysis suggests that the direction of causation runs from the former to the latter. This effect is especially strong for males and among kin. The difference in risk attitudes is measured on a six-point scale: for each point difference, kin are five percentage points more likely to be in conflict. Relatives are often tied together in informal risk-sharing arrangements (IRSAs) and joint economic ventures; when their risk attitudes differ, they want different things for their common endeavours, which may give rise to conflict (Lahno et al., 2015).

## 4. Turning findings into recommendations

### Local lessons

Here we summarise what we learnt from our engagement with local stakeholders. We also draw on 40 in-depth interviews with farmers who participated in our research; they were interviewed on how they take agricultural investment decisions.<sup>2</sup>

The vast majority of farmers in our representative sample of 1,803 grow maize intercropped with beans (93% grow maize and 97% grow beans). Some grow maize commercially (about 14% of the entire sample) and they routinely use fertiliser. The others invest in fertiliser when they have a surplus over and above their subsistence needs: they invest what they can afford to lose. Among our sample, 53% of farmers have used fertiliser at some point during the previous two completed cropping seasons. However, its use is erratic, dependent as it is on having ‘spare cash’.

**Table 1: Profits in agriculture in eastern Uganda**

Scenario	Worst-case profits	Best-case profits
Traditional	0	1.30
+ fertiliser	-0.18	1.89
Tomatoes + inputs	-1.66	3.34
Onions + inputs	-0.92	2.88
Cabbages + inputs	-0.77	2.87
Coffee + fertiliser	-0.19	3.51

Figures are in millions of shillings per acre per agricultural season, and relative to a ‘lean year’ scenario of growing maize intercropped with beans and minimal reliance on bought inputs (Verschoor et al., 2015).

A more entrepreneurial group of farmers – 31% of our sample – would use their surplus over subsistence for the growing of cash crops such as tomatoes, with all the recommended inputs (pesticides, stakes, irrigation, hired labour, fertiliser, etc.). Some of their land would be allocated to that purpose, with the remainder being used for maize and beans. Such crops are highly lucrative by local standards but their profitability is much more variable than that of conventional agriculture (see Table 1).

The question is then how to encourage prudent agricultural investment, given the locally available investment opportunities and given what we learnt about farmers’ risk-taking and risk-sharing behaviour. The following policy lessons emerged from local stakeholders’ reflections on our findings:

<sup>2</sup> The 40 farmers are a stratified random sample from among the 1,803 who participated in the research. Stratification took place along the lines of investment behaviour in the experiments and in real life.

### Local lesson 1: The time is ripe for piloting forms of micro insurance

We saw that risk aversion matters for fertiliser uptake (Finding 1) and that traditional farmers, unlike entrepreneurial farmers, have a tendency to avoid even fairly small probabilities of an investment making a loss (Finding 2). Insurance that covers such losses should encourage farmers to invest. Informal risk-sharing also does so, but is on the decline according to some of those consulted: they mentioned this when reflecting on Finding 6, that loss-sharing reduces investment. The advantage of an insurance contract is that it comes with ‘no strings attached’ other than the requirement to regularly pay a premium. The local stakeholders observed that farmers find this increasingly attractive, no longer wishing to be held to others in exchange for having accepted their assistance.

### Local lesson 2: Influence the social norm on fertiliser use

The finding that individuals rapidly adjusted to what they understood to be the social norm (Finding 5) suggested to our local informants that farmers’ risk attitudes are not set in stone. They pointed out that information about adoption rates elsewhere – for example, communicated through radio campaigns, in farmer field schools and to farmers’ fora – may encourage farmers to invest. Indeed, Appropriate Technology (AT-Uganda) managed to promote fertiliser successfully in our study area in the mid-2000s through a combination of media campaigns, training, demonstration plots and making fertiliser easily available, repackaged in smaller quantities (Nyachwo and Mesigwa Wilfred, 2010). The latter is also a separate local lesson.

