DEGRP Agriculture research portfolio

Call 1 & 2 research summaries

July 2016
# Guide to the DEGRP Agriculture Portfolio

Two page summaries for each of the 19 DEGRP Agriculture research studies. Most of these have been prepared by the Principal Investigator (PI) during the last few weeks. Seven were not received; for these we have included the summary produced for the last workshop in late 2014.

## CALL 1 SUMMARIES

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CALL 1 at a glance

**Information, market creation and agricultural growth**
Will provision of agricultural information enhance farmer production and welfare?
RCT: Karnataka, India
Arjunan Subramanian, Glasgow

**A Behavioural Economic Analysis of Agricultural Investment Decisions in Uganda**
How do farmers perceive risk, and how does this affect their investment on farms? Are perceptions and actions affected by the views of peers?
Experimental economics in villages, Mbane, Uganda
Arjan Verschoor, UEA

**Innovation systems, agricultural growth and rural livelihoods in East Africa**
Which institutions affect farmer innovation? How do farmers innovate? What factors stimulate or obstruct innovations?
Qualitative studies in Kenya, Sudan, Uganda; household surveys when hypotheses developed + participatory farm management
Peter Dorward, Reading

**Innovations to Promote Growth among Small-scale Irrigators in Africa: An Ethnographic and Knowledge-Exchange Approach**
How do small-scale irrigators organise to irrigate their land? Are there common principals that lie behind this? If we share information across irrigation sites, will this affect irrigation?
Ethnographic study, use of video to share information in W Bangladesh, Malawi, Tanzania
Elizabeth Harrison, Sussex

**Which farmer(s) should we target? How do extension approaches influence social learning and spread of agricultural innovations?**
Will giving farmers better access to inputs and output markets enhance the spread and adoption of technology? How do social networks affect the spread of information?
RCT: Kivu, E DR Congo
[Erwin Bulte] Ezra Berkhout & Lonneke Nillesen, WAU

**Rural Property Rights, Returns to Scale and Contracts**
How has land leasing, only recently permitted, affected the use and trading of land in rural China?
What impact has this had on investment, labour use? What impact does contracting between farmers and large companies have?
Household surveys, China
Elaine Liu, Houston

**Agricultural Supply Chains, Growth and Poverty in Sub-Saharan Africa: Market Structure, Farm Constraints and Grass-root Institutions**
How can supply chains be improved in Africa for the benefit of farmers and consumers?
Map supply chains, use household models to look at welfare impacts of improvement
Nicolas Depetris Chauvin, ACET Accra

**Assessing the Contribution of the Dairy Sector to Economic Growth and Food Security in Malawi**
How can milk production, supply and consumption be stimulated in Malawi? What obstacles are found in current value chain? What welfare gains might result from improvements to the chain?
Supply chain analysis, Modelling the dairy sector
Cesar Revoredo G., SAC Edinburgh

**Space, Markets and Employment in Agricultural Development: Case Studies from Southern Africa**
How much does the nature of farming by scale and by activity affect the vigour of the local non-farm economy?
What impacts do differing linkages have on different social groups?
Mapping linkages in 2 districts of Malawi, South Africa and Zimbabwe. Social network analysis
Andries du Toit, Western Cape
## Call 2 at a glance

### Agricultural misallocation, occupational choice and aggregate productivity — the role of insecure land rights and missing financial markets

How much do land tenure and imperfect financial markets lead to mis-allocation of factors both between agriculture and other sectors, and between farms? How costly is this? What would happen if the market failures could be mitigated?

- Surveys of households and analysis of data on land rights, access to finance, use of factors on and off farm, returns. Dynamic structural models of macro-economy to capture general equilibrium effects

**Ethiopia & Uganda**

### Assessing models of Public-Private Partnerships for irrigation development in Africa

How do PPP irrigation investments affect potential irrigators? What arrangements work best for growth and equity? How can capacity of public agencies be improved to take advantage of PPP?

- Largely qual work, case studies of selected irrigation schemes

**Ghana & Tanzania**

**Ruth Meinzen-Dick, International Food Policy Research Inst.**

### Studying African farmer-led irrigation [SAFI]

What drives informal small-scale irrigation, and with what effects? How do public agencies see such irrigation?

- Case studies of irrigation schemes at 3 sites each in Mozambique and Tanzania, comparisons with existing research in Burkina Faso

**Burkina Faso, Mozambique & Tanzania**

**Philip Woodhouse, University of Manchester**

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### Gender and pro-poor agricultural growth: nonfarm/farm linkages and village dynamics in sub-Saharan Africa

What are the consequences of gender-differentiated access to productive and institutional resources under broad-based agricultural growth? How do links from agriculture to non-farm sector affect gender outcomes? What village characteristics matter?

- Quant & qual. data, panel
- Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Tanzania and Zambia

**Dirgha Ghimire, University of Michigan**

### Disseminating innovative resources and technologies to smallholders in Northern Region, Ghana

What prevents increased productivity of farming? What is potential impact of agricultural insurance, access to inputs and agricultural extension?

- RC trials in Northern Region. Builds on previous studies
- Ghana
- Chris Udry, Innovations for Poverty Action, Yale University

### Integrated assessment of the determinants of the maize yield gap in Sub-Saharan Africa: towards farm innovation and enabling policies

What are bio-physical and socio-economic limits to achieving potential yields for maize?

- Physical crop models; field surveys that look at plot, household and village characteristics
- Ghana & Ethiopia
- Martin Van Ittersum, Wageningen University

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### The generation and distribution of rural prosperity: insights from longitudinal survey data

What can be learned about long-term development from re-surveying villages and districts studied in the 1990s?

- Re-surveys of previous research sites, 15 in all, plus qual interviews
- Tanzania

**Daniel Brockington, University of Manchester**

### Labor outmigration, agricultural productivity and food security

What causes people to leave their farms? What are the consequences for farming? How are remittances used?

- Quant analysis of panel data for Chitwan Valley
- Nepal

**Dirgha Ghimire, University of Michigan**

### Heterogeneous quality of agricultural commercial inputs and learning through experimentation

How much do farmers experiment with novel inputs, when they are many of unknown and often low quality? Are on-farm trials of innovations reliable guides to economic returns? How does knowledge transfer among farmers?

- RC trials in Siaya of different input packages and forms of extension
- Kenya

**Karen Macours, Paris School of Economics**

### Optimal packaging of insurance and credit for smallholder farmers in Africa

How do different forms of insurance affect access to formal credit, and hence to uptake of farm inputs?

- Surveys followed by experiments to assess demand and supply of credit
- Kenya & Zambia

**Ana Marr, University of Greenwich**

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- Case studies of irrigation schemes at 3 sites each in Mozambique and Tanzania, comparisons with existing research in Burkina Faso

**Burkina Faso, Mozambique & Tanzania**

**Philip Woodhouse, University of Manchester**
Information, market creation and agricultural growth

**Institution:** Business School (economics), University of Glasgow, UK
**Principal investigator:** Dr. Arjunan Subramanian
**Research status:** Progressing to the final year; Project Conclusion

**RESEARCH MOTIVATION**

Farmers in developing countries face a variety of challenges including adverse weather, lack of knowledge, access to modern technology and difficulty in accessing or affording inputs. As a result, most farmers are unable to intensify crop production, and struggle with low profits and food insecurity. India’s development priorities include poverty reduction and faster, more inclusive growth. In the current debate among academics and policy makers on inclusive growth in India, there is a growing concern that poor people, especially in rural India, have benefited very little from rapid economic growth. Asymmetric information coupled with poor skill sets are considered the root cause of the inability of the rural poor to take advantage of the opportunities in the markets created by technology advancement and policy changes. Addressing the problem of asymmetric information is expected to empower the rural poor to take advantage of the market opportunities as well as overcome the skill set deficits in the long run.

**RESEARCH QUESTIONS/HYPOTHESES**

The key aim of this project is to implement a large-scale randomized trial to examine what happens when specified new information through tele-centres and other e-governance facilities becomes available in rural areas. The information includes services in the area of agriculture – weather, input and output prices, cultivation practices and other extension services.

The research explores the research question on the themes: (1) Direct and economy-wide impact, (2): Social network, (3) Risk coping strategies, (4) Role of caste

Q1 – Identification of direct and economy-wide impact of ICT on small holder agriculture?
Q2 – What impact does new information and market creation have on social network?
Q3 – Can households adequately plan for consumption? Whether well informed households make better economic decisions compared to less informed? What impact does access to information have on household consumption smoothing strategies?
Q4 – To what extent is caste a barrier to information access? Will the benefits of ICT accrue only to upper castes that have better access to resources and knowledge? To what extent will this technology further the existing caste inequality?

Besides skills exchange and capacity building activity of rural communities, the research also aims to further and develop strong partnership between civil society and government to ensure that project outcomes become part of the policy-making process.
APPROACH AND METHODS

Research Methods – Household interviews, randomized experiment, focus group discussions: Given the complexity of identification problem, this study applies an innovative methodology involving experimental design using large scale field experiments among 1320 farmers in the Indian state of Karnataka. Along with the Institute of Social and Economic Change, Bangalore and the University of Agricultural Sciences, Raichur, the study team has partnered with the Government of Karnataka to support 600 randomly selected treatment farmers from two districts of Karnataka with information on best agricultural practices, weather, credit, insurance and input and output prices with the objectives of enhancing their crop yields, reduce cost of cultivation and augment overall farm profitability. The project was also associated with the start-up private software firm, no longer allied with us, that developed the e-SAP software (Electronic Solutions Against Agricultural Pests – e-SAP), a

The Survey data is collected thrice during the project period, first survey at the beginning of the project to collect baseline information and second, after the experiment to record comparable information capturing changes that can be attributed to the experiment – midline survey. The third and final endline survey is designed after a year of gap i.e. after a year’s rest to flow of farm information in the treatment areas in order to capture the idea of capacity building, training and learning aspiration of the rural community. The endline survey questionnaire is designed to obtain data and information from farmers, and also to relay information and results from the experiment back to them. The endline survey is currently under progress in the selected experimental sites in India.

MAIN FINDINGS (IF APPLICABLE)

The partnership between researchers and the policy-makers involved six rounds of interventions over two years using randomised control trials (information vs no information). As a result of the farm intervention, providing farmers with a range of information along with real-time connectivity with agricultural experts, through tablet computers, for timely diagnosis of pest and diseases, increased the average yield overall by close to 20%, with maximum benefits found in ragi and paddy out of the selected focus crops (ragi, redgram, paddy, bengal gram, cotton) at the experimental sites. The expected medium to long term impact will be on poor households with some moving out of poverty as a result of higher farm incomes that may translate to better nutrition and health. However, higher farm incomes generated as a result of increased yields may not immediately translate into increased expenditure on food, education and health, but overtime the households may adjust to the changes in income by buying better nutrition, education and health. The other research questions are yet to be explored in the data.

POLICY IMPLICATIONS

The research programme is helping local policy makers change their views on the role of government, from a mere provider of subsidy to a provider of ICT aided agricultural information to enhance crop productivity. Conversely, the farmers that took part in the research are highly receptive of the project intervention, providing complete cooperation with the project field staff. The programme foresees also to emphasize that the use of ICT for economic performance is not the end of the story by any means. The policy-makers should be focussing on providing technical skills / agriculture extension to adopt modern farm practices. The low or non-use of new ICTs may have very little to do with enforced exclusion related to the lack of technical skills or other resources as assumed in the current policy discourse.
Innovation systems, agricultural growth and rural livelihoods in East Africa

Institution: University of Reading
Principal investigator: Peter Dorward
Research status: Complete

RESEARCH MOTIVATION
Smallholder farming is widely seen as a potential engine for economic growth and for poverty alleviation in rural areas of sub-Saharan Africa. Farmers have, for centuries, demonstrated their innovativeness in taking advantage of new market opportunities and adapting new technology to their local physical and social environments. Yet the arrangements put in place by governments and others to encourage the uptake of new technology, and to improve the management of resources by smallholders, have not been particularly effective. The region's agricultural production still lags behind population growth - in contrast to all other regions of the world.

