

# Risk aversion among smallholder farmers in Uganda

In this Research in Context, agriculture theme lead Steve Wiggins provides a background to DEGRP-funded project [A Behavioural Economic Analysis of Agricultural Investment Decisions in Uganda](#).

Starting in 2012 and wrapping up in 2015, the project – led by Dr Arjan Verschoor and Dr Ben D'Exelle from University of East Anglia – investigated how smallholder farmers in Eastern Uganda perceived financial risks, and whether this influenced decisions to invest in productivity-boosting technologies such as fertiliser, seeds and irrigation.

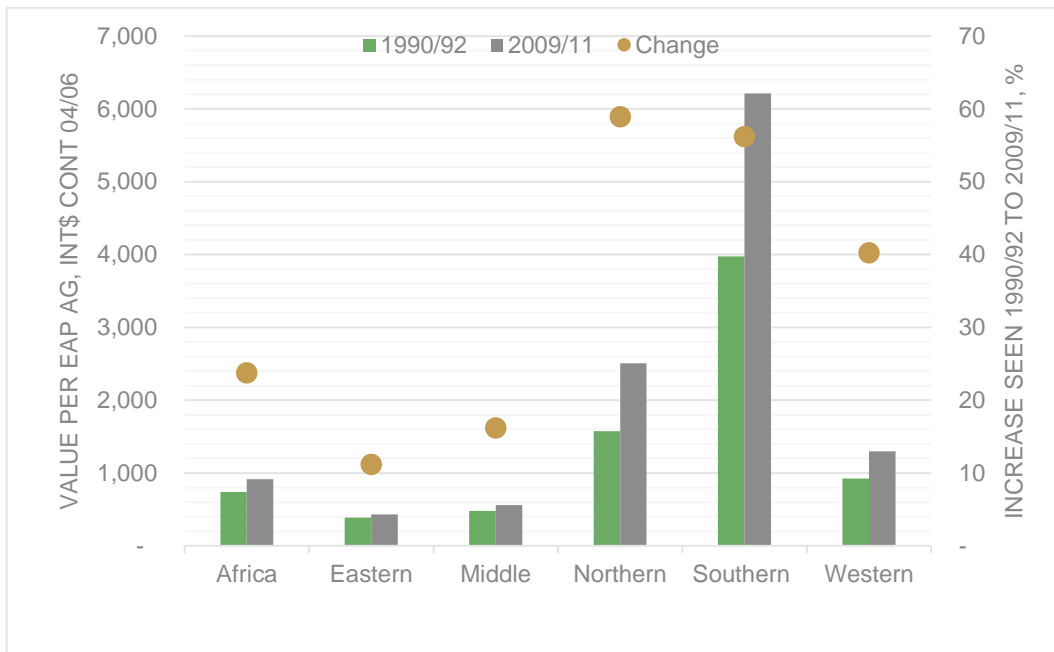
## The broader issue: raising agricultural productivity

Recent interest in African agricultural productivity has been stimulated by debates over the nature of renewed growth seen across much of Africa since the mid-1990s (Radelet 2010, IMF 2014). While in many countries the economy has grown, much of that has been driven by primary production – agriculture, mining, oil and gas – aided by commodity price increases from the mid-2000s onwards; rather than through growth in manufacturing and services. Moreover, productivity, whether it be of land, labour or all factors, in agriculture has grown slowly. Growth, it seems, has not been accompanied by economic transformation (ACET 2014).

If development and transformation are to take place, then agricultural productivity needs to increase, both to raise farm incomes as well as to allow labour and capital to be transferred to manufacturing and high value services.

While agricultural output has grown faster than population since the early 1990s, at just under an average of 1% a year across the continent, productivity gains have been modest at best. The value of crop output per unit area increased by just 45% over 19 years, while the more critical labour productivity rose by only 25% (Figure A). Moreover, these limited gains come from a low base. By 2009/11 on average each person employed in agriculture generated less than US\$1,000 of gross value a year, from which must be deducted costs of inputs and tools, so that farm work typically did not provide incomes sufficient to escape poverty.

Figure A: Labour productivity of agriculture, Africa and regions, 1990/92 to 2009/11



Source: FAOStat. Value of output divided by economically active population in agriculture

### OBSTACLES TO PRODUCTIVITY

Several reasons for low agricultural productivity have been advanced, as summarised in DEGRP report [Raising agricultural productivity in sub-Saharan Africa](#). The following arguments stand out:

**First of all**, farmers may not have access to technology suited to their particular farming systems, crops and livestock. The agricultural research that drove the green revolution seen in Asia from the late 1960s onwards focused initially on maize, rice and wheat often grown under irrigation, ignoring staples important in Africa such as cassava, yams, millet and sorghum, which are usually cultivated in rainfed fields.

