

Does a multi-faceted market-based approach to food crops stimulate food security and agricultural development in Tanzania?

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Note to readers

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Summary

Despite the recent advances in the fight against poverty and hunger, food insecurity is still a pressing problem. Smallholder farmers dominate production, and most African countries have not been able to realise a successful agricultural revolution. While the agricultural sector has traditionally relied on export crops, the greatest market potential for most African farmers lies in the domestic and regional market for food staples. Hence, agricultural growth in the food sector offers the largest potential for poverty reduction and can thus not only improve food security through higher availability of local food in the market but also through higher income of the rural poor. The relation between increased production and sales of food crops and food security is, however, not straightforward at the level of the producer household. Increased commercialisation of food crops may result in higher male control over resources, which in some cases has been shown to have negative effects on household nutrition.

Like most African countries, Tanzania has a history of state control over marketing in the agricultural sector. While state control has decreased over time, private-sector marketing is still rudimentary. Within this context, the *Integrated Project to Increase Agricultural Productivity (IPIAP)* intended to stimulate the production of staple food crops (maize, rice, soy, and beans) through a value chain approach built around the strengthening of farm organisations. The project applied “an inclusive business model to create market opportunities for farmers which are commercially viable and scalable to small-scale farmers, processing industry, buyers and agribusiness dealers to ensure reliable and timely access to quality inputs, sufficient quality, quantity and reliability of supply for processors/buyers”.

This results in the following evaluation questions:

1. Did the market-based approach targeted at food crop production stimulate agricultural productivity?
2. To what extent does the project contribute towards obtaining the targets of food and nutrition security at the households involved?

The project ran from 2014 until 2017 and targeted Farmer organisation (FOs) and their members in Mbeya, Kyela, Mbarali, Mbozi, Momba and Sumbawanga Districts in Mbeya and Rukwa Regions. The implementers were the Netherlands Development Organisation (SNV) –coordinating partner, support to warehouses and community information centres, Ruvuma Commercialization and Diversification of Agriculture (Rucodia) –capacity building of farmer organisations and agro dealers, the African Conservation Tillage Network (ACTN) –promotion of good agricultural practices through e.g. demo plots, days, training of government extension workers; and Private Agricultural Sector Support (PASS) –financial training and linking of farmer organisations to microfinance institutes (MFIs).

The evaluation strategy was based on randomised implementation of the project. The project followed a location-based approach in which target locations were selected and all eligible FOs and relevant agro dealers and other business in these villages were included in the project to benefit from locational synergies. We agreed that within each of the six project district, eligibility of wards would be determined based on the crops grown and the absence of (planned) related interventions to avoid contamination. From the eligible wards, treatment wards were randomly selected. However, ward numbers are small, especially for the control

group, where not all FOs were identified, and the sample was not balanced. In addition, there may be spill overs from activities targeted at government extension agents and agro dealers.

We attempted to mitigate the data problems by adapting our econometric strategy. We used a matching estimator, as well as a double-robust estimator that uses a propensity score to weight ordinary least squares (OLS) coefficients. The advantage of this technique is that it allows for misspecifications in either the propensity score or OLS models. However, as it assumes parallel trends, we interpret the results with care.

The treated FOs in our sample are Kapunga SH SACCOS¹, Kongolo, Ruanda Majenje, Njalalila, Madibira AMCOS², Iyawayaya Group, Mshewe Irrigators, Ilembu Usafwa AMCOS, Jipemoyo AMCOS, Ulenje AMCOS, Iwindi AMCOS, Ndalambo Coop. Society, Tunduma SACCOS 1, Tunduma Mixed Producers 1, Momba Farmers Association 1, Tunduma Border Market1, Migoneka AMCOS, Nandanga Association, Mpemba Association, Ruanda AMCOS, Imasha AMCOS, Hasambo AMCOS, Upendo SACCOS, Shiwinga AMCOS, Malolo AMCOSS, Isalalo AMCOS, Isumi AMCOS, Mlangali AMCOS, Mwanda AMCOS, Nkana AMCOS, Insani AMCOS, Chama cha Wafugaji Isangu. We find that agricultural productivity in this treatment group increased, relative to the change in productivity in the control group. This might be explained by a larger observed increase in the use of improved technologies in the treatment group relative to the control (who decreased the use of improved seeds). We find no effect of the project beyond productivity. Prices and the percentage of crops sold does not appear to increase due to the treatment. This could imply that the input and technology-related project activities were effective, whereas the project's efforts to link to markets were not. The persistent government policy of banning crop exports severely limits the interest of traders in engaging in contracts with farmers, severely limiting the opportunities for improvement.

We supplemented the survey data with an artefactual field experiment that analysed how the labour division between spouses affects spending decisions. We find that couples in our sample have a special sensitivity to private and jointly produced income: additional labour on a joint project does not affect spending power, but additional earnings from a private project does. We find a correlation with choices in the experiment and farm production. This suggests that the effect we measure has important consequences. For example, when market crops become more dominant at the cost of women-controlled food crops, this may decrease their bargaining power and thus ultimately hamper household nutrition.

¹ Savings and Credit Cooperative Society

² Agricultural Marketing Cooperative Society

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Abbreviations and Acronyms

AMCOS	Agricultural Marketing Cooperative Society
ACTN	African Conservation Tillage Network
BRN	Big Results Now
DAICO	District Agricultural Officer
DID	Difference in differences
GEW	Government extension worker
IPIAP	Integrated Project to Increase Agricultural Productivity
ITT	Intention to treat
MFI	Microfinance institute
OLS	Ordinary least squares
PASS	Private Agricultural Sector Support
RUCODIA	Ruvuma Commercialization and Diversification of Agriculture
SACCOS	Savings and Credit Cooperative Society
SNV	Netherlands Development Organisation

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1. Introduction

Despite the recent advances in the fight against poverty and hunger, food insecurity is still a pressing problem. In Africa, about 25 per cent of the population still suffers from hunger and under nourishment due to low food availability and limited access to nutritious foods (Fan, 2015; FAO, 2015). More than a third of Africa's children are stunted, a situation that exposes them to a range of physical and cognitive challenges (Benson, 2004). Undernutrition is the major risk factor underlying over 2.9 million deaths (28 per cent of all deaths) in Africa annually (Benson, 2004).

At the same time, agriculture has remained the main source of employment and livelihoods in rural Africa. Smallholder farmers dominate production, and most African countries have not been able to realise a successful agricultural revolution due to underinvestment in the sector and relevant non-agricultural sectors such as technology, physical infrastructure, institutions and health (Diao et al., 2007). While the agricultural sector has traditionally relied on export crops such as coffee, tea, cotton and cocoa, the greatest market potential for most African farmers lies in the domestic and regional market for food staples (Diao and Hazell, 2004). Hence, agricultural growth in the food sector offers the largest potential for poverty reduction (Diao et al., 2007) and can thus not only improve food security through higher availability of local food in the market but also through higher income of the rural poor.

African agriculture has been subjected to a series of reforms aiming at transforming subsistence agriculture to market oriented production. After a period of intensive government intervention, the structural adjustment programmes in the 1980s and 90s led governments across sub-Saharan Africa to withdraw from produce marketing as well as providing other services to farmers. This was meant to encourage entry by private traders and foster competition, which in turn would improve producer-level prices, thus improving profitability and stimulating investments and productivity. However, liberalisation policies have had diverse effects on market prices. Farm prices have become unstable and unpredictable, and this affects household income and food security (Barrett, 1997; Ellis and Freeman, 2004; Kherallah et al., 2002).

Like most African countries, Tanzania has a history of state control over marketing in the agricultural sector. While state control has decreased over time, private-sector marketing is still rudimentary. The capacity of agribusiness actors, particularly in marketing of the agricultural outputs and inputs are constrained by entrepreneurial skills, inadequate capital/finance, poor infrastructure, an un-conducive legal and institutional framework, and inadequate competition. Periodic export bans of staple crops lower producer prices, wages of unskilled labour and returns to land. Farmers have little access to technologies, inputs, capital, and buyers/storage facilities for their produce. This results in low farm productivity and limited food production. Despite its potential, the country's food self-sufficiency therefore ranges between 80 per cent in years with good harvests and 67 per cent in 'bad years', with the rest imported (RLDC, 2009). Farmers in Tanzania are relatively uncoordinated. Farmer organisations often do not live up to the expectation of their members in terms of provision of financial, advisory and marketing services and a common voice on issues of common interest to their members.

Within this context, the *Integrated Project to Increase Agricultural Productivity (IPIAP)* intended to stimulate the production of staple food crops (maize, rice, soy, and beans) through a value

chain approach built around the strengthening of farm organisations. The project ran from 2014 until 2017 and aimed to reach 45,000 smallholder farmers -40 per cent men and 60 per cent women, in Mbeya, Kyela, Mbarali, Mbozi, Momba and Sumbawanga Districts in Mbeya and Rukwa Regions. The project applied “an inclusive business model to create market opportunities for farmers which are commercially viable and scalable to small-scale farmers, processing industry, buyers and agribusiness dealers to ensure reliable and timely access to quality inputs, sufficient quality, quantity and reliability of supply for processors/buyers“. The ultimate objective was to “enable men and women smallholder farmers to benefit from improved technologies, agronomy and efficient markets necessary to improve their food security and increase household incomes.” The project’s specific objectives are fourfold and reflect the components of the integrated, chain-oriented framework: 1) to strengthen the capacity and efficiency of farmer organisations; 2) to increase smallholder market-led agricultural production; 3) to enhance smallholder farmers’ access to structured produce markets and; 4) to improve access to extension and advisory services among smallholder farmers and the private sector.

The relation between increased production and sales of food crops and food security is not straightforward, at least not at the level of the producer household. The resulting higher cash incomes would enable households to purchase a more diverse and healthy diet, but increased commercialisation of food crops may result in higher male control over resources (Fischer & Qaim, 2012; Gray & Kevane, 1999; Kaaria & Ashby, 2000), which in some cases has been shown to have negative effects on household nutrition (Angelucci and Attanasio, 2013; Duflo and Udry, 2004; Quisumbing et al., 1995). However, robust empirical evidence on these relations is scarce.

This evaluation aims to answer two key questions, as specified in the pre-analysis plan. The first relates to the direct impacts of the project:

- Did the market-based approach targeted at food crop production stimulate agricultural productivity?

More specifically:

- To what extent did the IPIAP cause increased technology adoption?
- To what extent did the project increase the agricultural productivity and production?
- To what extent did the project strengthen farmer organisations?
- Did the project improve marketed volumes and prices of food crops?
- To what extent did the project improve the income of smallholder farmers and women?

The second key question relates to indirect impacts through household decision-making:

- To what extent does the project contribute towards obtaining the targets of food and nutrition security at the households involved?

More specifically:

- Did the project improve food consumption and increase diet diversity?
- Did the project affect the nutritional status of women and children under five?
- To what extent did the project affect the decision making power of women in the household, and how did this affect nutrition?

We try to answer these questions based on survey data from the treatment and a control group just before the start of the project and two years later. Although the research was originally designed as an RCT, this approach did not work. We now use DID with PSM and doubly robust estimators to limit potential biases.

The questions on indirect impacts—related to nutrition and intra-household bargaining—are only relevant if direct impacts are achieved by the project. In addition, establishing the causal mechanisms relating agricultural production to decision making power and childhood nutrition presents methodological problem, as unobservable household characteristics could simultaneously affect production decisions, outcomes and intra-household bargaining. As an additional approach, we therefore implemented a ‘lab-in-the-field’ experiment using a novel design. In order to measure the relationship between labour input, income and female bargaining power causally, we exogenously vary labour inputs and returns by both male and female subjects, and then subsequently measure how this affects bargaining in a controlled environment.

The rest of the report is structured as follows. Section 2 presents the intervention, the theory of change and the research, while Section 3 presents the context. In Section 4, we present the timeline of the evaluation and implementation. Section 5 presents the evaluation design, methods and implementation. We describe our sampling strategy, the data collection process, our survey instruments, and the experiment. Section 6 presents the evaluated programme. Section 7 presents the empirical strategy and results related to direct project impact and agricultural productivity. As we do not find evidence of project impact, we do not analyse project impact on nutrition and household decision-making. Instead, we present the results of the experiment on intra-household bargaining. Section 8 provides a discussion. The report ends summarising the specific findings for policy and practice in Chapter 9.

2. Intervention, theory of change and research hypotheses

Key question 1 relates to the theory of change of IPIAP. The project assumes that farmers face multiple constraints to the production of staple crops that need to be alleviated to increase market production. These constraints relate to access to capital, agronomic knowledge, access to inputs and access to output markets (see Figure 1, just above the horizontal blue line). Focussing on key staple crops –maize, rice, beans and soy, the project intended to address these constraints through diverse activities targeted at farmer organisations and their members as well as other actors in the chain: microfinance institutes (MFIs), extension services, agro dealers, processors and warehouses (grey boxes in Figure 1). By improving the linkage of individual farmers with these actors –through their FOs, farmers’ capacity to produce and sell staples would increase. Through extension, the farmers would gain knowledge of improved technologies (improved seeds and soil management). At the same time, they would get increased access to markets for inputs and outputs through linkages with agro dealers and processors. Additionally, access to MFI credit would be improved. By presenting all these interventions at the same time, farmers would be able to increase the use of inputs and technology (1.1a) and prices received (1.1b) and thus increase production of the target and possibly other crops (1.2), the volume and value of crop sales (1.3) and incomes. Yet, we need to keep in mind that if the project is very successful in increasing production but not so much in increasing linkages with external markets, the increased local production may simply depress prices. (See boxes between solid and dotted blue line in Figure 1.)

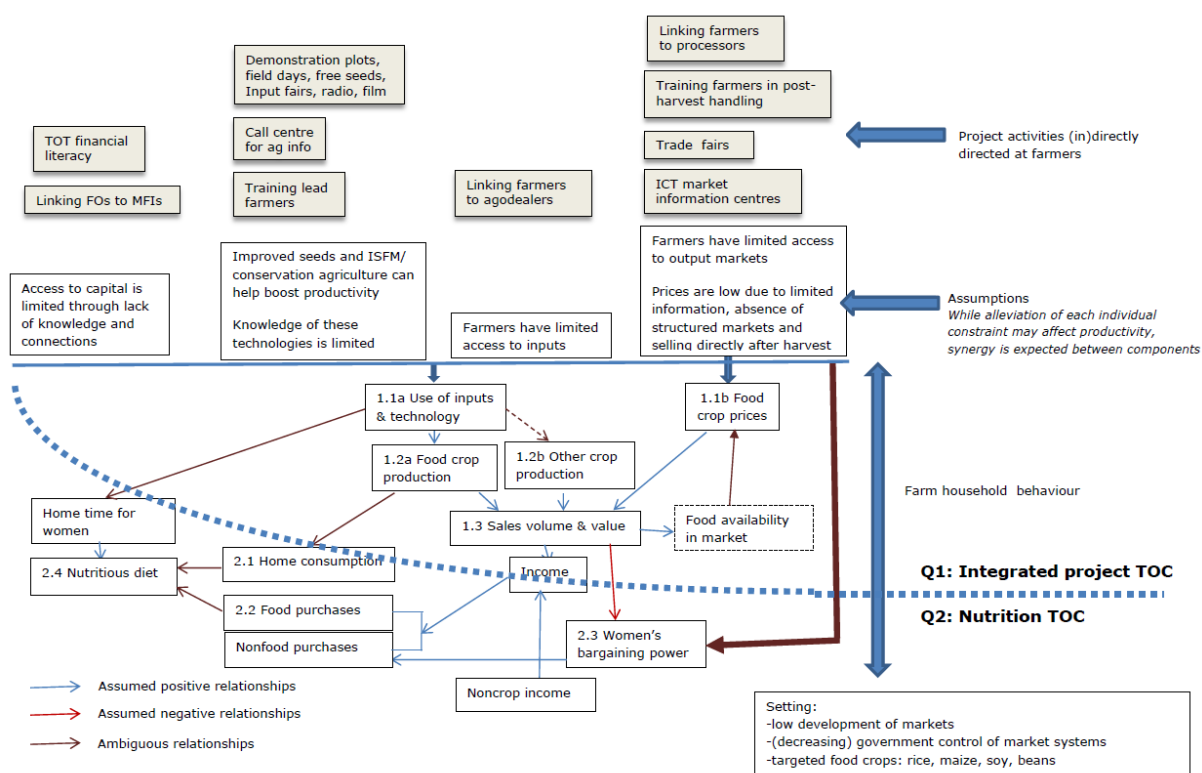


Figure 1: Theory of Change

At regional/national level, this would lead to a higher availability of food in the market. Yet this does not necessarily imply that food and nutrition security increases. Past agricultural policies focussing on increasing production of staple cereals made dietary energy more affordable while dietary quality became more expensive (Bouis et al., 2011). Relatedly, the limited evidence available suggests that agricultural growth is positively and significantly linked with calorie intake but that its effect on dietary diversity –as an indicator of nutritional quality, is minimal (Bouis et al., 2011). This project targets both cereals and pulses, which may lead to more positive impacts on protein nutrition, but relative price of micronutrients may still increase.

Key question 2 of our evaluation relates not to these aggregate effects but focuses on the impact of the project on food and nutrition security for the farmers involved and their families (See Figure 1 below the blue dotted line). For these people, increased staple crop production may mean higher availability of food as well as higher income. How this works out for food consumption is ambiguous. Increased staple food crop production does not necessarily result in higher quantities of staple food available for home consumption (2.1) nor do these necessarily lead to better diets (2.4). Farmers may prefer to sell rather than keep sufficient produce for home consumption with increased access to product markets, or they may be forced to sell to repay loans. In addition, possible additional income may not be used to buy more (2.2) or more nutritious foods. Not even the poorest spent all income gains on food, and additional food expenditures do not necessarily lead to a more nutritious diet (AV Banerjee, 2011).

Women play an important role in these relations. Like in most of Africa, men and women in Tanzania have different responsibilities regarding farming and households. Women are

generally responsible for the provision of food, while men engage in production for cash and have less food-oriented preferences. An increase in market production of food crops may therefore shift bargaining power (2.3) to men and as a result decrease food consumption and nutrition. On the other hand, the project aims to increase female involvement in the farmer organisations. If they succeed in doing this, this may increase women's bargaining power but if they fail and unintendedly exclude women, their bargaining power may decrease even further.

3. Context

3.1 Smallholder production in Tanzania

In recent years, Tanzania's economy has grown because of sound macroeconomic policies towards market liberalisation. The gross domestic product (GDP) grew at 6.6 per cent per year between 1998 and 2007 (Pauw & Thurlow, 2012). Because of these promising numbers, Tanzania is often named as an example of "African successes" by multilateral institutions (Nord et al., 2009). At the same time, many scientists and organisations argue that reforms towards market liberalisation have failed to bring the prosperity that is claimed by the government and donor organisations (Cooksey, 2011). The rapid economic growth did not translate into rapid reductions in poverty and malnutrition (Pauw & Thurlow, 2011), and corruption and an authoritarian government are still problematic issues (Edwards, 2014). Even after economic liberalisation, the economy in Tanzania is characterized by high levels of public control and low private action (Ellis & Mdoe, 2003; Cooksey, 2011). Market liberalisation is induced since the 1990s, but the market environment still does not manage to bring the entire rural population out of poverty.

Though the share of agriculture in GDP is decreasing, Tanzania can still be considered an agriculture-based country, with 72 per cent of the population living in rural areas and 75 per cent of the labour force working in agriculture (World Bank, 2014). The larger part of the poor live in rural areas and depend on agricultural livelihoods, which makes the agricultural sector a key sector for development (Pauw & Thurlow, 2011). Despite the several strategies and policies, the agricultural sector in Tanzania is not performing well enough to make serious progress in alleviating poverty. Rural households still face low rates of productivity and high rates of food insecurity and poverty (Mdoe, Mlay, & Kadigi, 2015). The biggest source of the growth came from major export crops: cotton, sugarcane, coffee and tobacco, which are mainly cultivated by large-scale commercial farmers. To the contrary, the growth from subsistence farmers cultivating staple crops remained low due to traditional production systems (Pauw & Thurlow, 2011).

In the National Agriculture Policy of 2013 the following hurdles in agriculture were addressed as the main constraints to agricultural growth: low productivity of land, labour and production inputs; underdeveloped irrigation potential, limited capital and access to financial services, weak agricultural technical support services, poor rural infrastructure; infestations and outbreaks of crop pests and diseases; erosion of the natural resource base and environmental degradation. Other factors mentioned are weak producer organisations; gender relations; depressed prices for primary commodities in global markets; limited involvement of the private sector; limited participation of youth and weak property rights (Ministry of Agriculture, 2013).

3.2. The study area and study population

The farmers and farmer organisations studied are situated in the region of Mbeya (see Figure 2). According to the Mbeya Region Agriculture Sample Census, about 80 per cent of the Mbeya region relies on (subsistence) agriculture (United Republic of Tanzania, 2012). In 2012, the region had a total of 454.824 agricultural households, of which 54,5 per cent were involved in crops only, 45.2 per cent were involved in both crop and livestock production, and 0,3 per cent were involved in livestock only. There is one agricultural season, and both cash and food crops are produced in the region. The average rural household in the region uses 1.5 hectares for agricultural purposes. The main food crops are maize, paddy, beans, sorghum, Irish potatoes and sweet potatoes. The main cash crops grown are coffee, Pyrethrum, and tea. The crop that is grown the most is maize; this crop occupies 47.7 per cent of the total agricultural area. Area planted for maize is at least 3 times bigger than area for beans, the second dominant crop. More than 80 per cent of households sell crops to the market. The sale of food crops counts for 69 per cent and the sale of cash crops for 8 per cent of the cash income for rural households in the region. The census identifies several reasons that make the marketing and selling of crops difficult for farmers. The main reason is that selling prices are too low in the open market (99.3 per cent of the households selling crops mentions this). Other problems are long distances to the market, high transportation costs, lack of market information and lack of buyers.

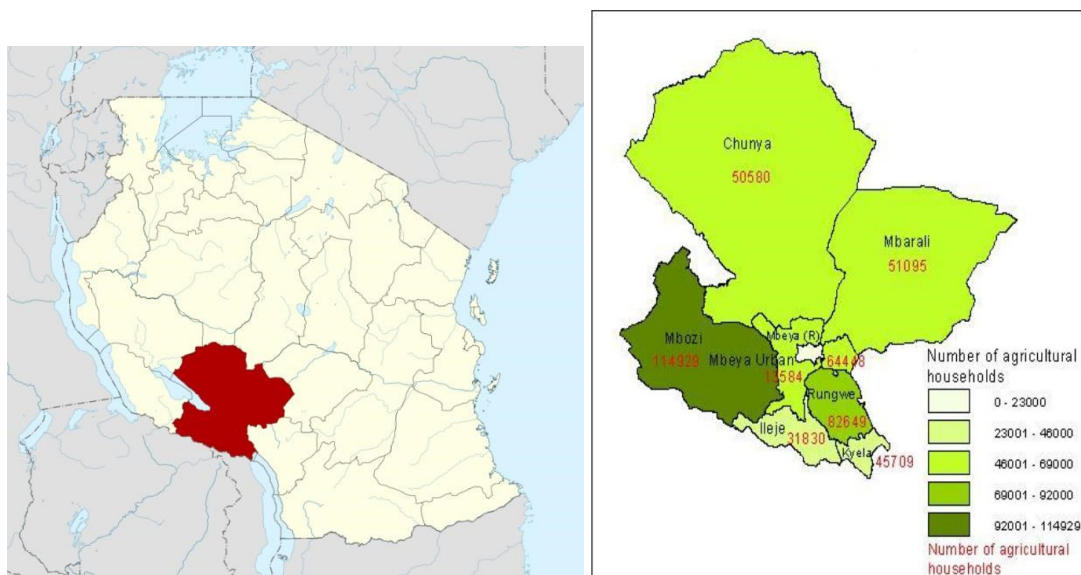


Figure 2: Mbeya region Source: United Republic of Tanzania (2012)

In 46 per cent of the rural households in Mbeya region, one or more family members are involved in off-farm income activities. These activities include working in the public or private sector, permanently or temporary. Off-farm income activities also include working on farms that belong to other farmers. In most cases only one household member is involved in off farm employment (60 per cent), as opposed to two (33 per cent) or more than two (7 per cent).

The overall literacy rate in the Mbeya region is 76 per cent. The literacy rate among household heads is 72 per cent, 82 per cent of the male household heads are literate and 47 per cent of the female household heads are literate. 74 per cent of the population in the

region has completed at least one level of schooling or is still attending school. Twenty per cent of the population in the region has never attended school. About 73 per cent of the households is male headed.

The farmers in our sample are all members of farmer organisations. These are still smallholders, but relatively wealthy compared to the average. This is for example reflected in higher cultivated area (almost about 6 hectares on average compared to 1.5) and less female heads (14 per cent compared to 27). In addition, the study locations were selected for the dominance of maize, rice, beans, and to a smaller extent soy.

4. Timeline

After a long preparation time with repeated negotiations on randomization (also involving AGRA), the implementing organisations selected the locations eligible for the project at the end of November 2014. Shortly after that, they started project implementations.

