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Agriculture Support Services in Malawi: Direct Effects, Complementarities, and Time Dynamics

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Abstract

Using a randomized controlled trial, we examine the impacts of cash and input transfers, and a cross-randomized program of intensive agricultural extension over two years. We find large effects on the total value of agricultural production from the transfers (both cash and inputs) in both years. Gains to production are driven by an increase in resources allocated to inputs, specifically pesticides (in the first year) and casual labor (both years). We see no direct evidence that intensive extension is more effective than lead farmer extension support after one year. However, we do find evidence of production gains attributable to intensive extension in the subsequent year, highlighting important time dynamics. In the first year, farmers experience the best outcomes when they receive both transfers and extension, though that pattern is less clear in year 2. These results suggest that more research is needed to understand the interactions between and the time dynamics of programs aimed at boosting agricultural productivity.

Keywords: Agriculture, Extension, Cash transfer, Inputs, Malawi

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1. Introduction

Despite tremendous progress in reducing the incidence of poverty over the last two decaides, more than 700 million people still live in extreme poverty (UN 2016). Globally, poverty is heavily concentrated in rural areas and among those who rely on agriculture for their livelihoods. Therefore, understanding how to construct interventions that most effectively reduce poverty in rural areas is of great interest to policy makers, academics, and development practitioners alike. Though many programs focus on moving rural households away from agriculture, improving agricultural productivity cannot be ignored in countries like Malawi, where 80 percent of the population is smallholder farmers and these farmers produce 80 percent of the country's food. Moreover, the gap between potential and actual yields is large, suggesting that programs designed to enhance agricultural productivity have real potential to reduce poverty (World Bank 2007). Nevertheless, both the macro- and the micro-development literatures are largely silent on how to most effectively intervene in agriculture to reduce poverty, despite widespread government and nongovernmental organization (NGO) programs aimed at this objective. This paper examines the impacts of an intervention that combines two popular elements of such programs: transfers and agricultural training. The research design explicitly allows for an analysis of the independent and joint impacts of these program elements, and an examination of any possible dynamic effects.

Agricultural production and productivity may be limited by several factors including, but not limited to, a lack of knowledge about production technologies, farm management techniques, or both; resource constraints; and production risk. Many households may be limited by multiple factors, implying that a program addressing one area may be more effective when farmers also receive other services. Dynamic elements of these programs are also important because impacts may fade over time or, conversely, take time to appear. The transfer element of this intervention

provides capital while reducing risk (because the transfers are not loans), and the training program addresses knowledge constraints.

Various impact evaluations study outcomes associated with projects that contain similar elements, but much is still not understood. Moreover, the potential for complementarities between asset or cash transfers and agricultural training is clear and has been highlighted by policy makers and academics (FAO 2013, 2015). However, limited rigorous empirical evidence exists directly testing their relative importance. This study examines a cross-cutting randomized controlled trial with a transfer arm that offers either cash or in-kind transfers and an agricultural training arm that tests an intensive agricultural extension model. The research design allows the identification of separate impacts of transfers and training, and their potential complementarities, over time. We implemented the program in partnership with the National Smallholder Farmers' Association of Malawi (NASFAM) and worked with approximately 1,200 households randomly allocated at the farmer club level (120 clubs in total) to the transfer and agricultural training treatments.

For the transfer treatment, farmers were randomly allocated to a control group that received no transfers; a cash group that received a series of three framed cash transfers,[1] at planting (US$36),[2] midseason ($22), and harvest ($26); and an input group that received transfers of equivalent value, of which approximately 50 percent were given in kind (seed, hoes, inoculant, storage sacks). Transfers were provided only in the first year of the project, with the goal of achieving large production improvements so farmers could afford to make similar investments in the second year. To improve the likelihood of sustained impacts, a savings element was also built in; farmers were asked to make deposits of seeds in a NASFAM seed bank at harvest, which were

[1] Framed transfers have been shown to be effective at achieving their intended outcomes, even without conditions (Benhassine et al. 2015 in the context of education in Morocco; Ambler, de Brauw, and Godlonton 2017 in agriculture in Senegal).
[2] All dollar amounts are in U.S. dollars.

then made available to them the following season.

For the agricultural training treatment, farmers were assigned to receive either standard NASFAM extension services or intensive extension services. Standard NASFAM extension services primarily rely on the lead farmer model, in which chosen community members (lead farmers) are the key point of contact between extension agents hired by NASFAM and the farmers. Lead farmers receive periodic training by NASFAM and are elected by NASFAM members in their area. The intensive extension model provided additional support to farmers, with professional extension agents (hired by NASFAM) expected to conduct at least three one-on-one visits with each farmer. During the first visit of the year, extension agents worked with farmers to develop a farm management plan for the agricultural season. On subsequent visits, they were expected to follow up with farmers with explicit reference to the individualized plan. In addition to management advice, extension agents provided technical support. In year 1, farmers were randomly allocated to one mode of extension support, and in year 2, they were randomly allocated to one mode of extension support, stratified on their year 1 assignment. The re-randomization allows us to examine both the potential deferred benefits from extension services (because farmers may take time to adopt or perfect new practices) and the potential for reinforced learning (among farmers who received intensive services and support for two years consecutively). Due to the cross-cutting design of the study, we can also consider the interaction between the transfers and the different modes of agricultural extension support in both years.

Findings are as follows. First, both cash and in-kind transfers led to increases in production of the project focus crops as well as in the total value of crop production. The effects on the total value of production are sizable, representing a gain of 25 percent (exceeding the value of the transfer) in the first year for those in the cash group, and gains to overall crop production of 21

and 36 percent after the second year for inputs and cash, respectively. We find suggestive evidence of increased yields in the first year and robust evidence in the second year. There are limited significant differences between the cash and input package transfers, though there is some evidence that the cash arm was more effective in the first year than the input package. Production gains are driven by increased investments in farming; households invest more in both agricultural assets and productive inputs. Farmers receiving either type of transfer invested more heavily in agriculture-specific assets, increased their adoption of pesticides (in the first year), and increased their use of and expenditure on *ganyu* (day labor) in both years.

Second, there is no evidence that intensive extension led to increased production in the first year, despite the fact that farmers receiving intensive extension made some additional investments in inputs. However, these investments may be suboptimal or ill-timed, or they may exhibit only longer-run effects. We find suggestive evidence of deferred impacts of intensive extension received in the first year on production in the second year among those who received services in only the first year. The impact of receiving two years of extension is similar in magnitude to receiving services only in the first year, suggesting that the first-year extension drives the results. These production gains may be achieved through the increased adoption of legumes, which enrich the soil for the second year.

Finally, we examine complementarities between the two intervention components. In the first year, we observe strong complementarities; impacts are greatest when farmers receive a transfer and intensive extension services. Among those receiving both intensive extension services and either transfer modality in the first year, the total value of crop production increases by as much as 82 percent relative to the control group. The pattern of results is consistent with earlier findings, in that production improvements appear to be driven by increased investment in

agriculture-specific inputs. The results are imprecisely estimated in the second year, so although there is some suggestive evidence that those receiving both the transfer and intensive extension are better off than those who receive just extension or transfers, it is not possible to make definitive conclusions.

A number of related papers have studied large transfers specifically intended for agricultural investment.[3] This paper is most closely related to a series of studies conducted in West Africa (Ambler, de Brauw, and Godlonton 2017, Senegal; Karlan et al. 2014, Ghana; Beaman, Dean, et al. 2015, Mali) that find mixed results on agricultural outcomes in response to large, one-off lump sum cash transfers. Both the Ambler, de Brauw, and Godlonton (2017) and the Beaman, Dean, and others (2015) studies find large positive impacts on agricultural production after one year, whereas Karlan and colleagues (2014) find modest effects of cash relative to insurance. Although Ambler, de Brauw, and Godlonton (2017) find that production results are not sustained in the year following transfer disbursement, the analysis in Beaman, Dean, and others (2015) does document sustained impacts. We add to the evidence base by documenting large, positive effects on crop production sustained over two years and showing that a sizable transfer split across the agricultural season generates positive production impacts similar to those found in studies with large lump sum transfers.