RESEARCH QUESTIONS/HYPOTHESES
This project will explore how different institutional arrangements, within and between countries, affect the innovation activity of female and male farmers. It will then assess the impact of their innovation activity on their incomes and livelihoods, and on the local economy.

The project has four objectives.

First, it will build up a detailed picture of the institutions that support and constrain farmer innovation in Kenya, Sudan and Uganda. Each of these countries has a different history of government and non-government efforts to promote technological change and innovation among farmers; there are also differences in institutional support between regions of each country.

Second, research teams in each country will use participatory research tools to explore what this institutional landscape looks like from male and female farmers' points of view, by detailed investigation of recent innovation activity in four sites in each country and of the factors that have constrained and those that have supported innovation. From this analysis, hypotheses will be specified which link institutional arrangements, innovation activity, and changes in farm output, livelihoods, and incomes.

The third objective is to test these hypotheses using data from participatory research and a sample survey in each of the research sites.

This analysis will inform the fourth objective, which is to develop evidence-based conclusions on the potential and limitations for enhancing support for smallholder farmers’ innovation through new institutional arrangements and different ways of implementing support programmes at local level.
MAIN FINDINGS (IF APPLICABLE)

The research revealed multiple pathways through which innovation happens on smallholder farms. Understanding the notion of ‘uptake’ is important to be able to elucidate the actual processes that are involved in establishing productivity enhancing change at farm level, so that effective policies and interventions can be designed to support smallholders. This research found that the understanding of how farmers ‘uptake’ technology and innovation from an institutional (‘top-down’) perspective is very different from the reality of how farmer’s experience and perceive innovation on their farms and in their communities.

Whilst key informants and literature continually refer to ‘uptake’ as a linear transferal of technology, the experience of farmers is very different and much more nuanced. Farmers are actively looking to improve their livelihoods and their individual farm enterprises and, rather than being passive acceptors of technology, they seek, adapt and improve technologies to fit their own individual context. Men and women smallholder farmers innovate through different processes of innovation and using different technologies (some by choice and some due to the influence of policies / intervention, or changes in operating environment), influenced by factors of social differentiation such as age, marital status and community standing.

The main constraints to innovation are input and output markets, lack of reliable information and lack of support systems.

Another key finding from the research is that smallholder farmers’ propensity to innovate leads to measurable differences in income and expenditure at household and local economy level. In addition, smallholder farmer innovations drive important improvements in individual and household welfare and quality of life. These outcomes can sometimes benefit women more than men. The combination of monetary and non-monetary essential benefits in different contexts and with different patterns of social differentiation warrants further research as does understanding the way that farmer innovations are linked in often complementary and supporting ways in the household.

The methodology used during this research is novel and was successful. The research process started with inductive methods that developed hypotheses and led to deductive investigation. This was done using both participatory qualitative and quantitative methods alongside survey-based quantitative methods that covered multiple research paradigms. The approach included the generation of new and adaptation of existing participatory methods that have been specifically developed to support this research process. The combination of participatory methods has allowed for critical and analytical farmer perspectives that are different from the institutional perspectives that are frequently heard and that came across from formal key informant interviews. The research team built capacity by providing specific training and research experience to staff and students (research and taught) at Makerere University, University of Nairobi and Afhad University for Women. This training and field experience has led to the use of the participatory tools in other proposed and funded research involving project partners in Kenya, Uganda and Sudan (both with and without the University of Reading). The tools used in both inductive and deductive research have also been integrated into curricula of partner universities.

[Jan 2016]
Which farmer(s) should we target? How do extension approaches influence social learning and spread of agricultural innovations?

**Institution:** Wageningen University

**Principal investigator:** Erwin Bulte

**Research status:**

**RESEARCH QUESTIONS/HYPOTHESES**

1. Are levels of awareness on, experimentation with, or adoption of a new agricultural technology affected by the method used to select lead farmers? If so, which methods work more effectively?

2. Are some methods likely to be more effective given observed characteristics of households, villages or social networks?

3. Are existing social networks efficiently designed for social learning? Specifically, are farmers that could learn most from each other also closely connected to each other in existing social networks?

4. How do technologies spread through social networks and to which degree are decisions on adopting agricultural technologies influenced by decisions taken of neighbours?

**APPROACHES AND METHODS**

Household surveys in Kivu, DRC

**FINDINGS**

Study in progress
A Behavioural Economic Analysis of Agricultural Investment Decisions in Uganda

**Institution:** University of East Anglia  
**Principal investigator:** Arjan Verschoor  
**Research status:** Project completed

**RESEARCH MOTIVATION**

Farmers in developing countries typically face extraordinarily hazardous environments, which affects their investment decisions in numerous and profound ways. Policies to increase agricultural productivity – policies on agricultural research and extension, crop insurance, agricultural lending, rural infrastructure, and so forth – rely on particular behavioural assumptions about how farmers decide on investments, but much of their investment behaviour is ill-understood. We conducted new, innovative behavioural economic research on how individual farmers evaluate uncertain investment prospects, and on how anticipating the social repercussions of either the success or failure of investments affects individual investment decisions, that contribute to filling the gaps in our understanding.

**RESEARCH QUESTIONS/HYPOTHESES**

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?

**APPROACH AND METHODS**

The case study country we selected is Uganda. For a region in eastern Uganda, we implemented a representative survey among 1,800 farmers. These farmers participated in economic experiments that enabled us to assess their risk-taking and risk-sharing habits. We also administered a detailed questionnaire that allowed us to link these attitudes towards risk and sharing practices with real-life agricultural investment behaviour.

**MAIN FINDINGS**

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

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

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

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

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

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

**Finding 7:** People take more risk when profits are shared.
Finding 8: Divergent risk attitudes are associated with interpersonal conflict.

POLICY IMPLICATIONS

Recommendation 1: Bundle index insurance, credit and agricultural inputs as this may encourage farmers to take up the insurance product and invest.

Recommendation 2: Frame insurance as a clever way of saving when index insurance is offered.

Recommendation 3: Offer index insurance to risk-sharing groups, as this could increase uptake and encourage agricultural investment.

Recommendation 4: Promote inventory credit/warrantage at the community level.

Recommendation 5: Make fertiliser available in smaller quantities.

Recommendation 6: Leverage modal behaviour on fertiliser use.
Innovations to promote growth among small-scale irrigators

**Institution:** University of Sussex  
**Principal investigator:** Elizabeth Harrison  
**Research status:** Completed

**RESEARCH MOTIVATION**

Small-scale irrigation is seen as key to improving agricultural productivity, food security and rural incomes. However, a complex combination of challenges has frequently conspired to limit its progress. Climate change further compounds these challenges. A better understanding of the ways in which knowledge and innovation in irrigation are produced, used and transferred may lead to more productive and equitable approaches to irrigation development.

**RESEARCH QUESTIONS/HYPOTHESES**

The project aimed to explore the role of power, politics and institutions in shaping the impacts and responses to environmental (climate) change among small-scale irrigators. This included questions relating to the relationship between ‘local’ and ‘external’ rules and norms for the governance of water. Key questions included:

- What are the ‘local rules’ for governing access to water and what shapes these?
- What is the relationship between ‘local’ rules and ‘outside’ influences such as government, business and NGO initiatives?
- How are the politics of water control changing?
- What shapes success or failure in small-scale irrigation?
- What are the politics of knowledge and practice around agricultural water management for irrigation? How is this knowledge produced, transferred and used by farmers?

**APPROACH AND METHODS**

We took a perspective that aimed to move beyond a simple dichotomy of formal and informal, considering the ways in which formality may reflect power in different spheres. Ethnographic fieldwork was carried out in locations in which irrigation has been informal and the result of local innovation (in Tanzania and Bangladesh), and those that have been more formalised (in Tanzania and Malawi).

- In Tanzania, we compared the donor-supported Dakawa irrigated rice farm with the irrigation innovations taking place in Choma on the lower slopes of the nearby Uluguru Mountains.
- In Southern Malawi, research focused on the rehabilitation of a well-established irrigation scheme at Muona and a newer scheme at Chitsukwa, both in Nsanje District.
- In Bangladesh, comparative fieldwork considered the innovation of irrigated watermelon production in the Noakhali chars.

**MAIN FINDINGS (IF APPLICABLE)**

- The project found significant evidence of farmer innovation with regard to irrigation. This was most common when irrigation practices were less formalised and located close to markets.
However, increased productivity has not always resulted in improved livelihoods. This was especially so where barriers to markets were present. There is also frequently competition with other livelihood strategies, such as livestock management.

- Irrigation has often been promoted in schemes that bring farmers together into collective organisations. Such organisations can obscure inequality and conflicts within the schemes as well as between the schemes and adjacent areas. The formalisation of scheme management can consolidate such inequalities and does not necessarily overcome tendencies towards individualised production priorities.

- A lack of integration between government departments promoting irrigation and national agricultural infrastructure can create barriers to irrigation development. Farmers can also be reluctant to learn from, and distrustful of, those who are used as ‘lead farmers’ by NGOs and the extension service, especially when these are singled out for ‘study tours’.

- Irrigating farmers do not appear to be changing their practices in response to climate change-induced water scarcity. More generally, the strengths and weaknesses of different approaches to irrigation need to be considered as part of the wider hydro-politics within which they are embedded, in which access to water resources is increasingly contested.

POLICY IMPLICATIONS

- Policy makers should pay careful attention to the formation of interests groups both within irrigation schemes and between these and neighbouring areas. These may exist outside of formal structures of representation, such as WUAs.

- A predisposition for collective irrigation-management practices should not be assumed.

- It is important to ensure that irrigation development is centrally placed within overall agricultural development structures.

- Irrigation should always be considered in coordination with rain-fed farming and other livelihood strategies. Extension activities that take place in situ should be prioritised over study visits for lead farmers.

- As agricultural marketing is key to irrigation success, it is important to ensure that adequate mechanisms to support this are in place.
Rural Property Rights, Returns to Scale and Contracts

**Institution:** University of Houston

**Principal investigator:** Elaine Liu

**Research status:**

**RESEARCH QUESTIONS/HYPOTHESES**

- How are rural property rights important for the decisions and the well-being of rural men and women in developing countries?
- In particular, how are land leasing rights important for investment decisions and agricultural productivity?
- Do land leasing rights affect the size of agricultural land cultivated by farmers? Do plot sizes increase or decrease following a reform that gives farmers the legal right to lease out their land and lease in the land of others? What does this tell us about the returns to scale in agricultural production?
- Do rural land leasing rights affect the urban migration decisions of men and women living in rural areas? Given that the returns to both urban and rural labor may differ by gender, does the impact of land leasing rights on urban migration vary by gender?
- What determines the type, structure and terms of contracts over rural land use rights? We will focus on the distinction between profit-sharing and fixed rent contracts, but also examine renegotiation terms and contract length. Are these choices partially driven by market failures, such as in the insurance, credit or labor markets?
- How does the choice regarding the type, structure and terms of the contract affect agricultural investments and productivity?
- How are these contracts different when the other party is a farmer versus an agricultural firm? Given that firms plausibly have different preferences for risk than individual farmers, do the outcomes of contracts vary depending on whether the other party is a farmer or an agricultural firm?
- How do differences across farmers in risk preferences, perceived contract risks and political connections affect contract choices and productivity? Given that there are gender differences in these dimensions, do choices and outcomes differ for male farmers and for female farmers in the ways that we would expect?
- How do the results shed light on the process of economic transition associated with the rise of large-scale firm-driven agricultural farming?