As we had our fieldwork team ready and trained, we could start the farmer survey almost immediately. It ran for two months between December 2014 and January 2015 and covered the previous agricultural year. The survey coincided with the start of the growing season and sometimes heavy rains. This greatly complicated data collection. Travel took much longer and some locations were not accessible at all when we tried to survey them. To limit non-availability of the respondents, who were busy on the farms, we generally started our visits very early in the morning and revisited late in the evening for the farm household were unavailable during the day (morning and afternoon). Still, many of the households could not be interviewed. In some cases long distances, poor road infrastructure, and the rainy season hindered the enumerator to reach the FO village in time, which prolonged the duration of the survey. Between interviews, enumerators sometimes had to wait for the rain to stop before moving to the next household, which decreased efficiency.

In March and April 2015, we revisited all FOs for a survey on the functioning of the FO and the services they provided.

The growing season 2015-2016 was unfavourable at least in part of the study area. Yields in Kyela district (not included in the evaluation) were low due to intense short rains causing floods and followed by drought. In addition, the government repeatedly imposed crop export bans, which discourages businesses and traders to sign contracts with smallholder farmers.

In October-November 2016, we conducted the endline survey. To avoid some of the problems encountered during the baseline household survey, we decided to do the survey not exactly two years after the baseline but a few months earlier, just before the start of the new growing season. We do not expect this has affected data on agricultural production, as in both cases these are recalls of the previous year. Data on consumption may have been affected as longer after harvest food may be less plentiful. In March-April 2017, two years after the FO baseline, we also revisited all FOs for a follow-up interview.

Shares:
$$Sample\ size = 2(1 + a)(1 + icc(m - 1)) \times \frac{((Z_{\alpha} + Z_{\beta})^2 (P_1(1 - P_1) + P_2(1 - P_2)) / (P_1 - P_2)^2)}{(1b)}$$

where a is the expected attrition rate, icc the intracluster correlation, m the number of observations per cluster, Z_{α} the critical value of the normal distribution at confidence level α , and Z_{β} the critical value of the normal distribution at power $1-\beta$. σ is the standard deviation of the indicator of interest, d the detectable difference, and P_1 and P_2 are the expected sample proportions of the two group. As there are only 2 years between our baseline and endline, we estimated attrition to be relatively low, 10 or 20 per cent. We use a power of 80 per cent and a significance level of 95 per cent throughout.

From the NPS 2008-2009, we selected only household in the project districts for the analysis and used STATA to generate means and standard deviations correlations for main indicators –yield, sales and prices for the project’s core crops, per capita food consumption and per capita total consumption (accounting for clustering and sample weights). Calculation of intra-cluster correlation was difficult, as our clusters (villages and farmer organisations) do not coincide with the survey clusters. As our respondents are located in specific villages that are relatively close and similar in that they are cultivating several of the project crops, we expect that the intra-cluster correlation is not very high. We used values of 0 and 0.1 (with a cluster size of 9, the average number of respondents per FO). From the DHS, we used the overall rural numbers for percentage of children stunted and underweight, which are likely to overestimate undernutrition, as the situation may have slightly improved, the study area is among the better areas of the country, and our respondents are not the poorest farmers.

The exact power computations can be found in the attached Excel sheet. The main conclusion is that, assuming no intra-cluster correlation. the proposed group size of 800 (the maximum feasible sample size within the budget) is sufficient to detect a difference in 10 per cent in food consumption per capita, maize prices, rice sales, and if attrition is low, total expenditures per capita. A difference of 15 per cent can also be detected for maize yields and beans yields (the latter with low attrition). In addition, a 20 per cent difference in rice yields can be detected. With an intra-cluster correlation of 10 per cent, for most continuous indicators a 20 per cent difference can be detected. Considering the proportion variables, a difference of 6.5-9 percentage points is sufficiently large to be detected for underweight children, while a difference of 7.5-10.5 per cent is sufficient for stunting. We think that our sample will be more homogeneous than the NPS sample, as all our respondents will be members of farmer organisations from selected villages, which are usually the somewhat better off farmers. In addition, the DHS numbers are likely to overestimate undernutrition, as the situation may have slightly improved, the study area is among the better areas of the country, and our respondents are not the poorest farmers. We therefore expected our power calculations to underestimate the actual power of the sample.

5.3. Sampling strategy and survey data collection

As the project started immediately after the selection of eligible and treatment wards, we had to sample and interview respondents in parallel and the survey coincided with the peak of the production season with farmers preparing the fields and planting an assortment of crops. Some groups were in the formation stage and not yet well organized. As a result, they did not all know each other, so that it took quite some time for the enumerators and group leaders to

identify members of the group. Contrary to prior agreements, the implementers included all the eligible wards in Sumbawanga and Kyela district in the treatment, due to their limited number. We therefore excluded these districts from our evaluation, as it would have been impossible to collect a suitable control group. The remaining four districts -Mbeya, Mbozi, Momba and Mbarali, each covered between 13 and 28 wards, including on average 7 villages (range: 3-58). From these wards, 41 were deemed eligible for the project. 25 would receive treatment, so sixteen could be used as controls (Table 1). For the treatment wards, we used FO lists provided by SNV, which we understood were complete. As they obviously did not compile similar lists for the control wards, the evaluation team compiled their own lists of FOs for these wards. In principle, we included all FOs on the lists in the surveys. Yet, the team failed to reach two control wards in Mbeya rural and Momba Districts due to bad weather in combination with poor infrastructure. This further decreased the size of our control group. In total, our sample for the farm household survey included 51 FOs: 32 in the treatment wards and 19 in the control wards.

Table 1: Distribution of treatment and control wards per district

District	Treatment		Control	
	Wards	FOs	Wards	FOs
Mbeya rural	10	6	2	6
Mbozi	5	13	5	6
Mbarali	5	5	5	5
Momba	5	8	4	2
Total	25	32	16	19

We randomly selected members for interviews from the FO membership lists. We interviewed on average about one third of all FO members (Tables 2a and b). For some small and remote groups, Lwanjiro Simoya irrigators and Simboya Farmers group, we interviewed relatively more members to get sufficient representation from this context. Some of the FO members from the list dropped their membership and others had died or moved to another district. We decided to replace them using a random selection from the membership list. The sample size at baseline consisted of 1648 households, with survey data collected from both the male household head and his wife or another knowledgeable individual in case he was not married; for female-headed households, both questionnaires were completed by the household head.

The fieldwork team for the farmer survey consisted of a survey leader, 2 supervisors and 26 enumerators -13 men and 13 women. The enumerators were selected from a somewhat larger group proposed by Sokoine University that received extensive training from the survey leader and four other Wageningen graduate students. In the field, the team split in two, covering different districts, implying that each sub-team covered both treatment and control areas. All interviews were done using tablets with ODK. Each evening, the supervisors and survey leader checked that day's interviews.

Besides the farmer survey, we visited all FOs for a survey on the functioning of the FO and the services they provided. The Agricultural officer from the district headquarter and a Field agriculture officer assisted in the organisation of the meetings but were not present at the discussions in order to enable the FO members to discuss freely and openly. Two newly established FOs approached the field team requesting a discussion. We decided to include them in the survey, bringing the total number of FOs in the survey to 53. The fieldwork team

for the FO surveys included the survey leader and four interviewers. An expert from Wageningen University and Research provided training.

At endline, we used as much as possible the same enumerators and interviewers and repeated the training. We were able to reach all FOs and all but 196 household heads (plus 3 households for which enumerators failed to complete the 'female' questionnaire). In all (including missing surveys for female household members in the baseline survey) we have complete data from 1434 households. Given the challenges of reaching households in rural areas, where seasonal migration is common, and given that we could spend around only 2 days in each village, we consider our response rate, around 87 per cent, very successful. Attrition was balanced across treatments nearly perfectly: we collected full survey data from 86.6 per cent of treatment households compared to 87.6 per cent of control households.

Table 2a: Treatment sample

	Ward	FO Name	Members	Sample d	Replaced	Interviewed baseline	Interviewed endline
Mbarali							
	Chimala	Kapunga SH SACCOS	65	46		25	20
	Kongolo	Kongolo	91	56	5	32	29
	Igurusi	Ruanda Majenje	53	33		26	24
	Igurusi	Njalalila	58	34		34	32
	Madibira	Madibira AMCOS	451	292	12	111	101
Mbeya Rural							
	Inyala	Iyawaya Group	285	146		108	102
	Mshewe	Mshewe Irrigators	100	68		66	58
	Ilembo	Ilembo Usafwa AMCOS	98	50		46	45
	Igale	Jipemoyo AMCOSS	62	40		39	36
	Ulenje	Ulenje AMCOS	85	47		45	46
	Iwiji	Iwindi AMCOS	60	32		34	30
Momba							
	Ndalambo	Ndalambo Coop. Society	214	51		51	47
	Tunduma	Tunduma SACCOS ¹	63	31		31	18
	Chapwa	Tunduma Mixed Producers ¹	50	36		34	25
	Tunduma	Momba Farmers Ass. ¹	50	36		32	22
	Mpande	Tunduma Border Market ¹	37	25		21	10
	Kaloleni/Tunduma	Migoneka AMCOS	102	60	5	39	35
	Mpemba	Nandanga Association	88	42		18	15
	Mpemba	Mpemba Association	35	25		19	15
Mbozi							
	Ruanda	Ruanda AMCOS	53	36		30	28
	Nambizo	Imasha AMCOS	137	75		47	41
	Hasambo	Hasambo AMCOS	175	111		58	52
	Ihanda	Upendo SACCOS	342	114		45	28
	Shiwinga	Shiwinga AMCOS	90	53		35	32
	Msia	Malolo AMCOSS	104	68		23	17
	Isansa	Isalalo AMCOS	88	44		46	43
	Ihanda	Isumi AMCOS	50	25		17	13
	Mlangali	Mlangali AMCOS	63	45		34	26
	Nyambili	Mwanda AMCOS	50	25		27	24
	Nambinzo	Nkana AMCOS	78	40		34	30
	Itaka	Insani AMCOS	62	32		28	24
	Hasanga	Chama cha Wafugaji Isangu	26	23		21	18
Total			3303	1809		1256	1086

¹ Farm-level data not included in the analyses

Table 2b: Control sample

<i>Ward</i>	<i>FO Name</i>	<i>Members</i>	<i>Sampled</i>	<i>Replaced</i>	<i>Interviewed baseline</i>	<i>Interviewed online</i>
Mbarali						
Mapogoro	Apple	31	21		15	12
Mapogoro	Pipeline	22	10		4	3
Mahongole	Ipatagwa	221	133	2	63	67
Mapogoro/Itamba	Vumilia	22	18		18	18
Mapogoro/Itamba	Awesije	15	8		3	3
Mbeya Rural						
Ilomba	Amkeni	65	39		28	23
Ilomba	Songambele	32	16	1	10	9
Lwanjilo	Ilowelo Group	30	20		20	20
Lwanjilo	Lwanjilo Group	34	16		16	16
Ikukwa	Simboya Group	48	23		15	13
Ikukwa	Umoja wa Umwagiliaji Simboya	38	25		22	21
Momba						
Nzoka	Myunga Group	74	38	4	24	22
Nzoka	Umoja Farmers Association	70	42		40	32
Mbozi						
Vwawa	Ushirika wa Uzalishaji Mali Ilembo	26	16		15	12
Igamba	Zyola Farmers Group	41	24		21	19
Halungu	Halungu AMCOS	210	105		38	35
Igamba	Igamba SACCOS	42	21		12	6
Isandula	Nufaika SACCOS	77	39		21	19
Halungu	Isimu Group	30	16		7	5
Total		1128	630		392	357

5.4. Survey Instruments

Farmer organisation survey

Information about the farmer organisations was collected in interviews with key group members and consecutive focus group discussions using semi-structured questionnaires. The questions focussed on general FO characteristics and statistics, sales volumes, FO support, (external and internal) linkages, and tension containment. In the endline, we added questions on self-perceived changes in tension containment.

Farm household surveys

The enumerators worked in mixed-gender pairs so that for each household two parallel interviews could be administered: one with the household head and one with his spouse or in some cases another female household member. (For female-head households, the household head completed both interviews.) The household-head interview included information on household characteristics as well as detailed information on agricultural inputs and outputs, land cultivated and information on sales of crops including timing, price and quantity. The

'female' questionnaire included information on family members, food consumption, childhood education, intra-household decision-making and expenditures. The baseline and endline questionnaires were largely identical, with a few exceptions. At endline, we added time allocation questions. In addition to the interviews, we collected anthropometric data (weight, height) for women and children under five at both baseline and endline.

For a random sub-sample of households, the 'female' questionnaire ended with a simple experiment that measured bargaining power by asking the women to choose between directly receiving cash (without their husband's knowledge) and a larger sum allocated to her and her husband, jointly. The responses provide a measure of bargaining power, as women who are willing to forgo larger amounts in order to receive the money secretly are assumed to have less power over determining how the common household budget is spent.



Figure 4. Male interviewer interviewing a household head



Figure 5. Female interviewer interviewing a spouse

5.5. Artefactual field experiment on production and intra-household bargaining

The artefactual (lab-in-the-) field experiment was designed to explore issues related to production and female bargaining power, given the problems described earlier in the field experiment. The experiment consisted of the following: members of FOs were invited for the experiment as couples. Each couple was given a task to complete. This consisted of sorting beans by colour—a standard way of measuring effort levels in behavioural economic experiments. For each cup of beans sorted, participants received vouchers that could be exchanged for a number of small items that we provided (e.g. sandals, wax cloth, matches, batteries etc..)

In the first treatment ($n=436$ couples), we randomised the amount of work that each member of the couple was responsible for completing. Then, the couple received vouchers corresponding to the total number of cups of beans sorted by the couple. We then observed the choices made with the vouchers earned. This outcome allows us to measure how distribution of labour affects bargaining power within couples: if an individual does more work, does she also get more decision making power over the proceeds of this work? Or is bargaining power fixed, and independent of labour inputs? A key question is whether this differs for men and women.

Some couples were assigned to sort beans as part of the same “project,” denoted by the colour of the cup containing the beans. The vouchers earned from each “project” were similarly colour-coded. This was done to study whether couples use different distributional rules to divide income differently when it is earned jointly or separately. This could have implications for understanding how agricultural decisions are made. If joint income is divided differently than individually earned income, there is an incentive for spouses to work on their own crops, even when doing so is less profitable for the household as a whole. This could be especially true for women, who have lower bargaining power.

A Wageningen University postdoc researcher, assisted by three Wageningen University research assistants (of which two were Tanzanian citizens) and four research assistants from Sokoine University, led the fieldwork. The team received extensive training, both in the office and in the field. In total, the fieldwork took 35 days with mostly two sessions per day, leading to a total of 65 sessions.





Figure 7. Cups of beans for sorting in experimental task

6. The IPIAP

In addition to SNV Tanzania, the coordinating partner who developed the proposal, there were three other implementing partners: Africa Conservation Tillage network (ACTN), Ruvuma Commercialisation and Diversification of Agriculture (RUCODIA), and CRDB Microfinance Services. Private Agricultural Sector Support Trust (PASS) later replaced CRDB. Each partner had their own role in the project, though there were some overlaps. During the project implementation period the project conducted one baseline survey, six field monitoring activities and two outcome surveys to monitor and evaluate project progress and outcomes. Every organisation developed and implemented a monthly a plan to monitor the activities. Monthly monitoring was done with community extension workers supervised by government extension officers who reported to the project field officer present in the locality. The M&E team for the project also had visited field activities and documented finding for improvements through reports. During the course of the project, there were regular contacts between the key implementers and the main field researcher. The frequency of contacts between the evaluation team and the implementers diminished when he had to leave the project.

ACTN worked on two areas: increasing smallholder market-led production and improving access to extension and advisory services. Key activities were the promotion of good agricultural practices –such as integrated soil fertility management, conservation agriculture and improved seeds, through demonstration plots, field days, farmer exchange visits the training of community-based extension workers, and the provision of support to Community Information Centres. In addition, ACTN trained government extension workers.

In total, ACTN established 200 demonstration plots. During establishment of the demonstration plots, ACTN worked closely with 96 government extension workers (GEW's) and the targeted farmers. The GEWs were trained on land preparation, planting methods and basal fertiliser application (how to apply and how much), top dressing, soybean inoculation and effect of crop residue burning, conservation agriculture (soil cover, crop rotation and minimum tillage), weeding, pest and disease management and also general demonstration plot management.

In addition, ACTN trained 435 farmers who served as community extension workers or lead farmers in their communities. This was done in response to the shortage of GEW) at the village level. Most villages in the project working areas had no GEW and were only served by ward extension officers. Topics covered were on good agronomic practices (GAPs) on the selected crops of maize, paddy, soybeans and common beans, extension delivery techniques and management of demonstrations plots. More than 1500 farmers participated in the field days organized at the demo plots. In addition, 54 agro-dealers participated in trainings on good agricultural practices.

ACTN moreover organised two exchange field visits involving 156 smallholder farmers, community extension workers and local government officials. The visits aimed at linking smallholders farmers from the project district, to other actors in the crop value chains and at providing on-farm technical support and initiating exchanges of ideas and sharing of knowledge and experience on how good agricultural practices can be executed in their locality/district.

Finally, ACTN was assigned to develop ICT based information systems through collaboration with agriculture-based ICT providers to establish extension service information centres e.g. call centres, use of mobile phones. As the budget was only 18 per cent of the requirement, they decided in consultation with AGRA to concentrate on strengthening the five existing Community Information Centres, which perform almost the same activities.

RUCODIA organized training programmes and complementary mentoring and coaching sessions to strengthen the capacity and efficiency of farmer organisations. They developed and used training packages on managerial, organisational and entrepreneurial skills development for the leaders and members of FOs. The capacity building program addressed in detailed issues pertaining to leadership skills, governance, group dynamics, democratic decision making and records keeping. In total, they trained 180 farmer organisations.

In addition, RUCODIA worked at improving access to agro-inputs through the development of an agro-dealer network, training of agro dealers, and input fairs. The project organized and provided mentoring and coaching services to the six-agro dealer associations, which on average have 30 agro dealers, in order to build their capacity to respond positively to their members' needs. RUCODIA also organised training for 299 individual agro dealers whereby 236 of trained agro-dealers effectively remained in the business. An important target of the trainings was to create or strengthen business relationships with farmers through FOs to improve the quantities of inputs sold to farmers through agro dealers. In total, 18 input fairs were organized, which were attended by over 1,200 smallholder farmers. Finally, Rucodia organized 350 promotion demos during the three seasons of its operation: 133 for Maize, 87 for Beans, 79 for Soya and 52 for Paddy. The plots demonstrated various improved varieties.

The financial component of the project would be executed by CBRD. CBRD would enhance financial access through developing appropriate financial services, e.g., credit-SACCO, group lending or linking to other grassroots financial intermediaries; they would train local trainers in financial literacy; and they would support local warehouses. Unfortunately, CBRD did not participate in the project as anticipated. According to our information, they did not do any of the planned activities. Therefore, they were replaced by PASS mid-project. PASS provided training to 79 FOs on issues related to loan processing, documentation and marketing. In addition, they assessed groups for financial linkage possibilities. However, these activities

happened only in preparation for the 2017-2018 agricultural season –after our endline survey. This implies that our evaluation does not cover this specific project component.

Besides being lead and coordinating partner, SNV Tanzania executed a number of activities to enhance access to produce markets and extension and advisory services. Core activities were the rehabilitation and equipment of warehouses and the training of warehouse operators and Community Information Centres. At the start of the program, twenty-four warehouses were identified in the project area. Two warehouses would receive renovation and equipment supply from the Big Result Now (BRN) intervention, so IPIAP only provided training on warehouse operation and management, structured market and the proper crop handling in storage. Twelve warehouses were under BRN but had only renovation covered so IPIAP worked on equipping as well as trainings. The remaining 10 warehouses benefited from the project on minor rehabilitation, equipping and training components. Before the start of this project, the farmers had to collect their crops from the small warehouses in their localities for transport to central storage structures at least located at district headquarters for selling. The project therefore aimed to facilitate farmers to sign agreements with transporters. However, the market structure changed with buyers purchasing straight from the village warehouses. Contracts between farmers and transporters were therefore no longer needed. SNV also collaborated with ATCN on training of lead farmers, extension workers, and Community Information Centres.

7. Impact analysis: IPIAP and agricultural productivity

7.1. Data issues

When we analysed the baseline data, we noticed that the sample treatment and control groups were not balanced on a number of key characteristics (see table 3). In the baseline report, we give two possible reasons: the limited number of randomization units and lack of control over the selection process by the evaluation team. After endline, we combined the baseline and endline data and linked these to lists of the implementing organisation. This appeared very difficult as names of wards and farmer organisations did not always match. When comparing the list of treated farmer organisations and our sample, we observed the following:

Table 3 Treatment Balance at Baseline

	Male-headed households		
	Treatment (1)	Control (2)	Difference (3)
<i>Crops grown</i>			
-- Maize	0.96 (0.20)	0.93 (0.26)	0.03 **
-- Rice	0.22 (0.41)	0.31 (0.46)	-0.10 ***
-- Beans	0.66 (0.47)	0.65 (0.48)	0.01
-- Peanuts	0.32 (0.47)	0.27 (0.44)	0.06 **

-- Coffee	0.25 (0.44)	0.11 (0.32)	0.14***
Female-headed HH	0.13 (0.34)	0.17 (0.37)	-0.03
Number of HH residents	5.28 (2.20)	4.98 (2.07)	0.30 *
Children under 5	0.55 (0.72)	0.63 (0.75)	-0.07*
Children 6-12	1.17 (1.07)	1.20 (1.00)	-0.03
Children 13-18	0.91 (0.95)	0.77 (0.84)	0.14 **
Age of HH head	49.13 (13.00)	46.69 (13.54)	2.44 ***
Age of 2 nd HH member	38.39 (13.83)	36.57 (13.30)	1.82 **
Education of HH head	3.06 (1.37)	3.23 (1.66)	-0.17
Total cultivated land (acres)	5.79 (9.10)	7.37 (13.86)	-1.57 **
<i>Household expenses</i>			
-- School	304.94 (892.95)	679.99 (8094.96)	-375.05
-- Other education	100.13 (394.18)	66.61 (115.60)	33.52
-- Housing	171.01 (794.16)	109.95 (355.81)	61.06
-- Furniture	15.45 (66.88)	39.37 (422.16)	-23.92
-- Insurance	327.84 (10074.36)	33.49 (537.11)	294.35
-- Weddings	52.28 (355.33)	46.58 (157.53)	5.69
-- Clothes/shoes	122.29 (354.69)	128.46 (395.87)	-6.16
-- Funerals	66.32	5929.53	-5863.21

	(479.87)	(104838.58)	
-- Festivals	42.42	29.54	12.88
	(494.91)	(159.39)	
-- Church charity	339.20	196.11	143.09
	(8310.83)	(2789.92)	
-- Credit	197.33	172.43	24.90
	1020.00	725.82	
Face food insecurity	0.21	0.23	-0.02
	(0.40)	(0.42)	
Total asset value	1555.86	1490.86	65.00
	(8875.20)	(7407.76)	
<i>Assets owned</i>			
--Big	0.63	0.69	-0.06 **
	(0.48)	(0.46)	
--Phone	0.78	0.84	-0.06**
	(0.42)	(0.37)	
--Generator	0.04	0.06	-0.02 *
	(0.20)	(0.24)	
--Bicycle	0.56	0.64	-0.08 ***
	(0.50)	(0.48)	
--Cattle	0.47	0.49	-0.02
	(0.50)	(0.50)	
--Goat	0.39	0.34	0.04
	(0.49)	(0.47)	
--Chicken	0.72	0.69	0.03
	(0.45)	(0.46)	
--Pig	0.13	0.15	-0.02
	(0.34)	(0.36)	
--Other animals	0.02	0.01	0.01
	(0.13)	(0.09)	
<hr/>			
N=	1009	350	

- Treatment FOs in wards that are not on the list of eligible wards (a small number of these FOs are in our sample).
- Treatment FOs that are not in our sample but that are in selected treatment wards (mostly another FO in this ward is in the sample. Sometimes no FO in the treatment ward is included in the sample).
- Treatment FOs in wards that were selected as control wards (few).
- Systematically fewer FOs per treatment ward than per control ward in our sample.

This implies that the list of eligible wards was arbitrary/incorrect and not adhered to. More importantly, the lists of farmer organisations were incomplete. We called district extension

officers for complete lists and found that in neither treatment nor control wards our sample is complete. The selection procedure is likely to be different: in the treatment wards we interviewed farmers from organisations that were on the initial treatment list from SNV, which supposedly were all FOs in villages selected for first-year implementation, while in the control wards we have data from all FOs that were identified by our initial researcher. (As the number of control wards was limited, we did not select villages.) In combination with the differences observed at baseline, this makes us suspect that there is selection bias in the farmer organisations.

Despite the overall low attrition rates, the end-line response rate was low in one location - Tunduma. In three farmer's organisations in Tunduma, 33 out of 86 participants could not be reached. Anecdotally, this is related to greater economic opportunities available in this location: Tunduma is an urban border town, in stark contrast to the majority of villages in our sample, which are rural in character. We therefore decided to exclude the Tunduma farmers from our analyses.