Research on these crops and cultivation methods has subsequently produced suitable technologies. Yet these technologies are still not widely used despite widespread awareness of their existence. This is evident from the large gaps between the yields achieved in farm plots managed according to research recommendations and those operated by most smallholders (Nin-Pratt et al. 2011).

It may result, **second**, from economics of production, when the marginal returns to higher-yielding techniques do not cover the marginal costs. This can happen when seeds, fertiliser, irrigation etc. are costly, and output prices are low. Transport costs in rural Africa are notably higher than in other parts of the world (Gollin & Rogerson 2013; Livingston et al. 2014), and when costs of transport to and from market are high, farm gate input costs rise while output prices fall.

A **third** reason may be reluctance to invest in new technology when property rights are insecure. There is longstanding controversy in Africa surrounding collective tenure systems and the security they offer farmers with customary rights. Some studies report less investment and conservation of land under such tenure, but more provide contrary evidence that smallholders do feel sufficiently secure of their rights to invest. For example, Place and Otsuka, 2002 and Deininger & Ali 2008, both on tenure in Uganda, give contrasting results.

## RESEARCH IN CONTEXT

**Fourth**, farmers face failing markets for agricultural inputs and finance in rural areas, so they either cannot get the inputs they need and credit to cover their costs, or only at very high cost, well beyond the costs of supply. These failures stem in large part from high transaction costs because suppliers and bankers do not sufficiently know the needs, character and competence of potential client farmers, while the latter for their part know too little of what may be on offer (Poulton et al. 2006).

**Fifth**, farmers may be reluctant to invest in higher-yielding inputs since this entails risks: the subject of this research. Crops may fail owing to poor weather, pests, disease and damage by wild animals. When these failures occur spending on inputs and hired labour converts into losses. In addition, prices in markets may prove to be lower than expected.

## CURRENT RESPONSES TO RISK

Farmers respond to the risks they face in several ways (Fafchamps 2003):

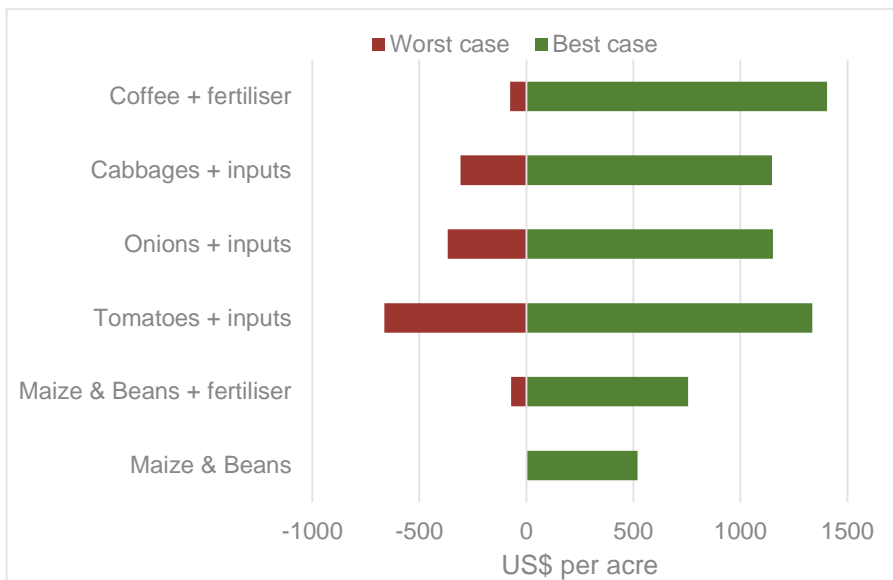
- They accumulate savings which may be in unproductive assets (such as jewellery or cash under the mattress) thereby reducing the capital they have to invest in farming.
- They diversify their farming, growing some crops that are more resilient to bad weather, pests and diseases but which yield less than varieties bred primarily to optimise yields. Diversification may prevent them from specialising in high value crops.
- They tend to invest less in inputs such as improved seed, fertiliser and hired labour. This effect may be minimal when farmers have the wealth to withstand such losses; but for farmers who live in or close to poverty, the deterrent may be significant.

Formal insurance might offset risks, but it is rarely available for agriculture: market failures are often too severe for formal insurance in rural Africa. Instead, farmers seek protection by forming strong networks of relatives and neighbours, or by allying themselves with richer patrons. These associations may help with idiosyncratic risks, but may break down when covariant hazards — such as drought — affect all within the network.

## The research

In the area of Eastern Uganda studied, the productivity of different crops varies considerably between good and bad years. As Figure B shows, though average net returns were higher for cash crops in good years, losses from these crops can be substantial in a bad year. In comparison, while low-yield crops such as maize and beans may result in consistently poorer returns, financial losses are also consistently lower.

**Figure B: Expected returns to different crops in eastern Uganda, 2013, US\$ an acre**



Source: Research team

## AIMS & METHODS

Verschoor and D’Exelle’s project explored the issue of low adoption of more productive agricultural technology in Uganda. The research aimed to address two questions:

1. How do farmers assess the riskiness of investment prospects, and how does this influence their propensity to invest?
2. Are farmers' investment decisions influenced by (anticipated) peer responses?