**APPROACHES AND METHODS**

Large-scale survey of households with quantitative analysis.

**FINDINGS**

The security of land rights and the functioning of land markets can have important effects on the ability of farmers to maximize agricultural productivity. This project is one of the first to examine the impact of the 2003 Rural Land Reform in China, which gave farmers formal leasing land rights. We evaluate the
impact of rural land reform on farmers’ flexibility in response to cotton price changes. We find that more land leasing occurs in villages with positive cotton price shocks that have implemented the formal law to protect leasing rights. We also see a shift towards cotton production in terms of more land being allocated to cotton and more production in cotton. We also look at the intensity of the use of various agricultural inputs. We find that farmers use more chemical fertilizer as a result of the law.

The result suggests that the reform gives farmers more flexibility in adjusting the size of land in response to the crop price change. During the time when cotton prices spike, as a result of the reform, farmers have more flexibility in leasing more land and producing more cotton effectively.

This reform should help improve farmers’ livelihoods. This finding is important to policymakers in China as the process of strengthening property rights in rural areas is still ongoing. These research projects have important implications for policy in many other developing countries where property rights over rural land are ambiguous and land transactions are uncommon.

We also find that one drawback of the reform is that farmers use more chemical fertilizer after the reform. This is probably due to the fact that farmers are mostly leasing land for the short term, and chemical fertilizers are known to have short-term payoff in increasing yield but in the long run can erode soil quality. Acidification of soil in China has been a concern among agricultural economists and environmental scientists. A recent publication in Science has suggested that soil acidification in China is attributable to the overuse of chemical fertilizer. Thus, our finding is important for not only economists but also environmental scientists whose goals are to understand how to prevent farmers’ overuse of chemical fertilizer. Our finding provides suggestive evidence that having a short-term lease might affect the use of the chemical fertilizer.

[Jan 16]
Agricultural supply chains. Growth and poverty in sub-Saharan Africa: market structure, farm constraints and grass-root institutions

**Institution:** African Center for Economic Transformation

**Principal investigator:** Nicolas Depetris Chauvin

**Research status:**

**SUMMARY**

In Africa, rural poverty is a widespread phenomenon. The countries that historically managed to pull out of poverty are those that have been successful in diversifying their economies away from agriculture and other natural resource based activities. However, in Africa, the agriculture sector has so far failed to become an engine of growth and economic transformation for most countries in the continent. In Africa, international market conditions combine with domestic market configurations in shaping agriculture growth and poverty reduction. In Sub-Saharan Africa the levels of productivity in agriculture are of the order of one third of those enjoyed by small-holders in Asia.

Part of the problem lies in the market structures and in the poor institutions, policies, and infrastructure serving the agriculture sector. Often, the commercialization of the agriculture output is produced along a value chain where intermediaries, exporters, and downstream producers interact with farmers. While in Africa the farming sector is composed mostly of atomistic smallholders, the lower-layers of the value chains are usually dominated by a small number of firms. Farmers may suffer from the non-competitive behavior of other agents along the chain, or be constrained from selling output in markets because transport and other services are not available or are too costly.

Our research will investigate if and how agricultural market structures and farm constraints affect the development of dynamic food and cash crop sectors and whether these sectors can contribute to a process of economic transformation and poverty reduction in Sub-Saharan Africa. To do that we plan to study the interplay between agriculture supply chains, farm constraints and poverty in a number of crops and countries. We will do a mapping of the existing supply chains characterizing the existing market structures and domestic competition policies (privatization, regulation, entry, merger, etc).

At the farm level we will study the constraints faced by small holders to increase productivity and break a vicious cycle where low productivity exacerbates vulnerability to poverty. In a series of case studies, we will explore how grass-root institutions may help overcome those constraints. We will study how the market configurations, farm constraints, and the action of grass-root institutions interact to create useful instruments of poverty eradication. We will also study the differential effect on female-headed households vis-à-vis male-headed households. As women and poor households often confront greater barriers to participation in agricultural value chains and in nonmarket institutions, it is important to highlight such differential constraints and their impacts in our analysis. Our analysis builds around several case studies covering much of Sub-Saharan Africa and many of the major food and cash crops produced in the continent. Each case study has three building blocks, supply chains, farm constraints
and grass-root institutions, and poverty impacts. In turn, the analysis in each building block is based on a sound theoretical framework and on a comprehensive quantitative assessment.

[Proposal]

FINDINGS

What have you discovered or developed through the research funded on this grant? Please explain for a non-specialist audience.

Our research investigates if and how agricultural market structures and farm constraints affect the development of dynamic food and cash crop sectors and whether these sectors can contribute to economic transformation and poverty reduction in Africa. We map the current cash and food crops supply chains in six African countries, characterizing their market structures and domestic competition policies. At the farm level, we study the constraints faced by small holders to increase productivity and break out of a vicious cycle in which low productivity exacerbates vulnerability to poverty. In a series of micro case studies, the project explores how cooperatives and institutions may help overcome these constraints.

We find that the effect of more competition on farm gate prices depends on the initial level of competition in each crop. For many crops, in particular food crops, there is already a lot of competition and further changes in the level of competition will not affect farm gate prices much. In some other specific cases, in particular in cash crops, the initial level of competition is low and more competition is likely to have larger impact on producer prices.

In terms of the effect of complementary policy and other factors affecting the allocation decision of farmers, the largest impacts often come from an increase of the international price. The response of prices to this shock and others in the model is cushioned to a very large extent by the market structure.

Our research should appeal to scholars and policy makers seeking instruments to promote increased agriculture productivity, resolve food security issues, and promote agribusiness by diversifying exports and increasing trade and competitiveness.

In what ways might your findings be taken forward or put to use by others?

The research provides: - Essential knowledge for policy makers currently seeking improved capabilities to deal with effective competition policy to promote increases in agriculture productivity, solve food security issues, promote agribusiness diversifying exports and increasing trade and competitiveness, and remove some of the constraints faced by poor farmers - Mapping of current institutional and domestic markets configurations for food and cash crops in Sub Sahara Africa - Development of new analytical tools to assess the poverty effects of value chains - Better understanding of the constrained faced in commercial agriculture by poor households and how grass-root institutions could work to ease those constraints

Following this research ACET has decided to the dedicate its next flagship report the African Transformation Report to Agriculture. The ATR 2017 has three objectives. First, the report aims to focus agricultural policy in Africa on transformation in this sector by putting together and presenting analysis and results that would inform policies on agricultural transformation and through ACET’s advisory and
advocacy activities. Second, the report will provide an index, the *African Agricultural Transformation Index (AATI)*, which would identify metrics to be used by policymakers, researchers, and other stakeholders to analyze and monitor agricultural transformation in African countries. Third, the report aims to contribute new insights to the important work on the current state and the future of African agriculture, and in particular the investigations of ‘how to improve livelihoods of smallholder farmers’ that have been undertaken by the Comprehensive Africa Agriculture Development Programme (CAADP) and Bill & Melinda Gates Foundation, and contribute to the post-2015 agenda and the growing body of research on South-South cooperation.

[Jan 2016]
Assessing the Contribution of the Dairy Sector to Economic Growth and Food Security in Malawi

**Institution:** Scotland’s Rural College  
**Principal investigator:** Cesar Revoredo-Giha  
**Research status:** Completed

### RESEARCH MOTIVATION

Fractured supply chains have been identified as a barrier to growth for the agricultural sector. In this regard, African agriculture is particularly handicapped. Hence, the purpose of this project is to address some of the key challenges through an assessment of the current and potential contribution of the dairy sector to economic growth and food security in Malawi. Dairy is considered a key investment sector for the Government of Malawi, and donors such as the USA, Japan and Belgium have focused part of their development aid on the sector (in the case of USAID since 1998 with the participation of Land O’Lakes). Despite this, domestic production response was unimpressive, with FAO data, showing an increasing trend between 1961 and 1987 but then followed by continuous instability with periods of rapid production growth (though not reaching the peak of 1987) followed by conspicuous decreases.

The project was motivated by three facts: (1) The Malawi Government considers dairy production a priority within the livestock sector; (2) ‘Supply chains in disarray’ have been identified as a barrier to growth for the agricultural sector (e.g., inefficiency, transaction costs, unbalanced power along the chain, poor product quality); (3) They can also be a constraint to the achievement of food security in a country as they will produce less than the optimal amount with a given level of resources; they will do so at higher prices; and they will be poor creators of employment.

The logic of the project was based on the following facts according to the literature and available data up to early 2011 (when the project was formulated): (1) Underutilisation of processing capacity; (2) Use of imported reconstituted powder milk instead of domestic supplies; (3) A profitable processing sector targeting affluent urban population; (4) Poor quality milk leading to rejection by processors (17%); (5) Significant proportion of milk production sold as raw milk (i.e., through the “informal market”); (6) The lowest consumption of milk per capita in Africa (estimated at 4.7 kg/capita/year). (7) Donors have been contributing to the development of the sector for several years without significant results.

### RESEARCH QUESTIONS/HYPOTHESES

The programme of research involved 8 workpackages (WPs), each with own questions. They are presented below: workpackages 1 to 7 deal with different parts the dairy supply chain, which are integrated into workpackage 8, which involves the construction of the empirical model and policy simulations to generate a ranking of different strategies along the chain in terms of economic growth and food security.

**Workpackage 1:** Dairy farms – The question in this WP aimed to characterise the dairy farms operating within Malawi (smallholder and large farms and by milk shed areas of Blantyre, Lilongwe and Mzuzu) in terms of their production and marketing.

**Workpackage 2:** Milk bulking groups – The questions of this WP were related to the operation (e.g., the purchasing and the selling of milk, quality testing and its cost, payments to producers). It focused on the
profitability of the MBGs, their constraints and investment behaviour. Relationships with farms (smallholder and large) and with processors from the point of view of the MBGs were also considered.

Workpackage 3: Processors - The key question as regards the processing sector was whether companies operate in a non-competitive way on both sides (with respect to producers paying low prices and with respect to consumers, selling products at high prices).

Workpackage 4: Distribution of dairy products (including trade) – The questions in this WP were linked to studying the operation, profitability, relationships with trade (imports), and relationships with processors. Competition of domestic products with imported one and the presence of trade barriers was also be studied.

Workpackage 5: Consumption of dairy products – The main questions here involved understanding the demand for dairy products in different regions of Malawi and by socioeconomic group.

Workpackage 6: Legislation and government offices involved on the dairy supply chains – Questions in the workpackage relate to the legislation and functioning of government offices associated to the dairy sector such as the Malawi Standards Bureau, the Department of Animal Health.

Workpackage 7: International development sector and the dairy supply chain – Questions in this workpackage relate to the way international donors operate in the dairy sector. In particular, it will study the performance of Bvumbwe cooperative, which received support from JICA for marketing directly milk to consumers and not through the major milk companies.

Workpackage 8: Assessment of the current and potential contribution of the dairy sector on economic growth and food security – The questions in this WP are aimed at evaluating the current and potential (under alternative scenarios/strategies) contribution of the dairy sector to economic growth and food security as there is the need to integrate all the aforementioned elements.