We also contribute to the literature on transfer modality. Cash transfers are largely justified on efficiency grounds, because they allow individuals to optimize their consumption without placing a constraint on it. Further, in the context of food distribution, cash programs are also less

[3] Most papers that study the relationship between transfers and agricultural production examine the impact of small, regular transfers, principally intended for social protection, on agriculture as a secondary outcome. These studies usually document small, positive effects. See Handa, Seidenfeld, et al. 2015; Boone et al. 2013; Gertler, Martinez, and Rubio-Codina 2012; Covarrubias, Davis, and Winters 2012; Todd, Winters, and Hertz 2010; Veras Soares, Perez Ribas, and Issamu Hirata 2010.

costly than in-kind distribution (Margolies and Hoddinott 2015). On the other hand, in-kind transfers have been motivated by paternalism (Cunha 2014; Currie and Gahvari 2008), used as a strategy to improve targeting to the poor (Bearse, Glomm, and Janeba 2000), and used to leverage pecuniary redistribution (Coate, Johnson, and Zeckhauser 1994; Cunha, De Giorgi, and Jayachandran 2011). While some literature has sought to examine differences between cash and in-kind transfers, it has been limited to the study of impacts on food consumption and dietary diversity (Aker 2015; Gilligan et al. 2014; and Hidrobo et al. 2014). We extend this research to a setting where cash transfers are heavily framed and given in lump sums meant for agricultural investment. Our results suggest that cash can be just as effective as in-kind transfers, even when given in large amounts and with the intended purpose of investment stated. Specific framing can be very effective in these situations, allowing organizations to achieve their goals while providing households with some flexibility and taking advantage of the cost savings of cash disbursal.

This paper also contributes to the economics literature on the design of agricultural extension services to improve learning and technology adoption. In the last three decades, the World Bank alone has spent close to $4 billion supporting agricultural extension programs. Two reviews—one by Birkhaeuser, Everson, and Feder (1991) and one by Evenson (2001)—document that at that time, most existing studies found significant positive impacts, with highly variable returns. A systematic review of evidence on a common method of disseminating agricultural information, through farmer field schools, demonstrates that they are not effective when taken to scale (Waddington and White 2014). Evidence from a randomized controlled trial studying the lead farmer model suggests that although specialized training boosts technology adoption by lead farmers themselves, no impacts are found on the behaviors of other farmers (Kondylis, Mueller, and Zhu 2017). BenYishay and Mobarak (forthcoming) find that incentivized peer farmers, similar

to the farmers being studied in the present paper, were most effective at increasing adoption rates of the two focus technologies (pit planting and Chinese composting), relative to lead farmers or status quo services from a government extension agent serving thousands of farmers. Bobic and colleagues (2017) find that a program in Uganda focusing on trainings by female model farmers and provision of improved seeds increased the purchase of improved seeds and led to improved production. The authors also use a randomized phaseout of the program to argue that impacts persist beyond program implementation.

The present paper focuses on whether an intensive model of extension by trained agents is more effective than a lead farmer model. Whereas previous studies have focused on the adoption of specific technologies, the intensive program studied here focuses on holistic advice, including management advice. Instead of adoption, we focus directly on production outcomes and also consider other measures of household well-being such as consumption. Unlike most similar studies, our study design also enables us to contribute to understanding the dynamic effects in terms of reinforcement and delayed benefits of extension services across two years. Though this model of extension is more expensive than the status quo, our results suggest that one year of treatment may be enough to benefit farmers, increasing the cost-effectiveness of the program.

Finally, we contribute to the literature examining the simultaneous relaxation of credit and information constraints. Much of this literature works with nonfarm enterprises in developing countries, providing both capital and training (McKenzie and Woodruff 2013). For example, de Mel, McKenzie, and Woodruff (2014) combine a cash grant with training for women in Sri Lanka, and find a small initial increase in profits that was not sustained. Blattman and others (2016) find an increase in business income when poor, conflict-affected women in Uganda are given cash and business skills training. Brudevold-Newman and colleagues (2017) similarly test a business

training and grant program in urban Kenya among 18- and 19-year-old women, and find short-term positive impacts on income that dissipate after two years. Graduation programs that provide asset transfers and intensive services to the ultra-poor have also been shown to have large impacts (Banerjee et al. 2015), but these studies cannot differentiate between the impacts of the transfers and those of the training. Daidone and others (2017) find that a program that provided seeds and training on homestead gardening was more effective when combined with a cash transfer. Ambler, de Brauw, and Godlonton (2017) study a program that offers cash transfers and management advice for farmers in Senegal; there we analyze the impacts of management advice and management advice plus cash transfers, but are not able to fully cross-randomize the treatments. In the present paper, we study the independent and combined impact of transfers and an information treatment that includes both technical and management advice in an agricultural setting.

This paper is also related to the growing literature on social protection programs in Malawi. Two evaluations of the social cash transfer program, a program that provides transfers every two months to very poor households, show that the transfer has important impacts on a number of dimensions including food security, consumption, health, and education (Miller, Tsoka, and Reichert 2011; Luseno et al. 2014; Handa, Angeles, et al. 2015; Handa et al. 2016). Though not specifically targeted at agriculture, studies by Covarrubias, Davis, and Winters (2012) and by Boone and others (2013) both show that the transfer program has moderate positive impacts on agricultural indicators. The largest agriculture support program in Malawi is the Farm Input Support Program (FISP), which primarily provides coupons for maize fertilizer and accounted for 61 percent of the national agricultural budget (6.5 percent of the overall national budget) in 2010/2011 (Lunduka, Ricker-Gilbert, and Fisher 2013). A meta-analysis of a number of farm-level

studies shows that though fertilizer use has increased during the period that FISP has been implemented, maize prices have also increased, and there are questions regarding the program's efficiency and targeting (Lunduka, Ricker-Gilbert, and Fisher 2013). A rigorous causal evaluation of FISP has never been performed.[4] Malawi also operates a public works program, designed to improve food security and encourage take-up of FISP. A recent evaluation of this program finds no improvements in food security or in fertilizer use among those offered the program (Beegle, Galasso, and Goldberg 2017).

The paper proceeds as follows. Section 2 describes the institutional setting and the experimental design. Section 3 presents the data, discusses the measurement of key outcomes, and outlines the empirical analysis. We present the main results in Section 4 and provide further discussion of the results in Section 5.

2. NASFAM Program and Experimental Design

2.1. Background

Malawi is one of the world's poorest countries, ranking 173rd out of 188 countries on the Human Development Index in 2015 (UNDP 2015). Most of the population resides in rural areas, and rural poverty is high, at 50.7 percent (NSO 2011). Agriculture drives the Malawian economy, contributing approximately 28 percent of GDP and 80 percent of exports (GoM 2017). Smallholder farmers make up the bulk of the agricultural sector, cultivating maize, cassava, and sweet potatoes. Few smallholder farmers engage in farming high-value cash crops. Despite being largely agriculture dependent, Malawi does not meet its agricultural potential; by some estimates, farmer yields are only 20 percent of average yields from farm demonstration plots (World Bank 2007).

[4] Pace and colleagues (2017) evaluate the combined impacts of the social cash transfer program and FISP, and find that each program has incremental impacts on agricultural outcomes.

Productivity gaps are particularly pronounced for female farmers. Kilic, Palacios-Lopes, and Goldstein (2015) find that 82 percent of the productivity differential between male and female farmers can be explained by observable factors, particularly cash crop cultivation and male labor inputs. In addition, female farmers in Malawi are less likely to receive agriculture-related advice than male farmers (Ragasa and Niu 2017).