We drop all observations from the analysis for which we do not have complete data. This means, both surveys, completed from both the household head and his wife (or another household member for unmarried men).

The data on production and yields is noisy. We drop outliers, based on unrealistic yields. We drop households that reported maize yields of over 4000 kg per acre, rice yields of 1500 kg per acre and bean yields of 2000 kg per acre. We drop these observations for the relevant outcomes only.

7.2. Econometric approach

Our pre-analysis plan specifies an empirical strategy centred on a "difference-in-differences" (DID) approach, in which we would compare changes in baseline and endline outcomes across the treatment and control groups, using an ordinary least squares (OLS) regression model. As we intended to sample from all FOs in the treatment and control areas, the resulting effects would measure intention to treat (ITT) effects. Given the sampling issues, we cannot estimate ITT in practice and have resorted to a different empirical strategy. We use double robust estimation as preferred method, as suggested by 3ie in combination with OLS and PSM as robustness checks. The outcome indicators remain as planned, though we only estimate the direct effects.

The DID estimator is equal to the average treatment effect when the average trend in the outcome variable is the same in treatment and control groups. When this is not the case, however, DID is biased: a time variant trend that differs by unobservable characteristics, which are correlated with the treatment, can be considered an omitted variable, and produces biased OLS estimates. One indication that trends might differ between sub-samples is when baseline characteristics greatly differ between groups. In attempt to correct for this, one can construct a propensity score, based on observable characteristics at baseline. We use a number of the pre-treatment variables that we have available in the survey data, which plausibly describe differences between treatment and control farmers, as described in Tables 3 and A.1. Then, based on this, one can find the common support of the sample, and restrict the analysis to

these observations. This would help to limit the analysis to control observations that are roughly similar to treated observations, while omitting observations that are clearly different.

We use a simple OLS model:

$$y_{ijt} = \alpha + \beta T_j + \delta y_{ijt-1} + X_{ij}\gamma + \epsilon_{ij}, \quad (2)$$

Where y_{ijt} is the outcome of interest, for household i in farmer's organisation j . The outcome of interest is β , which captures the effect of T_j , whether the farmer's organisation was in the treatment group. We control for the outcome at baseline, as well as a vector of farm-level controls. We cluster standard errors at the farmer-organisation level, as this is the level targeted by the interventions.

A drawback to using OLS to estimate DID effects is that it is a linear estimator that must be properly specified in order to produce unbiased and consistent estimates. Non-parametric techniques, such as propensity-score matching (PSM), can provide an alternative to OLS that has less restrictive assumptions about functional form (Caliendo and Kopeinig, 2008). However, the propensity score is calculated using a probit regression, and this must be properly specified to obtain unbiased estimates. Thus, the researcher exchanges one risk of misspecification for another.

Double-robust estimators combine regression and inverse probability weighting, and produce unbiased estimates if either model (the propensity score or regression) is properly specified. Thus, the researcher has two chances of "getting it right" (Bang and Robins, 2005). Given this, we will use the double robust estimator, in addition to the simple OLS DID estimator and the PSM estimates, to evaluate the treatment.³ While we present all three options, we consider the double robust estimator to be the most credible as it has the highest probability of being unbiased –if either the OLS or the PSM is unbiased, so is the double robust estimator.

The double-robust estimation technique has four steps. First, we fit a logistic regression to calculate the propensity score, similar to PSM. This gives predicted values \hat{p}_{ij} . Next, run OLS on baseline outcomes for the treatment group only, and save the predicted values based on these coefficients for the whole sample. Third, do the same for the control group. This gives $\widehat{m}_T(X_{ij}) = E[y_{ijt}|X_{ij}, T_{ij}]$. Fourth, we use these values for the double-robust estimation, which estimates treatment effects, with inverse-probability weighting:

$$\widehat{\tau}_{DR} = \frac{1}{N} \sum_{i=1}^N \frac{T_{ij}y_{ijt} - (T_{ij} - \hat{p}_{ij})\widehat{m}_{T=1}X_{ij}}{\hat{p}_{ij}} - \frac{1}{N} \sum_{i=1}^N \frac{(1 - T_{ij})y_{ijt} - (1 - \hat{p}_{ij})\widehat{m}_{T=0}X_{ij}}{1 - \hat{p}_{ij}} \quad (3)$$

The proposed approach restricts the impact of biases resulting from differences in time-invariant and observed time variant characteristics between treatment and controls. However, we are unable to control for the potential effects of unobserved time-variant differences and systematic differences in the (potential) treatment effects. Moreover, the DID analysis relies

³ We use the Stata command developed by Emsley et al. (2008), which is in turn based on the method proposed by Lunceford and Davidian (2004).

on assuming a common trend in the treatment and control groups, which is potentially not the case, as there are significant differences in outcomes at baseline.

In Appendix Table A.1 we report results from the probit regression that we used to generate the propensity score. Importantly, the balancing property is not satisfied. As an additional test to assess the specification of the propensity score estimator, we compare the probit regression results from the whole sample with the sub-sample of matched observations (using the nearest-neighbour method). After dropping the unmatched control observations, the pseudo r-square should decrease, as only control observations that are similar to treated observations remain in the sample. In fact, we find no substantial change in the pseudo r-square, which actually increases slightly from 0.13 to 0.14 after dropping the non-matched observations. Because of these issues, the matching estimates should be interpreted with care. This applies to the double-robust estimates as well: since we already have concerns about the robustness of the matching estimator, it may not have much benefit when compared to the OLS estimates. However, since the randomization was unsuccessful, we employ a “kitchen sink” approach by including multiple estimates in the results and comparing treatment effects across specifications.

7.3. Farmer organisations

At baseline, treatment groups were on average older than those in the control group: treatment FOs were formed 11.26 years before baseline (2014), compared to an average of only 3.82 years among control groups (ranksum, $p=0.002$). Control groups were, however, larger than treatment groups at baseline (Table 4). At endline, this is the reverse: treatment groups on average increased in size, while the control groups got smaller. The number of active members moved in the same direction as total members. Active members are the members that participate in meetings and other activities organized by the FOs, as reported during the FGDs. The number of active female members increased compared to the number of active male member on average between baseline and endline. However, due to the small sample size and the differences between groups none of these differences is statistically significant.

Table 4 Group size and gender composition by year and treatment

	Baseline		Endline		Treatment Effect
	<i>Treatment</i> (1)	<i>Control</i> (2)	<i>Treatment</i> (3)	<i>Control</i> (4)	
Total members	105.58 (82.23)	110.78** (222.02)	217.90 (564.86)	93.29*** (197.11)	129.81*
Active female members	22.31 (26.89)	36.88 (66.37)	69.34 (234.90)	18.23 (21.18)	65.68
Active male members	63.19 (37.98)	84.75 (169.41)	128.28 (329.41)	28.83*** (35.37)	121.01
Number of groups	17	9	29	12	

Standard errors in parentheses. Star levels represent results from Wilcoxon rank-sum tests, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

7.4. Support received

When we asked the FO representatives which organisations had provided support during the past two years, the active consortium members were mentioned significantly more in the treatment FOs. Not all consortium members were equally mentioned (see Table 5). RUCODIA was mentioned by 66 per cent of treatment FOs (compared to 24 per cent of controls). At the other extreme, ATCN was only mentioned as provider of support by 22 per cent of the treatment FOs. One NGO indicated that ACTN promised to organize a demonstration plot, but had never delivered. Though treatment FOs also seemed to mention other NGOs more often, this difference was not statistically significant.

Table 5: Service providers mentioned by treatment status

	<i>Treatment Control</i>		Difference
	Mean		
	(1)	(2)	(3)
<i>Consortium partners</i>			
RUCODIA	0.61	0.24	0.37**
SNV	0.52	0.06	0.46***
ACTN	0.19	0.00	0.19*
PASS	0.35	0.00	0.35***
<i>Other service providers</i>			
AGRA	0.06	0.00	0.06
TASAF	0.03	0.00	0.03
HRNS	0.03	0.00	0.03
District Council	0.23	0.12	0.11
Other NGOs	0.58	0.53	0.05
N	31	17	

Notes: Star levels represent results from Wilcoxon rank-sum tests, *** p<0.01, ** p<0.05, * p<0.1.

When we asked which type of service they had received, most were listed more by the treatment FOs (see Table 6). Support for fertiliser use and land preparation, key components of the conservation agriculture approach promoted by the project, were mentioned by 71 and 74 per cent of the treatment group, respectively, compared to 35 and 41 per cent of the control group. Conservation agriculture itself is mentioned by 52 per cent of the treatment group compared to 24 per cent of the controls. Other agronomic support significantly more often mentioned by the treatment group related to pesticides (61 compared to 18 per cent) and

weeding (39 compared to 12 per cent.) Technical training conservation agriculture was the responsibility of ACTN, the least-mentioned consortium member. This suggests that farmers are not always aware of which organisation provides the support they receive.

Unsurprisingly, given the problems encountered within the consortium, the treatment group does not mention microfinance significantly more-though they do mention support from PASS. Still, 48 per cent of the treatment group and 41 per cent of the controls mentioned support for microfinance. Also other key components of the intervention—support for collective marketing and capacity building were mentioned by just over 40 per cent of the treatment group, but this was not significantly more than for the control group.

Overall, these results suggest that the project did lead to an increase in support for the FOs and their members, though this is not always properly linked to the actual service provider and most strongly observed for technical training.

**Table 6: Support received by Farmers' Organisations
by treatment (shares)**

	Mean		Difference
	<i>Treatment</i> (1)	<i>Control</i> (2)	
Fertiliser	0.71	0.35	0.36**
Land preparation	0.74	0.41	0.33**
Pesticides	0.61	0.18	0.43***
Improved seeds	0.61	0.41	0.20
Conservation agriculture	0.52	0.24	0.28*
Microfinance	0.48	0.41	0.07
Collective marketing	0.45	0.29	0.16
Weeding	0.39	0.12	0.27**
Capacity building	0.42	0.47	-0.05
Entrepreneurship	0.32	0.18	0.14
Post-harvest support	0.23	0.18	0.05
Irrigation	0.06	0.24	-0.18*
N	31	17	

Notes: Star levels represent results from Wilcoxon rank-sum tests, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

7.5. Technology adoption

Analysis of trends in technology adoption (Table 7) indicates that, at baseline, there were significant differences between the treatment and control groups. Treatment farmers had better knowledge of improved agricultural techniques and were more likely to use improved seeds and organic fertiliser. At endline, the control group catches up with the treatment group in terms of knowledge of pesticides and improved seeds. In addition, they overtake the treatment group in terms of knowledge about the use of crop residues. Knowledge about zero tillage improves at about the same rate, while fertilisers were already known by most at baseline.

The share of farmers using improved seeds increases marginally in the treatment group and decreases in the control group between baseline and endline. This results in a significant positive difference in the change in improved seeds use for the treatment group compared to the control group, both for the full sample and the restricted sample. The use of organic fertilisers experienced a similar decrease between treatment and control group.

We find similar results using regression analysis. In Table 8, we estimate (2), on the whole sample (panel A) and on the common support, panel (B). The specification includes controls for basic agricultural activity at baseline—including which crops were grown—as well as household size, education of the household head and number of children. Standard errors are clustered at the farmer-organisation level.

Consistent with the comparison of means results, there is a positive and statistically significant treatment effect on use of improved seeds, which is stable across all of the estimation techniques that we employ. We also find a negative treatment effect on knowledge of improved seeds, likely due to the lower baseline level in the control group.

Table 7: Knowledge and use of agricultural technology – Trends

	Baseline		Endline		Difference
	Treatment	Control	Treatment	Control	in differences
	(1)	(2)	(3)	(4)	(5)
<i>Knowledge of agricultural techniques</i>					
Leaving crop residuals	0.56 (0.50)	0.50* (0.50)	0.71 (0.45)	0.74* (0.44)	-0.08**
Zero tillage	0.41 (0.49)	0.33*** (0.47)	0.64 (0.48)	0.52** (0.50)	0.04
Chemical fertilizer	0.99 (0.09)	0.97** (0.16)	0.97 (0.18)	0.96 (0.19)	-0.01
Pesticides	0.87 (0.33)	0.81*** (0.39)	0.87 (0.34)	0.87 (0.34)	-0.06**
Improved seeds	0.94 (0.23)	0.85*** (0.36)	0.92 (0.27)	0.92 (0.27)	-0.09***
<i>Input use</i>					
Improved seeds	0.65 (0.48)	0.54*** (0.50)	0.67 (0.47)	0.45*** (0.50)	0.11***
Organic fertilizer	0.53 (0.50)	0.44*** (0.50)	0.40 (0.49)	0.28*** (0.45)	0.02

Table 8: Knowledge and use of agricultural technology – Treatment effects

	Knowledge of agricultural techniques				Use of Agricultural techniques	
	(1) Zero tillage	(2) Chemical fertilizers	(3) Pesticides	(4) Improved seeds	(5) Improved seeds	(6) Organic fertilizer
<i>Panel A: OLS on Full sample</i>						
Treatment	0.01 (0.04)	-0.00 (0.01)	-0.02 (0.03)	-0.03 (0.03)	0.13*** (0.05)	0.03 (0.04)
Baseline (for respective outcome)	0.12*** (0.04)	-0.01 (0.05)	0.04 (0.03)	0.11*** (0.03)	0.41*** (0.05)	0.18*** (0.02)
Observations	1,311	1,319	1,319	1,315	1,329	1,316
R-squared	0.10	0.04	0.02	0.05	0.25	0.17
<i>Panel B: OLS on Common support</i>						
Treatment	-0.00 (0.05)	-0.00 (0.01)	-0.01 (0.03)	-0.05 (0.03)	0.09* (0.05)	0.04 (0.05)
Baseline (for respective outcome)	0.13*** (0.04)	-0.09*** (0.01)	0.04 (0.03)	0.13*** (0.04)	0.39*** (0.05)	0.18*** (0.03)
Observations	1,076	1,083	1,083	1,079	1,092	1,081
R-squared	0.10	0.04	0.03	0.07	0.24	0.18
<i>Panel C: Propensity-score matching (nearest neighbour)</i>						
ATT	-0.02 (0.05)	0.01** (0.02)	0.05** (0.04)	-0.01 (0.02)	0.09** (0.05)	-0.04** (0.04)
Number treated	845	845	845	845	845	845
Number matched	199	199	199	198	199	199
<i>Panel D: Double robust estimation</i>						
ATT	0.00 (0.00)	0.01 (0.00)	-0.01 (0.00)	-0.04*** (0.00)	0.11*** (0.00)	0.05 (0.00)
Observations	1152	1152	1152	1148	1161	1150

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS regressions in panels A, B and D includes the following baseline controls: dummies for growing beans, peanuts, and coffee; number of household residents, number of children 0-5, 6-12, and 13-18, respectively, Age of household head, Age of female respondent, Female hh head (d), education of hh head, and total cultivated land. In panels A-B, standard

errors are clustered at the farmer-organization level. The propensity score used in panels B-D is reported in Table A.1

7.6. Production

Table 9 summarizes farm characteristics. In Panel A, we observe that farms in the control group had slightly more cultivated land, and owned a higher percentage of the land they farm. In Panel B-C, we report which crops were cultivated. Almost all farmers in both treatment arms grow maize. Beans were the next most prevalent crop, followed by rice, peanuts and coffee. We find systematic variation in crops grown between farmers in the treatment and control wards; further supporting our conclusion that randomization was unsuccessful. Treated farmers were more likely to grow cash crops, peanuts and coffee. This difference remained stable over the study period. Control farmers were more likely to grow rice at baseline, rice became more popular in the control over the course of the study, and the difference-in-differences is statistically significant.

Table 10 summarizes baseline levels of production and yields in the core crops. Maize production was more efficient among farmers in the treatment group, both at baseline and at endline. The difference remained stable across the study period.

Table 9: Farm-level Production

	Mean (sd), N				Difference in differences
	Baseline		Endline		
	Treatment	Control	Treatment	Control	
	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Farm size</i>					
Total cultivated land (acres)	5.76 (9.13)	7.34*** (13.95)	5.40 (6.29)	5.43 (5.03)	1.55*
Total cultivated owned (acres)	5.22 (8.27)	6.85 (14.08)	4.66 (5.95)	4.7 (5.26)	1.59**
Percent of cultivated land owned	0.92 (0.23)	0.87*** (0.29)	0.87 (0.28)	0.80*** (0.34)	0.01
N=	997	344	982	342	
<i>Panel B: Crops grown</i>					
Maize	0.96 (0.20)	0.93** (0.26)	0.94 (0.24)	0.90* (0.31)	0.01
Rice	0.22 (0.41)	0.31*** (0.46)	0.20 (0.40)	0.39*** (0.49)	-0.10
Beans	0.66 (0.47)	0.65 (0.48)	0.66 (0.47)	0.62 (0.49)	0.03
Peanuts	0.32 (0.47)	0.27** (0.44)	0.37 (0.48)	0.26** (0.44)	0.06
Coffee	0.25 (0.44)	0.11*** (0.32)	0.34 (0.47)	0.12*** (0.32)	0.08*
Soya	0.02	0.02	0.01	0.00	0.00

	(0.14)	(0.13)	(0.10)	(0.06)	
Sunflower	0.11	0.14	0.12	0.12	0.02
	(0.32)	(0.35)	0.32	0.33	
N=	1009	350	1009	350	
Panel C: crop cover (proportion of total cultivated land) ^a					
Maize	0.68	0.56***	0.60	0.58	-0.10**
	(1.55)	(0.63)	(1.45)	(0.56)	
Rice	0.84	0.91	1.08	0.76	0.38*
	(1.16)	(1.42)	(1.53)	(0.53)	
Beans	0.30	0.27	0.29	0.31	-0.04*
	(0.29)	(0.24)	(1.33)	(0.68)	
Peanuts	0.22	0.26	0.18	0.22*	0.00
	(0.18)	(0.43)	(0.28)	(0.26)	
Coffee	0.46	0.38	0.37	0.38	-0.09
	(0.44)	(0.19)	(0.31)	(0.23)	

Note: Results shown for subsample of respondents for whom we have complete survey data from both survey rounds. Sample sizes differ due to changes in cultivation practices.

^a Among sub-sample of farmers who grow crop.

All significance levels are results from Wilcoxon rank-sum tests, * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 10: Production and Yields -- Trends

	Baseline		Endline		Difference in difference s
	Treatment	Control	Treatment	Control	
	Mean (sd), N				
	(1)	(2)	(3)	(4)	
<i>Production per crop</i>					
Maize (kilos)	2703.61 (3244.48)	2555.46* (3076.03)	2011.44 (2741.11)	1803.87* (2305.85)	59.43
Rice (kilos)	6240.69 (12499.09)	3492.53 (3883.78)	5647.08 (9726.02)	3611.26 (5411.13)	-712.34*
Beans (kilos)	255.85 (455.32)	279.51 (316.80)	263.05 (457.83)	250.48 (390.66)	36.23*
Peanuts (tins)	41.77 45.89	52.93* 60.35	52.16 53.95	55.39 54.93	7.93
Coffee (kilos)	380.41 (688.45)	640.86 (1692.43)	541.56 (1040.65)	972.55 (2150.28)	-170.54
<i>Yields per crop</i>					
Maize (kilos per acre)	1144.44 (648.45)	1011.69** *	906.61 (642.08)	744.32*** (627.81)	29.54
Rice (kilos per acre)	977.57 (452.76)	958.30 (427.45)	1012.37 (471.84)	948.96 (388.57)	44.13
Beans (kilos per acre)	246.22 (213.24)	222.64 (173.07)	232.07 (185.32)	201.01* (168.96)	7.48
Peanuts (tins per acre)	42.26 (37.14)	48.85 (43.28)	50.23 (75.40)	54.99 (50.77)	1.82
Coffee (kilos per acre)	100.59 (105.37)	116.92 (94.99)	126.95 (110.26)	164.75 (144.56)	-21.47

Note: Results shown for subsample of respondents for whom we have complete survey data from both survey rounds. Sample sizes differ due to changes in cultivation practices.

All significance levels are results from Wilcoxon rank-sum tests, * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 11: Production and Yields – Treatment effects

	Total production					Yield (kg/acre)				
	Maize (1)	Rice (2)	Beans (3)	Coffee (4)	Peanuts ^a (5)	Maize (6)	Rice (7)	Beans (8)	Coffee (9)	Peanuts ^a (10)
<i>Panel A: OLS on Full Sample</i>										
Treatment	61.38 (218.91)	400.94 (309.66)	44.72 (42.69)	-150.30 (228.45)	-8.20 (13.20)	96.22 (73.70)	77.40 (77.54)	33.61* (19.58)	-38.81 (38.10)	0.43 (7.10)
Baseline (for respective outcome)	0.48*** (0.09)	0.76*** (0.05)	0.63*** (0.11)	0.42*** (0.12)	0.07 (0.12)	0.37*** (0.04)	0.48*** (0.08)	0.25*** (0.04)	0.37*** (0.08)	0.86*** (0.17)
Observations	1,140	239	682	245	240	1,140	239	682	219	240
R-squared	0.38	0.59	0.42	0.35	0.12	0.22	0.42	0.14	0.17	0.25
<i>Panel B: OLS on Common support</i>										
Treatment	-26.62 (265.77)	-40.64 (297.68)	0.54 (43.77)	-172.42 (225.60)	-8.49 (14.91)	39.86 (76.12)	70.39 (70.01)	18.39 (19.36)	-50.69 (43.76)	-0.47 (8.57)
Baseline (for respective outcome)	0.46*** (0.11)	0.58*** (0.14)	0.69*** (0.10)	0.37*** (0.11)	-0.00 (0.13)	0.37*** (0.04)	0.47*** (0.09)	0.26*** (0.04)	0.35*** (0.09)	0.85*** (0.21)
Observations	936	182	564	220	210	936	182	564	196	210
R-squared	0.38	0.38	0.46	0.36	0.15	0.22	0.41	0.14	0.17	0.22
<i>Propensity-score matching (nearest neighbor)</i>										
ATT	-28.8 (298.07)	23.33 (1726.40)	33.13** (43.70)	93.2 (186.02)	9.94 (12.21)	-33.1 (73.74)	86.36** (79.96)	34.54** (21.04)	-38.03** (33.43)	-16.03 (10.95)
SE										
Number treated	777	167	449	200	188	845	845	845	845	845
Number control	172	47	99	26	43	182	58	136	39	52
<i>Double robust estimation</i>										
ATT	-123.37 (258.97)	533.29 (413.04)	67.32** (26.32)	23.98 (215.46)	-4.40 (9.86)	82.52* (50.18)	84.71 (63.21)	36.12** (16.51)	26.21 (87.94)	-12.78 (8.67)
Observations	1049	240	617	234	245	1049	240	617	218	213

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS regressions in panels A, B and D includes the following baseline controls: dummies for growing beans, peanuts, and coffee; number of household residents, number of children 0-5, 6-12, and 13-18,

respectively, Age of household head, Age of female respondent, Female hh head (d), education of hh head, and total cultivated land. In panels A-B, standard errors are clustered at the farmer-organization level. The propensity score used in panels B-D is reported in Table A.1 The sample for each crop includes only farmers who report growing that crop both at baseline and endline.

^a Units are in “tins”.

In table 11, we present analysis of treatment effects on production and yields. The OLS models in Panels A-B do not show any statistically significant effects of treatment on either production or yields. However, this is not the case with the matching and double-robust estimator in panels B-D, which show a statistically significant treatment effect on the production of beans, with treatment farmers increasing production by around 67 kg more than farmers in the control group do. There is also an increase in bean yields that is positive and statistically significant.

The double-robust estimator also shows a statistically significant increase in maize, rice and bean yields. The matching estimator shows a statistically significant increase in rice yields, while this is not robust to the double-robust estimator, the estimated ATT of treatment on rice yields in panel D is nonetheless positive.

From this, we conclude that the program possibly had an impact on technical efficiency for production of staple crops. The most likely mechanism underlying this effect is the increase in use of improved seeds that we observe among treated individuals in section 5.3. However, we interpret these results with extreme caution: knowledge and use of improved agricultural technology was significantly higher among farmers in the treatment group at baseline. The problems described in randomization and sampling make it possible that unobservable village or household characteristics are correlated with treatment. If not only baseline levels of knowledge and use of improved agriculture practices differed, but if the *trend* in technology adoption also differed between the treatment and control groups, this could account for the treatment effect on yields that we observe. The double-robust and matching estimators correct for this only to the extent that such differences are explained by *observable* characteristics.

7.7. Sales and prices

In Table 12, we report sale prices of the most commonly grown crops, within one month of harvest. Prices are significantly higher in the treatment group for maize and beans. This represents an important source of endogeneity, since the intervention was aimed at increasing market integration of these crops. However, there was no significant difference in the change in prices over time across treatment, as shown in column 7. It should be noted that there is incomplete data on crop prices, and this hampers our ability to conduct a thorough analysis.