APPROACH AND METHODS

The approach to be used in the project draws on economic and marketing, involving elements of value chain analysis together with industrial organisation analysis (including under this umbrella a number of analyses such as theory of contracts, imperfect competition theory, economics of information, supply chain relationships theory, transaction costs theory). From the description of the sector it is clear that an approach that involves the analysis of the entire dairy supply chain is required (i.e., from farmers to consumers). Value chain analysis provides such approach. This is a useful framework to describe the activities of the organization (in this case the dairy supply chain), linking them to the organization’s competitive position. It evaluates the value-added by each particular activity to products or services. Furthermore, the relationships between the different stakeholders in the supply chain are considered in the analysis.

Value chain analysis has proved useful in the identification of problems of the dairy industry (and other agribusiness sectors) in Central and Eastern European countries following transition from centrally planned to more market based economies. It is important to note that supply chains in those countries have several elements in common with the situation of the dairy supply chain in Malawi including important smallholding farming, milk quality problems, imperfect information, unutilised producing capacity at the processing sector. Industrial organisation provides a number of tools that are useful to understand situations present in the Malawian dairy sector, such as the possible use of market oligopsony power by processors, i.e., selling dairy products at high prices to the affluent urban population, the presence of milk quality problems, and high transactions costs related to production by many small
holders and asymmetric information in a non transparent milk (quality) testing process. When combined with market power from buyers, these problems help explain the high percentage of milk that is marketed through informal channels. This has impacts on incomes and introduces distortion in the appropriate adoption and diffusion of technological improvements to increase efficiency in the food supply chain. The project methodology will comprise the complementary application of qualitative and quantitative methodologies. The first stage, qualitative approach, will consists of a number of small studies, using secondary information and semi-structured interviews of key informants in different parts of the entire dairy supply chain. This stage of the research aims to provide a complete overview of the sector and to guide the subsequent modelling exercise. The envisaged small studies are:

- The domestic supply of milk (smallholder farms and large farms) and their utilisation.
- The milk bulking groups (they purchase milk from smallholder farms and sell them to processors)
- The dairy processing sector
- The demand for dairy products in Malawi (consumption)
- The distribution sector and international trade
- The international development sector including food aid
- Government institution associated with the sector (e.g., Malawi Standard Bureau)

To evaluate supply chain potential, there is the need to integrate the aforementioned elements into a regional multimarket model of the entire dairy supply chain. The second stage of the project will construct such a model to be used to illustrate alternative scenarios and policy strategies for the sector and their impact on economic growth (i.e. national GDP and the incomes of different stakeholders of the chain) and food security (in terms of availability, accessibility and affordability of dairy products). We suggest that this model will provide useful analytical insights to illustrate policy options for Malawi; e.g. the model will be used to assess the current impact of the sector, the impact of current investments (e.g., towards the expansion of the smallholder dairy production) and to explore ways to foster the development of the sector.

MAIN FINDINGS

The two major aims of the project were (1) to identify factors hampering the contribution of the sector to economic growth and food security and (2) to assess whether a strategy of revamping the existing formal dairy supply chain would be more effective than one promoting "short dairy supply chains" by investing in small-scale dairy marketing and processing facilities.

Major findings as regards aim (1) are:

(a) The project found significant differences in the production of milk at the farm level, with the Southern region being the most efficient and the Northern region the least efficient. This speaks well of the strategy of expanding mix breeding animals (mix of native zebus and pure breeds), which have lower milk yields per cow than pure breeds but also have lower costs.

(b) Marketing of milk suffers from issues regarding infrastructure, e.g., roads quality, electricity power cuts, quality of equipment and management at the milk bulking group (MBG) level. This affects not only the collection and the quality of the milk but also the returns of farmers, since the inefficiencies at the MBGs level are reflected in the price paid to farmers.

(c) The project did not find processors to have market power on both the buying and selling markets. On the buying side because of the size of the informal market where farmers can sell their products directly if they find processors’ price too low. On the selling side because of retailers (supermarkets) power in
deciding the final price paid by consumers. In that context, processors’ idle capacity is engineering and not economic and is due to the fact that they sell products with added value to customers with relatively high purchasing power, which is a relatively small population. The fact that processors set prices can be taken as a case of barometric price leadership (they are the best informed buyers).

(d) Retailers were found to have some market power over processors and urban consumers. Based on information of processors price lists and retail audits to supermarkets, it was found that supermarkets set high marketing margins over pasteurised milk (in some cases more than twice the processors’ recommended retail margin). This has effects on food security (affordability) because these are products purchased by relatively poor urban population.

(e) The informal market can be thought as a contributor to food security (affordability) as it sells raw milk at a price much lower than that of pasteurised milk (about 1/3 of the price of pasteurised milk). In 2013 it was estimated that the informal market receives about 63% of the milk from the dairy herd (i.e., excluding milk from the native zebus).

Major findings as regards aim (2) are:

(a) Economic growth of the sector should differentiate the milk production and value added products. The growth of raw milk production (by 7% per year from 2004 to 2013) have been through the improvement of productivity and increase in the number of dairy cows (between 2004 and 2013 yields grew by 2.1% per year and the number of cows by 4.8% per year). This has been due to the work of donors, Government and producers associations. The formal sector has also grown by 12% per year during the same period (as measured by milk collection). Nevertheless, excluding milk from the zebu herd, processors collection represented only 36.4% of the milk produced.

(b) As regards the strategy to further develop the sector: (1) The processors/formal sector would benefit with investment to improve infrastructure (particularly roads and electricity power). (2) Micro processing is a strategy that seems not to have future due to: management issues, lack of purchasing power of the population, lack of scale economies in comparison with the large processors sector. However, it should be noted that the Government and some milk bulking groups are keen on this. (3) Given the size of the informal market, selling directly is already happening. This is in direct conflict with the reform of the Milk Act that aims at stopping the selling of raw milk in urban and rural areas. Instead the discussion should be on how to ensure that the raw milk is of good quality.

POLICY IMPLICATIONS

The dairy sector in Malawi has the potential to contribute to economic growth, food security and to improve the livelihood of the poor. The limiting factor for economic growth seems to be the demand in both cases (raw and processed milk). Domestic demand is limited by the population’s purchasing power.

It is our view, given the facts, the Government of Malawi, the donors and other stakeholders need to commit on a joint strategy for the dairy sector so the results are coherent. We feel that there needs to be stakeholder consensus as regards:

- whether the strategy should be guided by business development or poverty alleviation;
- whether the Government and donors should focus on consolidating in the Southern and Central regions instead of trying to develop the Northern region. Or just focus on the Southern region;
- What strategy Malawi should follow in terms of development.
As regards the strategy to further develop the dairy sector in Malawi: The processors/formal sector (including MBGs and also farmers because the prices they receive is also reduced by the MBGs inefficiencies) would benefit with investment to improve infrastructure (particularly roads and electricity power). Farmers with finding ways to reduce their costs (e.g., feed costs)

Micro dairy processing is a strategy that seems not to have future due to: management issues, lack of purchasing power of the population, lack of scale economies in comparison with the large processors sector. However, it should be noted that the Government and some milk bulking groups are keen on this. Moreover, given the size of the informal market, selling directly is already happening. This is in direct conflict with the reform of the Milk Act that aims at stopping the selling of raw milk in urban and rural areas. Instead the discussion should be on how to ensure that the raw milk is of good quality.
Space Markets and Employment in Agricultural Development

**Institution:** Institute for Poverty, Land and Agrarian Studies, UWC, South Africa  
**Principal investigator:** Andries du Toit  
**Research status:** Completed

**RESEARCH MOTIVATION**

The research project was concerned with understanding the relationship between agricultural development and the nature of the rural non-farm economy. While policymakers recognize the importance of agricultural development for growth in low and middle income countries, employment-rich growth cannot depend on agricultural activities alone. While some will benefit from increases in the intensity or productivity of agriculture, these changes also tend to push many of the poor and vulnerable off the land and out of agricultural employment.

Urban development and the formal economy is not always able to pick up the slack. Much therefore depends on the ability of the rural non-farm economy to create employment and economic opportunities. A key question for policymakers is therefore whether the path or nature of agricultural development can not only bring benefits to farmers and farm workers, but to others involved in services, inputs and related non-farm and off-farm economic activities. The research aimed to answer that question through a careful investigation of the nature of the local multipliers linked to agricultural production.

**RESEARCH QUESTIONS/HYPOTHESES**

The research project was based on the postulation that the ability of agricultural development to support local non-farm multipliers would be based not only on the extent of growth in external tradables and the consequent growth in farmer incomes, but also on the scale and spatial configuration of agriculture’s forward and backward linkages, on the nature and functioning of local institutions, and on the local political economy of agricultural investment and ownership.

**APPROACH AND METHODS**

Approaches like Social Accounting Matrices that are traditionally used to understand forward and backward linkages are not suitable to the investigation of local linkages at the sub-national scale proposed by the study. Rather than a quantitative investigation of flows between sectors, the research team proposed the detailed qualitative exploration of the spatial configuration of socio-economic networks by ‘following the money’ upstream and downstream from farming enterprises in rural districts of Malawi, Zimbabwe and South Africa in a recursive process. This allowed them to build up detailed maps of backward and forward linkages and to link these to a detailed understanding of local context.

**MAIN FINDINGS (IF APPLICABLE)**

The studies showed significant differences in the nature of the spatial networks created in the three case study districts by the forward and backward linkages of agriculture. Key differentiating characteristics of these networks were their **density** (the number of enterprise nodes and their spatial clustering), **external connectedness** (the degree to which they were linked to distant markets and economic actors), **local embeddedness** (the degree to which decisions within enterprises were subject to local influence or...
regulation) and power differentials (the degree of concentration or vertical integration between nodes, resulting in differences in degree of control and agency).

Crucially, the evidence seems to suggest that external connectedness on its own is not enough to ensure that agricultural development benefits local economies. True: a complete lack of external connections can be crippling -- without access to good markets, small farmers and local entrepreneurs are deprived of economic opportunity. But where farming is large in scale, where it is owned or controlled by external stakeholders, where input procurement is highly centralized, where investment and consumption expenditure occurs outside the local district, and where value chains are characterised by high degrees of vertical integration and concentration, agricultural development can be locally disembedded: windfalls from trade do not circulate in the local economy and few opportunities for inclusive growth are created.

External links can also expose local entrepreneurs to competition from powerful and distant corporate players, undermining multipliers and channelling money out of the area. But where external connectedness occurs in dense, locally embedded networks the financial rewards from agriculture can circulate in the non-farm economy.

POLICY IMPLICATIONS

These findings have important implications for agricultural and economic policy. Firstly, they suggest that agricultural policy should promote smallholder agriculture – not simply as a contribution to food security, but also as a source of employment in itself, and as a hub for forward and backward linkages into the local economy. There is a strong case to be made for agricultural policy to be more effectively oriented towards smallholder farmers who are not tightly integrated into spatially extensive, centralised, corporate value chains. In South Africa, land reform that is oriented towards smallholders can help achieve an economic and political ‘win’ scenario by enabling beleaguered medium-scale white farmers – who contribute little to food security anyway – to exit the market. Elsewhere, land and investment deals that create large-scale farming enterprises, externally owned and plugged into distant export markets, are unlikely to contribute positively to local employment growth and should not be supported in the mistaken belief that they do.