### Local lesson 3: Make fertiliser available in smaller quantities

Farmers who are more risk-averse in our experiments are also less inclined than others to invest in fertiliser in real life (Finding 1). Risk aversion does not mean investing nothing: almost everybody invests at least a small proportion of the money we endow them with. In follow-up interviews we asked them why and the typical response was: ‘it’s like in farming: you try investing a little and then if it works, next time you invest a little more’. This suggests that inputs such as fertiliser should be made available in small quantities. Fertiliser is now sold in bags of 50 kg. Agro-input dealers will sell smaller amounts, but adulteration of the product could take place once a bag has been opened.

AT-Uganda, in the campaign just mentioned, piloted a scheme in our study area of selling fertiliser in packs of 2, 5 and 10 kg – pre-packed and from a reputable supplier in Kenya – which led to overwhelming uptake. A small-pack approach resonates with the cautious approach to investing that farmers who do not invest in fertiliser in real life exhibit in our experiments.

The discussions with local stakeholders were wide-ranging. Some of their recommendations were not strictly rooted in our findings. Generally speaking, these were about making agriculture more profitable, which would encourage investment; and about increasing access to credit for inputs. All of them involve a form of collective action:

- **Encouraging farmer organisations to invest in local maize storage facilities and handling capacity, which would enable farmers to fetch a higher price for their produce.** One way is through intertemporal arbitrage: taking advantage of the higher prices during the hunger months of January to June, when they are typically at least double those in the immediate aftermath of the July/August maize harvest. The investment in handling capacity required for storage – the produce needs to be cleaned and treated so that it is not susceptible to pests during the months of storage – would also enable them to take advantage of a quality premium. However, as poor farmers are cash-strapped after the harvest, a bridging loan (or an advance) after they have deposited the maize in a central warehouse is required to enable

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them to delay selling maize. An average return of more than 100% in less than half a year renders such a loan affordable.

- **Encourage farmer organisations to form input** associations and negotiate with agro-input dealers to make their inputs available on credit.
- **Farmer organisations should bulk their produce** and thereby increase their bargaining power vis-à-vis traders.

Most recommendations were made in a rudimentary form (especially the one on insurance). After the local stakeholders had made the recommendations, we reviewed the literature on them. We also considered whether our findings shed light on their viability: although some of them are not rooted in our findings, it turns out that our findings are relevant for the conditions of their success. Together with feedback on findings from stakeholders operating at the national level, we used our knowledge of risk-taking and risk-sharing habits among small farmers to propose some of these recommendations in a modified form, as described next.

## National insights

The insights and observations that the stakeholders active in national-level policy-making shared with us helped us to sharpen the policy lessons that we learnt from the local stakeholders. As mentioned, in order to arrive at the final recommendations, we also reviewed studies of related interventions in Uganda and elsewhere, combined with a sustained reflection on the implications of our research findings. We present here the recommendations that emerged from the combination of these four inputs (local policy lessons, national consultation, literature review and reflection on our findings).

## 5. Recommendations

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### Index insurance

The first three recommendations are in the area of index insurance:

**R1: Bundle index insurance, credit and agricultural inputs as this may encourage farmers to take up the insurance product and invest.**

The local stakeholders had seemed unaware of the pitfalls of traditional crop insurance. Insurance against actual losses incurred when growing particular crops may (a) lead to less diligent farming ('moral hazard') and (b) attract farmers more prone to make losses ('adverse selection'); there are other pitfalls too (e.g. Morduch, 2006; Barnett and Mahul, 2007; Dercon et al., 2009). The administrative costs of dealing with these problems are so high compared to the insurance premium that in practice no insurance company will find it worth their while to offer crop insurance to smallholder farmers – a well-attested market failure (e.g. Morduch, 2006).

An elegant solution to these problems is to determine indemnity payments not on the basis of actual losses but on the basis of the value of an index correlated with these losses. Such an index could, for example, be based on rainfall, temperatures or the average yield in the area in which a farmer resides. It is a commonplace in the academic and policy literature on index insurance that, for the insurance provider, it eliminates at a stroke the problems of moral hazard and adverse selection (ibid.). Moral hazard no longer applies since less diligent farming will not increase the likelihood of indemnity payments. Adverse selection is for the insurance company no longer an issue since pay-out to the farmers is no longer influenced by farmer type, only by whether an index exceeds (or falls below) a threshold. It is of course crucial that the index is highly correlated with actual losses. The uninsured risk that remains because of imperfect correlation between pay-outs and actual losses is known as basis risk. The better the index, the lower the basis risk; its magnitude has been found to be an important determinant of index insurance uptake (Giné et al., 2008; Mobarak and Rosenzweig, 2013; Dercon et al., 2014).