The implementing organization, NASFAM, provides farmers with both social and commercial services. Operational since 1998, NASFAM currently serves approximately 165,000 farmers in 13 districts spanning all regions, and its farmer base is steadily growing. Farmers self-organize into clubs of up to 15 members and are required to pay an annual membership fee of approximately $8 per club.[5] NASFAM provides farmers with an input starter package of seeds for a high-yielding variety of a cash crop suited to their particular region.[6] In standard NASFAM programs, farmers are expected to repay NASFAM in seed at the rate of 1.5 to 2 times the quantity of seed received. The same rate of repayment applies to all farmers in a particular year, but varies from year to year. These seed loans are provided to farmers during their first two years of registering as a NASFAM member, after which it is expected that farmers retain sufficient seed to not rely on the seed loan. The excess is used to support other new farmers. Farmers also receive group-based extension support primarily through the lead farmer approach, in which NASFAM extension agents train a local farmer, who is responsible for disseminating knowledge to other farmers, largely through group activities. Table 2 shows that among farmers receiving standard NASFAM services, 79 percent and 78 percent report receiving group-based extension support in the first and second year, respectively. On average, farmers receiving standard NASFAM services

[5] We use an exchange rate of 385.78 Malawi kwachas/US$1 for baseline values.
[6] Crops that NASFAM actively supports are include groundnuts, soybeans, bird's eye chilies, coffee, cotton, pigeon peas, and rice.

report on average five and three group-based activities in the first and second year, respectively. Finally, NASFAM helps organize marketing activities and negotiates rates with large buyers on behalf of farmers. Thus, NASFAM members have a guaranteed market for the supported cash crop but are not required to sell to NASFAM.

2.2. Experimental design

The experiment was conducted in Ntchisi and Dowa districts in central Malawi between August 2014 and October 2016. Central Malawi, like much of the rest of the country, is characterized by high rates of rural poverty, with most households engaged in subsistence agriculture.[7] The 120 newest farmer clubs in the region as identified by NASFAM were selected to participate.[8] The average club size is 10 farmers, resulting in a total sample size of approximately 1,200 smallholder farmers. The selection rule excluded farmer clubs that exclusively grow tobacco, which is the primary cash crop and accounts for more than half of export earnings. Due to the reliance on tobacco, many government policies and NGOs seek to broaden the export base by encouraging adoption of other cash crops. Groundnuts and soybeans were chosen because they were appropriate for the area and were prioritized by NASFAM in Ntchisi and Dowa, in part due to explicit interest in diversifying risk in tobacco-reliant communities.

Using this sample of farmers, we implement a cross-cutting cluster-randomized design. The framed capital transfer component has three study arms: cash only, an input-cash package, and control. The information component offers either intensive extension support or standard group-based extension support.

[7] For a more detailed description of how our sample compares with the region and the country in general, refer to Ambler, de Brauw, and Godlonton (2018).
[8] The program focused on newly registered farmer clubs because they were the most likely to have not yet benefited from any NASFAM services.

2.2.1. Framed capital transfers

Capital transfers were distributed only during the first year of implementation. The total value of the transfers is equivalent to approximately $84, roughly equal to 15 percent of annual gross value of agricultural output (GVAO) at baseline. The large total transfer, with staggered payouts, was designed to target resource gaps at strategic times of the year for agricultural investments. The transfer was intentionally large, with the goal of enabling farmers to make sustainable and substantive investments in their farms.

Cash treatment condition: The value of the first disbursement (given in November 2014) was $36, the second was $22 (February 2015), and the final disbursement was $26 (April 2015). The value of each disbursement was set to equal the cost of inputs given at each point in time. Individuals assigned to the cash group received the equivalent of these amounts in Malawi kwacha (MWK).

Input treatment condition: In the first disbursement, individuals assigned to the input group received seed, inoculant (a nitrogen fixer), and hoes.[9] In the second disbursement, they received cash for *ganyu* (day labor, the relevant input at midseason), and in the third, sacks, [10] strings, and cash for transportation and *ganyu* for harvest.[11]

Control condition: Farmers assigned to this group received standard NASFAM services. That is, if they were newly registered members, they received a seed loan equivalent to about two-

[9] Inoculants encourage the development of high-nitrogen nodules on the roots of legume plants, which improve both yields and the amount of nitrogen the plant can fix in the soil. Biologically, this process occurs by adding bacteria (*Rhizobium*) to the soil, which symbiotically work with the legume plant to take nitrogen from the air and make it useful to the plant.

[10] Treated sacks are provided to farms to facilitate improved storage and reduce postharvest losses.

[11] Another input considered for inclusion as part of the input transfer condition was fertilizer. However, due to the extensive FISP implemented by the government of Malawi, it was agreed that this was not a suitable input in this context. Furthermore, NASFAM at the time discouraged fertilizer application on groundnut and soybean crops, making it an input incompatible with the extension advice provided.

thirds of the seed disbursement provided in the input treatment condition.

For both the input and cash treatment conditions, a requirement linked to the first disbursement was that members repay twice the amount of seed received back to NASFAM at the end of the agricultural season. However, this functioned as a savings mechanism instead of a loan because at the start of the second season, farmers received the full amount they had repaid earlier (and they knew this in advance). At the end of the second season, they repaid the same amount as in the first year. They then reverted to the standard NASFAM approach, whereby farmers repay 1.5 to 2 times the amount given in the form of the same seed received at the beginning of the year.

2.2.2. Intensive extension services

To support the intensive extension component, 15 additional extension officers were hired, 7 of whom were female. Extension officers were relatively young (average age 27), and all of them held a diploma.[12] Extension officers were responsible for providing, in their assigned catchment area, both the standard NASFAM support to control group farmers and the individualized support to farmers receiving the intensive extension services. Extension workers met with NASFAM personnel monthly to discuss the challenges faced by the farmers, which facilitated broader discussion and input on the challenges farmers faced. During these monthly meetings, extension workers were also provided additional training as needed. For example, during harvest, extension workers were trained on the importance of mitigating aflatoxins in groundnuts and how to do so.

Standard NASFAM extension condition: Farmers assigned to this treatment condition received standard NASFAM extension services. The model used at the time in the area was the lead farmer approach, whereby farmers select a NASFAM member to be a lead farmer for their

[12] NASFAM followed its standard recruitment protocols to fill these positions.

area. The selected farmers attend trainings with extension agents and are encouraged to impart the covered information to other area farmers. Most activities conducted by lead farmers are group activities, including demonstration plots and trainings.

Intensive extension condition: In addition to the group extension services described above, farmers assigned to the intensive extension condition received supplemental individualized extension support, which included both technical agricultural services and farm management planning. Extension agents were expected to visit farmers three times during the agricultural season. During the first visit, at the beginning of the season, extension agents assisted farmers in developing a farm management plan that covered a wide variety of topics including land allocation across crops, livestock production income (breeding and by-product revenue), crop production and livestock production expenses, and the appropriate timing of activities.[13] As part of this process, farmers chose three key farming goals for the year. During the follow-up visits, extension agents were expected to check in with farmers to assess their progress relative to their management plan and to provide assistance with any technical issues.

There was one key difference in the implementation of the intensive extension services across years. In the second year, in addition to completing the management plans, farmers received a one-page laminated sheet on which they wrote down three focal business goals for the agricultural season, as well as an activity calendar on which they could record the date they completed key activities for their focal cash crop (either groundnuts or soybeans). On the other side of the handout were technical specifications for planting that reflected NASFAM recommendations and included accurate rulers that farmers could use in their fields to facilitate optimal spacing when planting.[14]

[13] Refer to Appendix A for the farm business plan template.
[14] Refer to Appendix B for the groundnut and soybean visual aids provided to farmers.