Maximising the economic benefit from agricultural development and smallholder farming will require better support for local retail and informal markets, including in livestock; often disregarded by urban planners. Finally, local planning, land use, zoning and anti-trust law and policy should be geared at protecting small informal markets and retailers from being swamped by large commercial agriculture and the intrusion of powerful corporate retailers into rural markets.
CALL 2 RESEARCH SUMMARIES

CALL 2

Gender and pro-poor agricultural growth: nonfarm/farm linkages and village dynamics in sub-Saharan Africa

**Institution:** Department of Human Geography, Lund University, Sweden
Institute of Continuing Education, Sokoine University of Agriculture, Tanzania
Econpolicy Ltd, Maputo, Mozambique

**Principal investigator:** Agnes Andersson Djurfeldt

**Research status:** data collection nearly completed, analysis started

RESEARCH MOTIVATION

More research needed on gender based exclusion from agriculture, and especially how and if processes of commercialization are gendered over time

RESEARCH QUESTIONS/HYPOTHESES

Aims of the research: identify patterns of pro-poor agricultural growth and their gender dynamics in a context where a priori women are excluded from productive resources

RQs:

- Where are the sources of female exclusion (if there are any) in the production and commercialization process?
- If and how exclusion from agricultural commercialization plays out between male and female headed households as well as within female headed households
- If and how the nonfarm sector is used to compensate for women’s poorer access to agrarian resources
- How village level institutions and factors outside the household affect processes of commercialization and gender access to (output) markets.

APPROACH AND METHODS


Qualitative data from nine villages showing long term pro-poor agricultural growth in Kenya, Zambia and Tanzania (3 villages in each country). Data has been collected in Kenya and Zambia and will be collected in Tanzania in October. No analysis so far.

MAIN FINDINGS

Market participation is biased against female headed households in the case of traditional cash crops in Malawi, Tanzania and Zambia, but market participation generally is not gender biased, despite the persistent notion of “womens’ crops”. The sources of male bias with respect to cash crops rests primarily
in marketing arrangement that discriminate against women, for instance in the case of Malawi membership in tobacco farming clubs are only open to men.

Commercial opportunities shift over time and both men and women appear to seize these opportunities, moving in and out of particular markets.

For the grain crops, sources of exclusion lie primarily in access to productive resources rather than markets in themselves, since the volumes of marketable surplus produced by female headed households are much smaller.

Nonfarm cash incomes are not able to compensate for lacking access to farm incomes among female headed households

Intra-household access to cash income collected individually for all adult members in male headed households shows that women’s command over cash income is very limited, with male household members commanding most cash income.

POLICY IMPLICATIONS

Enabling the production of a marketable surplus among female headed households appears to be a more important intervention than redressing gender biases in output markets (of which there are few examples)

Strong emphasis is placed on women’s access to individual income as a key to empowerment – the prospects for this are very limited, however
The generation and distribution of rural prosperity: insights from longitudinal survey data

**Institution:** University of Sheffield
**Principal investigator:** Dan Brockington
**Research status:** In progress, early stages

**RESEARCH MOTIVATION**

Our project revisits households and communities in Tanzania that were surveyed by diverse researchers in the 1990s and early 2000s, to build up longitudinal datasets exploring economic change and poverty dynamics.

This work will help to fill a crucial data gap in Tanzania and other African countries where datasets recording the impacts of economic change and growth in recent decades are woefully thin. Since the 1990s many economies have been growing, but there are few panel datasets which can chart the impacts of this growth on poverty dynamics before the late 2000s. We seek to address that gap.

We also seek to do so using measures of poverty that are not normally covered, namely by exploring assets. Cross-sectional studies using household budget survey data are possible, but the poverty lines constructed are based on consumption measures which excludes assets. In contrast local definitions of wealth and poverty often hinge upon assets.

We hope to contribute to national and regional policy debates about the role of small-scale agriculture in local economic prosperity.

**RESEARCH QUESTIONS/HYPOTHESES**

Our questions are both methodological and substantive. The former are:

1. How can different household surveys be combined for one retrospective study?
2. How can problems of attrition be dealt with across different surveys?
3. How can livelihood changes be observed at the individual and household level?
4. What are the key indices of poverty mobility for this research?
5. Where and when have communities in Tanzania been surveyed in the last 25 years?

Substantively, we examine:

1. What factors enable families and individuals to build assets in agricultural livelihoods?
2. What factors enable families and individuals to build assets beyond agriculture economy?
3. What are the drivers of loss of assets and failure to build assets in the agricultural and non-agricultural economies?
4. How might asset-loss in families and individuals be mitigated?
5. How might paths to asset building be facilitated and spread to others?
CALL 2 RESEARCH SUMMARIES

APPROACH AND METHODS

We identify communities which were surveyed in the 1990s and early 2000s using either random or stratified random samples and in which measures of prosperity and assets were taken. We contact the researchers involved to see if the names of the original households are still available, and the original data. In the process we have built a network of researchers of diverse nationalities who have been active in the country over the past twenty to thirty years. We have now identified 15 separate studies, covering nearly 70 different villages. These are shown in the map below (and indicate a depressing road bias of research in rural areas in the last 25 years).

Our protocols for resurvey are 1. Focus group discussions on the meanings and identification of wealth and poverty and changes in these meanings over time; 2. Identify and re-survey originally surveyed households; 3. Explore where missing households have gone; 4. Survey a sample of secondary households (that have partitioned from the original households); 5. Qualitative interviews to explore the reasons for changes in livelihood and prosperity; 6. Discuss results with village focus groups.

MAIN FINDINGS

Resurveys are complete in two of the studies we have identified, and underway in four more, so it is far too early to say report any findings. Early results show higher levels of prosperity than expected (in three sites). This is manifest in high levels of investment in houses, education and shifting portfolios of productive assets. However this is not universally the case.

Our website hosts a number of blogs written by researchers about their initial impressions from the first set of re-visits. (http://livelihoodchangeta.wix.com/tanzania#!project-summary/aboutPage)

POLICY IMPLICATIONS

This is too early to say. Not only are results preliminary but policy is also shifting.
Labor Outmigration, Agricultural Productivity and Food Security

**Institution:** University of Michigan  
**Principal investigator:** Dhirga Ghimire  
**Research status:**

**BACKGROUND, AIMS AND OBJECTIVES**

This project investigates the consequences of labor out-migration on agricultural productivity in Chitwan, Nepal—a poor agricultural country persistently facing food security problems. We aim to answer three high-priority scientific and policy questions: To what extent:

1. Does labor out-migration influence (i) agricultural productivity, (ii) women’s participation in farming, and (iii) exit from farming?
2. Do remittances influence (i) farm technology use, (ii) women’s participation in farming, and (iii) exit from farming?
3. Do farm technology use and exit from farming influence subsequent out-migration?

With an estimated 214 million migrants—mostly from poor agricultural regions to more industrialized countries—international migration is a key concern in scholarly and policy arenas. This unprecedented phenomenon has wide-ranging consequences for both migrant-sending and receiving locations. This study focuses on one specific, but crucial consequence—the impact of labor out-migration on agricultural productivity in migrant-sending areas. This is crucial as agriculture productivity in poor subsistence economies is closely connected with one of the world’s epidemic problems: food security. FAO estimated about 870 million people were undernourished in 2010–2012. The vast majority of these (852 million) live in developing countries. Thus, increased agricultural productivity in poor countries is a key tool for addressing this problem. This project aims to better understand the relationship between labor out-migration and agriculture, providing crucial information for scientific and policy development of food security concerns.

Understanding the link between out-migration and agriculture is complicated by the fact that migration does not happen randomly. Additionally, changes in agricultural practices and migration are likely to influence each other. Thus, the empirical demands for adjudicating potential reciprocal relationships are high, limiting the ability of previous research to speak to these questions. To address this challenge, we will leverage the Chitwan Valley Family Study (CVFS), a case control comparison design at the community level with a 15-year panel study of a stratified systematic sample of communities, households, and individuals in Nepal. This unusual panel study enables us to address the non-random selection of individuals into migration. Furthermore, the case control design is particularly powerful for controlling macro-level effects (e.g., climate, prices, and policies) to detect the effect of change and variation in the phenomena of interest: farm labor loss, remittances, farm technology use, agricultural productivity, and women’s participation in farming. Despite the wealth of existing panel data, answering our specific questions requires a modest level of new data collection. Our proposed panel
measurement involves multi-mode mixed methods data collection with appropriate temporal order and timing precision necessary to assess the relationships.

This study will generate (i) comprehensive panel data with potential to address perplexing methodological problems; and (ii) empirical evidence of the consequences of labor out-migration, agricultural productivity, and its interplay with gender.

POLICY DEBATES WE HOPE TO INFLUENCE

- Global food security
- Formulation of migration and agricultural policies
- Migration and wellbeing of left behind women and children

RESEARCH METHODS

We will employ a multi-pronged research strategy that leverages existing CVFS panel data supplemented with new data collection.

Existing CVFS Panel Data. The CVFS sample has been refreshed at regular intervals since 1996 to ensure it remains representative of the general population of the study area. The most crucial part of the CVFS, for this study, is the multi-level panel measurements that include (1) detailed histories of 151 communities; (2) household consumption and agricultural practices; and (3) individual interviews with life histories. Household-level data include measures of agricultural production, wealth, assets, consumption and agriculture practices as well as demographic events such as births, deaths, marriages, divorces, and living arrangements (in- and out-migration with destination). Individual-level data include life histories and measures of values, attitudes and expectations from all adults. More crucial for this project are measures for migrants around the world and within Nepal, both before they move out and while abroad.

New Data Collection. We will collect new data from a CVFS subsample of 1,200 households (500 households for crop yield measurement). We will rely on our extensive experience in designing and collecting community-, household-, and individual-level measures. We will measure crop yield using standard crop yield survey practices described by Singh.

Household Agriculture and Migration Survey. With the existing well-tested household agriculture and migration measures, we will administer a 45-minute household agriculture and migration survey to 1,200 households. This survey will collect information on household agricultural practices, including farm technology use, wealth, assets, income, consumption, and information about each household member currently away from home. This information will include purpose of the travel abroad, timing of migration, location, remittances and other material goods sent to the household.

Population Events and Women’s Participation in Farming Survey. To create prospective measures of out-migration, remittances and related demographic events that are needed to adjudicate the effects of farm technology use and farm exit on the propensity to migrate, we will extend our household registration system. We will also collect information on women’s participation in farming, assessing the number of days worked in farming each month of the past year and the number of hours per day in the past week.
Seasonal Agriculture Survey. To measure farm technology use, agriculture productivity and exit from farming, we will administer a 25-minute household interview in each cropping season (i.e., three times a year). We have successfully conducted the seasonal agriculture survey from 1997–1999 and need to update the measures.

Crop Yield Measurement. To create measures of agricultural productivity, we will measure yields of major crops grown by farm households in each season (i.e., three times a year). We will use standard practices used in crop yield measurement surveys.

The study will take place in the Chitwan Valley, located in south central Nepal.

Key Dates: October 1, 2014 (Project Start Date)

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[Oct 2014]
Disseminating Innovative Resources and Technologies to Smallholders

**Institution**: Innovations for Poverty Action, Yale University
**Principal investigator**: Chris Udry
**Research status**: 

**KEY INFORMATION**

**Location**: 12 districts, Northern Region, Ghana


**Principal Investigators**: Prof. Christopher Udry, Prof. Dean Karlan, Dr. Mathias Fosu, Dr. Shashidara Kolavalli

**Implementing partners**: Ghana Ministry of Food and Agriculture, Ghana Agricultural Insurance Programme, Savanna Agricultural Research Institute

**BACKGROUND AND OBJECTIVES**

Innovations for Poverty Action (IPA) has partnered with the International Food Policy Research Institute (IFPRI), the Savanna Agricultural Research Institute (SARI), the Ghana Agricultural Insurance Program (GAIP), and the Ghana Ministry of Food and Agriculture (MoFA) to examine the barriers to adoption of intensified cultivation using high-yield inputs by smallholder farmers in northern Ghana. The Disseminating Innovative Resources and Technologies to Smallholders (DIRTS) project will use a randomized controlled trial to measure the impact of improved flows of extension information, access to agricultural input packages, and rainfall index insurance on agricultural intensification, in particular the use of fertilizers and improved seeds. The project will generate measures of the impact of intensified input use on profits, consumption/food security, intra-household labor allocation, and asset holdings. The DIRTS study includes key stakeholders in agriculture and will provide valuable information on the demand for these products and services so as to create a model for household economic improvement that can be commercialized and scaled up.