Despite its promise, uptake of index insurance has often been disappointing. A sizeable literature has identified the reasons for low uptake, which include the size of the premium; lack of trust in the product, which is remedied when the farmer observes that pay-outs do occur to people known to him or her; lack of understanding, for example, because of low financial literacy skills; and indeed basis risk.<sup>3</sup> The exception to the common occurrence of low uptake is when index insurance is bundled with agricultural credit and/or inputs. In India, NAIS (National Agricultural Insurance Scheme), mNAIS (m for modified) and WBCIS (Weather-Based Crop Insurance Scheme) provide index insurance – based on area yield or on a weather index – to tens of millions of farmers; see Greatrex et al. (2015) for an overview of the main features of these schemes, which include *compulsory* insurance when an agricultural loan is taken out. Index insurance in India is heavily subsidised.

By contrast, in Kenya and Rwanda, the Agriculture and Climate Risk Enterprise (ACRE, formerly known as Kilimo Salama) is the largest unsubsidised index insurance scheme in the world and offers insurance to some 200,000 farmers. Kilimo Salama started in 2009 as a programme of the Syngenta

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<sup>3</sup> Many specific factors are considered under these general headings; see Giné et al. (2008), Cole et al. (2013), Cole et al. (2014) and Dercon et al. (2014).

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Foundation, became the company named ACRE in June 2014 and is rapidly expanding (Greatrex et al., 2015).

ACRE's success appears to derive from bundling insurance and one or both of credit and inputs in ingenious ways that meet farmer needs. For example, its product called 'insurance in the bag' uses satellite imagery for a farmer's location and automatically compensates using M-Pesa (mobile money) if rains fail for 21 days. The clock starts ticking on the day the farmer sends an SMS with a code that s/he finds on a scratch card in a bag of seeds, the day of planting. If there is no rain for three weeks, the seeds would fail to germinate. The compensation is sent instantly and enables the farmer to buy a new bag of seeds and replant.<sup>4</sup>

Among those who attended the workshop, 38.5% thought that bundling index insurance, credit and inputs would be taken up in Uganda. If the recommendation were taken up, 61.5% thought it would encourage farmers to invest. Precisely half of those participating in the workshop were reasonably confident that their organisation would be involved in promoting the recommendation (Table 2).

Some stakeholders doubted that index insurance could be scaled up in Uganda, because they thought it unlikely that the investment in the infrastructure (e.g. rainfall stations) required for devising a suitable index would take place. However, they were not aware of the Food Early Solutions for Africa (FESA) Micro-Insurance project developed by Earth Environment Monitoring Delft (EARS).<sup>5</sup> This project piloted drought index insurance and excess precipitation index insurance during the years 2011 to 2013 in 11 sub-Saharan African countries, including Uganda. The indices are derived from satellite data on evapotranspiration (evaporation plus transpiration of plants that rises from Earth's surface to the atmosphere) and rainfall estimated from cloud presence.

The drought index insurance product in particular seems to have huge potential for scaling up. It is based on a relative evapotranspiration (RE) index (defined relative to potential evapotranspiration) that is a good indicator of the water actually used by crops, much better than a rainfall index. In farming areas, the major component of evapotranspiration is plant transpiration and this is known to be proportional to CO<sub>2</sub> uptake and thereby to crop growth and crop yield. Crop-specific response factors allow the computation of crop indices proportional to the RE index; pay-out is then determined by a crop yield index falling below a threshold and rises as the shortfall to the threshold is larger. The data are provided by the meteorological satellites of Meteosat, which have been in orbit since 1978, with a 3 km resolution for the entire continent of Africa. Because of the quality of the RE index and the small land area that it can be provided for, those insurance products based on it carry a small basis risk, compared to other weather index insurance products. Moreover, large-scale application would bring the costs of providing the index down to 0.5 euro per farmer. Potential for scaling up would therefore seem to be huge; indeed, the project's stated aim is to 'reach every farmer in Africa'. In Uganda, the product has been piloted on a small scale for maize and for livestock. The drought insurance product for livestock will be scaled up to reach some 5,000 farmers across the whole of the country.<sup>6</sup>

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<sup>4</sup> The source of this information is a presentation by Marco Ferroni of the Syngenta Foundation for Sustainable Agriculture: The Role of Index Insurance in Agricultural Risk Management, 3rd International Agricultural Risk, Finance & Insurance Conference, Zurich, Switzerland, June 2014. (Available at: [www.syngentafoundation.org/index.cfm?pageID=611](http://www.syngentafoundation.org/index.cfm?pageID=611) (accessed 8 June 2015)).