Table 12: Sale price of crops within 1 month of harvest

	Baseline		Endline		Difference in
	Treatment (1)	Control (2)	Treatment (3)	Control (4)	Differences (5)
<i>Sale price within 1 month of harvest</i>					
Maize	254.29 (131.26)	204.00*** (127.95)	409.30 (356.68)	371.43** (97.05)	-12.43
Rice	627.35 (399.11)	783.20 (992.04)	844.12 (318.68)	996.42 (1388.95)	3.55
Beans	917.01 (330.16)	958.38*** (1532.06)	1083.26 (308.13)	936.51*** (227.86)	188.12
Peanuts	10075.00 (8217.24)	9107.65 (8410.79)	7922.31 (7318.80)	6142.86 (4327.80)	812.10
Coffee	4249.81 (4000.47)	3961.87 (2078.25)	4049.19 (4098.35)	3770.21 (1063.76)	-8.97

Note: Star levels represent results from Wilcoxon rank-sum tests, *** p<0.01, ** p<0.05, * p<0.1.

Finally, we test for trends and treatment effects of market integration by analysing data on the percentage of each crop sold. Trends are presented in Table 13, with estimation of treatment effects presented in Table 14. This reflects one of the main objectives of the intervention: to increase market integration and increase the sale of food crops. On average, the percentage of beans sold did increase in the treatment group proportional to the control group, and a Wilcoxon rank-sum test shows that the difference between baseline and endline, across treatment and control, is statistically significant. However, rather than resulting from an increase in sales among treated farmers, the result is actually driven by a decrease in the percentage sold in the control group. Potentially a similar trend would have occurred among treated farmers in the absence of the intervention. However, in Table 14, the effect disappears when we add controls in the OLS models (panels A-B), in the matching results (panel C) and neither is there in effect on percentage of beans sold according to the results from the double-robust estimation in panel D.

For rice, on the other hand, there is actually a negative treatment effect when we compare the difference-in-differences of means in Table 13. However, again, this is not statistically significant according the OLS, matching and double-robust estimators reported in Table 14.⁴

Table 13: Percentage of crops sold – Trends

	Baseline		Endline		Difference in Differences
	Treatment (1)	Control (2)	Treatment (3)	Control (4)	
Maize	0.34 (0.29)	0.31 (0.31)	0.20 (0.26)	0.19 (0.25)	-0.01
Rice	0.66 (0.27)	0.54*** (0.29)	0.39 (0.30)	0.40 (0.28)	-0.13**
Beans	0.39 (0.33)	0.43 (0.32)	0.32 (0.34)	0.31 (0.33)	0.04**
Peanuts	2.10 (1.89)	1.71** (1.52)	8.42 (86.62)	2.25 (1.64)	5.78
Coffee	0.94 (0.21)	1.00 (0.01)	0.92 (0.23)	0.89 (0.25)	0.09**

Table 14: Percentage of crops sold – Treatment effects

Percentage of crop sold			
Maize	Beans	Rice	Coffee

⁴ In Table 12, we find a significant treatment effect on the amount of coffee sold. Almost all coffee is already sold, and since it is not a food crop, it is difficult to know what to make of this result. Potentially it reflects accuracy in reporting sales and harvest that differs across treatment/time.

	(1)	(2)	(3)	(4)
<i>OLS on Full sample</i>				
Treatment	0.01 (0.03)	0.04 (0.05)	-0.01 (0.04)	0.07 (0.05)
Baseline (for respective outcome)	0.27*** (0.03)	0.33*** (0.04)	0.17** (0.07)	0.06 (0.07)
Observations	1,116	658	227	218
R-squared	0.15	0.14	0.09	0.08
<i>OLS on Common support</i>				
Treatment	0.00 (0.03)	0.03 (0.05)	-0.02 (0.03)	0.06 (0.06)
Baseline (for respective outcome)	0.27*** (0.03)	0.29*** (0.05)	0.16* (0.08)	0.08 (0.07)
Observations	919	544	172	194
R-squared	0.16	0.12	0.14	0.09
<i>Propensity-score matching (nearest neighbour)</i>				
ATT	0.01 (0.03)	0.07** (0.04)	0.00 (0.06)	-0.01 (0.07)
SE				
Number treated	845	845	845	845
Number matched	179	130	58	43
<i>Double robust estimation</i>				
ATT	-0.05 (0.05)	0.03 (0.05)	-0.03 (0.04)	1.08*** (0.28)
Observations	1071	736	254	339

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. OLS regressions in panels A, B and D includes the following baseline controls: dummies for growing beans, peanuts, and coffee; number of household residents, number of children 0-5, 6-12, and 13-18, respectively, Age of household head, Age of female respondent, Female hh head (d), education of hh head, and total cultivated land. In panels A-B, standard errors are clustered at the farmer-organization level. The propensity score used in panels B-D is reported in Table A.1

7.8. Summary of findings on food crop production

We find a number of differences at baseline between treatment and control households across a number of key indicators, including knowledge and use of improved agricultural activities. This is potentially related to the observation that treatment farmers also reported higher production and yields of maize at baseline. We find positive and significant increases in yields when using the matching and double-robust estimators, which account for selection into treatment based on observable characteristics. However, this does not account for unobservable characteristics that are correlated with both treatment assignment and outcomes. Of particular concern is the possibility that time trends in technology adoption and resulting productivity differ systematically across treatment and control wards. This could potentially bias estimations. As we do not feel confident that the measured results reflect project impact, we refrain from doing cost-effectiveness analyses and heterogeneous treatment effects.

Lastly, we find no evidence the intervention affects the portion of food crops sold. This makes it difficult to test hypotheses regarding the effect of agricultural sales on women's bargaining power and childhood nutrition that would potentially result from increased market integration (i.e. those that fall under "Q2" in Figure 1).

We do, however, address these hypotheses, in part, through the artefactual field experiment.

7.9. Labour, income and intra-household decision-making

The artefactual field experiment demonstrates how bargaining power and labour choices influence household decision-making. We hypothesise that when a spouse earns a larger share of the joint household income, he or she has a higher bargaining power in deciding how to spend this income. In particular, we are interested in whether the source of income matters. In many households, spouses earn some money independently and some money jointly. Do they have more control over income earned alone? If so, this could lead to inefficient choices. Couples may avoid earning money jointly, even when doing so would maximize household income.

The farmers in the sample can choose from a variety of locally available crops for cultivation, and most households choose to grow more than one. Some crops are grown exclusively by a particular individual, while others are grown with labour from multiple household members. Similar patterns have been observed elsewhere in rural Africa (Udry 1996; Duflo and Udry, 2004). This division of labour is seemingly inefficient. While growing multiple crops can be efficient for several reasons, such as mitigating risk or minimizing soil depletion, these explanations do not account for why men and women concentrate on different crops. Most of the tasks that they perform are repetitive, and it is unlikely that human capital or specialization plays a role. An alternative explanation is that the division of labour determines who controls the household budget. Survey responses suggest that, rather than pooling all income, households employ a system of mental accounting that divides income by source. Spouses exert varying degrees of control over income from each crop that the household grows.

This is consistent with a robust literature rejecting the unitary model of the household (Becker, 1991), which assumes that households behave as a single agent, pooling income to maximize combined utility (Duflo, 2003; Bobonis, 2009; Attanasio and Lechene, 2014). A particularly relevant example is Duflo and Udry (2004), who demonstrate this among households in Cote d'Ivoire. They show that spouses farm separate crops, which are considered culturally male or female. Exogenous variation in rainfall favouring one particular crop over another creates income shocks that are specific to a given spouse. Household expenditures reflect this, with consumption patterns adapting according to which crop is affected. In a field experiment in Kenya, Robinson (2012) comes to a similar conclusion: income shocks are not pooled. Both of these findings suggest inefficiency, as an efficient household would maximize utility by pooling income.

A number of economic experiments have been run on intra-household decision making (Munro, 2017). Many concentrate on income hiding (Ashraf, 2009; Kebede et al., 2014; Fiala and He, 2016; Almas et al., 2018). These experiments offer individuals a choice between a sum of money given to their spouse or to the couple jointly, and a smaller sum to be received

privately without their spouses knowledge. It is argued that when an individual prefers to receive the money privately, this represents lower bargaining power.

Conducting economic experiments with family members presents a challenge. Since experiments with couples cannot be anonymous, the outcomes measured are not necessarily final. Income hiding experiments in the mould of Ashraf (2009) avoid this by assuming that couples will indeed redistribute income, and use this as a starting point for measuring deviations from the efficient choice. While elegant, this design limits the type inefficiency that can be studied in experiments with couples. We take a different approach. Our design mitigates the problem of post-experiment out-of-lab redistribution by using a real basket of goods, rather than cash pay-outs. Since we study a relatively cash-poor population, the goods they received in the experiment were more likely to represent the final distribution of resources. While the redistribution of wealth after the experiment was still possible, this should bias treatment effects towards zero. An innovative feature of our design is that we measure individual preferences and then compare them to decisions made by couples over the same set of goods. This allows us to measure how much control a particular spouse has over the household budget in a unique way. Previous experiments that use real goods to measuring bargaining power have taken a coarser approach. For example, Dasgupta and Mani (2014) divide goods into household public goods and personal consumption goods, by assumption.

The study consists of two, closely related experiments. In both, couples perform a real-effort task. As payment for their effort, the couple earns vouchers that can be spent in a "store" that we set up for the purpose of the study. In Experiment 1, we randomize the labour required of each spouse across several treatments. Importantly, the task is divided into several "projects". Each project involves identical labour: sorting cups of beans by colour. However, we create a salient distinction between the projects by i) varying the colour of the cups that contain the beans to be sorted and ii) varying the wage rate. For example, one project involves sorting blue cups of beans for a wage of one voucher per cup, and another involves sorting red cups for two vouchers per cup. In some treatments, both spouses might sort cups of beans of the same colour. In others, they each sort a different colour. This represents joint and private production, respectively. (Appendix Table A.2 describes all of the possible combinations, and corresponding sample sizes, in detail). After each spouse completes their assigned labour individually, the couple chooses how to spend the combined income together. By examining the choices made by couples, we can study how relative earnings affect control over the household budget. Moreover, we can compare treatments in which spouses work on the same project with those in which they work on different projects to test whether framing labour as a joint or private enterprise affects bargaining outcomes.

We use a novel method of measuring an individual's control over the household budget. We first elicit individual preferences from each spouse for the goods on offer. The difference between these revealed preferences and the goods picked out together by the couple allows us to construct a measure of budget control for each spouse. We compare this across treatments to test whether control over the budget increases with an individual's income, and whether couples treat income earned from joint and private projects differently. We also test whether treatment effects differ across gender.

The results are presented in Table 15. In columns 1-3, we examine how labour allocations affect bargaining power when there is only one joint project that both spouses collaborate on (i.e. only one colour of beans/vouchers). In columns 1-2, the dependent variable is the number

of items that husband (wife) wanted that were selected jointly by the couple. Unsurprisingly, this increases with income. However, the outcome of interest is the comparison of coefficients on earnings. In other words, does it matter who earns income? In columns 1-2 we fail to reject equality of coefficients, indicating that a higher share of household income in the experiment does not lead to greater bargaining power. This implies that for jointly earned income (e.g. a crop that both spouses contribute to), the incentive to expend effort is diluted.

In contrast, we compare income earned on joint and private projects in columns 4-6. Here, we control for the total earnings of each respective spouse, and the earnings that come from private projects (i.e. when a spouse was the only one sorting beans of a particular colour). There is a statistically significant effect of private earnings, though only for men. This indicates that, at least for husbands, joint earnings are shared according to a fixed rule, but private earnings increase bargaining power. This seemingly provides an incentive to work alone on income-generating activities. In an agricultural context, it suggests that spouses will be better off farming separate crops.⁵

Our results highlight one way in which households make inefficient decisions. Earning income alone increases a spouse's control over the household budget to a larger extent than earning income from a joint production activity. This creates an incentive for couples to avoid working together, even when doing so would maximize the household's income. Understanding this dynamic can help to explain patterns of agricultural labour in settings similar to the one we study. Moreover, while gender norms that relate to bargaining power and household labour are deep-seated and difficult to change, the effects we identify here are potentially malleable, and thus might be more suitable targets for policy interventions.

Table 15: Artefactual field experiment outcomes

Sample:	Joint vs individual income						Log of farm profits (7)
Dependent variable:	Number of goods selected by spouse also selected by couple jointly (For given budget)						
	Husband	Wife	Wife- husband	Husband	Wife	Wife- husband	
	(1)	(2)	(3)	(4)	(5)	(6)	
H. Earn	0.57*** (0.15)	0.62*** (0.15)	0.05 (0.19)	0.71*** (0.09)	0.77*** (0.08)	0.06 (0.11)	
F. Earn	0.53*** (0.13)	0.48*** (0.16)	-0.04 (0.16)	0.69*** (0.08)	0.70*** (0.10)	0.01 (0.11)	
M. private earn				0.16** (0.08)	-0.05 (0.06)	-0.21** (0.10)	
W. private earn.				-0.09	0.02	0.11	

⁵ One reason that we may observe the effect for men only might be the nature of the bargaining task. If women have preferences that are more closely aligned with household public goods, and if joint income is more likely to be spent on these, then this would attenuate the observed effect of private earnings on female bargaining power.

	(0.07)	(0.07)	(0.08)				
<i>Wife's experimental choices</i>							
--All low return (red/blue)							-0.89*** (0.24)
--Low return (green/yellow)							-0.44** (0.20)
<i>Husband's experimental choices</i>							
--All low return (red/blue)							-0.14 (0.18)
--Low return (green/yellow)							-0.02 (0.24)
Constant	-0.66 (0.46)	-0.37 (0.50)	0.29 (0.58)	-1.15*** (0.22)	1.03*** (0.28)	0.12 (0.33)	14.18*** (0.27)
Test of equality of coefficients (p-value)							
H.earn - W.earn =0	0.65	0.22	0.51	0.86	0.48	0.69	
H. earn + W.earn =0			0.99			0.71	
H. private earn = W private earn				0.07	0.53	0.04	
Observations	173	173	173	409	409	409	97
R-squared	0.08	0.08	0.00	0.26	0.22	0.02	0.21
Notes: OLS. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In columns 1 and 4, the dependent variable is a measure of husband's bargaining power, which is the number of items selected by the husband, independently, that were also chosen by the couple jointly at the end of the experiment. Columns 2 and 5 are similarly constructed for wives' choices. In columns 3 and 6, the dependent variable is the difference between the number of goods selected by wives-husbands.							

8. Discussion

The evaluation was designed to study important issues related to agricultural technology adoption and market integration of food crops, and the resulting impacts on household members. Specifically, the study asked how turning food crops into commercial crops affects women's bargaining power, and the nutrition of household members – particularly children. On the one hand, market integration has the potential improve the lives of smallholder farmers by creating increased cash income. On the other hand, turning food crops into cash crops could have negative impacts on the well-being of households, if it results in worse nutrition or lower bargaining power for women.

The study was executed in rural Tanzania, a male-dominated society with limited market development, inadequate public extension services, and diminished but still strong government involvement in trade relations. The project tried to address all farmer constraints at the same time –access to input and output markets, limited knowledge of improved technologies, lack of access to finance, using farmer organisations as intermediates. This implies that relatively well-off smallholders were targeted. It was executed by a consortium of NGOs, which not all performed equally well.

We attempted to answer the questions using a randomised design, in which the consortium would administer treatment, randomly, at the ward level. However, this process did not go smoothly. Our baseline results indicate that randomization was not successful, and there are a number of key indicators that are not balanced. This includes baseline use of improved agricultural technology, market integration and productivity. Moreover, we have reason to believe that there were problems that arose during the sampling phase, leading to excluded farmer's organisations in the control wards. This likely further introduces bias into our estimates. Finally, part of the project activities took place at the district level, causing spillover effects to the control group. This could for instance provide an explanation for the catch up on knowledge of technologies of the control group. In general, it would bias down any impact estimates.

We believe these problems were caused by two main reasons: 1) collaboration with an implementing consortium that seemed to consider the research as an unwelcome imposition on their activities; 2) too large reliance on local researchers due to lack of resources. This has made us more critical in the selection of projects that we undertake.

We attempted to mitigate the data problems by adapting our econometric strategy. We used a matching estimator, as well as a double-robust estimator that uses a propensity score to weight OLS coefficients. The advantage of this technique is that it allows for misspecifications in either the propensity score or OLS models.

Using this method, we find that agricultural productivity in the treatment group increased, relative to the change in productivity in the control group. This might be explained by a larger observed increase in the use of improved technologies in the treatment group relative to the control (who decreased the use of improved seeds). It is difficult however to interpret this causally, however, since the double robust estimation technique – while an improvement over OLS – does not account for unobserved characteristics that could influence both outcomes and likelihood of treatment simultaneously. Perhaps there is a trend in the adoption of agricultural techniques and productivity in treatment villages that differs from control villages, and this accounts for the change. Therefore, we interpret these results with caution and abstain from cost-effectiveness analysis and generalizing our findings.

We find no effect of the project beyond productivity. Prices and the percentage of crops sold does not appear to increase due to the treatment. This could imply that the input and technology-related project activities were effective, whereas the project's efforts to link to markets were not. In theory, the latter could have two opposing reasons: first, farmers were not constrained in the output market to begin with; second, the efforts of the project to link farmers to markets were ineffective. The first seems unlikely, as lack of buyers of produce appeared to be the key complaint of farmers. We therefore assume that the project's efforts did not reach the intended outcomes. This would not necessarily result from incapability of the implementers. The persistent government policy of banning crop exports severely limits the interest of traders in engaging in contracts with farmers, severely limiting the opportunities for improvement. The implementing agencies are relatively well known among the treatment group and support is acknowledged, though differences in treatment and control groups are found mostly for good agricultural practices and not for entrepreneurship, capacity building and post-harvest support.

The limited project impact observed in the observation could be related to the short period between baseline and endline, 22 months only, or two agricultural years. This obviously limits the chance of finding impacts further along the causal chains. When clear evidence of early impact is observed, one can reasonably assume that impacts further along the chain will occur later in time. We explicitly test for early impacts. Through additional extension services, knowledge and use of technologies could be expected to improve quite directly and surely in the second agricultural year after the trainings. We find evidence that knowledge increases between baseline and endline, but no evidence of a treatment effect. In fact, we find a negative treatment effect on knowledge of improved seeds, which we hypothesise to be due to the lower baseline level in the control group. We do find a positive and statistically significant treatment effect on use of improved seeds, which reflects a lower decline for the treatment group than the control group. This could explain the positive significant treatment effect we find for maize yields, which is similarly related to a lower yield decrease. For the other target crops, we find no yield effects. Regarding linking farmers to traders, the project team itself admits that this was not possible due to lack of interest from traders. This explains the lack of impact on sales, which could in theory increase quite directly given farmers' frequent complaints that they cannot sell their produce. Overall, we find a positive treatment effect for the use of improved seeds and the yields for one of the target crops after two agricultural years not sufficient evidence of short-term impact to expect further impacts in the longer run.

The absence of effects beyond productivity makes it infeasible to explore a number of our main hypotheses regarding the effects of such a change on household decision-making and childhood nutrition. We regret this, as based on economic theory and the literature, increased productivity and sales are straightforward results of technological training and increased market integration, whereas the ultimate effects on household nutrition, especially of vulnerable groups such as children, are highly debated through their potential effects on gender relations.

We supplemented the survey data with an artefactual field experiment that analysed how the labour division between spouses affects spending decisions. We find that couples in our sample have a special sensitivity to private and jointly produced income: additional labour on a joint project does not affect spending power, but additional earnings from a private project does. While this is measured in an artificial environment, the separation between private and joint earnings was created using a rather mild intervention (coloured cups). Therefore, it is possible that the effect in agricultural labour decisions is even larger. We find a correlation with choices in the experiment and farm production. This further suggests that the effect we measure has important consequences. For example, when market crops become more dominant at the cost of women-controlled food crops, this may decrease their bargaining power and thus ultimately hamper household nutrition. Given this and the current lack of relevant robust empirical studies, we feel that this topic remains an important one for further study.

9. Specific findings for policy and practice

Given the limitations of our sample, we are careful to overstretch the implications of our results. However, the evidence seems to suggest that the project approach of extension of good agricultural practices through training of government extension workers and community extension workers using demonstration plots was an effective approach to increasing knowledge and productivity even when constraints in output and financial markets were not

(yet) effectively targeted. The research also suggests that micro-level efforts to link farmers to markets are futile in a hostile meso- and macro-environment. Traders appeared responsive to the context: local market turbulence caused them to purchase from small local warehouses instead of large district-level warehouses; and the constant threat of export bans made them unwilling to engage in contracts. Finally, our artefactual field experiment points at the important role of gender, and in particular individual-controlled activities on household decision-making and efficiency of production decisions.

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Appendix A. Information from formative research

We initially agreed on a joint mapping exercise with the implementing team. While we were negotiating randomization and discussing starting dates, SNV decided to hire consultants to do the mapping independently. As this was close to the start of project implementation, we could no longer do our own formative research. Below are relevant parts of the consultant report, which was only produced during our baseline survey. Below, we present the executive summary of their mapping report.

SNV TANZANIA

INTEGRATED PROJECT TO INCREASE AGRICULTURAL PRODUCTIVITY IN THE BREAD BASKET SOUTHERN PART OF TANZANIA

Final Report

Mapping and Profiling Farmers' Organisations, Agro-dealers Agro-inputs, and Microfinance Institutions in Southern Highlands, Tanzania

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December 2014

Executive Summary

This report is one among three reports which have been produced under the baseline study for the Baseline Study, Mapping and Profiling Farmers' Organisations, Agro-dealers and Agro-inputs, Extension Services and Microfinance Institutions in Southern Highlands, Tanzania. Baseline information from this study will provide input into an integrated project that is being implemented by a consortium involving SNV- Tanzania as the lead agency, collaborating with CRDB bank and RUCODA; an NGO that is based in Ruvuma region. The project's goal is to contribute towards improving the wellbeing of smallholder farmers in six district or the Southern highlands namely Kyela, Mbarali, Mbeya rural, Mbozi and Momba in Mbeya region, and Sumbawanga in Rukwa region.

The project is expected to benefit 45,000 smallholder farmers in the target area. The project will use a value chain approach to facilitate the beneficiaries to address various limitations they face, limiting their ability to engage in value chain. The project will work to facilitate improvement of four value chains; rice, maize, beans and soybeans.

This report presents the finding of a mapping exercise that was done during October 2014 – November 2014; concurrently with a baselines survey for the same purpose. The report contains information summarized from the mapping of Farmers' organisations comprising which includes marketing cooperatives (AMCOS⁶), financial institutions (SACCOS⁷ & VICOBA⁸) and Water User Associations (WUA). Information for agrodealers is presented separately for input suppliers and produce buyers. The mapping also contains information on networks of agrodealers, village based storage facilities including privately owned ones and warehouse receipt practitioners where they existed. The manner in which each of these was sampled is described in the report.

A total 271 FOs were mapped, being 38 per cent AMCOS, 22.5 per cent SACCOS, 7 per cent VICOBA and 14.4 per cent other organisations that do not fall under these categories. The number of agrodealer was 701 involving 479 input suppliers and 222 produce buyers. The study also compiled information from 6 WHRS most of them being village based warehouses belonging to AMCOS, but there were some which were privately owned at the village level. Warehouses that were privately owned at the district or regional headquarters belonged to hub input suppliers for seed, fertiliser and agrochemicals. Fifty two (52) extension service providers were also interviewed, most of them belonging to public extension services under the Local Government system operating from the district headquarters, Ward Offices and at the village level

The findings present characteristics of the mapped businesses or FOs and the other service providers in terms of location and their engagement with farmers in terms as actors or service providers in the value chain covering their location within the district, the number of villages

⁶ AMCOS stands for Agricultural Marketing Cooperative Society

⁷ SACCOS stands for Savings and Marketing Cooperative Society

⁸ VICOBA stands for Village Community Banks

and farmers they serve, their size and whether or not they have been trained, the crops they trade in or the input they supply, and how their business is financed. The training needs of each of the service provider categories are presented.

The findings show much diversity for each of these variables. Recommendations for improvement are made where appropriate. These findings will guide user to foster better linkages among value chain actors and between actors and other stakeholders in the course of value chain development

Appendix B. Sample Design

FIELD VISIT REPORT IN MBEYA AND SUMBAWANGA

DAY ONE 02/11/2014

Meeting with consortium members in Mbeya Rural District 02/11/2014

Members attended: Erastus Mkojela: Project Manager and consortium from SNV

Mr. Mhagama: Consortium Member from RUCODIA

Mr. Msigwa: Consortium member from RUCODIA

Mr. Nicholaus Johanes: Consortium Member from ACTN

Abiud January: Researcher from Wageningen University

Sivan van Leerzem; Researcher from Wageningen University

Absentees: Mr. Kayombo: Consortium member from CRDB Microfinance Company

Agenda of the meeting

1. Project Area selection (wards and villages)
2. Project implementation modality
3. Development of the content of the MoU with Local Government Authority
4. Improvement of milestones for the first year project implementation
5. Project office and use (Mbeya office)
6. Proper and friendly use of the project vehicle and motorcycles
7. Activities tracking and quality management

The meeting was opened by the project manager around 9.30 am with an introduction of all members of the meeting followed by agreeing on the outline of the meeting agenda. This report will discuss in detail the first two agenda points which are the project area selection (ward and village) and project implementation modality.