The study directly addresses the question of how agricultural productivity and profits can be raised at the household and farm level. This study incorporates rainfall index insurance, timely access to agricultural inputs and increased access to technical/extension advice through the use of mobile technology. The sample for DIRTS is 3,240 farmers in 162 communities. The multifaceted data collection process will include comprehensive annual surveys; qualitative focus group discussions; plot-level GPS data, and weekly collection of household labor data over the course of the agricultural season.

**PREVIOUS RESEARCH**

DIRTS builds on the results of two earlier studies with the same target population: IPA’s Examining Underinvestment in Agriculture (EUI) project, and SARI’s Soil Health Project (SHP). The EUI study, which ran from 2009 – 2012, explored whether underinvestment was due to cash constraints or risk
aversion on the part of smallholder farmers. Participating farmers were randomly assigned to receive rainfall index insurance, cash grants, or both. Demand for the commercially-priced insurance was high, and most of the positive effects documented by the study were driven by the provision of insurance. Farmers who received both capital and insurance increased their total investment by 20 percent. Insurance made up most of this effect since farmers with insurance alone increased total farm expenditure by 13 percent. Insured farmers were also found to have increased inorganic fertilizer use by 25 percent, cultivation area by 8 percent, expenditures on land preparation by 12 percent (mostly due to increased cultivation area) and total labor use on plots by 13 percent. Farmers with insurance also harvested more: their output increased by 8 percent. This was enough to cover additional purchased inputs, but not enough to cover the costs of the additional labor used. Farmers who received only capital used more inorganic fertilizer, but made no other significant changes to their activities. For most EUI farmers, the slight increase in output led to a small amount of extra cash and increased food security in the form of grain stocks, rather than significant gains in farm profitability. Overall, farmers with access to insurance strongly increased investment, but they earned only minimal returns on these investments.

In sum, the EUI study showed that insurance is a viable means of increasing on-farm investment. The current DIRTS study examines the hypothesis that improved access to technical/extension advice and timely access to input markets will be particularly effective in increasing farmer yields and profits in a context in which the availability of insurance facilitates increased farm investment. Testing all three interventions simultaneously will allow IPA to study the interactions of the programs, and determine which program or combination of programs leads to optimal outcomes for farmers.

POLICY DEBATES

DIRTS' activities are expected to be of interest to national and regional policymakers, development practitioners, insurance companies, agricultural input suppliers, and funders in the following ways:

1) Testing the overall effectiveness of extension services, input provision, and rainfall index insurance in the Northern Ghanaian context. Identifying the agricultural policies which do or don’t work will allow policymakers to better target their scarce resources towards effective policies. Stakeholders who may be interested in this work include policymakers from regional ministries of agriculture, development practitioners, and funding organizations.

2) Potential for commercialization and scalability of existing products and services. Information collected on the demand for insurance, extension services and intensified agricultural inputs as well as the profitability of each will inform the potential and scope of privatization for each component. Beyond the direct evaluation of the costs and benefits of improved access to insurance, input markets, and extension advice, this project is designed to shed light on a number of other important policy issues:

**Land tenure:** Extension content will include both practices that boost productivity immediately, and techniques that contribute to the long-term viability of farms. How do perceptions about tenure rights affect adoption of certain techniques? How does this interact with plot allocation within the household, given women’s less secure rights over plots?

**Savings and dynamic incentives:** Does illiquidity amplify the importance of imperfect insurance? When do farmers have liquid assets? How does an opportunity to purchase at harvest influence demand for inputs and insurance?
Gender, technology adoption and intrahousehold resource allocation: Year two of the extension intervention will include an arm that focuses advice on female farmers and on the crops in which they specialize. How does the effectiveness of the extension intervention vary across gender? Does this interact with baseline characteristics of resource allocation within the household?

Learning: What are the spillovers from intensified extension and experience with the new technology to farmers not directly reached? This can be estimated given data on social connections across communities.

Labor markets and gender dynamics: How is demand for gender-specific labor influenced by adoption of intensified cultivation? What is the opportunity cost of additional family labor used on intensively cultivated plots? Are farmers constrained by lack of labor? What role do women play in managing intercropping activities on otherwise male-managed plots?

RESEARCH METHODS

IPA will use a randomized controlled trial (RCT) to study the impact of the DIRTS program. DIRTS will offer three interventions. First, to test the importance of imperfect farmer knowledge of farming best practices, randomly selected communities will be provided with more intensive extension through a community-based extension agent (CEA) who will act as a supplement to existing MoFA extension services (CEA treatment). Second, to test the importance of guaranteed, timely, and affordable access to appropriate inputs, DIRTS will make commercial fertilizer and improved seeds available to farmers, through a network of affiliated retailers (marketing treatment). Third, farmers will be able to purchase a rainfall index insurance product from GAIP at varying prices, including a price of 0 in the first year (insurance treatment). Randomization proceeded in two stages. First, communities were randomized into four groups: T1 communities are assigned to insurance and CEA treatments; T2 communities are assigned to insurance and marketing treatments; T3 communities are assigned to insurance, CEA, and marketing treatments; and T4 communities are assigned only to be insurance treatment. Second, households within each community are randomly assigned to insurance and CEA treatments. The marketing treatment is a community level intervention, hence all households in T2 and T3 communities receive this intervention. In all communities, access to insurance is provided at randomly assigned household-specific prices. In each CEA community, five randomly chosen households are assigned to receive the treatment. Annual surveys are undertaken to provide data on outcomes, including rich information on agricultural practices. In years two and three, community-based survey assistants will provide detailed information on a biweekly basis on plot activities, including labor use.

[Oct 2014]
Integrated assessment of the determinants of the Maize yield Gap in Sub-Saharan Africa: towards farm INnovation and Enabling policies? (IMAGINE)

**Institutions:** Wageningen University (Netherlands); University of Ghana; Ethiopian Economic Policy Research Institute; International Maize and Wheat Improvement Centre (Ethiopia)

**Principal investigator:** Martin van Ittersum, Wageningen University

**Research status:** work in progress (end date 2017)

**RESEARCH MOTIVATION**

The prospect and context for agricultural growth in low income countries (LICs) have changed considerably over the last decade. An important question is how agricultural development, an important contributor to economic growth, employment and food security, can be best promoted. More specifically, insight is needed into how agricultural productivity can be raised at the level of households, farms, crops and farming communities. Still significant yield gaps are observed in the agricultural sector of LICs, which suggest possibilities for improving performance. An example is maize, an important food crop in Sub-Saharan Africa, which accounts for 30% to -50% household expenditure.

**RESEARCH QUESTIONS/HYPOTHESES**

The IMAGINE-project aims at:

- identifying the key bio-physical and farm and crop management factors that determine the maize yield gap in SSA;
- analysing how the yield gaps and/or their drivers factors relate to existing institutional, infrastructural, socio-economic and policy constraints;
- drawing insights, lessons and recommendations from the obtained results, which can then be used to improve agricultural practices (farmers, extension service providers, demonstration pilots) and agricultural and other policies (policy makers), in such a way that yield gaps will be reduced and maize yields increase.

Through this IMAGINE aims to make a contribution to an increase in maize production, that is produced in a sustainable way (proper management and use of resources), which will contribute to an improved food security and enhanced the prosperity of rural communities.

**APPROACH AND METHODS**

This project uses a framework that integrates agronomic and economic approaches to assess the yield gap and analyse agricultural performance at the plot and farm level. Based on production ecological concepts and economic production theory three different gaps are distinguished that bridge four yield estimates. Figure 1 summarises the framework including a first list of factors determining the yield gap.
In the project the yield gap is estimated and explained at two different levels. Nationally representative farm level surveys are analysed with econometric estimation techniques to assess the impact of economic and infrastructural constraints at the national and sub-regional level. This is deepened by means of an in-depth investigation of farm and plot level production data that will be gathered via surveys in selected regions in Ghana and Ethiopia. Based on this the project will identify promising technological improvements and policy interventions, that will be assessed in on-farm experiments and policy and stakeholder workshops.

MAIN FINDINGS

The research aims to generate results that are:

- relevant for policy makers by providing insights into drivers of agricultural performance and how these are linked to policy and donor interventions.
- helping farmers and rural communities and provide them insights and education on how productivity can be improved in the target region (using a model farm and active dissemination and extension actions to share practical knowledge)
- contributing to capacity development at the level of socio-economic – agronomic research, policy making level, and other stakeholders in the supply chain
- contributing to the wider research and stakeholder community.

The results of the research will be integrated in the Global Yield Atlas (www.yieldgap.org). Policy makers and international donors can use the outcomes of the research to better target their agricultural and food security initiatives.

POLICY IMPLICATIONS (PLANNED)

IMAGINE aims to make a difference at the policy level as well as at the local farmer level. We are aware that changing policies is a difficult and slow process, which is likely to be beyond the scope of the IMAGINE project. However, in order to influence policy makers at the maximum level we aim to disseminate our output in an active way. As a preparation to the Policy Round Table a number (ca. 3) policy briefs will be prepared and circulated with the aim to raise the awareness of policy circles. Network contacts will be used to invite persons from the Ministry that are identified as being key players with respect to the maize yield issue. We will focus to interact with policy makers at different levels, including the national level. A policy round table has been foreseen in both countries (Ghana, Ethiopia). These high level meetings will be organised in the second half of 2017. In the set-up of these high-level meetings our aim is to also involve local policy makers, extension agencies and NGOs.

Figure 1. Yield gaps and key determining factors.

*water-limited yield potential in case of rainfed systems

Factors determining the gap(s):

- Access to technology
- Socio-economic context: market conditions; support programs; infrastructure.
- Farm-specific factors: farm size, knowledge, experience, crop and farm management and risk aversion
- Unexpected or random events: extreme weather events, diseases, pests, unanticipated seasonal events but also price volatility and crisis.
Information barriers can be an important constraint preventing adoption of a profitable technology. Whether such information constraints exist and persist likely depends on farmers’ ability to learn about the use of, and the returns to, the new technologies, through learning-by-doing or through learning-from-others. Given the low fixed cost of many technologies, the cost of experimenting may seem relatively small compared to the long-term benefits of the technology adoption, but farmers’ own experimentation with new products does not always seem to happen. We hypothesize that this is because farmers are not considering one input in isolation, but a large number of inputs with unobservable and variable returns, and learning about each input combination is a lengthy process. To the best of our knowledge, little is known about whether variation in the returns of different available agricultural technologies, and the high frequency of low-return ones, are important constraints to adoption. If they are, farmers’ learning experiences about such variation can enhance adoption of the high return technologies, and encouraging farmers to experiment with high quality and suitable products might hence increase adoption.

This research focuses on the role of heterogeneous input returns, the dynamic processes underlying farmers’ learning and their appreciation about new inputs. We aim to provide causal evidence on the impact of providing information on the returns to specific combination of inputs that rely on experimentation on the farmer’s own land. We pay special attention to the heterogeneity in returns and learning due to local soil conditions and differences in skill levels of male and female farmers. Beyond providing unique evidence on learning-by-doing regarding input quality and suitability, the research also contributes by analyzing learning-from-others along a number of innovative channels. First of all, we analyze learning within the household, building on a rich baseline datasets with individual skill measures for the two main farmers in the household. Second, we analyze learning by other farmers in the village, and how differences between neighbors and participating farmers affect the learning process. As such, the research will provide evidence on potential hidden constraints to information dissemination within and across households.