<sup>5</sup> The project is a Millennium Agreements Project (no. 38) and was funded by the Netherlands Ministry of Foreign Affairs, Directorate Sustainable Economic Development (DDE).

<sup>6</sup> This may already have begun. The report that this paragraph draws on (Rosema et al., 2014) states that this would take place from early 2014 onwards.



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The drought insurance and excessive rainfall insurance for crops based on the EARS RE index and its precipitation index respectively, are provided in Uganda by Lion Assurance Co. (the main provider) and seven others. The umbrella name of the insurance products is 'kungula', a Luganda word that literally means 'harvest'. A micro-finance institution, Advance Uganda Microfinance, has recently teamed up with Lion Assurance to offer the kungula products together with loans for the growing of coffee, maize, beans and sweet potatoes, and for the rearing of cattle. The scheme started in 2014 and operates in Kiboga district and the surrounding Mityana and Kyankwanzi districts in western Uganda.

Since scaling up would, as mentioned, bring the cost of provision down to affordable levels, it seems safe to conclude that technically feasible, cost-effective index insurance products are on the horizon in Uganda. Combined with the light shed by stakeholder reflections on our findings and ACRE's experience in neighbouring Kenya and Rwanda, our first recommendation is therefore to bundle index insurance, credit and agricultural inputs as this may encourage farmers to take up the insurance product and invest.

### **R2: Frame insurance as a clever way of saving, in pilot studies when index insurance is offered.**

There are very many challenges in devising an index insurance product that is technically feasible and beneficial to farmers. These are outside our scope; there exists excellent literature on how these challenges can be overcome (e.g. Dick and Stoppa, 2011; World Bank, 2011; Rosema et al., 2014 and the references therein). Our interest is in the risk-taking and risk-sharing habits of farmers that would encourage adoption and subsequent investment.

In particular, our findings can shed light on a potentially powerful reason for inertia in uptake. We found that when risk-taking is naturally expected, farmers will take more risk than they do when the default is comparatively safe behaviour (Finding 4). An insurance decision can be thought of as a move from a situation in which risk-taking is naturally expected to one of comparative safety: the status quo in risky choice behaviour has a powerful pull (see Clist et al., 2015). A farmer might reason, 'We've managed these risks so far; we'll manage in the future too'.

Many of the stakeholders consulted pointed to the force of farmers' habits in the area of risky choice (these are finely calibrated as they have ensured survival to date) as being a major reason for their reluctance to take up index insurance, even when a product has been devised that is in their best interests. Reducing the pull of the status quo could be achieved in various ways. One suggestion is to frame insurance as an ultra-efficient way of saving. Saving is something the farmers are familiar with: they do this as best they can in order to be able to absorb negative income shocks (the paucity of savings instruments is a major hindrance here). For saving to lead to a sufficiently large buffer for the worst shocks, farmers would normally need to accumulate savings over many years. By contrast, taking out an insurance contract makes the 'buffer' available instantly.

The corresponding change in farmers' mindsets would thus be one from 'this is risk we can manage' to 'this is a better way of managing our risks'. The idea was not suggested to us by stakeholders, but occurred to us while reflecting on Finding 4, as well as more generally on the fact that how a decision is framed matters for risk-taking behaviour in the experiments (Findings 3, 4 and 5). Some stakeholders spoke out enthusiastically in favour of framing insurance as a clever way of saving, but judging by the figures presented in Table 2, scepticism was more common. Even so, the minority could be right. To us, the idea is appealing and is worth testing.