To this end, the team conducted experiments with 1,803 smallholders in 100 villages in eastern Uganda.

In a typical experiment, participants were asked to play a lottery game where ten coins were allocated between one safe option or multiple riskier options; where funds could either increase or be lost according to the luck of the draw — as indicated by selecting a coloured ball from a bag.

Starting choices were framed in different ways — most coins were already in either the safe or risky options, or not allocated. In some runs the participants knew what choices others had made. Later, the participants played in pairs either with people they knew or relative strangers from other villages.

Experiments were repeated to generate enough results to identify factors which might explain variations in choices, including the characteristics of the participants. They were complemented by a survey of participants’ livelihoods and social networks, plus interviews with key informants and others interested in agricultural development in the villages and district headquarters.

### FINDINGS

The key results can be summarised as eight findings:

1. Low investment in the experiments is associated with low fertiliser use, but not with growing cash crops
2. Farmers who grow cash crops, unlike semi-subsistence farmers, downplay a small probability of investment failure.
3. A priming task designed to induce learned helplessness reduces persistence in an investment task by about 20%.
4. People take more risks when risk-taking is naturally expected.
5. The social mode has a very strong pull on risk-taking.
6. People take fewer risks when losses are shared.
7. People take more risk when profits are shared.
8. Divergent risk attitudes are associated with interpersonal conflict.

It was no surprise that many participants were significantly risk averse, a finding that could help explain why most did not specialise in cash crops such as cabbages, coffee, onions and tomatoes that would, over the medium term, maximise their earnings from their farms.

Three findings, however, are particularly interesting:

- **Personal experience:** Personal experience and knowledge of what others do modifies reactions to risk. Those who grow cash crops become less averse to risk, as do those who know others who take on risk.
- **Social contexts of risk:** The experiments with participants in pairs showed that people take fewer risks when this may impose costs on others within a shared social network, and, conversely, take more risks when expected gains would be shared. This result may reflect the strength of peer pressure, or individuals being unwilling to burden others with their problems, or individuals fearing that being forced to ask for help would impose a reciprocal obligation on them in the future.
- **Risk in group decision-making:** The third notable result is that differing degrees of risk aversion tend to put people in conflict with one another. For those interested in forming farmer associations, this is quite a finding. If collective decisions involve a risk, then it may be hard to reach agreement if there are variations in risk aversion among individuals in decision-making groups.

### IMPLICATIONS

More broadly, this research is about risk and vulnerability in a rural society. Risks in farming are but one of a wider set of risks that people face, including some personal, idiosyncratic risks that can have very serious consequences, for instance disease, accidents, crime and addiction. These latter are hazards with considerable losses, and no potential benefits.

Risks in farming differ from these in that they may not be as catastrophic as some of the life risks; but above all, the risky investments have a potential upside that should apply more often than the relatively uncommon downsides.

Hence the policy question for agricultural development concerns how to protect those who are vulnerable against the occasional losses that occur as a result of increased risk-taking. That comes down to at least three things, as the research team discovered when discussing their findings with local and national stakeholders:

- **Make it possible for the risk-averse to make small investments and so limit their vulnerability to loss.** One practical recommendation, aimed at agricultural input dealers, is to make and market fertiliser in smaller packs to appeal to more cautious individuals.
- **Shift the framing of decisions** so that investing on the farm is seen as a venture more likely to end in profit rather than loss. Ensuring that people can see the results of investment and innovation, and encouraging farmers to mix with those who have invested and prospered are two practical proposals from the consultations.
- **Invest in insurance to limit occasional losses.** This has sparked interest in the possibility of index insurance against bad weather, with the insurance bundled as part of the price of seeds, fertiliser and other inputs — a model already in use in Kenya and Rwanda by the [One Acre Fund](#). When the weather is poor, farmers get the costs of their inputs refunded.

### CONCLUSIONS

What else has the research uncovered? The social dimensions are fascinating, particularly the reluctance to impose losses on others and willingness to share gains. That said, the interpretation of this can be debated, while the practical implications are not obvious. But at least it reminds policy-makers of just how strongly social bonds can affect productive decisions.

The implication of conflict when risk aversion differs matters for collective action. A framework for assessing the likelihood of effective collective action was proposed by Johnston & Clark (1982). It hypothesised that successful associations worked when they produced valued benefits that could not be produced by individual effort; and when these benefits exceeded the costs of collective action. Costs were seen as those of coordination: costs mounting when the collective pursued multiple objectives; when it included members from diverse backgrounds with varying motivations for membership; and when the relation of individual input to the collective and outcomes was hard to discern.

This study sheds more light on the diversity of membership, in that aversion to risk may be added to the list of characteristics that may divide members.

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