Agenda 1: Project Area selection (wards and villages)

The discussion started by developing criteria for project area selection. The following are the criteria agreed:

1. Willingness of the ward and village leaders to cooperate in the project
 2. Presence of at least of two crops that are targeted in the project (at least one cereal and one legume).
 3. The Farmer Organisations (FOs) that will work with the project must be profiled.
 4. The area assed for training need assessment should never miss
 5. Priority to the areas with warehouses
 6. Availability of a Village Agricultural Extension Office (VAEO) will be an added advantage
 7. Accessibility
 8. Synergy with other organisation in terms of effectiveness of outputs should be complementary and not duplicating.
-
9. Whenever the project area reaches the point that the amount of qualifying areas is higher than can be managed, considering the resources available, random selection will be practiced.

During the meeting we decided that the specific targeting within the project districts will be done at a joint meeting with the evaluation team after the consultant report on the baseline has become available. The agreed-upon procedure is the following two-step randomised selection process:

1. Within each of the 6 project districts, eligibility of wards will be determined based on the crops grown. From the eligible wards, the evaluation team will randomly select treatment and control wards
2. Within each of the treatment wards, the evaluation team will randomly select treatment villages. The number of villages will depend on village size (to reach the intended number of beneficiaries) and the number of FOs in the villages. Within the control wards, control villages will be selected in a similar manner.

In principle, all functioning FOs in the target villages will be included in the project. The project intends to target round 90 FOs in the first year, the same number in the second year, and about 20 in the third year. To allow maximum impact within the research period, we will focus our study on the FOs that are targeted in the first year. To avoid contamination of the survey, we will select all target villages in the manner described above, distinguishing 3 groups: first randomly drawing first-year villages, then second-year villages and finally last-year villages.

We will include all FOs targeted in our first year in our FO survey and a random selection of their members in our household survey. The latter survey will cover a stratified random sample from FO membership lists in both treatment and control villages. We intend to draw a fixed share of members from each FO, to make the sample self-weighing. However, we may deviate from this if this causes logistical problems.

We had elaborate discussions with SNV about possibilities for a random phase-in of the project, to be able to detect synergies between the various project components. However, SNV is strongly committed to introduce all components within the first growing season that an FO is included in the project. During the subsequent project year(s), some continuation activities will take place. Unfortunately, this means that we will not be able to answer our research question regarding costs and benefits of integrated projects.

Findings on sampling

When we analysed the baseline data, we noticed that the randomization did not work properly. In the baseline report, we give two possible reasons: the limited number of randomization units, and the unclear selection process. We then proposed pseudo-experimental methods combining dif-in-dif and propensity score matching to minimize potential biases. In preparation for the endline, I became increasingly dissatisfied with the performance of the PhD student. He had needed very intensive assistance and supervision during data cleaning and analysis, which was therefore more limited than we had anticipated, and did not make sufficient progress in proposal writing and course work. In the end, I let him go and increased the involvement of a postdoc –which not only meant a severe cut in the budget (as we would not get the supervision fee) but also higher costs (largely paid by our own budget). After endline, the postdoc prepared descriptive statistics and then ventured on combining the baseline and endline data and link these to lists of the implementing organisation. This appeared very difficult as names of wards and farmer organisations did not always match. When comparing the list of treated farmer organisations and our sample, we observed the following:

- Treatment FOs in wards that are not on the list of eligible wards (a small number of these FOs are in our sample)
- Treatment FOs that are not in our sample but that are in selected treatment wards (mostly another FO in this ward is in the sample. Sometimes no FO in the treatment ward is included in the sample)
- Treatment FOs in wards that were selected as control wards (few)

- Systematically less FOs per treatment ward than per control ward in our sample

This implies that the list of eligible wards was arbitrary/incorrect and not adhered to. More importantly, the lists of farmer organisations were incomplete. We called district extension officers for complete lists and found that in neither treatment and control wards our sample is complete. The selection procedure is likely to be different: in the treatment wards we interviewed farmers from organisations that were on the initial treatment list from SNV while in the control wards we had FOs that were easily identified by our PhD student. The initial treatment list covered the FOs in selected villages for treatment in the first year, while we intended to select all FOs in the treatment wards -due to the limited number of treatment wards, but this was obviously not achieved. In combination with the differences observed at endline, this makes us suspect that there is selection bias in the farmer organisations.

Appendix C: Survey instruments

Endline female interview (excerpt from ODK)

label::English

Please switch GPS, Bluetooth and Wi-Fi off.

Module 0: Identification

0001: HOUSEHOLD CODE

0002: ENUMERATOR

0003: CONTROLLER

0005: Is the first, second, third, fourth or fifth household that are you interviewing today, in this village?

0006: DISTRICT

0007: FARMER GROUP NUMBER

0008: VILLAGE

0009: FARMER GROUP NAME

0010: JINA LA MWANAKIKUNDI

Consent

Good day, I am [NAME]. I am part of a team of researchers from Wageningen University and Sokoine University of Agriculture conducting a research study about agriculture in the districts of Kyela, Mbozi, Momba, Mbarali, Mbeya and Sumbawanga.

This information will be kept absolutely confidential. No personally identifying information will be published or shared with anyone outside the project team. So, anything you tell me in this questionnaire will not be shared with anyone else in your family or in your village. There are no risks to you or your family in answering these questions. There are no right or wrong answers, so we kindly ask you to give honest answers. Your participation is completely voluntary and you may stop participating at any time.

We would like to ask some questions to the household head and the spouse separately. The questions will be about agricultural production, food security, and household background.

0010: DOES THE RESPONDENT AGREE TO BE INTERVIEWED?

- Contact your field supervisor.
- If you cannot reach the field supervisor, STOP the interview.

0011: RESPONDENT NAME

Does the respondent have a telephone?

0012: RESPONDENT PHONE

Module 1: Household Roster

HH members names

100: Please give me the names of the people who usually live in your household, including both family members and non-family members, starting with the head of the household.

Name household head:

Name 2

Name 3

Name 4

Name 5

Name 6

Name 7
Name 8
Name 9
Name 10
Name 11
Name 12
Name 13
Name 14
Name 15
Name 16
Name 17
Name 18
Name 19
Name 20

HH members check

101: You have mentioned the following names:

101.1: \${name1}
101.2: \${name2}
101.3: \${name3}
101.4: \${name4}
101.5: \${name5}
101.6: \${name6}
101.7: \${name7}
101.8: \${name8}
101.9: \${name9}
101.10: \${name10}
101.11: \${name11}
101.12: \${name12}
101.13: \${name13}
101.14: \${name14}
101.15: \${name15}
101.16: \${name16}
101.17: \${name17}
101.18: \${name18}
101.19: \${name19}
101.20: \${name20}

102: Are these really all the members of your household, including babies, servants, grandparents, etc?

Household head

102.1: Is \${name1} male or female?

103.1: What is the age of \${name1}?

104.1: What is \${name1}'s current residence status within the hh?

105.1: Is \${name1} a new household member?

105.1: What is the marital status of \${name1}?

107.1: What is the highest level of school that \${name1} attended?

108.1: What are the main occupations of \${name1}?

Second person

102.2: Is \${name2} male or female?

birth2

103.2: What is the age of \${name2}?

104.2: What is \${name2}'s relationship to \${name1}?

105.2: Is \${name2} a new household member?

106.2: Who is the mother of \${name2}?

106.2: What is \${name2}'s current residence status within the hh?

107.2: What is the marital status of \${name2}?

108.2: What is the highest level of school that \${name2} attended?

109.2: What are the main occupations of \${name2}?

Third person

102.3: Is \${name3} male or female?

Birth 3

103.3: What is the age of \${name3}?

104.3: What is \${name3}'s relationship to \${name1}?

105.3: Is \${name3} a new household member?

106.3: Who is the mother of \${name3}?

106.3: What is \${name3}'s current residence status within the hh?

107.3: What is the marital status of \${name3}?

108.3: What is the highest level of school that \${name3} attended?

109.3: What are the main occupations of \${name3}?

Fourth person

102.4: Is \${name4} male or female?

Birth 4

103.4: What is the age of \${name4}?

104.4: What is \${name4}'s relationship to \${name1}?

105.4: Is \${name4} a new household member?

106.4: Who is the mother of \${name4}?

106.4: What is \${name4}'s current residence status within the hh?

107.4: What is the marital status of \${name4}?

108.4: What is the highest level of school that \${name4} attended?

109.4: What are the main occupations of \${name4}?

Fifth person

102.5: Is \${name5} male or female?

Birth 5

103.5: What is the age of \${name5}?

104.5: What is \${name5}'s relationship to \${name1}?

105.5: Is \${name5} a new household member?

106.5: Who is the mother of \${name5}?

106.5: What is \${name5}'s current residence status within the hh?

107.5: What is the marital status of \${name5}?

108.5: What is the highest level of school that \${name5} attended?

109.5: What are the main occupations of \${name5}?

Sixth person

102.6: Is \${name6} male or female?

Birth 6

103.6: What is the age of \${name6}?

104.6: What is \${name6}'s relationship to \${name1}?

105.6: Is \${name6} a new household member?

106.6: Who is the mother of \${name6}?

106.6: What is \${name6}'s current residence status within the hh?

107.6: What is the marital status of \${name6}?

108.6: What is the highest level of school that \${name6} attended?

109.6: What are the main occupations of \${name6}?

Seventh person

102.7: Is \${name7} male or female?

Birth 7

103.7: What is the age of \${name7}?

104.7: What is \${name7}'s relationship to \${name1}?

105.7: Is \${name7} a new household member?

106.7: Who is the mother of \${name7}?

106.7: What is \${name7}'s current residence status within the hh?

107.7: What is the marital status of \${name7}?
108.7: What is the highest level of school that \${name7} attended?
109.7: What are the main occupations of \${name7}?

Eighth person

102.8: Is \${name8} male or female?

Birth 8

103.8: What is the age of \${name8}?

104.8: What is \${name8}'s relationship to \${name1}?
105.8: Is \${name8} a new household member?
106.8: Who is the mother of \${name8}?
106.8: What is \${name8}'s current residence status within the hh?
107.8: What is the marital status of \${name8}?
108.8: What is the highest level of school that \${name8} attended?
109.8: What are the main occupations of \${name8}?

Ninth person

102.9: Is \${name9} male or female?

Birth 9

103.9: What is the age of \${name9}?

104.9: What is \${name9}'s relationship to \${name1}?
105.9: Is \${name9} a new household member?
106.9: Who is the mother of \${name9}?
106.9: What is \${name9}'s current residence status within the hh?
107.9: What is the marital status of \${name9}?
108.9: What is the highest level of school that \${name9} attended?
109.9: What are the main occupations of \${name9}?

Tenth person

102.10: Is \${name10} male or female?

Birth 10

103.10: What is the age of \${name10}?

104.10: What is \${name10}'s relationship to \${name1}?
105.10: Is \${name10} a new household member?
106.10: Who is the mother of \${name10}?
106.10: What is \${name10}'s current residence status within the hh?
107.10: What is the marital status of \${name10}?
108.10: What is the highest level of school that \${name10} attended?
109.10: What are the main occupations of \${name10}?

Eleventh person

102.11: Is \${name11} male or female?

Birth 11

103.11: What is the age of \${name11}?

104.11: What is \${name11}'s relationship to \${name1}?

105.11: Is \${name11} a new household member?
106.11: Who is the mother of \${name11}?
106.11: What is \${name11}'s current residence status within the hh?
107.11: What is the marital status of \${name11}?
108.11: What is the highest level of school that \${name11} attended?
109.11: What are the main occupations of \${name11}?

Twelfth person

102.12: Is \${name12} male or female?

Birth 12

103.12: What is the age of \${name12}?

104.12: What is \${name12}'s relationship to \${name1}?
105.12: Is \${name12} a new household member?
106.12: Who is the mother of \${name12}?
106.12: What is \${name12}'s current residence status within the hh?
107.12: What is the marital status of \${name12}?
108.12: What is the highest level of school that \${name12} attended?
109.12: What are the main occupations of \${name12}?

Thirteenth person

102.13: Is \${name13} male or female?

Birth 13

103.13: What is the age of \${name13}?

104.13: What is \${name13}'s relationship to \${name1}?
105.13: Is \${name13} a new household member?
106.13: Who is the mother of \${name13}?
106.13: What is \${name13}'s current residence status within the hh?
107.13: What is the marital status of \${name13}?
108.13: What is the highest level of school that \${name13} attended?
109.13: What are the main occupations of \${name13}?

Fourteenth person

102.14: Is \${name14} male or female?

Birth 14

103.14: What is the age of \${name14}?

104.14: What is \${name14}'s relationship to \${name1}?
105.14: Is \${name14} a new household member?
106.14: Who is the mother of \${name14}?
106.14: What is \${name14}'s current residence status within the hh?
107.14: What is the marital status of \${name14}?
108.14: What is the highest level of school that \${name14} attended?
109.14: What are the main occupations of \${name14}?

Fifteenth person

102.15: Is \${name15} male or female?

Birth 15

103.15: What is the age of \${name15}?

104.15: What is \${name15}'s relationship to \${name1}?

105.15: Is \${name15} a new household member?

106.15: Who is the mother of \${name15}?

106.15: What is \${name15}'s current residence status within the hh?

107.15: What is the marital status of \${name15}?

108.15: What is the highest level of school that \${name15} attended?

109.15: What are the main occupations of \${name15}?

Sixteenth person

102.16: Is \${name16} male or female?

Birth 16

103.16: What is the age of \${name16}?

104.16: What is \${name16}'s relationship to \${name1}?

105.16: Is \${name16} a new household member?

106.16: Who is the mother of \${name16}?

106.16: What is \${name16}'s current residence status within the hh?

107.16: What is the marital status of \${name16}?

108.16: What is the highest level of school that \${name16} attended?

109.16: What are the main occupations of \${name16}?

Seventeenth person

102.17: Is \${name17} male or female?

Birth 17

103.17: What is the age of \${name17}?

104.17: What is \${name17}'s relationship to \${name1}?

105.17: Is \${name17} a new household member?

106.17: Who is the mother of \${name17}?

106.17: What is \${name17}'s current residence status within the hh?

107.17: What is the marital status of \${name17}?

108.17: What is the highest level of school that \${name17} attended?

109.17: What are the main occupations of \${name17}?

Eighteenth person

102.18: Is \${name18} male or female?

Birth 18

103.18: What is the age of \${name18}?

104.18: What is \${name18}'s relationship to \${name1}?

105.18: Is \${name18} a new household member?

106.18: Who is the mother of \${name18}?

106.18: What is \${name18}'s current residence status within the hh?

107.18: What is the marital status of \${name18}?

108.18: What is the highest level of school that \${name18} attended?

109.18: What are the main occupations of \${name18}?

Nineteenth person

102.19: Is \${name19} male or female?

Birth 19

103.19: What is the age of \${name19}?

104.19: What is \${name19}'s relationship to \${name1}?

105.19: Is \${name19} a new household member?

106.19: Who is the mother of \${name19}?

106.19: What is \${name19}'s current residence status within the hh?

107.19: What is the marital status of \${name19}?

108.19: What is the highest level of school that \${name19} attended?

109.19: What are the main occupations of \${name19}?

Twentieth person

102.20: Is \${name20} male or female?

Birth 20

103.20: What is the age of \${name20}?

104.20: What is \${name20}'s relationship to \${name1}?

105.20: Is \${name20} a new household member?

106.20: Who is the mother of \${name20}?

106.20: What is \${name20}'s current residence status within the hh?

107.20: What is the marital status of \${name20}?

108.20: What is the highest level of school that \${name20} attended?

109.20: What are the main occupations of \${name20}?

Module 2: Household Assets and Expenditure

Goods

201: Do you or anyone in your household own any of the following?

- a: Mobile Phone
- b: Radio
- c: Tv
- d: Generator
- e: Solar
- f: Bicycle
- g: Motorbike
- h: Car
- i: Improved Stove
- l: Mattress
- m: Panga knife
- n: Hoe
- o: Pan

q_a: How many mobile phones does your household own?

q_b: How many radios does your household own?

q_c: How many TVs does your household own?

q_d: How many generators does your household own?

q_e: How many solar panels does your household own?

q_f: How many bicycles does your household own?

q_g: How many motorbikes does your household own?

q_h: How many cars does your household own?

q_i: How many improved stoves does your household own?

q_l: How many mattresses does your household own?

q_m: How many panga knives does your household own?

q_n: How many hoes does your household own?

q_o: How many pans does your household own?

Animals

202: Do your household own any of the following animals?

- p: Cattle inc. Cows
- q: Goat
- r: Chicken and other poultry
- s: Pig
- t: Rabbit / Guinea Pig
- u: Other animals

z_1: Specify the other animals:

q_p: How many cattle does your household own?

q_q: How many goats does your household own?

q_r: How many chickens and other poultry does your household own?

q_s: How many pigs does your household own?

q_t: How many rabbits / guinea pigs does your household own?

q_u: How many \${other_animal_spec}s does your household own?

House material

203: What is the main material of the roof?

203.1: Specify the roof material:

204: What is the main material of the walls?

204.1: Specify the wall material:

205: What is the main material of the floor?

205.1: Specify the floor material:

206: How many rooms in your homestead are used by your household?

Expenditure

Last year

201: Did your household have expenditures in the last year on the following items?

201.01: School fees (all children together)

201.02: Other education expenditures (books, uniforms, pens etc.)

201.03: Housing (Construction/Repairs)

201.04: Household Furnishing and Appliances (couch, tv)

201.05: Insurance

201.06: Weddings

201.07: Clothing/shoes

201.08: Funerals

201.09: Festivals

201.1: Church/charity

201.11: loan

Expenditure last year

202: Now I will ask you what were your expenses on each of the item categories that you state you had expenditure in the last week?

202.16: School fees (all children together)

202.17: Expenditure per

202.18: Other education expenditures (books, uniforms, pens etc.)

202.19: Expenditure per

202.2: Housing (Construction/Repairs)

202.21: Expenditure per

202.22: Household Furnishing and Appliances (couch, tv)

202.23: Expenditure per

202.24: Insurance

202.25: Expenditure per

202.26: Weddings

202.27: Expenditure per

202.28: Clothing/shoes

202.29: Expenditure per

202.3: Funerals

202.31: Expenditure per

202.32: Festivals

202.33: Expenditure per

202.34: Church/charity

202.35: Expenditure per

202.36: Credit

202.37: Expenditure per

Module 3: Food security

300.3: READ TO THE RESPONDENT: I am going to ask you detailed questions about YOUR food consumption. Please mention all food you ate yesterday during day and night. Start with the first food or drink of the morning, then continue with lunch and dinner.

300: What have you eaten during the past 24 hours?

301: Which of the following items did you or anyone in your household eat during the last 7 days?

m3_1: maize_flour

302.1: Did you buy maize_flour during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive as a gift?

Unit:

m3_2: maize_green_cob

302.1: Did you buy maize_green_cob during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

maize_grain

302.1: Did you buy maize_grain during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

wheat_other_cereals

302.1: Did you buy wheat_other_cereals during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

rice_husked

302.1: Did you buy rice_husked during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

bread

302.1: Did you buy bread during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

cassava

302.1: Did you buy cassava during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

yam

302.1: Did you buy yam during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

cooked_banana

302.1: Did you buy cooked_banana during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

millet_sorghum_grain

302.1: Did you buy millet_sorghum_grain during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

millet_sorghum_flour

302.1: Did you buy millet_sorghum_flour during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

sweet_potatoes

302.1: Did you buy sweet_potatoes during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

round_potatoes

302.1: Did you buy round_potatoes during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

chicken_poultry

302.1: Did you buy chicken_poultry during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

goat

302.1: Did you buy goat during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

beef

302.1: Did you buy beef during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

pork

302.1: Did you buy pork during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

wild_birds_insects

302.1: Did you buy wild_birds_insects during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

fish

302.1: Did you buy fish during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

groundnuts_in_shell

302.1: Did you buy groundnuts_in_shell during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

coconuts_mature_immature

302.1: Did you buy coconuts_mature_immature during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

cashews

302.1: Did you buy cashews during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

other_nuts_seedproducts

302.1: Did you buy other_nuts_seedproducts during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

onions

302.1: Did you buy onions during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

tomatoes

302.1: Did you buy tomatoes during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

carrots

302.1: Did you buy carrots during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

green_peppers

302.1: Did you buy green_peppers during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

spinach

302.1: Did you buy spinach during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

cabbage

302.1: Did you buy cabbage during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

dried_wild_vegetables

302.1: Did you buy dried_wild_vegetables during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

ripe_bananas

302.1: Did you buy ripe_bananas during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

oranges_lemons_other_citrus_fruits

302.1: Did you buy oranges_lemons_other_citrus_fruits during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

mangoes

302.1: Did you buy mangoes during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

avocadoes

302.1: Did you buy avocadoes during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

eggs

302.1: Did you buy eggs during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

milk_milk_products

302.1: Did you buy milk_milk_products during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

butter

302.1: Did you buy butter during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

cooking_oil

302.1: Did you buy cooking_oil during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

salt

302.1: Did you buy salt during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

tea

302.1: Did you buy tea during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

coffee

302.1: Did you buy coffee during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

sugar

302.1: Did you buy sugar during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

sweets

302.1: Did you buy sweets during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

cake_biscuits

302.1: Did you buy cake_biscuits during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

sugarcane

302.1: Did you buy sugarcane during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

sodas

302.1: Did you buy sodas during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

beer

302.1: Did you buy beer during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

local_brews

302.1: Did you buy local_brews during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

other_alcoholic_beverages

302.1: Did you buy other_alcoholic_beverages during the last 7 days?

302.2: How much did you buy of it in the last 7 days?

Unit:

302.3: How much did you spend on it in the last 7 days?

302.4: Did you use your own production or stock during the last 7 days?

302.5: How much did you use from your own stock?

Unit:

302.6: Have you received any of it as a gift during the last 7 days?

302.6: How much did you receive for free?

Unit:

Module 4: Hunger months

400: In the last 12 months, did your household at any time not have enough food?

401: In the past 12 months, for how many months did you not have enough food to meet your family needs?

Module 5: Household Hunger Scale and Coping strategy

500: For each of the following questions, consider what has happened in the past 1 month. Please answer whether this happened never, rarely (once or twice), sometimes (3-10 times), or often (more than 10 times) in the past 1 month?

501: Did you worry that your household would not have enough food?

502: Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?

503: Did you or any household member eat a limited variety of foods due to a lack of resources?

504: Did you or any household member eat food that you did not want to eat because a lack of resources to obtain other types of food?

505: Was there ever no food at all in your household because there were no resources to get more?

506: Did you or any household member go to sleep at night hungry because there was not enough food?

507: Did you or any household member go a whole day without eating anything because there was not enough food?

508: Did anybody in your household eat a smaller meal than you felt you needed because there was not enough food?

509: Did anybody in your household eat fewer meals in a day because there was not enough food?

510: Did anybody in your household borrow money to buy food because there was not enough food in the house?

511: Did anybody in your household borrow food because there was not enough food in the house?

512: Did anybody in your household consume stocks in a day because there was not enough food?

513: Did anybody in your household gather wild food in a day because there was not enough food?

Module 6: Gender Decision Making

601: Now I will list a series of household activities. For each of them, can you please tell me, between you and your husband, who does make a decision on the following?

601.1: Buying food, consumption goods

601.2: Buying durable goods (such as bikes, television) or invest in the house (such as repairing roof)

601.3: Schooling of children (who is going to school)

601.4: Savings

601.5: Taking credit

601.6: Medical expenses

601.7: Distribution of household money?

Division Agricultural Work

602: Which crops did you cultivate in the last production season on any of your plots?

602.1: Specify other type of crops:

1: Module : Maize

603,1: Who does the land preparation?

How many days did you spend on land preparation?

604,1: Who does the planting?

How many days did you spend on planting?

605,1: Who does weed the field?

How many days did you spend on weeding the field?

606,1: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,1: Who does sells it?

How many days did you take to sell it?

608,1: Who does decide what kind of input to use?

Who choses how to spend money earned from selling this crop would be spent?

2: Module : Rice

603,2: Who does the land preparation?

How many days did you spend on land preparation?

604,2: Who does the planting?

How many days did you spend on planting?

605,2: Who does weed the field?

How many days did you spend on weeding the field?

606,2: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,2: Who does sells it?

How many days did you take to sell it?

608,2: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

3: Module : Beans

603,3: Who does the land preparation?

How many days did you spend on land preparation?

604,3: Who does the planting?

How many days did you spend to on planting?

605,3: Who does weed the field?

How many days did you spend on weeding the field?

606,3: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,3: Who does sells it?

How many days did you take to sell it?

608,3: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

4: Module : Soya beans

603,4: Who does the land preparation?

How many days did you spend on land preparation?

604,4: Who does the planting?

How many days did you spend on planting?

605,4: Who does weed the field?

How many days did you spend on weeding the field?

606,4: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,4: Who does sells it?

How many days did you take to sell it?

608,4: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

5: Module : Wheat

603,5: Who does the land preparation?

How many days did you spend on land preparation?

604,5: Who does the planting?

How many days did you spend on planting?

605,5: Who does weed the field?