2.2.3. Timing and other design considerations

The experimental design is illustrated in Figure 1. From August to September 2014, farmers in the clubs identified by NASFAM participated in a baseline survey, after which NASFAM assigned clubs to extension officers. The assignment was done to minimize travel time for the extension officers, so each extension officer worked in a relatively contained geographical area. Randomization was then conducted at the club level, stratified by extension officer, an indicator for below versus above the median share of females in the club, and an indicator for below or above the modal club size. In the first year (starting in October 2014), clubs were randomized to receive one framed transfer treatment (control, cash, or inputs) and one extension treatment (standard NASFAM or intensive extension). In March 2015, a short subsample survey was conducted.[15] In August–October 2015, a complete follow-up survey was conducted (follow-up survey 1).

Year 2 activities began after follow-up survey 1 in October 2015. No transfers were given in the second year, but extension services did continue, and clubs were re-randomized into the extension treatment, stratified by their year 1 extension treatment status. Thus, clubs received either no, one (in the first or second year), or two years of intensive extension services. In August–October 2016, a second complete follow-up survey was conducted (follow-up survey 2).

3. Data and Empirical Approach

3.1 Data sources

Several data sources are used in the analysis. The timing of all data collection is outlined in Figure 1 alongside the project implementation activities. This paper primarily uses the survey

[15] This survey was conducted during the lean season for a subsample of households. The subsample comprised all club chairs as well as two randomly selected club members per club. This survey included modules on food security, time use, and employment-related information, as well as projected agricultural output for the season.

data collected between August and October during each of the three years of implementation. In all cases, the survey respondent was the NASFAM member, who was not necessarily the household head. We targeted all club members for inclusion in the surveys based on a club roster provided by NASFAM and updated through discussion with each farmer club chair. For follow-up surveys 1 and 2, we included club members added since baseline as well as any households who were no longer club members. All households in the sample list remained on the list for follow-up regardless of whether they could be located at baseline (or during follow-up 1). The baseline sample includes 1,187 households, follow-up 1 includes 1,144 households, and follow-up 2 includes 1,119 households.

The baseline survey includes modules on socioeconomic characteristics; extensive information pertaining to agricultural production and practices, livestock, and time use; employment-related information by household member; and modules on remittances, credit, and savings. Both follow-up surveys follow a structure similar to that of the baseline. In addition, they include modules pertaining to household enterprises and program implementation monitoring, and an extensive consumption module. Many of the modules draw heavily on the Malawi Integrated Household Survey (IHS) questionnaires to ensure comparability.

3.2 Sample characteristics

Table 1, column 1 presents the summary statistics for a subset of variables available in the baseline sample. NASFAM members are disproportionately female (64 percent), most are married (82 percent), and on average they are 41 years old. They have little education: 72 percent either have never been to school or have not completed primary schooling. The household head's characteristics also likely affect decisions made about agricultural activities. Yet in almost half of the households (47 percent), the NASFAM respondent is not identified as the household head.

Household heads are slightly older than the NASFAM respondent on average (44 years old), have limited formal education, and only 15 percent are female.

Households are engaged in numerous agricultural activities, having grown on average 4.5 distinct crops in the previous agricultural season. Common crops grown include maize (almost universally grown at 98 percent), groundnuts, soybeans, tobacco, pumpkins, and common beans. The GVAO at baseline is approximately $600 per year.[16] GVAO per acre captures overall agricultural productivity and averages $125.[17] Livestock ownership is relatively low among these farmers. The average tropical livestock units owned is less than 1, and the total livestock value is approximately $200.[18] In Ambler, de Brauw, and Godlonton (2018), we compare, to the extent possible, characteristics of our sample relative to the full sample of the nationally representative IHS data, as well as a restricted sample of only those IHS respondents resident in Dowa and Ntchisi districts. The farmers studied here are more likely to be engaged in agriculture, growing a more diverse set of crops, on more land, with considerably higher gross sales revenue, than these comparison groups. However, conditional on growing crops, the average production of this sample is similar to that of other farmers in the same two districts. Although that sample is not representative of the area, it is the relevant group of interest because it comprises farmers who are committed to cash crop farming.

[16] The GVAO was calculated using a method similar to that for constructing consumption aggregates outlined in Deaton and Zaidi (2002). For crops for which the household reported a unit sales price, that sales price was used to estimate the total value of the household's production of that crop. For households that did not report a unit sales price for that crop, their crop value was estimated by using the median price at the lowest administrative aggregation possible: NASFAM club, NASFAM GAC (a group of geographically clustered NASFAM clubs, defined by NASFAM), or district. Prices were reported in local currency units (Malawi kwachas) and converted to US dollars using the market exchange rate reported by xe.com on September 1 of the reference year (baseline = 2014, midline = 2015, midline 2 = 2016).

[17] GVAO per acre uses the GVAO measure described in footnote 16 divided by total land area cultivated. Cultivated land area in acres includes any land owned, rented, borrowed, or sharecropped and used by the household for crop production in the previous season.

[18] As is standard in the literature, we use tropical livestock units to aggregate all the different animals to a common unit using exchange rates. We use 0.70 for cattle; 0.30 for pigs and donkeys; 0.10 for goats and sheep; and 0.01 for chickens, other poultry (including turkeys, guinea fowl, ducks, and pigeons), hares, rabbits, and guinea pigs.

3.3 Sample balance and attrition

Table 1 also allows us to examine whether the treatment randomizations were successful. Columns 2 and 3 show the group means for those assigned to standard and intensive extension services in year 1, respectively, and column 4 reports the p-value testing the null hypothesis that the group means are the same. Households assigned to the group-based extension are slightly larger than those in the intensive extension group, but the difference of 0.40 household members is not economically meaningful. Columns 5, 6, and 7 report the group means for those assigned to the control, cash, and input transfer treatments, respectively, and column 8 reports the p-value of the joint test that group means of all transfer treatment conditions are the same.[19] Again, there are no meaningful differences across the treatment groups. Finally, we consider balance in the year 2 randomization of intensive extension services. Columns 9, 10, 11, and 12 report the group means for those assigned to receive no intensive extension, intensive extension in the first year only, intensive extension in the second year only, and two years of intensive extension, respectively. Across all outcomes, we cannot reject the null hypothesis that the averages across these treatment groups are equal (column 13).

Next, we examine attrition from baseline to follow-up 1 and from baseline to follow-up 2. Recall that in each round, club rosters were updated to reflect the current composition of the farmer clubs. As a result, attrition cannot be immediately reconciled with sample sizes reported in Section 3.1, because the follow-up surveys included people missed at baseline and also included new farmers. Attrition is moderate, 10 percent and 19 percent in follow-up 1 and follow-up 2,

[19] Pairwise tests of equality of group means of the treatment arms are rarely statistically significant (results not shown but available on request). There are three cases across all comparisons that are statistically significant: there are fewer NASFAM members who have completed primary or some secondary schooling assigned to the input group relative to those assigned to the control group; and NASFAM households in the cash group have slightly more livestock relative to those assigned to the input group.

respectively. Attrition by treatment by survey round is presented in the last two rows of Table 1. Attrition is not economically or statistically significantly related to the extension treatment for either follow-up (columns 2 through 4 for the year 1 randomization, columns 9 through 13 for the year 2 randomization). For the transfer treatments (see columns 5 through 8), attrition is slightly higher in the control group (12 percent and 23 percent in follow-ups 1 and 2, respectively) relative to the cash treatment group (10 percent and 17 percent, respectively) and the inputs treatment group (7 percent and 17 percent, respectively). However, none of these differences are statistically significant. Additionally, differential attrition across treatment groups correlated with farmer baseline characteristics is minimal and small in magnitude (refer to Appendix Table 1 for follow-up 1 results and Appendix Table 2 for follow-up 2 results).

3.4 Treatment compliance

This project and all associated treatments were administered directly by NASFAM. Therefore the research team worked with NASFAM to develop a set of tools to monitor implementation of and adherence to the randomization. In addition, during the surveys, we asked a series of questions to elicit information pertaining to the appropriate delivery of the interventions. Table 2 examines compliance using the self-reported survey data.