We set up an agronomical research RCT in Siaya (Western Kenya), where smallholder farmers were invited to participate in an agronomical trial on one of their plots that lasted for three seasons. The RCT was designed to provide an exogenous increase in the farmers’ information on input quality and suitability. We study the dynamic impacts of farmers’ experimentation with multiple products over three seasons and test whether this leads to an increase in the use of high quality and suitable inputs and yields.
Prior to the long rain season 2014, we identified ten farmers per village in 96 villages and the plots that they would dedicate to the research trials. Half of the villages were randomly selected to the control group, and in the other half all identified farmers were selected to apply the research trials during three seasons. In the first (random) 24 villages, trials started in the long rain season 2014, in the second batch of 24 villages trials started in the short rain season 2014. Within each village, we sampled

5 random farmers, as well as 5 farmers specifically selected as promising farmers for the trials, so lessons can be drawn for both average and highly skilled or motivated farmers. Following standard agronomical protocols, agronomists worked with each farmer in the treatment group to implement an agronomical trial. Each plot was randomly divided into a control sub-plot without inputs and 5 treatment sub-plots where different combinations of inputs were tested. Inputs were selected to ensure variation in the quality and suitability of the inputs tested by each farmer, ranging from inputs of known stable high returns to inputs with more uncertain quality signals. The inputs were varied randomly by farmer, but each farmer tested a set of inputs that satisfy the same function. The trials tested different combinations of seeds and fertilizer packages, for soya and maize.

The protocol was designed so that the agronomist working with the farmers does not provide any signals about which input is expected to perform better. As a result, a significantly higher use of the high quality inputs in the treatment villages should indicate that farmers learned about the quality of inputs from observations of the trials. Indeed, the design of the RCT is based on an assumption that, due to possible heterogeneity in soil and farmer characteristics, dissemination of information on input quality through experimentation may be more credible than merely telling farmers which inputs to use. Intensive data collection during and after the implementation of the RCTs allows the analysis of the dynamic learning and adoption decisions. The data collected after the end of the trial allows studying the sustainability of the adoption patterns, as well as any potential dis-adoption. Attrition was kept to a minimum, at less than 5% in each of the follow-up rounds.

We also surveyed the second farmer in the household after 3 seasons on their agricultural knowledge, perceptions about the new technologies, and their related investments and decisions, after their spouses have participated three seasons in the agricultural trials. This allows testing for intra-household learning. To further shed light on the relative importance of own experimentation for learning, we organized field days in the last season of the trials in the treatment villages, where the results and experiences of the trials were discussed among participating farmers and presented to other interested farmers in the village. We subsequently study spillovers in the wider village population by surveying non-participating farmers randomly selected from the village population. Further evidence on learning-from-others comes from studying changes in soya input use and practices among farmers that were randomly assigned to maize treatment, and vice versa.

MAIN FINDINGS (IF APPLICABLE)

The preliminary findings show that experimentation on farmers’ own plots results in clear learning gains. Farmers’ learning is slow but it matches well the agronomic findings and after several seasons many identify which inputs worked best and increase the demand for those specific inputs. Community selected farmers learn faster and more, but differences with random farmers decrease over time. And learning is not limited to specific inputs, but farmers’ also grasp wider lessons regarding optimal agronomical practices, and apply those on their own plots. Learning increased the willingness to purchase the inputs, but only partially translates into purchase, pointing to important remaining constraints, in particular on the supply side.
CALL 2 RESEARCH SUMMARIES

Learning-by-doing is to a certain extent accompanied by learning from others. Indeed learning is strong across treatments: farmers with maize trials learn about soya and vice versa, suggesting high communication among participating farmers in the village. Indeed, we find that participation in the trials increases the communication among the participating farmers, and this increases over time. Yet learning of neighboring farmers that themselves did not participate in any trials appears much more limited. In contrast, we find significant learning spillovers within the participating households.

POLICY IMPLICATIONS

While the study is set up as a proof-of-concept study, encouraging experimentation by farmers is at the core of the technology dissemination approach of many other extension programs. The insights of the study hence aim to contribute to the literature on extension, where rigorous evidence on scalable cost-effective interventions remains scarce. The lessons regarding the slow learning process, and the limited learning-from-others in this context, suggest in particular that low-intensity extension efforts may have limited impact. In contrast, facilitating experimentation over multiple seasons can lead to clear learning gains, even regarding relatively complex technologies.
Optimal Packaging of Insurance and Credit for Smallholder Farmers in Africa

**Principal investigator:** Ana Marr  
**Institutions:** Greenwich University  
**Research status:**

**BACKGROUND AND OBJECTIVES**

The project seeks to enhance the agricultural productivity of smallholder farmers by improving the contribution that insurance products can make in providing farmers with access to inputs. It specifically looks into the role that insurance plays in packages offered to farmers, consisting of agricultural inputs and credit. The project considers the contribution that the extent of insurance can make to both the implied demand for credit and the supply thereof. We also look into how insurance can change the conditions of credit provision (i.e. interest rate, collateral, delivery to individuals or to groups). The goal is to derive improved packages of insurance, credit and inputs that can reach larger numbers of farmers at lower costs.

Recent literature on insurance shows that insuring farmers can induce them to opt for more risky, more profitable activities (Cole, Giné and Vickery 2013; Cai et al 2009) but the uptake of insurance by itself has been generally small. This can simply be ascribed to the high price of the insurance (Clarke 2011), but Carter et al (2011) point out that the farmers’ alternative of self-insurance may even be more costly. Better use of insurance can be made by combining insurance with credit or by ‘crowding-in credit supply’ or ‘bundling index-based insurance with micro-loans’ (Carter, Galarza and Boucher 2007). Similarly, Norton et al (2012) find that ‘more effective insurance products and intervention bundles should be developed’ and Brown et al (2011) encourage insurance companies to ‘work to build trust with their clients and provide their products as part of a package that combines insurance cover with loans for investment in higher productivity.’ This alludes to a combination of insurance with credit and inputs that enhance productivity.

We propose to study precisely this ‘package’, and its composition. The combination of insurance with credit can have very strong effects on the supply of credit (Skees et al 2007; Carter 2011; Hazell et al 2010), though not always in a positive direction (Farrin and Miranda 2013), but little empirical research has actually been done. Insuring farmers against covariant risks (such as those typically associated with weather) can mitigate the portfolio risks for the lender and can increase the willingness of the farmer to take credit. When combined with input provision, the credit is (or can be) converted into a productivity increase, which enhances the potential for repayment of the loan. In this combination, the formal insurance may dominate the self-insurance that farmers would otherwise choose (Carter et al 2011). The costs involved for loan provision and those for insurance provision are strongly affected by the group size of the farmers. For individual farmers, costs can be prohibitively high, but loans and insurance through cooperatives or other ‘aggregators’ benefit from economies of scale in monitoring and administration and in pooling the basis risk of weather index-based insurance. When groups can bear the smaller risks themselves, insurance can be limited to covering larger, infrequent episodes of damage, at substantially lower fees (De Janvry and Sadoulet 2011; Cole
et al 2012). The possibilities offered by grouping farmers, either bottom-up or top-down (as in MFI- or trader-organised groups) will therefore play an important role in the empirical work we propose. By investigating packages and including groups we expect to capture what Karlan and Morduch (2009) refer to in their ‘mechanisms’ of credit provision.

RESEARCH QUESTIONS

The research questions addressed in our project are:

- How does insurance affect supply of credit for farm inputs?
- How does insurance-cum-credit affect the uptake of inputs by farmers?

POLICY DEBATES WE HOPE TO INFLUENCE

- Innovation in financial products for agriculture
- Farmers associations’ willingness and ability to enhance agricultural productivity
- Stakeholder interactions/consensus towards improved finance for agriculture in Africa

RESEARCH METHODS

Research question 1: supply of credit

Our first aim is to study the impact of bundling insurance with credit, on credit supply terms such as price and other loan attributes. To this end, we meet with a number of potential and actual lenders involved with our partner organisations, both in Kenya and Zambia. Discussions with them and with other experts are used for a first inventory of the costs involved in providing credit to farmers as a function of the degree of insurance and the features of the agricultural settings and farmers involved, including their degree of grouping.

The next step is to conduct experimental games aimed at eliciting their trade-off between price and attributes. The best experimental game for this purpose is the multi-round multi-attribute sealed-bid auction in which the auctioneer invites bids from suppliers. The auctioneer uses a scoring rule to weigh the price and the attributes of the bids. By varying the scoring rule slightly between rounds, information on the suppliers’ cost functions is revealed. The approach amounts to ‘framed field experiments’. The games will be structured so as to simulate a market situation in order to arrive at a quantification of their supply as a function of degrees of insurance. The findings of the earlier interviews are used to present the options as realistically as possible. To enhance the wider validity of these findings, we join forces with the African Development Bank to conduct similar experimental games with representative experts of other financial institutions in Africa. The games are complemented with a survey among the participating financial institutions to gain insights into the specific background of each player, particularly on how the portfolio of the lender influenced their supply of credit for the package.

Research question 2: demand for packages

We aim to address our second research question by a variety of methodologies. First, we will survey farmers who have bought credit-cum-insurance contracts in Kenya and Zambia and farmers in similar districts who have not done so. We will sample 1% of all participants in Zambia and 0.3% in Kenya, and an equal number of non-participants. This amounts to some 600 households in both countries. The sample is stratified so as to include sufficient numbers of households from groups that
are likely to be different in the way they respond to the packages (including female-headed households). In the surveys, we will collect information on the benefits, costs and risks of input use for crops, and how insurance can affect the choices made. Experimental games will be held to elicit the preferences of farmers and intermediaries over combinations of costs and (remaining) risk exposure and the perceived benefits of the packages. For these experimental games, the findings of the surveys are used to present the options as realistically as possible. The games will be held with a random selection of a third of the farmers surveyed, rendering 200 observations per country.

Optimal packages can be derived using the analysis of the supply and demand sides. These analyses, based on the interviews, surveys and experimental games, provide all the input that is needed to find a degree of insurance that will elicit a demand equal to supply, given certain conditions as to grouping, agricultural setting etc. This ‘conditional equilibrium’ will guide the recommendations as to how packages can be attuned to groups of farmers and in particular can be attuned to female groups of farmers.

**Location:** Kenya and Zambia

**Key dates:**

*Start date of the project:* 1st October 2014
*First visit to Kenya and Zambia and Stakeholder Workshops:* November 2014-March 2015
*Supply study, demand study and optimal packages:* Nov 2014-June 2017
*Dissemination of findings:* Sept 2015-Sept 2017

**PI and key collaborators:** Dr Ana Marr, Principal Investigator, University of Greenwich, UK. In collaboration with: Dr Kees Burger, Dr Marcel van Asseldonk and Professor Robert Lensink, Wageningen University, NL. Mr Paul Gamba, Egerton University, Kenya. The Zambia National Farmers Union, Zambia. Syngenta Foundation, Kenya. The African Development Bank.

[Oct 2014]
Agricultural Misallocation, Occupational Choice, and Aggregate Productivity

Institutions: University of Edinburgh
Principal investigator: Jan Grobovsek
Research status: In progress

RESEARCH MOTIVATION
A typical feature that differentiates Least Developed Countries (LDCs) from rich economies is the stylized fact that labour productivity is substantially lower in agriculture relative to the non-agricultural sector. Interestingly, relative agricultural productivity in LDCs is low both in real as well as in nominal terms. The first one points to the conclusion that phenomena such as factor misallocation, technological inefficiency and low factor endowments disproportionately beset the agricultural sector. The second feature – depressed nominal labour productivity in agriculture – implies that relative sectoral wages do not adjust sufficiently to compensate real relative productivity differentials. In other words, it leads to the conclusion that there exist frictions to labour mobility that hold too many farmers in the farming sector.