How many days did you spend on weeding the field?

606,5: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,5: Who does sells it?

How many days did you take to sell it?

608,5: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

6: Module : Cassava

603,6: Who does the land preparation?

How many days did you spend on land preparation?

604,6: Who does the planting?

How many days did you spend on planting?

605,6: Who does weed the field?

How many days did you spend on weeding the field?

606,6: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,6: Who does sells it?
How many days did you take to sell it?
608,6: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

7: Module : Sorghum

603,7: Who does the land preparation?
How many days did you spend on land preparation?
604,7: Who does the planting?
How many days did you spend on planting?
605,7: Who does weed the field?
How many days did you spend on weeding the field?
606,7: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,7: Who does sells it?
How many days did you take to sell it?
608,7: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

8: Module : Finger millet

603,8: Who does the land preparation?
How many days did you spend on land preparation?
604,8: Who does the planting?
How many days did you spend on planting?
605,8: Who does weed the field?
How many days did you spend on weeding the field?
606,8: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,8: Who does sells it?
How many days did you take to sell it?
608,8: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

9: Module : Yam

603,9: Who does the land preparation?
How many days did you spend on land preparation?
604,9: Who does the planting?
How many days did you spend on planting?
605,9: Who does weed the field?
How many days did you spend on weeding the field?
606,9: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,9: Who does sells it?
How many days did you take to sell it?
608,9: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

10: Module : Banana

603,10: Who does the land preparation?

How many days did you spend on land preparation?

604,10: Who does the planting?

How many days did you spend on planting?

605,10: Who does weed the field?

How many days did you spend on weeding the field?

606,10: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,10: Who does sells it?

How many days did you take to sell it?

608,10: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

11: Module : Round Potato

603,11: Who does the land preparation?

How many days did you spend on land preparation?

604,11: Who does the planting?

How many days did you spend on planting?

605,11: Who does weed the field?

How many days did you spend on weeding the field?

606,11: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,11: Who does sells it?

How many days did you take to sell it?

608,11: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

12: Module : Sweet Potato

603,12: Who does the land preparation?

How many days did you spend on land preparation?

604,12: Who does the planting?

How many days did you spend to on planting?

605,12: Who does weed the field?

How many days did you spend on weeding the field?

606,12: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,12: Who does sells it?

How many days did you take to sell it?

608,12: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

13: Module : Palm oil

603,13: Who does the land preparation?

How many days did you spend on land preparation?

604,13: Who does the planting?

How many days did you spend on planting?

605,13: Who does weed the field?

How many days did you spend on weeding the field?

606,13: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,13: Who does sells it?

How many days did you take to sell it?

608,13: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

14: Module : Sesame

603,14: Who does the land preparation?

How many days did you spend on land preparation?

604,14: Who does the planting?

How many days did you spend on planting?

605,14: Who does weed the field?

How many days did you spend on weeding the field?

606,14: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,14: Who does sells it?

How many days did you take to sell it?

608,14: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

15: Module : Sunflower

603,15: Who does the land preparation?

How many days did you spend on land preparation?

604,15: Who does the planting?

How many days did you spend on planting?

605,15: Who does weed the field?

How many days did you spend on weeding the field?

606,15: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,15: Who does sells it?

How many days did you take to sell it?

608,15: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

16: Module : Bambara nuts

603,16: Who does the land preparation?

How many days did you spend on land preparation?

604,16: Who does the planting?

How many days did you spend on planting?

605,16: Who does weed the field?

How many days did you spend on weeding the field?

606,16: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,16: Who does sells it?

How many days did you take to sell it?

608,16: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

17: Module : Groundnuts

603,17: Who does the land preparation?

How many days did you spend on land preparation?

604,17: Who does the planting?

How many days did you spend on planting?

605,17: Who does weed the field?

How many days did you spend on weeding the field?

606,17: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,17: Who does sells it?

How many days did you take to sell it?

608,17: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

18: Module : Cow peas

603,18: Who does the land preparation?

How many days did you spend on land preparation?

604,18: Who does the planting?

How many days did you spend on planting?

605,18: Who does weed the field?

How many days did you spend on weeding the field?

606,18: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,18: Who does sells it?

How many days did you take to sell it?

608,18: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

19: Module : Green gram

603,19: Who does the land preparation?

How many days did you spend on land preparation?

604,19: Who does the planting?

How many days did you spend on planting?

605,19: Who does weed the field?

How many days did you spend on weeding the field?

606,19: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,19: Who does sells it?

How many days did you take to sell it?

608,19: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

20: Module : Pigeon peas

603,20: Who does the land preparation?

How many days did you spend on land preparation?

604,20: Who does the planting?

How many days did you spend on planting?

605,20: Who does weed the field?

How many days did you spend on weeding the field?

606,20: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,20: Who does sells it?
How many days did you take to sell it?
608,20: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

21: Module : Sugarcane

603,21: Who does the land preparation?
How many days did you spend on land preparation?
604,21: Who does the planting?
How many days did you spend on planting?
605,21: Who does weed the field?
How many days did you spend on weeding the field?
606,21: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,21: Who does sells it?
How many days did you take to sell it?
608,21: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

22: Module : Amaranth

603,22: Who does the land preparation?
How many days did you spend on land preparation?
604,22: Who does the planting?
How many days did you spend on planting?
605,22: Who does weed the field?
How many days did you spend on weeding the field?
606,22: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,22: Who does sells it?
How many days did you take to sell it?
608,22: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

23: Module : Coffee

603,23: Who does the land preparation?
How many days did you spend on land preparation?
604,23: Who does the planting?
How many days did you spend on planting?
605,23: Who does weed the field?
How many days did you spend on weeding the field?
606,23: Who does the harvesting?
How many days did you spend to complete the harvesting?
607,23: Who does sells it?
How many days did you take to sell it?
608,23: Who does decide what kind of input to use?
Who choses how money from selling this crop would be spent?

24: Module : Tomato

603,24: Who does the land preparation?

How many days did you spend on land preparation?

604,24: Who does the planting?

How many days did you spend on planting?

605,24: Who does weed the field?

How many days did you spend on weeding the field?

606,24: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,24: Who does sells it?

How many days did you take to sell it?

608,24: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

25: Module : Onion

603,25: Who does the land preparation?

How many days did you spend on land preparation?

604,25: Who does the planting?

How many days did you spend on planting?

605,25: Who does weed the field?

How many days did you spend on weeding the field?

606,25: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,25: Who does sells it?

How many days did you take to sell it?

608,25: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

26: Module : Okra

603,26: Who does the land preparation?

How many days did you spend on land preparation?

604,26: Who does the planting?

How many days did you spend on planting?

605,26: Who does weed the field?

How many days did you spend on weeding the field?

606,26: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,26: Who does sells it?

How many days did you take to sell it?

608,26: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

27: Module : Cabbage

603,27: Who does the land preparation?

How many days did you spend on land preparation?

604,27: Who does the planting?

How many days did you spend on planting?

605,27: Who does weed the field?

How many days did you spend on weeding the field?

606,27: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,27: Who does sells it?

How many days did you take to sell it?

608,27: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

28: Module : Other crop

603,28: Who does the land preparation?

How many days did you spend on land preparation?

604,28: Who does the planting?

How many days did you spend to complete the planting?

605,28: Who does weed the field?

How many days did you spend on weeding the field?

606,28: Who does the harvesting?

How many days did you spend to complete the harvesting?

607,28: Who does sells it?

How many days did you take to sell it?

608,28: Who does decide what kind of input to use?

Who choses how money from selling this crop would be spent?

1: Why did you join farmer organisation? Or what are the main benefits for you to join FO?

2: were there more than one FOs that you could have joined?

3: Why did you Join the one you are in and not a different FO?

4: If you are a member of more than one FOs why?

Is this household selected to do the experiment?

Module 7: Experiment

700: Now make sure that you are ALONE with the female household member.

We would like to thank you for the time you have spent with us. Now, we would like to ask you some more questions about money. One of the options you choose, we will pay out for real. You will choose nine times, but a lottery will decide which one we will pay out.

701: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 4000 Tsh. What do you prefer?

702: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 4500 Tsh. What do you prefer?

703: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 5000 Tsh. What do you prefer?

704: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 5500 Tsh. What do you prefer?

705: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 6000 Tsh. What do you prefer?

706: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 6500 Tsh. What do you prefer?

707: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 7000 Tsh. What do you prefer?

708: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 7500 Tsh. What do you prefer?

709: Either I give you 4000 Tsh and I will not tell your husband, or I give your husband 8000 Tsh. What do you prefer?

710: Please now randomly draw a card from a set of 1 to 9.

711: Indicate the number that shows on the card that you pulled.

You indicated that you would prefer 4000 for you over 4000 for your husband. So I will now pay you 4000 Tsh anonymously.

You indicated that you would prefer 4000 for your husband over 4000 for yourself. So I will now pay your husband 4000 Tsh.

You indicated that you would prefer 4000 for you over 4500 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 4500 for your husband over 4000 for yourself. So I will now pay your husband 4500 Tsh.

You indicated that you would prefer 4000 for you over 5000 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 5000 for your husband over 4000 for yourself. So I will now pay your husband 5000 Tsh.

You indicated that you would prefer 4000 for you over 5500 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 5500 for your husband over 4000 for yourself. So I will now pay your husband 5500 Tsh.

You indicated that you would prefer 4000 for you over 6000 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 6000 for your husband over 4000 for yourself. So I will now pay your husband 6000 Tsh.

You indicated that you would prefer 4000 for you over 6500 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 6500 for your husband over 4000 for yourself. So I will now pay your husband 6500 Tsh.

You indicated that you would prefer 4000 for you over 7000 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 7000 for your husband over 4000 for yourself. So I will now pay your husband 7000 Tsh.

You indicated that you would prefer 4000 for you over 7500 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 7500 for your husband over 4000 for yourself. So I will now pay your husband 7500 Tsh.

You indicated that you would prefer 4000 for you over 8000 for your husband. So I will now pay you, 4000 Tsh anonymously.

You indicated that you would prefer 8000 for your husband over 4000 for yourself. So I will now pay your husband 8000 Tsh.

Module 8: Child Nutritional Status and Anthropometric measurement

8: We have identified the following children aged 0-7 in the household.

8.1: \${name1}

8.2: \${name2}

8.3: \${name3}

8.4: \${name4}

8.5: \${name5}

8.6: \${name6}

8.7: \${name7}
8.8: \${name8}
8.9: \${name9}
8.10: \${name10}
8.11: \${name11}
8.12: \${name12}
8.13: \${name13}
8.14: \${name14}
8.15: \${name15}
8.16: \${name16}
8.17: \${name17}
8.18: \${name18}
8.19: \${name19}
8.20: \${name20}

child_1

8.01: What is the date of birth of \${name1}?
8.011: May I weigh \${name1}?
8.012: May I measure the height of \${name1}?

child_2

8.02: What is the date of birth of \${name2}?
8.021: May I weigh \${name2}?
8.022: May I measure the height of \${name2}?

child_3

8.03: What is the date of birth of \${name3}?
8.031: May I weigh \${name3}?
8.032: May I measure the height of \${name3}?

child_4

8.04: What is the date of birth of \${name4}?
8.041: May I weigh \${name4}?
8.042: May I measure the height of \${name4}?

child_5

8.05: What is the date of birth of \${name5}?
8.051: May I weigh \${name5}?
8.052: May I measure the height of \${name5}?

child_6

8.06: What is the date of birth of \${name6}?
8.061: May I weigh \${name6}?
8.062: May I measure the height of \${name6}?

child_7

8.07: What is the date of birth of \${name7}?
8.071: May I weigh \${name7}?
8.072: May I measure the height of \${name7}?

child_8

8.08: What is the date of birth of \${name8}?

8.081: May I weigh \${name8}?

8.082: May I measure the height of \${name8}?

child_9

8.09: What is the date of birth of \${name9}?

8.091: May I weigh \${name9}?

8.092: May I measure the height of \${name9}?

child_10

8.1: What is the date of birth of \${name10}?

8.101: May I weigh \${name10}?

8.102: May I measure the height of \${name10}?

child_11

8.11: May I measure the height of \${name11}?

8.111: May I weigh \${name11}?

8.112: May I measure the height of \${name11}?

child_12

8.12: What is the date of birth of \${name12}?

8.121: May I weigh \${name12}?

8.122: May I measure the height of \${name12}?

child_13

8.13: What is the date of birth of \${name13}?

8.131: May I weigh \${name13}?

8.132: May I measure the height of \${name13}?

child_14

8.14: What is the date of birth of \${name14}?

8.141: May I weigh \${name14}?

8.142: May I measure the height of \${name14}?

child_15

8.15: What is the date of birth of \${name15}?

8.151: May I weigh \${name15}?

8.152: May I measure the height of \${name15}?

child_16

8.16: What is the date of birth of \${name16}?

8.161: May I weigh \${name16}?

8.162: May I measure the height of \${name16}?

child_17

8.17: What is the date of birth of \${name17}?

8.171: May I weigh \${name17}?

8.172: May I measure the height of \${name17}?

child_18

8.18: What is the date of birth of \${name18}?

8.181: May I weigh \${name18}?

8.182: May I measure the height of \${name18}?

child_19

8.19: What is the date of birth of \${name19}?

8.191: May I weigh \${name19}?

8.1919999999999999: May I measure the height of \${name19}?

child_20

8.2: What is the date of birth of \${name20}?

8.201: May I weigh \${name20}?

8.2019999999999999: May I measure the height of \${name20}?

Mother

811: May I measure your weight?

Please indicate the weight:

Module 8: Comments and observations

INTERVIEWER'S COMMENTS ABOUT RESPONDENT

INTERVIEWER'S COMMENTS ABOUT SPECIFIC QUESTIONS

ANY OTHER INTERVIEWER'S COMMENTS

GPS

- Pull down the settings bar on your tablet.
- Switch ON the GPS receiver by clicking on the GPS icon.
- Pull the settings bar up again.
- Collect the GPS coordinates of the interview location.
- Pull down the settings bar.
- Switch the GPS receiver OFF by clicking on the GPS icon.
- Pull the settings bar up again.

HOUSEHOLD CODE

Module 0: Identification

Enumerator instruction

Consent

Module 1: Agriculture -General questions

Module 2: Plots

Now I am going to ask you a series of questions about the land your household uses for productive purposes- that is leases or sharecrops, owns or rents out. I would like you to consider not only the land your household uses now, but the land your household used during the previous growing season. Please start with the largest plot and move to the smallest plot.

How many plots did your household use in the last cropping season?

Now, I will ask you questions about each plot. Please, start with the biggest plot.

Plot1
Plot2
Plot3
Plot4
Plot5
Plot6

How high is the threat of declining soil fertility to your farm?

How high is the threat of soil erosion to your farm?

Module 3: Crops

You stated that you grew these crops in the last cropping season.

I will now ask you some questions about the last production season for each of the crops that you grew.

Module 3_1 : Maize

Over the last cropping season, in which month(s) did you harvest Maize?

Do you want to indicate the Maize acreage in acres or meters x meters?

What acreage did the Maize cover in the last production season?

What is the length of the Maize plot?

What is the width of the Maize plot?

How much seed did you use during the last production season?

Unit:

Specify unit:

What type of seeds did you use?

How did you obtain the seeds?

Specify:

How much did you pay for the seeds?

How much have you harvested from this crop in the last production season?

Unit:

Specify unit:

How much of Maize have you stored for food consumption?

Unit:

Specify unit:

How much of Maize have you stored as seed?

Unit:

Specify unit:

How much of Maize have you given away?

Unit:

Specify unit:

How much was lost in storage?

Unit:

Specify unit:

How much of the harvest of Maize did you sell?

Unit:

Specify unit:

What part of it did you sell before harvest?

Where did you sell it?

Specify where you sell it:

What was the selling price?

Unit:

Specify unit:

Why did you sell it before harvest?

Specify why you did sell it before the harvest:

What part of it did you sell within 1 month after harvest?

Where did you sell it?

Specify where you sell it:

A solid green rectangular box, likely a placeholder for a response.

What was the selling price?

Unit:

Specify unit:

A solid red rectangular box, likely a placeholder for a response.

Why did you sell it within 1 month?

Specify why did you sell it within 1 month:

What part of this did you sell/are you planning to sell between 1 month and 6 months after harvest?

Where did you sell it?

Specify where you sell it:

A solid green rectangular box, likely a placeholder for a response.

What was the selling price?

Unit:

Specify unit:

Why did you sell this part at this moment?

Specify why did you sell this part at this moment:

Where did you store your harvest before sales?

Specify where you store the harvest:

Land preparation and planting

How many days did you spend on land preparation and planting maize?

Are there other members besides you and your wife that contributed labour.

How many days in total were other members involved

Did any unpaid labour assist with land preparation and planting?

For how many days in total did the unpaid labour assist in land preparation?

Did you hire any paid labour for preparing land?

For how many days in total did paid labour do land preparation and planting on Maize?

Weeding

Did you weed Maize?

How many days did you spend on weeding maize?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved

Did any unpaid labour assist with weeding maize?

For how many days in total did the unpaid labour assist in weeding maize?

Did you hire any paid labour for weeding maize?

How many days in total did paid labour do weeding Maize plots?

Inputs application

How many days did you spend on applying inputs to Maize?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved?

Did any unpaid labour assist with applying inputs?

For how many days in total did the unpaid labour assist in input application?

Did you hire any paid labour for applying inputs?

How many days in total did paid labour do work on input application in Maize plots?

Harvesting

Have you harvested maize?

How many days in total did you spend harvesting maize?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved?

Did any unpaid labour assist in harvesting?

For how many days in total did the unpaid labour assist harvesting?

Did you hire any paid labour for harvesting?

For how many days in total did paid labour for harvesting maize?

Fertilisers

Did you use any organic/inorganic fertilisers?

Compost

Did you use any COMPOST on maize crop?

How much did you spend on COMPOST for this crop?

Animal Manure

Did you use any ANIMAL MANURE on this crop?

How much did you spend on ANIMAL MANURE for this this crop?

Farm Yard Manuring (FYM)

Did you use any FARM YARD MANURE on this crop?

How much did you spend on FARM YARD MANURE for this this crop?

Urea

Did you use any UREA on this crop?

How much did you spend on UREA for this this crop?

DAP

Did you use any DAP on this crop?

How much did you spend on DAP for this crop?

NPK

Did you use any NPK on this crop?

How much did you spend on NPK for this this crop?

MINJINGU PHOSPHATE

Did you use any MINJINGU PHOSPHATE on maize crop?

How much did you spend on MINJINGU PHOSPHATE for this crop?

TSP

Did you use any TSP on maize crop?

How much did you spend on TSP for maize crop?

Insecticides

Did you use any INSECTICIDES on maize crop?

How much did you spend on INSECTICIDES for maize crop?

Herbicides

Did you use any HERBICIDES on maize crop?

How much did you spend on HERBICIDES for maize crop?

Seeds

How much in total did you spend on the the seed that you bought for maize crop? (Do not include seed not planted/used)

Module 3_2 : Rice

Over the last cropping season, in which month(s) did you harvest Rice?

Do you want to indicate the Rice acreage in acres or meters x meters?

What acreage did the Rice cover in the last production season?

What is the length of the Rice plot?

What is the width of the Rice plot?

How much seed did you use during the last production season?

Unit:

Specify unit:

What type of seeds did you use?

How did you obtain the seeds?

Specify:

How much did you pay for the seeds?

How much have you harvested from this crop in the last production season?

Unit:

Specify unit:

How much of Rice have you stored for food consumption?

Unit:

Specify unit:

How much of Rice have you stored as seed?

Unit:

Specify unit:

How much of Rice have you given away?

Unit:

Specify unit:

How much was lost in storage?

Unit:

Specify unit:

How much of the harvest of Rice did you sell?


Unit:

Specify unit:

What part of it did you sell before harvest?

Where did you sell it?

Specify where you sell it:



What was the selling price?

Unit:

Specify unit:




Why did you sell it before harvest?

Specify why you did sell it before the harvest:

What part of it did you sell within 1 month after harvest?

Where did you sell it?

Specify where you sell it:



What was the selling price?

Unit:

Specify unit:



Why did you sell it within 1 month?

Specify why did you sell it within 1 month:

What part of this did you sell/are you planning to sell between 1 month and 6 months after harvest?

Where did you sell it?

Specify where you sell it:



What was the selling price?

Unit:

Specify unit:



Why did you sell this part at this moment?

Specify why did you sell this part at this moment:

Where did you store your harvest before sales?

Specify where you store the harvest:

Land preparation and planting

How many days did you spend planting rice?

Are there other members besides you and your wife that contributed labour.

How many days in total were other members involved

Did any unpaid labour assist with land preparation and planting?

For how many days in total did the unpaid labour assist in land preparation?

Did you hire any paid labour for preparing land?

For how many days in total did paid labour do land preparation and planting on rice?

Weeding

Did you weed rice?

How many days did you spend on weeding rice?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved

Did any unpaid labour assist with weeding rice?

For how many days in total did the unpaid labour assist in weeding rice?

Did you hire any paid labour for weeding rice?

How many days in total did paid labour do weeding rice plots?

Inputs application

How many days did you spend on applying inputs to rice?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved?

Did any unpaid labour assist with applying inputs?

For how many days in total did the unpaid labour assist in input application?

Did you hire any paid labour for applying inputs?

How many days in total did paid labour do work on input application in rice plots?

Harvesting

Have you harvested rice?

How many days in total did you spend harvesting rice?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved?

Did any unpaid labour assist in harvesting?

For how many days in total did the unpaid labour assist harvesting?

Did you hire any paid labour for harvesting?

For how many days in total did paid labour for harvesting rice?

Fertilisers

Did you use any organic/inorganic fertilisers?

Compost

Did you use any COMPOST on rice crop?

How much did you spend on COMPOST for this crop?

Animal Manure

Did you use any ANIMAL MANURE on this crop?

How much did you spend on ANIMAL MANURE for this this crop?

Farm Yard Manuring (FYM)

Did you use any FARM YARD MANURE on this crop?

How much did you spend on FARM YARD MANURE for this this crop?

Urea

Did you use any UREA on this crop?

How much did you spend on UREA for this this crop?

DAP

Did you use any DAP on this crop?

How much did you spend on DAP for this crop?

NPK

Did you use any NPK on this crop?

How much did you spend on NPK for this this crop?

MINJINGU PHOSPHATE

Did you use any MINJINGU PHOSPHATE on rice crop?

How much did you spend on MINJINGU PHOSPHATE for this crop?

TSP

Did you use any TSP on rice crop?

How much did you spend on TSP for rice crop?

Insecticides

Did you use any INSECTICIDES on rice crop?

How much did you spend on INSECTICIDES for rice crop?

Herbicides

Did you use any HERBICIDES on rice crop?

How much did you spend on HERBICIDES for rice crop?

Seeds

How much in total did you spend on the the seed that you bought for rice crop? (Do not include seed not planted/used)

Module 3_3 : Beans

Over the last cropping season, in which month(s) did you harvest Beans?

Do you want to indicate the Beans acreage in acres or meters x meters?

What acreage did the Beans cover in the last production season?

What is the length of the Beans plot?

What is the width of the Beans plot?

How much seed did you use during the last production season?

Unit:

Specify unit:

What type of seeds did you use?

How did you obtain the seeds?

Specify:

How much did you pay for the seeds?

How much have you harvested from this crop in the last production season?

Unit:

Specify unit:

How much of Beans have you stored for food consumption?

Unit:

Specify unit:

How much of Beans have you stored as seed?

Unit:

Specify unit:

How much of Beans have you given away?

Unit:

Specify unit:

How much was lost in storage?

Unit:

Specify unit:

How much of the harvest of Beans did you sell?

Unit:

Specify unit:

What part of it did you sell before harvest?

Where did you sell it?

Specify where you sell it:

What was the selling price?

Unit:

Specify unit:

Why did you sell it before harvest?

Specify why you did sell it before the harvest:

What part of it did you sell within 1 month after harvest?

Where did you sell it?

Specify where you sell it:

What was the selling price?

Unit:

Specify unit:

Why did you sell it within 1 month?

Specify why did you sell it within 1 month:

What part of this did you sell/are you planning to sell between 1 month and 6 months after harvest?

Where did you sell it?

Specify where you sell it:

What was the selling price?

Unit:

Specify unit:

Why did you sell this part at this moment?

Specify why did you sell this part at this moment:

Where did you store your harvest before sales?

Specify where you store the harvest:

Land preparation and planting

How many days did you spend planting beans?

Are there other members besides you and your wife that contributed labour.

How many days in total were other members involved

Did any unpaid labour assist with land preparation and planting?

For how many days in total did the unpaid labour assist in land preparation?

Did you hire any paid labour for preparing land?

For how many days in total did paid labour do land preparation and planting on beans?

Weeding

Did you weed beans?

How many days did you spend on weeding beans?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved

Did any unpaid labour assist with weeding beans?

For how many days in total did the unpaid labour assist in weeding beans?

Did you hire any paid labour for weeding beans?

How many days in total did paid labour do weeding beans plots?

Inputs application

How many days did you spend on applying inputs to beans?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved?

Did any unpaid labour assist with applying inputs?