Data from the first follow-up survey demonstrate that the transfers were reasonably well implemented (Table 2, panel A). Columns 1, 2, and 3 show averages for the control, cash, and input groups, respectively. We first report the percentage of farmers who reported receiving each of the three transfers and the conditional mean of the amount received (in Malawi kwachas). For the first transfer, 1.1 percent, 91.5 percent, and 33.3 percent of farmers in clubs assigned to the control, cash, and input groups, respectively, reported receiving any money. The mean amount reported received in the cash group is K 12,472, slightly lower than the actual amount given of

K 15,000. For the second transfer, both the cash group and the input group received cash, and high proportions of the farmers in both groups reported receiving the cash (91 percent and 88 percent for the cash and inputs groups, respectively), whereas only 4 percent in the control group reported receiving cash. The reported amounts received, of K 7,914 and K 8,772 for the cash and inputs groups, respectively, are similar in magnitude and close to the actual transfer amount of K 10,000, though the difference between them is statistically significant. Last, for the third transfer, the input group received a hybrid transfer of both cash and inputs. Farmers in both transfer groups reported receiving cash at high rates, and as expected, farmers in the input group reported a lower conditional mean of the transfer amount, because the input group received a smaller amount of cash in the third transfer.

Next, we examine compliance with input provision. Across inputs, the reported rate of receipt and number or amount of inputs received by farmers in the input group is higher than in the other two groups. Notably, more than 80 percent in the input group reported receiving the hoes, inoculant, and seed, although fewer (only 28 percent) reported receipt of the NASFAM-provided sacks. This input appears not to have been handed out as intended, but it accounted for a small share of the cost of the input package. For most inputs, reported receipt in the cash transfer group, though low, is higher than in the control group. This is likely due to cash transfer recipients' conflating the receipt of cash targeted at a specific purchase with receipt of the input itself. The exception is seed receipt; 64 percent of farmers in the control group reported receiving seed. These farmers were likely participating in NASFAM's seed bank program and received seed with a requirement to redeposit an equivalent amount, with interest, at the end of season.[20]

For the intensive extension services, we analyze adherence to protocol in both years of

[20] All differences in Table 2 are statistically significant with the exception of the following three cases, all for the test of equality between cash and inputs: receipt of second transfer, receipt of sacks, number of sacks received.

implementation. Panel B presents the results for year 1. Those assigned to the intensive extension services (column 2) reported receiving more group and individual visits than those receiving the standard NASFAM services (column 1). Farmers assigned to receive intensive extension support reported an average of 2.9 individual visits—almost precisely the 3 intended visits. Panel C shows similar statistics for year 2, breaking the sample into the four extension treatment groups. Again, those who were assigned to receive intensive services in year 2 (columns 3 and 4) were more likely to receive both group and individual extension and to receive more visits. Those with two years of services (column 4) reported more individual visits overall (2.5 compared with 1.8), a difference that could be due to their longer experience with the program. It should be noted that simply receiving visits of either type when assigned to standard services is not against protocol; standard services included access to group activities led by lead farmers, and individual visits could be requested on a case-by-case basis.

3.5 Empirical specifications

Due to the experimental design, the analyses avoid the limitations of cross-sectional or longitudinal studies that may be affected by omitted-variable bias. We initially examine the impact of the cash and input transfers by estimating the following regression:

$$Y_{hj} = \alpha + \beta_1 Cash_j + \beta_2 Inputs_j + \tau Y_{h0} + \gamma X_{hj} + \delta_s + \varepsilon_{hj}, \quad (1)$$

where Y_{hj} is a measure of agriculture production of household *h* in farmer group *j*. Outcomes are measured at two points in time: in the year following the transfer two years following the transfer. $Cash_j$ is an indicator variable that takes the value of 1 if the respondent's club was assigned to the cash transfer, and $Inputs_j$ similarly indicates whether the farmer was assigned to receive the input transfer. In this case, we are interested not only in the direction and size of β_1 and β_2, but also the relationship between β_1 and β_2. In this and all regression specifications

that follow, X_{hj} is a vector of household baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of indicators for the NASFAM member's level of education.[21] We also control, when possible, for the baseline value of the outcome variable, Y_{h0}. δ_s represents stratification cell fixed effects. Standard errors are clustered by farmer club.

Next, we examine the impacts of the intensive extension services conducted in the first year of implementation. To model the first-year effects of receiving intensive extension services relative to the standard NASFAM extension group, we estimate the following equation:

$$Y_{hj} = \alpha + \beta_3 Intensive_j + \tau Y_{h0} + \gamma X_{hj} + \delta_s + \varepsilon_{hj}, \quad (2)$$

where $Intensive_j$ indicates whether the household's NASFAM club was allocated to the treatment group receiving intensive agriculture extension services during the first year. For this specification, outcomes are measured only after the first year.

Leveraging the second-year randomization, we estimate the one-year impact of intensive extension support provided in the second year, the two-year effects of intensive extension provided in the first year, and the impact of two consecutive years of intensive extension support. To do so, we estimate the following regression:

$$Y_{hj} = \alpha + \beta_4 OneYrInt1_j + \beta_5 OneYrInt2_j + \beta_6 2YrsInt_j + \tau Y_{h0} + \gamma X_{hj} + \delta_s + \varepsilon_{hj}, \quad (3)$$

where $OneYrInt1_j$ and $OneYrInt2_j$ are indicator variables equal to 1 if the NASFAM member's group was assigned to receive a year of intensive extension services in the first year and second year, respectively; and $2YrsInt_j$ equals 1 if the group received two consecutive years of intensive extension support. This specification is restricted to outcomes measured during the second follow-up survey. By testing the null hypothesis, $\beta_4 = 0$, we learn whether intensive extension shows

[21] Results are robust to the exclusion of baseline covariates.

better results than the standard model of extension after two years, even when services were received only in year 1, because farmers may continue to implement new technologies even when they are no longer receiving extension. Alternatively, farmers who receive intensive extension advice in one year may take time to adopt suggested new agricultural practices, or short-run production decisions may lead to future benefits. For example, both soybeans and groundnuts are legumes, which are "nitrogen fixers," crops that improve the nitrogen content of soils and thus can improve yields in future agricultural seasons (Frankow-Lindberg and Dahlin 2013).

By comparing β_3 (from equation 2) with β_5, we learn whether the impact of intensive extension is similar across years when farmers receive one year of services. There are several reasons that β_3 and β_5 could differ. For example, under different weather conditions, intensive extension may be more or less beneficial than group-based extension. Alternatively, extensionists may learn over time how to offer more tailored advice that is more effective than advice offered by lead farmers. Last, by testing whether $\beta_4 = \beta_6$ and $\beta_5 = \beta_6$, we directly test whether there is value-added from repeated exposure to treatment relative to only one year of intensive extension support. Such results are important to take into consideration when considering cost-effectiveness.

Finally, we address the critical question of whether the interventions exhibit complementary impacts. Specifically, we estimate the following equation:

$$Y_{hj} = \alpha + \beta_6 OneYrInt1_j + \beta_7 Transfer_j + \beta_8 (Transfer \cdot OneYrInt1)_j + \tau Y_{h0} + \gamma X_{hj} + \delta_s + \varepsilon_{hj}. \quad (4)$$

We use this specification in both year 1 and year 2 because our goal is to understand whether any complementary impacts from year 1 persist into year 2. Additionally, it makes sense to examine the impact of the extension that was provided at the same time as the transfers. Unfortunately, the study is not powered to detect the interaction of transfers with all four of the extension treatment

groups in year 2. The year 2 regressions do control for whether or not extension was received in the second year. *Transfer*$_i$ is an indicator equal to 1 if the NASFAM member's group was assigned to either the cash or the inputs group.[22] Here, β_8 enables us to test the impact of providing both capital and intensive extension simultaneously. If $\beta_8 > 0$, then the intensive extension support and the transfers are complementary. If $\beta_8 < 0$, then the intensive extension support and the framed capital transfers are substitutes. The size of the coefficient speaks to the magnitude of the complementarity of alleviating capital and information constraints.