At the same time, LDCs (most notably in Sub-Saharan Africa) are also characterised by insecurity in land tenure. In particular, they often feature a low degree in land transferability, both in terms of land sales but also in terms of land rentals. One implication is that land user rights exceed transfer rights, which means that landholders are excessively encouraged to farm land instead of selling or renting it out to other users. It also implies that landholders are discouraged from switching to non-agricultural activities.

RESEARCH QUESTIONS/HYPOTHESES
We measure how limited land transferability depresses agricultural labour productivity. In doing that we address the productivity puzzle mentioned above. In particular, we can also disentangle the extent to which distortions to relative sectoral productivity entail real consequences in terms of losses to aggregate GDP and consumption, and the extent to which they simply represent a statistical artefact (because of individual sorting) with no serious consequences at the aggregate level.

The first part of our research project computes how the existing distributions of land ownership and operations arise from a land tenure regime that (i) precludes land sales and (ii) imposes an expropriation threat when land is rented out. We then explore the long-term consequences associated with land tenure reforms that liberalise land transferability.

Our second research project simplifies land policies by replacing them with exogenous generic distortions. Instead, we refine the agricultural production function. One application is to consider production functions featuring indivisible outlays, namely in mechanization and irrigation. The other application consists of a production function where the optimal match between land quality and farmer quality is assortative (i.e. skilled relative to unskilled farmers differ in their ability to use low relative to high quality land). Our aim is to compute how frictions that impose limits to land operations affect agricultural productivity in such settings.
APPROACH AND METHODS

The distortions that we investigate produce important equilibrium consequences – i.e. relative prices and wages between the agricultural and non-agricultural sectors are endogenous responses to existing policies and market frictions. For this reason we approach our quantifications through the lens of general equilibrium macroeconomic models.

To date we relied mostly on publicly available household level data such as the LSMS-ISA. We also complement them via a pilot survey that we ran in Ethiopia and Uganda. In all likelihood we will roll out an amended version of the pilot on a larger representative sample of household in Uganda in January 2017. It will be centred on agricultural production, land transferability and migration options.

MAIN FINDINGS

The main finding from our first research paper relates to the effect of limited land transferability as it exists in Ethiopia (no sales and circumscribed land rentals, enforced through the threat of expropriation). We compute that lifting such restrictions is associated with a 70% (80%) increase in real (nominal) relative productivity between agriculture and non-agriculture. Our model suggests that land liberalisation would decrease agricultural employment by about 14 percentage points and raise GDP by about 6%. Our lesson from this exercise is that restrictions to land transferability go a long way in explaining the low relatively agricultural productivity in parts of Sub-Saharan Africa. They also have real consequences on GDP, but these are ultimately minor relative to sectoral productivity measures. It turns out that the existing communal land tenure regime encourages large masses of individuals to work in farming rather in non-agriculture. However, because of sorting such individuals are, at the margin, unskilled workers in any of the two sectors. As a result, standard aggregate measures make agriculture appear extremely productivity (relative to non-agriculture), but this is to large extent due to individual sorting.

POLICY IMPLICATIONS

One policy implication is that restrictions to land transferability have a non-trivial negative effect on GDP and do indeed impose sizeable barriers to migration from rural to urban areas. The associated losses must be weighted against any potential benefits of such policies.

Another finding concerns the likely general equilibrium dynamics following the lifting of land transfer restrictions. Our results suggest that at existing prices about 40% of farmers in an economy such as Ethiopia would prefer to switch activities. However, once the price adjustments are factored in (namely an increase in the price of agricultural goods and a drop in land rental rates) only about 20% would actually prefer to switch. This is noteworthy. It implies that policymakers worried about sudden and disruptive migration flows should take into account that far from all of the pent-up demand for outmigration (kept in check by land policies) would in effect materialise in equilibrium after lifting restrictions.
Assessing Models of Public-Private Partnerships for Irrigation Development in Africa (AMPPPIDA)

**Institution:** International Food Policy Research Institute (IFPRI)

**Principal investigator:** Ruth Meinzen-Dick

**Research status:** Ongoing

**RESEARCH MOTIVATION**

Public private partnerships (PPPs) have the potential to bring much-needed financial, technical, and managerial resources to the irrigation sector in SSA and are explicitly identified in the food security and irrigation strategies of Tanzania and Ghana. Previous experiences with PPPs suggest that governments and communities need significant capacity to effectively negotiate, monitor, and implement PPP irrigation projects to achieve environmentally, economically, and socially sustainable outcomes. The overall objective of this proposed research is to provide requested guidance to SSA ministries on the process of devising PPPs as institutional arrangements for irrigation development that help to meet food security goals and provide benefits for both the investors and people in affected communities.

**RESEARCH QUESTIONS/HYPOTHESES**

The project addresses the following questions:

- What role can PPPs play in the expansion of irrigation by providing for increased innovation through the creation, transfer, and adoption of new knowledge?
- How do different types of PPPs create incentives for actors to participate and how have these influenced environmental, economic, and social sustainability?
- What are the procedural and distributional impacts of PPP schemes and the ways in which men and women participate in, benefit from, or are affected by PPP institutional arrangements?
- What can be done to improve the outcomes of PPPs for irrigation development?

**APPROACH AND METHODS**

The project has developed a framework for assessing PPPs and is applying it to case studies of PPPs in Tanzania and Ghana, using Focus Groups, Key Informant Interviews, document review, and Net-Mapping to understand the social, economic, and environmental impacts of various types of PPP arrangements. Throughout the project, partners will work with stakeholders, including government officials, private sector representatives, donors, and community-based organizations, to understand capacity needs and gaps to negotiate equitable and inclusive PPPs and to facilitate the process of future investment in irrigation.

**MAIN FINDINGS**

PPPs for irrigation development are gaining importance in policy, political and investment circles, mainly as a way of overcoming financial resource constraints. While they do have potential to tap both financing and external expertise, our preliminary work suggests that there are several shortcomings in the ways that these arrangements are typically implemented.
CALL 2 RESEARCH SUMMARIES

- The roles of the various partners and the distribution of costs, risks and benefits are often not spelled out clearly.

- More efforts should be made to involve smallholder farmers—as key private sector actors—into the process of developing PPPs.

- Access to land and water resources are essential for any irrigation development. In PPPs, (re)distribution of land and water rights needs careful examination, including attention to existing customary rights and claims, to ensure that the PPP activity does not exacerbate inequalities.

- Sound data on long-term water availability and seasonal fluctuations is needed for planning to ensure that new water users do not deprive existing users.

- Extending irrigation access is only the beginning. To succeed, PPPs need to attend to the entire chain of irrigation service provision and marketing of the increased production.

POLICY IMPLICATIONS

While PPPs may offer some advantages in terms of mobilizing additional resources for cash-strapped governments, they potentially have large environmental and social implications that must be addressed, particularly to ensure that they benefit smallholders and local communities as well as the private investor and also meet government objectives.

The framework we developed in this project can identify a broader range of options for PPPs, and the stakeholder NetMapping can be used to identify active participation in different aspects. There is interest by IFAD, for example, in developing the framework as a tool that can be used to increase clarity about the roles and responsibilities of different actors in each aspect of irrigation development and production.
Assessing the growth potential of farmer-led irrigation development in sub-Saharan Africa (SAFI) (http://www.safi-research.org/)

**Institution:** University of Manchester; Wageningen University; Sheffield University; Nelson Mandela African Institute for Science and Technology, Tanzania; Instituto Superior Politécnico de Manica, Mozambique.

**Principal investigator:** P. Woodhouse (p.woodhouse@manchester.ac.uk)

**Research status:** in progress (Jan 2015- Dec 2017)

**RESEARCH MOTIVATION**

Formal irrigation investments in Africa are widely perceived to have performed poorly, with little public funding of irrigation from 1985 to 2005, but there has been widespread investment by African farmers themselves in diverse ‘informal’ irrigation methods. These include diversion of streams into furrows to water crops, small pump systems, wetland reclamation, and other methods of improved water control and productivity. However, there are no systematic studies of this phenomenon and its contribution to growth in agricultural production or the wider economy. This research seeks to understand the factors that are influencing farmers’ decisions to invest, or not, in irrigation and the consequences for economic growth and income distribution.

**RESEARCH QUESTIONS/HYPOTHESIS**

‘Farmer initiatives’ in irrigation development rarely take place in complete isolation from ‘external’ agencies of government, markets and international funders or NGOs. The research questions this project addresses are therefore:

1. What differences can be identified in the patterns of engagement between farmer-led irrigation development and external agencies?
2. How do different models and ideals shape this engagement in the interconnected political domains of irrigation development, community development, agricultural development, natural resources management?
3. How do these models and ideals play out in practice and how do irrigation realities shape these engagements?
4. How do different groups of farmers engage with irrigation initiatives, including (different forms of) exclusion, and with what outcomes for their assets and abilities to derive benefits from agriculture?
5. What forms of irrigation initiatives can be identified on this basis?
6. At a policy level, how significant are these different forms of irrigation development and their outcomes for farmers in the respective countries?

**APPROACH AND METHODS**

The project will undertake three main activities in Tanzania and Mozambique:
Irrigation case studies will include questionnaire surveys and qualitative interviews to understand water management aspects, socio-economic characteristics, and the processes through which irrigation technology is acquired. Each case study will initially focus on establishing the economic rationale for farmers’ use of irrigation, the technical and institutional services on which they draw and the social and economic consequences of irrigation development. Each case study will include non-adopters of irrigation and particular attention will be paid to identifying differences in irrigation use associated with gender, ethnicity and age.

Analysis of national policy context will review how irrigated areas are inventoried and government policies are geared towards different types of irrigation. This will involve interviews of key policy-makers and technical personnel in irrigation agencies, and in a variety of NGOs, private sector and/or government actors supplying technical support and equipment. Further information will be generated through a series of workshops in both Tanzania and Mozambique. This will enable case study findings to be used to interrogate the current policy context in terms of the potential contribution of farmer-initiated irrigation to broader agricultural development.

A comparative framework will be generated from the data generated by the irrigation case studies and by the analysis of the national policy context. This will establish key parameters of different types of farmer-led irrigation, including (but not be restricted to): sustainability of the irrigation system (productivity and durability of water supply); inclusivity (in terms of local trends towards socio-economic differentiation); and scaleability (in terms of a supportive economic, technological and institutional environment).

MAIN FINDINGS (IF APPLICABLE)

Fieldwork is at an early stage and it is too early to elaborate conclusive findings. However, the study has already encountered evidence that the extent of ‘farmer-led’ irrigation is under-reported by official statistics. This is in part due to challenges experienced in many large-scale survey and census protocols to defining ‘irrigation’ in a way that captures the multifarious ways that farmers (and particularly small-scale farmers) direct water for crop production.

POLICY IMPLICATIONS

Key policy issues on which project researchers are engaging policy makers in Tanzania and Mozambique concern:

- The significance of ‘farmer-led irrigation’ in terms of productivity and food security;
- The extent to which farmer-led irrigation creates differentiation between winners and losers in rural communities.
- The different ways that ‘farmers’ engage with a range of other agents (government, individual and corporate traders in farm inputs and outputs, development funders, researchers and extension workers, local artisans) in seeking to develop irrigated production.
- The implications for investment strategies by governments and other funders.