For how many days in total did the unpaid labour assist in input application?

Did you hire any paid labour for applying inputs?

How many days in total did paid labour do work on input application in beans plots?

Harvesting

Have you harvested beans?

How many days in total did you spend harvesting beans?

Are there other members besides you and your wife that contributed labour?

How many days in total were other members involved?

Did any unpaid labour assist in harvesting?

For how many days in total did the unpaid labour assist harvesting?

Did you hire any paid labour for harvesting?

For how many days in total did paid labour for harvesting beans?

Fertilisers

Did you use any organic/inorganic fertilisers?

Compost

Did you use any COMPOST on beans crop?

How much did you spend on COMPOST for this crop?

Animal Manure

Did you use any ANIMAL MANURE on this crop?

How much did you spend on ANIMAL MANURE for this this crop?

Farm Yard Manuring (FYM)

Did you use any FARM YARD MANURE on this crop?

How much did you spend on FARM YARD MANURE for this this crop?

Urea

Did you use any UREA on this crop?

How much did you spend on UREA for this this crop?

DAP

Did you use any DAP on this crop?

How much did you spend on DAP for this crop?

NPK

Did you use any NPK on this crop?

How much did you spend on NPK for this this crop?

MINJINGU PHOSPHATE

Did you use any MINJINGU PHOSPHATE on beans crop?

How much did you spend on MINJINGU PHOSPHATE for this crop?

TSP

Did you use any TSP on beans crop?

How much did you spend on TSP for beans crop?

Insecticides

Did you use any INSECTICIDES on beans crop?

How much did you spend on INSECTICIDES for beans crop?

Herbicides

Did you use any HERBICIDES on beans crop?

How much did you spend on HERBICIDES for beans crop?

Seeds

How much in total did you spend on the the seed that you bought for beans crop? (Do not include seed not planted/used)

Module 3_4 : Soya beans

Module 3_5 : Wheat

Module 3_6 : Cassava

Module 3_7 : Sorghum

Module 3_8 : Finger millet

Module 3_9 : Yam

Module 3_10 : Banana

Module 3_11 : Round Potato

Module 3_12 : Sweet Potato

Module 3_13 : Oil palm

Module 3_14 : Sesame

Module 3_15 : Sunflower

Module 3_16 : Bambara nuts

Module 3_17 : Groundnuts

Module 3_18 : Cow peas

Module 3_19 : Green gram

Module 3_20 : Pigeon peas

Module 3_21 : Sugarcane

Module 3_22 : Amaranth

Module 3_23 : Coffee

Module 3_24 : Tomato

Module 3_25 : Onion

Module 3_26 : Okra

Module 3_27 : Cabbage

Module 3_28 : Other crop

Module 4: Equipment and Facilities

Module 5: Crop technologies

Module 6: Inputs

Module 7: Access to Extension, Trainings, Demonstration Plots

Module 8: Farmer Groups

Module 9: Saving and Access to credit

Photo

Module 10: Comments and observations

GPS

HH code check

Baseline qualitative survey

Integrated Project to Increase Agriculture Productivity in the Breadbasket Area of Southern Tanzania

(Mbarali, Kyela, Mbeya, Mbozi, Momba and Sumbawanga Districts)

Introduction for participants

Good day, I am [NAME]. I am part of a team of researchers from Wageningen University and Sokoine University of Agriculture conducting a research study about agriculture in the districts of Kyela, Mbozi, Momba, Mbarali, Mbeya and Sumbawanga. This information will be kept absolutely confidential. No personally identifying information will be published or shared with anyone outside the project team. So, anything you tell me in this questionnaire will not be shared with anyone else in your family or in your village. There are no risks to you or your family in answering these questions. There are no right or wrong answers, so we kindly ask you to give honest answers. Your participation is completely voluntary and you may stop participating at any time. The interviews consist out of two sections and will last about 90 minutes.

Notes to the researchers

- Please have the participants fill out the form specifying their name, gender and position before they leave. Also ask FOs to share their most updated list of members. This list should have been requested by the extension agent before the visit takes place.
- Makes sure to spent at least half of the time on the second section. So keep track of time during the first section.
- Please indicate clearly if something is not applicable or they don't know.

SECTION 1 – GENERAL FO CHARACTERISTICS AND STATISTICS

- THIS SECTION CAN BE DISCUSSED WITH FO LEADERS ONLY –

Notes to the researchers

This section contains basic statistics that can be discussed with the FO leaders only. The FOs will be informed beforehand when possible so as to prepare these data. The information can be checked and completed before the group discussion starts.

Section 1A: General FO characteristics		
1. Ask the FO leader to start with an explanation about the history of the group and the type of activities the focus on.		(Open)
2. Region		1= Mbeya, 2 = Rukwa
3. District		1104 = Mbarali District 1105 = Mbeya Rural District 1103 = Momba District 1102 = Mbozi District
4. Ward		Name of the ward
5. Village where headquarter is located		Name of village
6. Name of FO		See codes Annex
7. Year of establishment		Year
8. Reason of establishment		(Open)
9. Type of membership (multiple answers)		1=Membership by fee 2=Contribution in terms of time 3=Contribution in terms of harvest 4=Other
10. Is the FO registered?		0=no (► q14), 1= Yes, 2=In progress (► q13)
11. Where is it registered		1 = Ministry of Home Affairs 2 = District Community Development Department 3 = District Cooperative Section 4 = BRELA (Business Names and Licensing Agency) 5 = other?
12. In which year did it got registered?		Year
13. How long did the registration process take?		Number of years
14. Why did it not (yet) register?		FO members are not aware about regulation and their importance. They only have contract with the municipal
15. What are the main crops the FO deals with?		Vegetables and local brew/ business
16. Which services are provided by the FO?		1=collective marketing, 2=input supply, 3=training, 4=post-

		<i>harvest management 5=credit, 5=other</i>
17. How many villages does the FO serve?		<i>Also list villages in section 1B.7-10</i>

Section 1B: Membership

1. Is the list of members accurate and updated?		<i>0=no, 1=yes</i>	
2. Within the FO what is the main difference between active and non-active members?		<i>1=Membership by fee</i> <i>2=Contribution in terms of time</i> <i>3=Contribution in terms of harvest</i> <i>4=Other</i> <i>5=NA</i>	
Membership statistics			
	a) 2012	b) 2013	c) 2014
3. Total membership end of the year			
4. Nr of active female members			
5. Nr of active male members			
6. Village 1*mkuyuni			
7. Village 2* _____			
8. Village 3* _____			
9. Village 4* _____			

*Please insert the names of the village

Section 1C: Performance data

Volume and value						
Crop	a) 2012		b) 2013		c) 2014	
	1.Volume	2.Value	1.Volume	2.Value	1.Volume	2.Value
1. Rice						
2. Maize						
3. Beans						
4. Soy beans						
5. Other crop 1* _____						
6. Other crop 2* _____						
7. Other crop 3* _____						
8. Other crop 4* _____						
Profit and assets						
	a) 2012		b) 2013		c) 2014	

9. % of profit used to coordinate and manage the FO?			
Assets	a) Owned 0=no, 1=yes	b) Value Tanzanian Shillings	
10. Offices			
11. Machinery			
12. Motorcycles			
13. Cars			
14. Warehouses			
15. Land			
16. Bank account			
17. Other			

*Please insert the names of the crops

SECTION 2: FO SUPPORT (EXTERNAL AND INTERNAL) AND LINKAGES

- THIS SECTION SHOULD BE DISCUSSED WITH THE ENTIRE GROUP –

Section 2A: External support			
1. Did your FO undergo any strengthening now or in the past from external agents, including in its development stage?	1		0=no (► section 2B), 1= yes
a) Area of support? 1= land preparation, 2=improved seeds 3=fertiliser 4=weeding, 5=Conservation agriculture 6=pesticide use 7=post-harvest, 8=organisation capacity building, 9=microfinance/credit 10=entrepreneurship, 11=collective marketing, 12=irrigation	b) Service provider 1 = MIVARF 2 = TASAF 3 = Technoserve 4 = District Councils 5 = HRNS 6 = Others		c) Year(s)?
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Section 2B Internal Organisation		
1. Number of functional committees?		Number
2. Total number of women in leadership positions within FO		Number
3. Positions held by women leaders within FO - Chairperson		0=no, 1=yes

4. Positions held by women leaders within FO – Vice Chairperson		0=no, 1=yes
5. Positions held by women leaders within FO – Secretary		0=no, 1=yes
6. Positions held by women leaders within FO – Treasures		0=no, 1=yes
7. Number of leaders having received training (including committee leaders)		Number
8. Activities organized by the FO last year		0
9. Total number of farmers' activities organized last year by the FO		0
Type of media	a) Used 0=no, 1=yes	b) Content (multiple response) 1= land preparation, 2=improved seeds 3=fertiliser 4=weeding, 5=Conservation agriculture 6=pesticide use 7=post-harvest, 8=organisation capacity building, 9=microfinance/credit 10=entrepreneurship, 11=collective marketing, 12=irrigation
10. Radio		
11. Information boards		
12. Mobile phones		
13. Verbal		
14. Other?		

Section 2C: Linkages							
Type of link	a) Linkages? 0=no, 1=yes	b) Direct or Indirect (number)		c) Formal or Informal (number)		d) Type of formal linkages? 1=MoU, 2=contract 3=other (specify)	e) Why no (formal) linkages? (Open)
		1) direct	2) Indirect	1) formal	2) informal		
1. Agrodealers (small or large)							
2. Traders							
3. Processors							
4. Warehouses							
5. Extension agents							

6. Financial institutions / MFIs							
7. Other FOs (for aggregation)							
8. SMEs							

SECTION 3: TENSION CONTAINMENT TOOL

Introduction for participants

- This section includes some categorised and open ended questions related to the challenges and tensions that can occur in a farmer organisation. You will discuss seven potential tensions.
- Explain this section is not a question and answer session, and that they are encouraged to ask for clarifications, use elaborate examples and that there are no “right” answers.

Notes to the researchers

- The tensions will be asked for the main crops as identified under question 9. If the FO is involved in different crops, make sure to highlight the difference for different crops for each tension.
- First ask members whether they think it is a challenge/problem, and if so, whether and how the FO is trying to solve this. After this, ask leaders. This is important to prevent the discussion from being taken over or lead by the leaders only.
- In case the group is still at an early stage of development, you can ask them to talk about the strategies and plans they have (or don't have) to prevent these issues from arising in the future.

3A: Tension 1 ‘Regulating Member Supply’

Description: When output markets are constrained, tensions can emerge when individual members increase their supply to the marketing organisation, and, by doing so, negatively affect the opportunity for other members to supply.

Relevance		
1. Does it happen that the FO collects/buys/sells less than members supply?		0=no, 1=yes
2. Do some members complain because the group does not buy/sell all their product?		0=no, 1=yes
3. Is this tension relevant for this FO (also relevant if already solved)		0=no, 1=yes
4. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		.
If relevant: solutions		
5. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes
6. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (<u>probe for strength on this issue</u>)		(Open)
7. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions

If not relevant:		
8. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		
Other influencing factors		
9. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		

3B: Tension 2 'Quality Assurance Systems'

When a deal is made, the quality that the organisation has promised has to be checked: individual members may tend to deposit lower quality and the organisation needs a system to maintain minimum quality requirements..

Relevance		
1. Does the FO have a quality control system?		0=no, 1=yes
2. Do some members try to deliver products that are below the required quality?		0=no, 1=yes
3. Is this tension relevant for this FO (<u>also relevant if already solved</u>)		0=no, 1=yes
4. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		
If relevant: solutions		
5. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes
6. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (<u>probe for strength on this issue</u>)		(Open)
7. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions
If not relevant:		
8. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		
Other influencing factors		
9. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		

3C: Tension 3 'Reduce the need for working capital'

Many smallholder farmers tend to face cash constraints and want quick payment, while the organisation needs time to complete transactions with the ultimate buyer.

Relevance		
1. Does the FO pay (part) of the value of produce up front?		0=no, 1=yes
2. Do members press for cash payment for their product even when the organisation has not yet sold the product?		0=no, 1=yes
3. Is this tension relevant for this FO (<u>also relevant if already solved</u>)		0=no, 1=yes

4. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		
If relevant: solutions		
5. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes
6. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (<u>probe for strength on this issue</u>)		(Open)
7. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions
If not relevant:		
8. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		
Other influencing factors		
9. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		

3D Tension 4 'Prevention of disloyal behaviour'

The organisation might provide a credit service or advance payment system to enable production. However, there is a risk that farmers "side-sell" their product to competing buyers to whom they have no repayment obligation.

Relevance		
1. Do some members sell part of their product to other buyers, though they promised to sell to the organisation?		0=no, 1=yes
2. Is this tension relevant for this FO (<u>also relevant if already solved</u>)		0=no, 1=yes
3. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		
If relevant: solutions		
4. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes
5. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (<u>probe for strength on this issue</u>)		(Open)
6. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions
If not relevant:		
7. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		
Other influencing factors		

8. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		
3E Tension 5 'Ways to distribute Profits'		
When the organisation makes profit, the organisation prefers to invest or increase financial reserves, while the members prefer more short-term benefits, e.g. better prices.		
Relevance		
1. Do members accept that the organisation does not distribute all profit but retains part of it to reinvest?		0=no, 1=yes
2. Is this tension relevant for this FO (<u>also relevant if already solved</u>)		0=no, 1=yes
3. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		
If relevant: solutions		
4. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes
5. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (<u>probe for strength on this issue</u>)		(Open)
6. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions
If not relevant:		
7. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		.
Other influencing factors		
8. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		

3F Tension 6 'Differ benefits and services to Members and Non-Members'		
Most economic organisations need contributions from members to realise their business opportunities. However, members face a number of disincentives to do so when benefits accrue to members and non-members alike.		
Relevance		
1. Is there a preferential treatment (e.g. price difference) when buying from members compared to non-members?		0=no, 1=yes
2. Is this tension relevant for this FO (<u>also relevant if already solved</u>)		0=no, 1=yes
3. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		
If relevant: solutions		
4. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes

5. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (probe for strength on this issue)		(Open)
6. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions
If not relevant:		
7. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		
Other influencing factors		
8. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		

3G Tension 7 'Delegating and supervising marketing tasks'

Organisations may have board members or professional staff that negotiate prices for them. They need rules to do be assured that these are doing this job well, while giving them sufficient room for effective commercial decision making.

Relevance		
1. Do members accept that others take decisions about the price of products that are sold by the organisation without prior consult of the general assembly of members?		0=no, 1=yes
2. Is this tension relevant for this FO (also relevant if already solved)		0=no, 1=yes
3. Ask for examples given to back up <u>whether, why and how</u> they consider a tension relevant or not relevant?		
If relevant: solutions		
4. Does the FO solve/manage/prevent this problem/challenge/issue from occurring?		0=no, 1=yes
5. Ask for the rules/mechanisms/procedures that the FO uses to manage and resolve the tension. Ask for examples of <u>how</u> they have been used in practice. (probe for strength on this issue)		(Open)
6. Did the FO manage to resolve it with rules and regulations (1) or in the process of finding rules and regulations to resolve it (2) or did not need to resolve the issue (because not applicable or nothing is being done) (3)		See codes in questions
If not relevant:		
7. Which strategies and plans does the FO have (or don't have) to prevent these issues from arising in the future? <u>Why and how?</u>		
Other influencing factors		
8. Ask for other <u>external</u> factors influencing their organisational capacity that enables the group to manage or not manage the tensions		No any

SECTION 4 - CLOSING

4A Closing questions and remarks	
1. Please ask the group if there are any questions and remarks Questions / Remarks raised by the group	
2. Food security (based on Ethiopia questions: Is/are there some month(s) where members of the group faced shortage of food in their household? a) If yes which month(s)? b) If yes why?	

SECTION 5 - Capacity Performance Index

- THIS SECTION CAN BE DISCUSSED WITH FO LEADERS ONLY –

Section 5: Capacity Performance Index		
5A	Accountability	0= no, 1=yes
1	Does this FO have an executive committee?	
2	Does the executive committee consist of at least five people?	
3	Is there a performance evaluating system for the executive committee?	
4	Are FO decisions made in a participatory nature?	
5	Is this FO registered in the country?	
6	Does this FO have a constitution?	
7	Do members have access of the constitution?	
	Does this FO keep the following records?	
8	i) member registration records	
9	ii) meeting and training records	
10	iii) aggregation records of harvesting forecast,	
11	iv) Purchase and sales records	
12	v) financial records	
13	Does this FO has a functional/operational bank account?	
5B	Professional Capacity	0= no, 1=yes
14	Does this FO have an Internal auditor/internal audit team?	
	Does this FO have the following people with primary school qualification?	
15	i. Chairperson/President	
16	ii. CEO / Manager/Secretary	
17	iii. Treasurer	
18*	Doe this FO have a skilled human resources manager	
19	Does the staff have access to further training opportunities?	
5C	Income diversification	0= no, 1=yes
20	Does this FO have more than one source of funding?	

21	Are membership dues being paid?	
22	Does this FO charge membership/registration fee?	
23	Does this FO receive external income?	
24	Has the size of membership increased by 10-15% in the past 2 production seasons?	
25	Does this FO specialise in more than one crop production?	
26	Does this FO specialise in more than one livestock production?	
5D	Strategic potential	<i>0= no, 1=yes</i>
27	Does this FO have a vision and a mission statement?	
	Does this FO have the following business plans?	
28	Production plan	
29	Marketing plan	
30	Investment plan	
5E	Production Management	<i>0= no, 1=yes</i>
31	Does this FO assist members in soliciting agricultural finance?	
32	Does this FO collectively buy inputs?	
33	Does this FO monitor quality of collectively sourced inputs?	
34	Does this FO have production management committee?	
5F	Marketing	<i>0= no, 1=yes</i>
35	Does this FO collectively market members' produce?	
36	Does this FO provide storage facilities for members	
37	Does this FO have any linkages with an aggregating centre?	
38	Does this FO provide collective transport to the market for its members?	
39	Does this FO sell members' produce collectively?	
40	Does this FO provide members with marketing information?	
41	Does this FO arrange contractual marketing arrangements for members?	
5G	Participation	<i>0= no, 1=yes</i>
42	Does this FO keep members' profile and activities information?	
43	Does this FO have youth in its leadership positions?	
44	Does the FO have women in leadership positions?	
45	Does this FO carry out annual general meetings?	
46	Does this FO arrange training for members?	
47	Do FO members meet at least once every month?	
5H	Advocacy	<i>0= no, 1=yes</i>
48	Are the activities of this FO known outside its operational area?	
49	Are the activities of this FO known within its operational area?	

50	Does this FO have a network of more than 2 organisations?	
51	Does this FO participate in lobbying?	

CODES FOs

FO CODE	Name of the group
1	Apple
2	Pipeline
3	Ipatagwa
5	Kapunga SACCOS
6	Kongolo
8	Ruanda Majenje
9	Vumilia
7	Njalalila
4	Awesije
10	Madibira AMCOS
11	Amkeni
33	Songambebe
12	Ilowelo Group
13	Lwanjilo Group
15	Simboya Group
14	Umoja wa Umwagiliaji Simboya
16	Iyawaya Group
17	Mshewe Irrigators
18	Ilembo Usafwa AMCOS
19	Jipemoyo AMCOS
20	Ulenje AMCOS
21	Iwindi AMCOS
22	Ndalambo Cooperative Society
23	Tunduma SACCOS
24	Tunduma Mixed Producers
25	Momba Farmers Association
26	Tunduma Border Market
35	Chama cha Wafugaji Isangu
27	Myunga Group
28	Umoja Farmers Association
30	Ruanda AMCOS
31	Imasha AMCOS
36	Hasambo AMCOS
29	Migoneka AMCOS
32	Nandanga Association
34	Mpemba Association
37	Ushirika wa uzalishaji mali Ilembo
39	Upendo SACCOS
36	Hasambo AMCOS
39	Upendo SACCOS
38	Shiwinga AMCOS
41	Malolo AMCOS
40	Isumi AMCOS
42	Isalalo AMCOS
43	Mlangali AMCOS
44	Mwanda AMCOS

46	Nkana AMCOS
45	Insani AMCOS
47	Zyola Farmers Group
48	Halungu SACCOS
49	Igamba SACCOS
50	Isimu Group
51	Nufaika SACCOS

CODES CROPS

1 = Maize 2= Rice 3 = Beans = Soya beans 4 = Wheat 5 = Cassava 6 =Sorghum 7 = Finger millet 8 = Yam 9 = Banana 10 =Round Potato 11 = Sweet Potato 12 =Oil palm 13 = Sesame 14 =Sunflower 15 =Bambara nuts 16 =Groundnuts 17 =Cow peas 18 = Green gram 19 = Pigeon peas 20 = Sugarcane 21 = Amaranth 22 = Coffee 23=Tomato 24 =Onion 25 =Okra 26 =Cabbage

Appendix D: Pre-analysis plan

Integrated development programmes in Sub Sahara Africa: Does a multi-faceted market- based approach to food crops stimulate food security and agricultural development in the breadbasket of Tanzania

Marrit van den Berg⁹

Pre- Analysis Plan

1. Introduction

In this pre-analysis plan, we outline our empirical strategy for analysing data collected to assess the impact of the Integrated Project to Increase Agricultural Productivity (IPIAP), an intervention aimed at promoting market integration and agricultural productivity in Tanzania. We collected baseline data from 4 districts in which the project was implemented and in which treatment assignment was randomised by the implementing agencies in 2014/2015, and we will collect end-line data in autumn 2016. Both rounds of data collection are carried out by Wageningen University and Research Centre- Development Economics group while the project was implemented by a consortium of NGOs: SNV- Tanzania, Ruvuma Commercialisation and Diversification of Agriculture (RUCODIA), African Conservation Tillage Network (ACTN) and CRDB Microfinance Company Limited. The following sections outline the evaluation design, hypotheses for intermediate and final outcomes, the outcome variables that we will use to test these hypotheses and the econometric methods we will employ in the analysis.

2. Overview

2.1. Background and project overview

Tanzania has a history of state control over marketing in the agricultural sector, and the private-sector market integration for agriculture is still rudimentary. Moreover, agricultural productivity is low because farmers use outmoded seeds, limited amounts of fertilisers and poor agronomic practices. Agricultural products, especially maize, rice, soy beans and beans in Tanzania, are to a large extent characterized by inadequate adherence to quality standards and inadequate post-harvest management. In many developing countries, individual farmers bring goods to market through collectives, but farmers in Tanzania are relatively uncoordinated. Existing farmer often do not live up to the expectation of their members in terms of provision of financial, advisory and marketing services and a common voice on issues of common interest to their members. In addition, the capacity of agribusiness actors, particularly in marketing of the agricultural outputs and inputs are constrained by entrepreneurial skills, inadequate capital/finance, poor infrastructure, an un-conducive legal and institutional framework, and inadequate competition. Periodic export bans of staple crops lower producer prices, wages of unskilled labour and returns to land.

The project aims to increase the productivity of selected commodities (maize, rice, soy beans and beans) to competitively supply local, national and regional markets. This will be achieved

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through a value chain development approach, integrating various areas of intervention. An inclusive business model is applied to create market opportunities for farmers which are commercially viable and scalable to small-scale farmers, processing industry, buyers and agribusiness dealers to ensure reliable and timely access to quality inputs, sufficient quality, quantity and reliability of supply for processors/buyers.

The project aims to reach 45,000 smallholder farmers, of which 60 per cent (27,000) are women in Mbeya, Kyela, Mbarali, Mbozi, Momba and Sumbawanga Districts in Mbeya and Rukwa Regions. The ultimate objective is to “enable men and women smallholder farmers to benefit from improved technologies, agronomy and efficient markets necessary to improve their food security and increase household incomes.” The project’s specific objectives are fourfold and reflect the components of the integrated, chain-oriented framework: 1) to strengthen the capacity and efficiency of farmer organisations; 2) to increase smallholder market-led agricultural production; 3) to enhance smallholder farmers’ access to structured produce markets and; 4) to improve access to extension and advisory services among smallholder farmers and the private sector. The project duration is three years, beginning in 2014.

Evaluation overview

We evaluate small-scale farming households across 4 districts that benefited from the project. Baseline data collection was carried out in 2014/15 and end-line data collection will take place in late 2016. The study aims to establish the impact of the integrated project on agricultural productivity and food security, as well as the welfare of smallholder farming in the project area. We measure intermediate outcomes, which are direct effects of the programme, such as changes technologies adoption, assets and income, we hypothesise and test whether the programme has an effect on final outcomes related to household wellbeing, such as food security and consumption, nutrition, intra-household decision making and time allocation. As a large number of small-scale farmers tend to be women, the study further seeks to measure women’s empowerment in terms of intra-household decision-making. The long-term purpose of the evaluation is to contribute to knowledge about the role of integrated agricultural project in agriculture development and food security.

2.2. Evaluation Questions

Our main questions are

10. Does a market-based approach targeted at food crop production stimulate agricultural productivity?
 - To what extent does the IPIAP cause increased technology adoption?
 - To what extent does the project increase the agricultural productivity and production?
 - To what extent does the project strengthened farmer organisations and agro-dealer networks
 - Does the project improve marketed volumes and prices of food crops?
 - To what extent the project improve the income of smallholder farmers and women?
11. To what extent does the project contribute towards obtaining the targets of food and nutrition security?
 - Does the project increase food consumption and diet diversity?
 - Does the project affect the nutrition of women and children under five?
 - To what extent the project affect the women decision power in the household, and how does this affect nutrition?