Each table of results is organized in a similar manner. Panel A examines outcomes after one year, at the time of the first follow-up, and Panel B reports the estimated impacts at the time of the second follow-up. All continuous outcomes have been transformed using the inverse hyperbolic sine transformation (IHST).[23] Across specifications, we present only the intention-to-treat results.

4. Results

We examine program impacts by measuring impacts first of the transfers, then of the intensive extension services, and finally of their interaction. For each section of results, we first examine the impact on crop production and yields in the first and second year. To understand the mechanisms driving the production impacts, we then examine relevant indicators: productive investments, knowledge and use of specific agricultural practices, and farm management indicators. Finally, we consider the welfare impacts for each set of interventions by examining total household assets and savings, as well as food and nonfood consumption aggregates.

[22] For power reasons, we combine the cash and input transfer groups.
[23] Results (not shown here) are qualitatively similar in levels and when using winsorized (at the 99th percentile) values.

4.1. Framed agricultural transfers: Cash versus inputs

The goal of the program was to sustainably increase the welfare of participants through increased production of groundnuts and soybeans. Therefore, we start by examining the impact of the transfers on agricultural outcomes measured after the year in which the transfers were given and during the subsequent year (Table 3). The table shows the separate impacts of the cash and input transfers relative to the control group, as well as the p-value testing the hypothesis that coefficients on each transfer type are equal. We focus on two aggregate measures of production: the combined value of groundnut and soybean production (the two project focus crops) (column 1) and the GVAO (column 2). The GVAO provides a useful overall measure of crop production, incorporating all production, including the other main crops grown in our sample, maize and tobacco.

Panel A documents strong positive production impacts attributable to the transfers after the year in which the transfers were given.[24] The combined value of groundnut and soybean production is larger for both transfer types relative to the control group; however, the coefficient is statistically larger among the cash group relative to the input group. Importantly, we also observe a 25 percent increase in the GVAO for the cash group relative to the control, indicating that production

[24] Appendix Table 3 also presents results for four key crops: maize, groundnuts, soybeans, and tobacco. Maize is the local staple. Tobacco is commonly grown in the sample area and is the key export crop in the country. Groundnuts and soybeans are the key focus crops of NASFAM in this region among non-tobacco NASFAM groups. NASFAM farmer groups aren't exclusively "soybean" or "groundnut" groups. Instead, farmers often grow a mix of both and receive a mix of seed from NASFAM depending on seed availability and soil suitability. In our sample, at baseline the vast majority (more than 90 percent) of farmers grew groundnuts and about two-thirds grew soybeans; at both follow-up surveys, approximately 80 percent and 75 percent grew groundnuts and soybeans, respectively. The crop-level analysis shows that the aggregate production results are largely driven by increases in groundnut production, which approximately doubles. Positive production impacts for soybeans are observed only in the first year and for those assigned to the cash treatment group. This pattern of results is at least in part because a larger share of farmers received groundnut seed than soybean seed (in the input transfer group). In results not shown, we observe that farmers receiving soybean rather than groundnut seed exhibit production impacts more similar to the input group than to the cash group. Thus, the choice of seed and imperfect seed markets limit the crop choices of the input group.

increased overall in households that received cash. GVAO of the cash group in the control group is also statistically larger than in households that received the input transfer. We next examine impacts on productivity, utilizing the GVAO per acre planted (column 3). Although the coefficient on the cash transfer is positive, it is not statistically significant. In general, the pattern of results is similar across transfers, but the transfer modality does matter with respect to short-term production outcomes, with cash appearing to be more effective at boosting overall production.

Although the short-run production effects attributable to the transfers are promising, particularly for the cash group, if this type of program is to be effective in reducing poverty, the impacts need to be sustained. We next consider whether the results were sustained after the program's second year, when transfers distributed in the first year had been discontinued (panel B). The large impact on the combined value of the focus crops is sustained. Notably, the results in the second year are very similar in size to the cash transfer impacts observed in the first year. By the second year, the difference in impacts across the two modalities of transfer is eliminated. These results are large; the coefficients indicate that the value of the combined production of soybeans and groundnuts more than doubled among treatment households in year 2.[25] The GVAO also increases for both transfer types, by 36 percent for cash and 21 percent for inputs (column 2). Across all outcomes, the input and cash transfer impacts are not statistically different from one another in the second year. In year 2, we do find sizable and robust impacts on productivity. Both transfers increase GVAO per hectare by similar magnitudes, between 12 and 22 percent, though the impact of the cash treatment is statistically larger (p-value = 0.089; column 3).

The transfers distributed by this program led to large increases in production both in the year of implementation and in the following year. We next consider the mechanisms behind these

[25] We use IHST on all production quantities. Thus, the estimated impact attributable to the cash and input transfers is calculated as $100 * (e^{0.749} - 1)$ and $100 * (e^{0.764} - 1)$, respectively.

increases in production, beginning with investments made by farmers. Columns 4 and 5 of Table 3 examine the IHST value of agriculture-specific assets[26] and the IHST value of expenditures on agricultural inputs.[27] Input expenditures include the value of all expenditures that are purchased with cash, paid for using in-kind payments, and received for free. In other words, it includes the value of seeds received in the input treatment (if the farmer reports planting them) and any seeds farmers in the cash treatment purchased themselves. Consistent with the production results, we find that both transfer groups increased investments as measured by both of these indicators. These impacts are observed across both years, although they are somewhat smaller in the second year.[28] In all cases, the investments made are not statistically different across the cash and input groups. Appendix Table 4 looks beyond the aggregates and presents impacts on both the extensive and intensive margin for key inputs, namely, *ganyu*, pesticide, and fertilizer. The aggregated results are primarily driven by increased adoption and use of *ganyu*[29] across both years of implementation, complemented by increases in pesticide use in the first year and increases in fertilizer use (although only marginally significant) in the second year. There was a pest outbreak (in the first year and specific to soybeans), which helps explain the differences in pesticide use over time.

Figure 2 presents summary information on what farmers said they spent the cash transfers on and lends further support for these results. The most commonly reported categories are seeds for the November transfer and *ganyu* for the February and March transfers, consistent with the framing provided by NASFAM. Other common uses reported were food and tools. Tools include

[26] Agriculture-specific assets include oxcarts, wheelbarrows, plows, panga knives, hoes, axes, sickles, watering cans, treadle pumps, and sprayers.
[27] Total expenditure on agricultural inputs includes plowing costs, seeds, fertilizer, pesticide (in follow-up 2 only; pesticide expenditure was not captured in follow-up 1 due to a coding error in the survey program), and *ganyu*.
[28] The exception is the impact of inputs on assets in year 2, which is not statistically significant. The coefficient is, however, positive and similar in magnitude to the impact in the cash group.
[29] When disaggregating *ganyu* expenditure by crop, we find that farmers receiving either transfer increased their expenditure on all key crops (except soy; see Appendix Table 5).

primarily hoes and sacks, with a few sickles and one oxcart. This is broadly consistent with our results, with the exception of a noticeable increase in pesticide expenditure in the self-reported data. The data presented here also support the idea that framing a cash transfer can effectively influence expenditures. Each transfer was framed as being intended for specific time-relevant input purchases, following the inputs given to households in the input transfer group. The data indicate farmers largely followed this framing.

Finally, given that women are particularly disadvantaged in this setting, and on average are further from reaching their potential agricultural productivity, we examine results disaggregated by the gender of the NASFAM member. Broadly, we find the magnitude of the results to be fairly similar across men and women in the first year, with slightly larger impacts among women assigned to the input group in the second year (Appendix Tables 6a and 6b).