**Table 2: Workshop participants' views on the recommendations**

Recommendation	Will be adopted in Uganda	If adopted, will promote agricultural investment	My organisation will be involved in promoting the recommendation
<b>R1:</b> Bundle index insurance, credit and agricultural inputs	38.5	61.5	50.0
<b>R2:</b> Frame insurance as a clever way of saving	16.2	39.5	30.3
<b>R3:</b> Offer index insurance to risk-sharing groups	34.2	44.7	30.3
<b>R4:</b> Promote inventory credit/warrantage at the community level	54.1	50.0	39.4
<b>R5:</b> Make fertiliser available in small quantities	72.5	67.5	55.6
<b>R6:</b> Influence the social norm on fertiliser use	57.5	57.5	59.5

Figures are percentages of workshop participants who said 'likely' or 'very likely' in response to statement.

### **R3: Offer index insurance to risk-sharing groups, as this could increase uptake and encourage agricultural investment.**

Using the local lesson that there is potential demand for insurance as a starting point, a third refinement would be to offer insurance to existing risk-sharing groups. Examples of such groups are burial groups, organised friendship groups, drinking groups (the oldest form of community-based organisation in Uganda!), (sometimes) village savings and loans associations, and church/mosque members.

There are two limitations to risk-sharing within such groups. The first corresponds with our Finding 6, that loss-sharing reduces investment. Supported by the local stakeholders, we interpret this as people being reluctant to burden others with the consequences of their risk-taking (see D'Exelle and Verschoor, 2015). Things should be different when loss-sharing is taken over by the insurance provider, especially in the form of index insurance. Pay-out in that case is determined by the value of the index relative to a threshold; risk-taking has no influence on the probability that pay-out will take place (which in any case is no longer provided by somebody in one's risk-sharing network). Other things being equal, insurance provided by a formal provider should thus lead to more investment than informal insurance provided by group members.

The second limitation to risk-sharing within community-based groups is that these cannot deal effectively with co-variate shocks, i.e. shocks that affect everybody in the group (Dercon, 2009). Good examples are droughts, excessive or insufficient precipitation, and so forth – precisely the things that index insurance can protect against. However, if everybody in a group is protected against co-variate risks, then the group members can take care of some of the risk that remains: basis risk has an idiosyncratic component that naturally will be shared within such a group. When index insurance is

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offered to risk-sharing groups, basis risk may thus be reduced, which should encourage uptake and subsequent investment (since losses are covered to a greater degree). Corroborating evidence exists for Ethiopia (Dercon et al., 2014) and India (Mobarak and Rosenzweig, 2013).

The idea was suggested by some stakeholders and had reasonable support in the workshop (Table 2). It is important not to take the percentages in the table at face value however: the less familiar the recommendation, the lower the support.

## Inventory credit

### **R4: Promote inventory credit/warrantage at the community level.**

Our fourth recommendation is in the area of inventory credit. Local stakeholders had suggested that farmers' organisations should be encouraged to invest in storage and handling capacity. When this was shared with national stakeholders, they pointed to the warehouse receipt system (WRS) already in place in Uganda. In this system, farmers deposit their commodity – of standardised quality, so after it has been treated appropriately – in a licensed warehouse, for which they get a receipt. The receipt is the basis for credit at a financial institution. In this way, at least in theory, the farmer does not need to sell his or her produce at a time when prices are low to meet cash needs, but can afford to wait until the prices have risen. The WRS is an institution with a very long history. It has been pivotal in the agricultural development of some countries, and would seem to hold great promise for increasing the profitability of farming by enabling farmers to fetch a higher price for their produce through intertemporal arbitrage and a quality premium (Lacroix and Varangis, 1996; Coulter and Onumah, 2002; Larson et al., 2004).

The WRS was introduced in Uganda by law in 2006, with the Uganda Commodity Exchange (UCE) responsible for licensing and monitoring its performance. We do not have up-to-date information, but according to our most recent source (AGRA, 2010), there are nine licensed warehouses in Uganda. However, in Uganda, as in other sub-Saharan African countries, smallholders typically do not benefit from the WRS. They face obstacles such as the minimum-deposit requirement, transport costs, a lack of trust in the system, and a limited number of financial institutions accepting the receipts as collateral for loans, among others. These barriers were pointed out to us by stakeholders familiar with the WRS, and are echoed by studies of smallholder participation in the WRS in other sub-Saharan African countries (UNCTAD, 2009; Edelman et al., 2015).