3. Evaluation Design

3.1. Study Design

The impact evaluation for IPIAP is built around a randomised controlled trial (RCT). Between December 2014 and April 2015, baseline data collection was conducted to allow the study team to accurately describe characteristics of beneficiary households before receiving IPIAP interventions. The baseline household survey was conducted between December 2014 and February 2015, while qualitative baseline interviews were conducted from mid of March 2015 to early April 2015. This data will be compared to data to be collected in the follow-up round two years from that to assess the full impacts of the IPIAP's outcomes. Data from the control group will allow the researchers to identify which impacts over time are directly attributable to the IPIAP interventions, controlling for outside influences. This is done by taking the overall impacts experienced by beneficiaries and subtracting the impacts also experienced by control households. The remaining impacts are those directly related to the interventions.

3.2. Assignment to Treatment

The selection of treatment and control wards was conducted in collaboration with implementing consortium members and the district agriculture office of the respective project districts. Based on project-based selected criteria, 51 eligible wards from six districts were identified for IPIAP interventions. For Sumbawanga and Kyela district all the eligible wards were selected for treatment, and we therefore exclude them in our evaluation. From the eligible wards in the remaining four districts (Mbeya, Mbozi, Momba and Mbarali districts), SNV selected 25 treatment wards, leaving 16 control wards (Table 1). They state that the selection was stratified by district and random within the district. Once the treatment and control wards were selected, the evaluation team compiled a list of all FOs in each ward. In principle, all FOs were included in the evaluation. Yet, we failed to reach two control wards in Mbeya rural and Momba Districts due to bad weather in combination with poor infrastructure. This further decreased the size of our control group. In total, our sample for the farm household survey included 51 FOs: 32 in the treatment wards and 19 controls in control wards. During the FO survey, we located and interviewed two additional control FOs that had just been founded.

Table 1: Treatment and Control Samples

District	Treatment		Control	
	Wards	FOs	Wards	FOs
Mbeya rural	10	6	2	6
Mbozi	5	13	5	6
Mbarali	5	5	5	5
Momba	5	8	4	2
Total	25	32	16	19

We randomly selected members for interviews from the FO membership lists. We interviewed on average about one third of all FO members. Some of the FO members from the list dropped their membership and others had died or moved to another districts. Members who we were unable to interview were replaced by other individuals, randomly selected from the membership list.

3.3. Data Collection Methods and Instruments

For each household, we administered 2 surveys. The household-head survey included information on household characteristics as well as detailed information on agricultural inputs and outputs, land cultivated and information on sales of crops including timing, price and quantity. We also surveyed a female household member—usually the wife of the household head (for female-head households, the procedure was for household head to complete both surveys). This second survey included information on family members, food consumption, childhood education, intra-household decision making and expenditures. The survey instruments are attached.

Data collection occurs in 2 waves:

- 1) Baseline survey: conducted in December 2014-January 2015 (household level) March-April 2015 (FO level).
- 2) Endline survey: to be conducted in autumn 2016 (household level), spring 2017 (FO level).

The survey instruments for endline survey will contain the same time-variant variables of interest as the baseline survey. In addition, we add time allocation questions to the household survey.

3.4. Risk and Treatment of Attrition

To prevent attrition, we will track respondents using: phone number, GPS co-ordinates and social networks in their village and farmer organisation.

Among the sample who were successfully surveyed at baseline, we will test whether attrition is balanced across treatment groups by using a simple t-test. If there is no difference at the 5% level, we will not account for attrition in our econometric specifications. If there is a statistically significant difference we use propensity-score based weights to account for this.

4. Hypotheses:

In this section we present two sets of hypotheses related to the effect of treatment on intermediate and final outcomes described in Tables 2-3.

H1: Access to credit will increase at a higher rate in the treatment group.

H2: Sale prices available to farmers will increase at a higher rate in the treatment group.

H3: Farmers in the treatment group will wait comparatively longer after harvest to sell crops when prices are higher.

H4: The portion of output sold will increase at a higher rate in the treatment group.

H5: Output of crops grown for consumption will be affected by treatment:

H5a: Increase in treatment wards relative to control wards, indicating complementarities to increased production of crops for sale.

H5b: Decrease in treatment wards relative to control wards, indicating that market integration crowds out production for household consumption.

H6: Individuals in the treatment area will be more likely to use improved agricultural techniques and technologies.

H7: Improved agricultural techniques will lead to higher yields.

H8: Yields and production will increase at a higher rate in the treatment group.

H9: Farmers' organisations in the treatment group will become comparatively more effective in terms of:

H9.1: Range of activities

H9.2: Percentage of crops households sell through the farmers' organisation.

H9.3: Links between the Farmer's organisation with outside organisations.

H9.4: Frequency of meetings.

H10: There will be a change in the number of conflicts reported within Farmers' organisation in the treatment group compared to the control.

H10.a: Conflicts will increase in treatment wards compared to control.

H10.b: Conflicts will decrease in treatment wards compared to control.

Hypotheses for final outcomes:

H11: Household overall household expenditures will increase at a higher rate in treatment wards.

H12: Women's household bargaining and decision-making power will be affected by treatment.

H.12a: Women's bargaining and decision-making power will *increase* at a higher rate in the treatment group.

H.12b: Women's bargaining and decision-making power will *decrease* at a higher rate in the treatment group.

H.13: Childhood nutrition will be affected by treatment:

- **H.13.a:** Improve in treatment wards compared to control due to increase in yields and cash income.
- **H.13.b:** Decrease in treatment wards compared to the control due to shift from agricultural production for consumption to production for sale.

H.14: Education outcomes for children will increase in treatment wards relative to the control.

H.15: Any changes in female empowerment as a result of treatment **[H12]** will also affect child nutrition.

H.16: Heterogeneous effects: initial household bargaining power interacts with treatment. We hypothesise that households in which women have higher relative bargaining power (or female-headed households) will demonstrate larger relative improvements in terms of childhood health and nutrition.

H.17: Female participation rate in income generating activities be affected by treatment:

H.17a: Female participation rate will increase at a higher rate in the treatment group, responding to an increased marginal return of labour that results from increased market integration and increased higher market prices for crops.

H.17.b: Female participation rate will decrease at a higher rate in the treatment group, as female market participation is crowded out by male activity as profit margins for crop sales increase.

5. Outcomes of Interest and Empirical Strategy

5.1. Outcomes of interest

We will address the evaluation questions proposed in section 2.3 by analysing the following outcome variables, which were measured in the baseline survey and will be included in the end-line survey as well. We divide these into intermediate, which measure direct effects of the project and final outcomes, which represent changes in well-being that are the ultimate goal of the intervention.

Table 2: Intermediate outcomes

<i>Outcome</i>	<i>Description</i>
Access to and use of credit [H1]	Loans from: -- micro-finance institutions -- community members and families Buying supplies from agro-dealers on credit.
Sale price of crops sold [H2]	For each crop that was sold, price at time period it was sold.
Time of year crops sold [H3]	Amount sold at various intervals of time for each crop: before harvest, within 1 month of harvest, between 1-6 months after harvest and later than 6 months after harvest.
Sales volume of crops grown [H4]	Amount sold on the market for each crop grown.
Volume of food-production for own consumption [H5]	<i>(total production – sales volume)</i> , for each crop grown.
Use of improved agriculture technologies [H6-7]	--crop residuals --zero tillage --chemical fertiliser --herbicides --pesticides --improved seeds --organic fertiliser
Total production (yield) [H7-8]	Total amount of a given crop produced (divided by land cultivated).
Farmers' organisation activities [H9-10]	Measured at FO level: --range of activities --links to outside organisations --frequency of meetings --tension containment capacity --female participation rate

Table 3: Final Outcomes

<i>Outcome</i>	<i>Description</i>
Household expenditures [H11]	Total expenditures: --Food --Funerals --Education --Festivals --Housing --Charity --Insurance --Clothing --Weddings
Women's intra-household bargaining power [H12, 15, 16]	-- Self-reported survey measures of who makes financial decisions in several domains for the household including food, durable goods, school fees, savings, medical expenses and the distribution of household money. -- Results from an incentivized task, in which women choose between receiving a sum of money themselves, or their husbands receiving a greater amount.
Food security and nutrition [H13]	--dietary diversity score, based on consumption of 11 categories of food (24 hr recall). --number of months without sufficient food --Household Hunger Score (See Appendix) --anthropetric measures for children living in the household, including Height for Age, Weight for Age and Weight for height). --BMI of women in the household
Children's education [H14]	Share of school-age children enrolled/attending school.
Women's time use: domestic vs. income-generating activities [H17]	Time allocation during rainy and dry season; and leisure time, non-leisure and social activities (e.g. faith-based activities) (endline only).

5.2. Econometric Approach

Differences in Differences

Our identification strategy is based on randomization. However, rather than simply comparing post-treatment outcomes between treated and un-treated observations, we will exploit the fact that we have baseline data and use a difference-in-differences (DID) regression model. Adding controls for baseline outcomes reduces standard errors and increases the statistical power for detecting treatment effects. Given that we have a relatively low number of treatment units, and expect to observe intra-cluster correlation—due to similarities in environmental market

conditions from ward to ward—this is an especially useful extension of simple randomization as an identification strategy.

Our basic regression model is:

$$Y_{ijt} = \alpha + \beta_1 Post_t + \beta_2 D_j + \beta_3 Post_t * D_j + \gamma X_{ijt} + \varepsilon_{ijt},$$

Where Y_{ijt} denotes an outcome variable for respondent i in farmer organisation j , at time t ($t=0$ or $t=1$, in the baseline and end-line survey, respectively). D_j is a dummy variable equal to one if the respondent belonged to the treatment group, $Post_t$ is a dummy that indicates data at endline (i.e. $t=1$). X_{ijt} is a set of controls, and ε_{ijt} denotes the error term; we will cluster standard errors at the farmer-organisation and/or ward level.

For each outcome Y_{ijt} , described in Tables 2-3, the main coefficient of interest is β_3 , which is the difference between the change in outcomes from baseline to end-line in across treatments. Thus, if $\beta_3 > 0$ at the conventional level statistical significance (5%), this indicates that the treatment effect was positive.

Propensity score matching

While the DID approach theoretically provides an unbiased estimate of the average treatment effect on the treated (β_3), we will also employ propensity score matching to overcome potential problems related to treatment assignment. DID implicitly assumes that any time variant shocks—for example market and environmental shocks—affect treatment and control wards similarly, on average (Blundell and Costa-Dias, 2009). Given that we have a relatively small number of treatment clusters, it is possible that this would not be the case.

To mitigate this, we will construct a propensity score that predicts treatment assignment using observable control variables as well as outcomes at baseline. This will be done using a probit model, with treatment assignment as the outcome variable. Using coefficient values, it is then possible to create a score for each observation which predicts assignment to treatment.

We will construct propensity scores at the household level using baseline data on the following categories of variables: household demographics; household expenditures, measures of food security and anthropomorphic outcomes for children; female intra-household bargaining power; use of agricultural technology; and characteristics of household farms, including crops grown, plot sizes, production and measures of agricultural market integration. (These variables are described, along with means and balancing tests using the baseline data in Tables A.1-A.2 in the Baseline Report).

Our strategy is to use a DID analysis on the sub-sample of common support, which is defined as observations that fall within the range of propensity scores that include both treatment and control observations.

Heterogeneous effects

We will study heterogeneous effects of the treatment on several groups. First, as we discuss in **H16**, why hypothesise women's initial bargaining power will affect treatment effect. In addition, we will analyse how treatment affects might differ between households begin growing certain crops, initial market integration and between established and newer farmer organisations.

References

- Blundell, Richard and Monica Costa Dias. 2009. "Alternative Approaches to Evaluation in Empirical Microeconomics." *Journal of Human Resources*, 44 (3), **565-640**.
- Rosenbaum, Paul, and Rubins Donald. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70 (1): 41–55.

Appendix

Household Hunger Score

M.2.1	In the past 30 days, was there ever no food to eat of any kind in your house?	1 = Yes 2 = No, if no -> go to M.4.1
M.2.2	Was this because of lack of resources to get food?	1= Yes 2 = No, please specify
M 2.3	How often did this happen in the past 30 days?	1= Rarely (1-2 times in past 30 days)
		2 = Sometimes (3-10 times in past 30 days)
		3= Often (more than 10 times in past 30 days)
M 2.4	In the past 30 days, did you or any household member go to sleep at night hungry because there was not enough food	1 = Yes 2 = No
M 2.5	How often did this happen in the past 30 days?	1= Rarely (1-2 times in past 30 days)
		2 = Sometimes (3-10 times in past 30 days)
		3= Often (more than 10 times in past 30 days)
M 2.6	In the past 30 days, did you or any household member go a whole day and night without eating anything at all because there was not enough food?	1 = Yes 2 = No
M 2.7	How often did this happen in the past 30 days?	1= Rarely (1-2 times in past 30 days)
		2 = Sometimes (3-10 times in past 30 days)
		3= Often (more than 10 times in past 30 days)

Appendix E: Sample size and power calculations

source nutrition data		REPOA 2004 and DHS 2004/05																	
source other data		NPS 2008/2009																	
Note: indicators and numbers are indicative.																			
farm-level indicators		data		calculations (do not change cells with orange background!)								parameters for simulation							
proportions		current proportion		intra-cluster correlation	after proportion	average proportion	minimum group size	minimum group size with cluster correction (cc)	minimum group size with cc & attrition	total sample size	Z α	Z β	d1	d2	m	a			
% children stunted		0.4		0.00	0.47	0.43	910	910	1092	2183	1.96	0.84	6.5%	20.0%		9			0.2
% children underweight		0.20		0.00	0.27	0.23	661	661	793	1587									
Means		Mean	sd	intra-cluster correlation			minimum group size	minimum group size with cluster correction (cc)	minimum group size with cc & attrition	total sample size							parameters (information)		
<i>maize</i>																	power (β) Z β (one sided)		
yield		477	414	0.00			295	295	354	709							80%		0.84
sales		344	681	0.00			1536	1536	1844	3687							90%		1.28
price		1,195	453	0.00			56	56	68	135							significance level Z α (two sided)		
<i>rice</i>																	5%		1.96
yield		676	758	0.00			493	493	591	1183							10%		1.64
sales		547	221	0.00			64	64	77	154							number of groups		
price		792	1,008	0.00			635	635	762	1524							2		
<i>beans</i>																			
yield		142	140	0.00			380	380	456	913									
sales		145	261	0.00			1270	1270	1524	3048									
price		906	2,068	0.00			2042	2042	2451	4902									
<i>other</i>																			
food consumption/capita		329,488	212,404	0.00			163	163	195	391									
expenditures/capital		438,668	311,355	0.00			197	197	237	474									
Minimum sample size all									2451	4902									

simulation results										
parameter definition										
power	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
significance level	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
attrition	10	10	10	10	10	10	10	10	10	10
cluster size	NR	NR	NR	NR	NR	9	9	9	9	9
ICC	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1
difference of means	10%	15%	20%			10%	15%	20%		
difference of proportions				6.5%	7.5%				8.5%	10.0%
group size	800	800	800	800	800	800	800	800	800	800
sufficient power for	food consumption/capita, expenditures/capita, maize price, rice sales	id+maize yield, beans yield	id+rice yield, rice price	% underweight	id+% stunted		maize price, rice sales	id+food consumption/capita, expenditures/capita	% underweight	id+% stunted
simulation results										
parameter definition										
power	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
significance level	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
attrition	20	20	20	20	20	20	20	20	20	20
cluster size	NR	NR	NR	NR	NR	9	9	9	9	9
ICC	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1
difference of means	10%	15%	20%			10%	15%	20%		
difference of proportions				6.5%	8.0%				9.0%	10.5%
group size	800	800	800	800	800	800	800	800	800	800
sufficient power for	food consumption/capita, maize price, rice sales	id+maize yield, expenditures/capita	id+rice yield, rice price, beans yield	% underweight	id+% stunted		maize price, rice sales	id+food consumption/capita	% underweight	id+% stunted

Appendix F. Additional Tables

Table A.1: Propensity score

	Assigned to treatment (1)
Number of hh members	0.09** (0.04)
Number of children 0-5	-0.13* (0.07)
Number of children 6-12	-0.08 (0.06)
Number of children 13-18	-0.03 (0.06)
Age of hh head	0.01 (0.01)
Age of hh female respondent	-0.00 (0.00)
Female HH head	0.01 (0.31)
Education of level of hh Head	-0.04 (0.05)
Education of HH*Female HH head	-0.11 (0.09)
Total cultivated land (acres)	-0.01 (0.01)
Food insecurity in past 12 months	-0.08 (0.11)
Dietary diversity score	0.07 (0.06)
<i>Crops grown</i>	
Maize	0.25 (0.16)
--Rice	-0.29 (0.57)
--Beans	-0.07 (0.18)
--Peanuts	-0.02 (0.21)
--Soya	-0.06 (0.34)
--Coffee	0.43 (0.31)
--Wheat	-1.44*** (0.52)
--Casava	-0.52 (0.44)
--Millet	-0.33 (0.48)
--Bananas	-0.59

	(0.41)
--Potatos	-0.02
	(0.40)
--Sweet potatos	0.74**
	(0.32)
--Sesame	-2.16***
	(0.65)
--Sunflower	-0.25
	(0.18)
--Sugar cane	0.61
	(0.69)
--Amaranth	0.27
	(0.48)
--Tomato	-0.32
	(0.27)
--Onion	0.03
	(0.31)
<i>Household expenditures</i>	
<i>(TZS)</i>	
--Education	-0.00
	(0.00)
	0.00
	(0.00)
--Housing	0.00**
	(0.00)
--Furniture & appliances	-0.00*
	(0.00)
--Insurance	0.00
	(0.00)
--Weddings	0.00
	(0.00)
--Clothing	-0.00
	(0.00)
--Funerals	-0.00
	(0.00)
--Festivals	0.00
	(0.00)
--Church & charity	0.00
	(0.00)
--Credit	0.00
	(0.00)
Value of small assets	0.00
	(0.00)
Balance of big assets	0.16
	(0.21)
<i>Assets</i>	
--Phone	-0.13
	(0.17)
--Generator	-0.66***
	(0.16)
--Bicycle	-0.45**
	(0.23)
--Cattle	-0.27*
	(0.16)

--Goat	0.09 (0.11)
--Chicken	0.10 (0.16)
--Pig	0.11 (0.12)
--Other animals	0.14 (0.38)
Constant	0.59 (0.60)
Observations	1,153
Pseudo R-squared	0.134

Note that we calculated the propensity score based on household and farm characteristics that we considered ex-ante to be potentially important differences between treatment and control villages. However, the balancing property was not satisfied. Moreover, if the propensity score is a strong predictor of treatment assignment, one would expect the pseudo r-square of the probit regression on the matched sample to be lower than on the entire sample. In fact, we do not find this to be the case. The pseudo r-squared for the whole sample and matched sample is 0.134 and 0.144, respectively. Because of this, we take the matching estimates with a grain of salt and prefer to rely on the double-robust estimator.

Table A2: Treatment in Intra-household bargaining experiment

Treatment	Work allocation by			Combined work per spouse	Combined income per spouse	Total Household Income	Sample	
	spouse and task						(W,H)	(H,W)
	$f(x) = x$	$f(x) = 2x$	$f(x) = x/2$					
1	(2,2)			(2,2)	(2,2)	4	43	--
2	(1,2)			(1,2)	(1,2)	3	34	29
3	(1,3)			(1,3)	(1,3)	4	30	29
4	(1,0)	(0,2)		(1,2)	(1,4)	5	26	27
5	(1,0)	(0,1)		(1,1)	(1,2)	3	28	29
6	(1,0)	(1,1)		(2,1)	(3,2)	5	28	27
7	(1,2)		(2,0)	(3,2)	(2,2)	4	30	28

Table A3 Comparison of Male- and Female- Headed Households

	Male-headed households			Female-headed Households		
	Treatment (1)	Control (2)	Difference (3)	Treatment (4)	Control (5)	Difference (6)
<i>Crops grown</i>						
-- Maize	0.95 (0.21)	0.94 (0.24)	0.01	0.99 (0.09)	0.86 (0.35)	0.13
-- Rice	0.21 (0.41)	0.26 (0.44)	-0.05	0.23 (0.42)	0.59 (0.50)	-0.36
-- Beans	0.66 (0.48)	0.68 (0.47)	-0.02	0.67 (0.47)	0.47 (0.50)	0.2*
-- Peanuts	0.33 (0.47)	0.27 (0.45)	0.06*	0.27 (0.45)	0.22 (0.42)	0.05***
-- Coffee	0.28 (0.45)	0.13 (0.34)	0.15***	0.11 (0.31)	0.02 (0.13)	0.09**
Number of HH residents	5.53 (2.16)	5.24 (2.00)	0.29*	3.65 (1.77)	3.69 (1.97)	-0.04*
Children under 5	0.61 (0.73)	0.7 (0.77)	-0.09*	0.19 (0.45)	0.28 (0.49)	-0.09
Children 6-12	1.22 (1.09)	1.25 (0.99)	-0.03	0.8 (0.87)	0.93 (0.99)	-0.13**
Children 13-18	0.94 (0.96)	0.77 (0.84)	0.17**	0.73 (0.90)	0.72 (0.85)	0.01***
Age of HH head	49.06 (13.18)	46.18 (13.42)	2.88***	49.6 (11.79)	49.26 (13.94)	0.34**
Age of 2 nd HH member (wife)	40.36 (11.68)	38.74 (11.76)	1.62**			
Education of HH head	3.15 (1.40)	3.32 (1.68)	-0.17	2.46 (0.98)	2.79 (1.52)	-0.33
Total cultivated land (acres)	6.04 (8.82)	7.62 (13.99)	-1.58**	4.18 (10.75)	6.09 (13.24)	-1.91*
<i>Household expenses</i>						
-- School	313.88 (933.68)	779.82 (8852.32)	-465.94	254.83 (578.44)	172.06 (381.13)	82.77
-- Other education	89.93 (192.74)	70.61 (123.06)	19.32	167.87 (971.34)	46.55 (63.61)	121.32
-- Housing	170.31 (810.54)	114.43 (371.82)	55.88	180.86 (692.48)	87.07 (260.60)	93.79

-- Furniture	15.22 (66.52)	18.66 (67.67)	-3.44	17.4 (70.34)	145.09 (1032.97)	-127.69
-- Insurance	11.65 (129.13)	4.1 (22.05)	7.55	2442.44 (27930.38)	183 (1323.89)	2259.44
-- Weddings	53.9 (378.26)	50.34 (171.19)	3.56	42.63 (139.74)	27.39 (39.52)	15.24
--						
Clothes/shoes	129.92 (378.54)	116.86 (254.57)	13.06	74.64 (112.43)	187.26 (792.44)	-112.62
-- Funerals	73.62 (516.04)	7146.05 (115167.84)	-7072.43	20.7 (30.04)	46.02 (135.93)	-25.32
-- Festivals	33.55 (363.92)	32.81 (173.16)	0.74	102.49 (1000.22)	12.59 (38.26)	89.9
-- Church charity	386.54 (8949.36)	47.01 (75.28)	339.53	42.93 (75.49)	939.02 (6822.41)	-896.09*
-- Credit	210.74 (1086.37)	152.85 (685.60)	57.89*	112.2 (382.45)	270.34 (901.23)	-158.14
Face food insecurity	0.19 (0.39)	0.22 (0.41)	-0.03	0.31 (0.46)	0.29 (0.46)	0.02
Total asset value	1726.45 (9522.63)	1330.89 (5638.04)	395.56	468.84 (1067.95)	2296.23 (13149.66)	-1827.39*
<i>Assets owned</i>						
--Big	0.68 (0.46)	0.74 (0.44)	-0.06*	0.29 (0.45)	0.48 (0.50)	-0.19**
--Phone	0.79 (0.40)	0.85 (0.36)	-0.06**	0.67 (0.47)	0.78 (0.42)	-0.11
--Generator	0.05 (0.21)	0.07 (0.26)	-0.02	0 (0.00)	0.02 (0.13)	-0.02**
--Bicycle	0.61 (0.49)	0.68 (0.47)	-0.07**	0.23 (0.43)	0.43 (0.50)	-0.2
--Cattle	0.5 (0.50)	0.53 (0.50)	-0.03	0.27 (0.45)	0.26 (0.44)	0.01
--Goat	0.41 (0.49)	0.36 (0.48)	0.05	0.25 (0.43)	0.23 (0.42)	0.02
--Chicken	0.73 (0.44)	0.71 (0.46)	0.02	0.67 (0.47)	0.61 (0.49)	0.06
--Pig	0.13 (0.34)	0.16 (0.36)	-0.03	0.13 (0.34)	0.12 (0.33)	0.01
--Other animals	0.02 (0.13)	0.01 (0.10)	0.01	0.01 (0.09)	0 (0.00)	0.01
N=	872	292		132	57	