4.2. Intensive extension services

We next turn to the analysis of the direct effects of the extension intervention. The main results are presented in Table 4, with year 1 impacts in panel A and year 2 impacts in panel B. As in Table 3, the outcome variables concern agricultural production and investment. We find no evidence in the first year that intensive extension increased agricultural production, productivity, or overall investments in the farm (that is, assets and total input expenditures).[30] Across specifications, coefficients are often negative but imprecisely estimated.[31]

[30] Although in the aggregate we do not observe statistically distinguishable impacts on input expenditures, when we examine specific input use (Appendix Table 7) and crop-specific *ganyu* use (Appendix Table 8), we observe some impacts on input adoption. We observe increased use of pesticides and increased expenditures on *ganyu* attributable to the intensive extension services in the first year. The pesticide results are consistent with the specific advice provided by extension officers during the 2014/2015 agricultural season, given a pest outbreak specific to soybeans. It is also consistent with the positive (but not significant) coefficient for soybean production. However, it is possible that although the specific advice pertaining to the outbreak was understood, some farmers were unable to make the investment early enough to combat the outbreak.

[31] Crop-specific production impacts are presented in Appendix Table 9. We observe the largest positive impact for soybeans (although it is not significant). Of the main crops, soybeans were the crop farmers had the least experience

Table 4, panel B leverages the second-year randomization to examine (1) the deferred impact on crop production of the initial exposure to intensive extension, and (2) the impact of varying the amount of intensive extension services. There are several interesting findings. First, we see that the impacts of receiving intensive extension only in year 2 are remarkably similar to those observed in panel A in terms of production, productivity, and input investments. Varying weather conditions and extensionist learning do not seem to dramatically affect the efficacy of the intensive extension services in terms of increased production after one year of implementation. The within-year impact of receiving intensive extension on overall production is at best 0.

Even though the impact of intensive extension services after one year is 0, we observe some deferred returns to intensive extension provided in the first year. That is, there is evidence that farmers receiving intensive extension services only in the first year are more productive in the second year. Among this group, we observe large, statistically significant improvements in GVAO per acre in the second year. The impact on GVAO is also large and positive, but not statistically significant, and we find no impact on the value of soybean and groundnut production. These deferred impacts can be attributed to several factors. Farmers may adopt practices learned in one year only in the subsequent season if advice is provided too late for action in the current year. They may also learn over time and improve implementation in subsequent seasons. Alternatively, farmers may make farming decisions that result in lower outcomes in the first year with a goal of sustainable increases in production in subsequent years, such as allowing land to lie fallow or making a particular selection and placement of crops. Finally, part of the increased productivity may come from improved soil fertility attributable to increased adoption of legumes in year 1 and

in growing prior to the project, and therefore potentially the crop with the most opportunity for learning. Only 65 percent reported growing soybeans at baseline, as compared with 92 percent and 99 percent for groundnuts and maize, respectively.

to the intercropping of legumes in maize fields. This pattern of results suggests it is important to study the impact of extension programs beyond the first year to allow time for adoption and potential returns to be realized.[32] The suggestive production impacts and strong productivity impacts are not complemented by impacts on agricultural assets or input expenditures (columns 4 and 5), suggesting that the pathway to improved productivity is driven by changes other than input adoption.

Finally, farmers receiving two years of support exhibit statistically significantly higher levels of total production (GVAO, column 2) and productivity (GVAO per acre, column 3) relative to either the group receiving no intensive extension services or the group receiving extension services only in the second year. Notably, although the coefficients are consistently larger in magnitude for two years of support than for support only in the first year, neither production nor productivity is statistically different across these two groups.[33] Among farmers receiving two years of extension support, results are suggestive that increased investments in agriculture are a contributing factor: coefficients on agricultural asset value and input expenditures are positive but not statistically significant.

Intensive extension and repeated exposure to intensive extension appear to have generated deferred positive production impacts. The magnitude of the effects suggests that although two years of services may have provided some extra benefit, services in the first year accounted for the largest component of the productivity improvement. We document some evidence that productive investments are driving these improvements, but this evidence does not convincingly account for the large productivity increases. Table 5 moves beyond investments to consider changes in

[32] This is consistent with the active labor market program literature. Card, Kluve, and Weber (2010), in a meta-review of such programs, find that training programs are associated with positive medium-term (defined as two years after completion of the training program) impacts, despite frequently estimated short-term null impacts.
[33] The coefficient on the value of soybean and groundnut production is positive but not statistically significant.

knowledge and behaviors that are less constrained by household finances and logically affected by the intensive extension.

To further unpack these deferred production and productivity gains, we construct a number of indexes to capture general knowledge of agricultural practices, adoption of such practices, and crop-specific knowledge and actions. The agricultural practices knowledge index is a simple count of whether farmers have ever heard of 11 different agricultural practices or technologies, such as intercropping with legumes and crop rotation.[34] Similarly, the agricultural practices use index is a count of which of the same practices or technologies farmers adopted in the most recent season. Overall knowledge of the practices is relatively high; participants in the standard extension group reported knowledge of, on average, 9.48 out of 11 different practices, leaving little scope for changes in knowledge (column 1).[35] However, use of the same practices is considerably lower; among the standard extension group, participants reported using only 3.65 of the 11 practices on average (column 2). Columns 3, 4, and 5 show the impact, on use only, for subindexes of labor-intensive, capital-intensive, and cheap practices.[36] The pattern of results after the first follow-up (presented in panel A) shows limited evidence of an impact on practice knowledge and use. For both overall knowledge and use, the coefficients are positive but not statistically significant. However, analysis of the subindexes shows that intensive extension increased the use of labor-intensive practices. There was no impact on capital-intensive or cheap practices. Given that labor-

[34] The full list of practices includes (1) basin planting, (2) no-till / minimum soil disturbance, (3) crop cover / residue retention / no stover burning, (4) box ridges, (5) crop rotation, (6) inter- or mixed cropping with legumes, (7) one seed per station, (8) agroforestry; (9) manure application, (10) irrigation, and (11) two-row planting per ridge.
[35] There is an overall increase in respondents' knowledge and use of the practices on the list across the two follow-up survey rounds (increasing knowledge to 10.16 out of 11 for those receiving standard extension, and increasing use from 3.6 practices to 4.0). Furthermore, other research has shown that surveys themselves are a conduit for providing information (Zwane et al. 2011).
[36] The labor-intensive index includes five agricultural practices (practices 1, 3, 7, 9, and 11 in footnote 34), the capital intensive index includes four agricultural practices (practices 3, 5, 8, and 10 in footnote 34), and the cheap practice index includes three agricultural practices (practices 2, 4, and 6 in footnote 34).

intensive practices may be the ones requiring the most instruction, this result is sensible. The second-year results in Panel B follow a similar pattern. There is suggestive evidence that those who received intensive extension in year 2 show improvements in knowledge and use of agricultural practices, with statistically significant coefficients for those receiving one year of extension (in the second year) for overall and labor-intensive use, and for those receiving two years of extension for overall knowledge. However, beyond a second-year increase in general knowledge, there is no evidence that those who received intensive extension only in the first year continued to implement these practices in year 2.

Beyond general agricultural practices, the extension agents were expected to provide crop-specific support to farmers. NASFAM had in place a set of best-practice growing guidelines for soybean and groundnut farmers. Using these best practices, we construct two crop-specific indexes that count the number of guidelines (by crop) the farmer recalls correctly (knowledge) (columns 6 and 8 for groundnuts and soybeans, respectively) and reports implementing correctly (use) (columns 7 and 9 for groundnuts and soybeans, respectively). In response to the intensive extension, there is an increase in conformity with the NASFAM agricultural practice guidelines, particularly for soybeans in the first year and for both soybeans and groundnuts in the second year. The effect sizes in the second year are likely enhanced by the distribution of the visual aids that focused on these guidelines. As with previous results, positive impacts are limited to farmers who received extension in that year; there is no evidence of improved knowledge or use in year 2 for those who received services in year 1 only. This is despite the evidence of deferred production and productivity impacts previously documented.