A natural suggestion for enabling smallholder participation in the WRS would be for farmer organisations to aggregate and deposit a commodity on behalf of individual farmers. There are large challenges to overcome for this to become effective: limited trust in leaders, theft by leaders of some of the aggregated produce, the costs more generally of organising the process, and disagreement among members as to when to sell the produce – these are all among the recorded reasons for lack of success (Edelman et al., 2015).

Our Finding 8 suggests a reason why disagreement among farmers may occur regarding when to sell the collectively deposited produce: because of heterogeneity in risk attitudes, farmers are bound to differ in their views about when the time is right. The decision whether to sell is a risky choice: do we accept the current certain price or do we hold out for an uncertain price rise? More risk-averse farmers will tend to want to sell sooner, leading to conflict with the less risk-averse: our finding that diverging risk attitudes are a powerful source of conflict among those engaged in joint ventures thus sheds some light on why disagreements occur in farmer organisations attempting to jointly benefit from participation in a WRS.

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One way of overcoming this obstacle is to resort to a system in which individual deposits remain recognisable and under the control of the depositing farmer. An attractive alternative to the WRS is therefore the so-called warrantage system. This inventory credit system works on very similar principles to the WRS. A farmer deposits produce in a community warehouse jointly managed by a farmer organisation and a financial institution; crucially, the deposited produce remains the individual farmer's property, to dispose of as s/he sees fit. The farmer can typically borrow up to 80% of the value of the deposited commodity, which facilitates taking advantage of intertemporal arbitrage, just as in the WRS (UNCTAD, 2009).

The warrantage system is currently operating in Kenya, Madagascar, Ghana, Tanzania, Niger, Burkina Faso, Mali, Senegal and Conakry Guinea (Edelman et al., 2015). A randomised controlled trial in Kenya finds that farmers' profits benefit from warrantage as a result of their selling when prices are higher (Burke, 2014). Features such as links with agro-input dealers who provide inputs on credit, with the deposited commodity as collateral; post-harvest handling; the grading of the produce; collective bargaining with traders, etc. can be bolted onto the system.

Stakeholders present at the workshop were broadly supportive (Table 2). However, we do not wish to suggest that the warrantage system precludes smallholders from uniting and taking advantage of the WRS. Interestingly, the composition of categories of depositors varies greatly across warehouses in Uganda. Usually, farmer organisations make up a minority (~20%) of depositors, but in the Jinja district, where maize growing has a long history and farmer organisations of maize growers have become well established, the situation is quite different. Whereas usually most depositors are medium- to large-scale farmers and traders, in the Agro-ways warehouse in Jinja, 69% are farmer organisations (AGRO, 2010).

The tentative lesson we take from this is that the warrantage system may be a useful intermediate stage. If successful, a communal grain store would over time become known as a reliable provider of good-quality produce. When that point has been reached, the farmer organisation running it may be able to withdraw produce temporarily stored in the community grain store and deposit it in a licensed warehouse, thereby taking advantage of a larger market for its produce, as well as of the benefits of a WRS already mentioned. In the light of our Finding 8, it would seem important that this produce belongs to farmers who first commit themselves to a rule regarding when to sell. This would help ensure that only farmers with similar risk preferences unite for depositing in a licensed warehouse and thereby avoid conflict.

The warrantage system should thus be seen as a light-touch version of a WRS, with attractions in a somewhat watered-down form. The reason it is nonetheless attractive in many settings is that deposits remain individually recognisable, which means that aggregating produce and collectively depositing it on behalf of united farmers with similar risk preferences can be postponed until the farmer organisation has a governance structure that can deal with such sophisticated arrangements for securing joint benefits.

Stakeholders were broadly supportive of the recommendation to promote the warrantage system (Table 2).

### Fertiliser promotion

**R5: Make fertiliser available in smaller quantities.**

**R6: Leverage modal behaviour on fertiliser use.**

The fifth and sixth recommendations concern fertiliser promotion. Here the local lessons survived unscathed after exposure to the scrutiny of national stakeholders; see Section 4 on local consultation for the correspondence with our findings and an outline of how they could be (and indeed have been) implemented.

In addition to AT-Uganda's experience (briefly summarised in the local consultation discussion), we came across two further examples during the national consultation exercise of projects that, according to self-reports, successfully promoted fertiliser use by influencing the social norm. The first of these examples also used a small-pack approach.

Feed the Future, a USAID-funded project, uses demonstration sites to show the difference that using fertiliser makes when this is combined with good agronomic practices: appropriate site selection and land preparation, proper spacing when planting and weed control, among others. To help farmers to be able to afford fertiliser, the project works with the Export Trading Group, which was willing to supply packs of fertiliser of 1 and 2 kg. It also works with agro-input dealers and village agents. Village agents are normally employed by traders, i.e. they buy maize on the traders' behalf. In this project, they also go from door to door selling on commission the small packs on behalf of the agro-input dealers, who in turn purchase them from the Export Trading Group. The packs are provided to the farmers along with leaflets that spell out how to correctly apply the fertiliser. The project is active in 34 districts all over Uganda.

Sasakawa Global 2000, a project run by the NGO Sasakawa Africa Association has worked with the government's extension services in 43 districts since 1996, reaching more than 100,000 small farmers. Their main focus is on technology transfer, especially promoting fertiliser use. In a particularly promising way of influencing the social norm on fertiliser use, also used by Feed the Future, Sasakawa promotes demonstration plots that belong to volunteer farmers. The farmer is given incentives in the form of inputs and training.

Our findings shed light on AT-Uganda's, Feed the Future's and Sasakawa's experiences. We find that risk preferences are not set in stone: communicating information about modal behaviour in parallel sessions prompts farmers to adjust their investment behaviour instantaneously, on average by about 50% towards the (perceived) social norm. This suggests that the fertiliser promotion projects of the organisations mentioned, which use demonstration plots and information campaigns, achieve part of their success (inadvertently) through modifying risk preferences. This can be exploited more directly by targeting a number of geographically strategically located villages first, concentrating resources there, then communicating their adoption rates to neighbouring villages, gradually spreading outwards.

The approaches by AT-Uganda, Feed the Future and Sasakawa seem very promising. However, they need to be supplemented with market integration. In thin markets, a surge in supply will inevitably lead to a sharp drop in the output price, potentially rendering fertiliser unprofitable – the very risk that farmers reluctant to invest in fertiliser are keen to avoid.

To illustrate this, we refer back to the case of AT-Uganda, which as mentioned managed to promote fertiliser successfully in our study area in the mid-to-late 2000s through a combination of media

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campaigns, training, demonstration plots and making fertiliser easily available in smaller quantities. The highly successful project resulted in a bumper crop in 2009, a market glut and a fall in prices that led to an outcry among those who had invested in fertiliser (Nyachwo and Mesigwa Wilfred, 2010).

Promoting fertiliser use on a large scale should therefore not be pursued in isolation. Successful market integration that needs to be pursued as a complementary objective could begin with the warrantage system. The farmer organisation running it could 'graduate' to become a beneficiary of the WRS. Its treated, storable produce of standardised quality can then be sold in bulk and fetch a quality premium. This would help prompt the smoothing of spatial and intertemporal price variation, as well as raise the average price farmers receive for their produce.

## Agricultural extension

A final note is in order on agricultural extension. Almost all stakeholders saw a role for agricultural extension services in helping to promote all of the recommendations: educating and raising awareness about index insurance as and when a suitable product is introduced; helping farmers' organisations to invest in communal storage and to team up with a financial institution; and demonstrating to farmers through readily understood means the relationship between risk and return in investing in fertiliser. Sadly, extension services are in crisis in Uganda and at the time of writing woefully inadequate. Currently there is one extension worker for every 1,500 farmers (Sasakawa Newsletter, May 2014).

## Next steps

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Our recommendations have been summarised in a [short policy brief](#), and next steps will be to identify distinct measures that correspond with our recommendations for uptake. For this purpose we will hire four policy brokers – already identified – who are well placed to spell out distinct policy measures, identify key actors, target these for dissemination and facilitate the implementation of the measures deemed at that stage to be most promising. This work, which began in August 2015, will be ongoing until April 2016.

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