Given that the intensive extension program included a management component, specifically the development of a personalized farm management plan, another possible

mechanism for deferred production impacts is through improved management practices. We consider the impact of the intensive extension on management practices in Table 6. In both years, we collected information on whether a plan was completed and who was involved in drafting it. In the second year, we additionally asked about whether the plan was followed, whether the visual aid was filled out,[37] and how many business plan objectives were completed. We find strong impacts during the year of implementation of intensive extension (independent of which year) on the completion of and involvement of household members in drafting the farm management plan, as well as whether the plan was followed and objectives completed (in year 2). Multiple years of extension amplify the compliance with drafting a farm management plan, involving more household members in the decision making, discussing a wider range of topics with the extension officer in devising the farm management plan, and following the plan. These results suggest that at least in the second year, farmers did pay attention to their specific business goals.

Next, we examine differences in the impacts of extension on production by gender (Appendix Tables 10a and 10b). We observe considerable heterogeneity of impacts. In the first year, results are very similar across the two groups. In the second year, we find that men benefit from the intensive extension after one year, even when women do not. However, women accrue larger returns to the intensive extension in the second year, whereas men often are even worse off in the second year. These results suggest larger returns to women from the more individualized, one-on-one extension provision, as compared with the lead farmer approach, even if men can sometimes benefit immediately. Understanding these gender differences is important in future research and highlights the importance of studying populations over time to fully understand the

[37] On the visual aid provided, farmers had the opportunity to write in dates when they completed specific tasks. Part of this exercise was to encourage extensionists to bring out the visual aid to explicitly discuss progress toward the identified business goals.

dynamics that may differ in important ways across subgroups.

4.3. Framed capital transfers and extension: Complements or substitutes?

The final set of results considers the potential interactions of the two interventions (Table 7). The evidence from year 1 suggests the transfers and intensive extension services are highly complementary (panel A). The coefficient on the interaction term is large and positive for all three production indicators, and it is statistically significant for GVAO. This result is paired with sizable and significant increases in agriculture-specific assets and expenditures on inputs among those assigned to receive both intensive extension and cash transfers.[38] The complementary effects are driven by female NASFAM members relative to male NASFAM members; in fact, for male respondents, we find no complementary effects.[39] So men in the sample appear to be only credit constrained, whereas women are both credit and information constrained.

In the second year, we observe only suggestive evidence of sustained complementarities between the interventions on overall GVAO and GVAO per acre (panel B, columns 2 and 3); the coefficients are positive but not statistically significant, and the sample may be underpowered to detect these patterns. The more modest results, although not statistically significant in IHST form, are marginally significant when expressed in levels. There is some evidence (a statistically significant increase in groundnut and soybean production, and positive but imprecise coefficients for GVAO and GVAO per acre) of impacts in year 2 among those receiving only the transfers. For this group, the pathway to production improvements appears to be dominated by continued investment in inputs.

Further, intensive extension seems to harm farmers in the short run (when not paired with

[38] Despite large increases in groundnut production among those receiving only the capital transfer, these improvements do no translate into overall improvements in GVAO (in the short run) due to corresponding reductions in tobacco production (Appendix Table 11).

transfers), causing strong reductions in GVAO. These reductions correspond to significantly lower investment in agricultural assets as well as input expenditures. Further work is needed to understand this short-term negative impact.

4.4. Welfare

The goal of this project is to increase crop production so as to ultimately improve overall household welfare. In keeping with this goal, Tables 8, 9, and 10 present results for impacts on a broader range of welfare outcomes: overall assets, savings (including livestock, which is often used as a buffer stock, as in, for example, Kazianga and Udry 2006), and consumption aggregates (food, nonfood, and total expenditures) for the three key specifications.

First, we examine the impacts of the transfer treatments on the welfare measures (Table 8). The impacts of the transfers on crop production are accompanied by sizable improvements in asset accumulation (column 1), total savings (column 4), and nonfood and overall consumption (columns 6 and 7, respectively) in the first year. Estimates in the second year are smaller and noisier, but follow a similar pattern. One potential drawback with the consumption estimates is that they are measured in August, when households are least constrained. The food consumption portion of the consumption module is based on the last seven days of consumption, likely leading to an underestimate of consumption during the lean period. Appendix Table 13 attempts to understand this phenomenon further by considering a wider range of measures of food security, including measures obtained during the lean season of the first year, during a survey conducted among a subsample of respondents. These results are consistent with the consumption findings in that, in general, across surveys, the transfers are associated with lower levels of reported food insecurity, although the results are not always statistically significant. During the year 1 lean season, farmers receiving the input package reported fewer months of insufficient food. In the

main year 1 follow-up survey, we find evidence of more diverse diets as measured by the World Food Programme food consumption score. In the year 2 follow-up, we find that both the cash and input transfers reduced the probability of households' reporting having had insufficient food in any of the prior 12 months. Cash transfers also led to a reduction in the number of months of insufficient food and an increase in the food consumption score of the respondent. In sum, the results suggest that the transfers had a modest impact on food security, even a year after implementation.

Turning to the intensive extension results in Table 9, unsurprisingly, we observe limited impacts of the intensive extension on the set of welfare metrics during the year of implementation in both phases. There are some improvements in welfare for those receiving intensive extension in the first year (tropical livestock units and nonfood consumption) and those receiving two years of extension (total assets, tropical livestock units, and nonfood consumption), consistent with the earlier crop production results.

Last, we examine the interactions between the treatments in Table 10. In year 1, the positive impacts of the transfers on welfare are driven by those receiving both transfers and intensive extension support. The interaction term is large and positive for total assets, tropical livestock units owned, nonfood consumption, and total consumption. This finding is consistent with the pattern of the production results. In the year 2 specification, there is little evidence of sustained complementarities, and the only consistent result is a significant, negative effect among those receiving extension only. To the extent that some of the interaction terms are positive, though not significant, this pattern of results is also consistent with the production results.

5. Conclusion

The goal of this paper is to examine the independent and joint impacts of a project

combining framed transfers and agricultural extension services among smallholder farmers in Malawi. We find that framed transfers of both cash and inputs led to increases in production beyond the year in which the transfers were received. Overall, we find limited differences due to the modality of the transfers, though cash transfers appear to have stronger production impacts in the year in which they were received compared to the input transfers. Gains in production seem to be driven by increased investment in agricultural assets as well as ongoing increased adoption of inputs. These sustained benefits due to a one-season transfer are strong evidence that such transfers can potentially be an important component of social protection strategies that are often focused on continued consumption support.

Considering the impacts of the intensive extension services, we found that during the year of receipt of services, smallholder farmers are not better off. Interestingly, this is true in both years, and varying weather conditions or extension agent learning over the two years did not appear to matter in the short run. However, there do appear to be deferred benefits to intensive extension support; farmers who received services in year 1 only were better off in year 2. These production impacts appear to be driven by increased adoption of labor-intensive agricultural practices rather than increased on-farm investments. Finally, repeated exposure to intensive extension generates benefits similar in magnitude to the deferred benefits of one year of exposure, suggesting that repeated exposure to intensive support may be unnecessary, a finding that could improve the cost-effectiveness of such programs. Intensive, holistic programs such as this one may be an important component in improving farmer productivity.

Finally, our results highlight the importance of and the complementarities between providing capital and information services in situations in which farmers may be constrained by both. In the first year, we found strong complementarities between the two interventions,

suggesting that transfers are most effective when combined with extension, and that extension is not effective without capital transfer. However, in the second year, the joint results are somewhat limited, and the two interventions appear to have independent impacts. These puzzling results point to the need for more rigorous research that analyzes the joint effects of agricultural programs over time. This work should extend past the agricultural sector to consider the interaction of the many social programs implemented by governments and NGOs to improve the livelihoods of poor households in rural areas.

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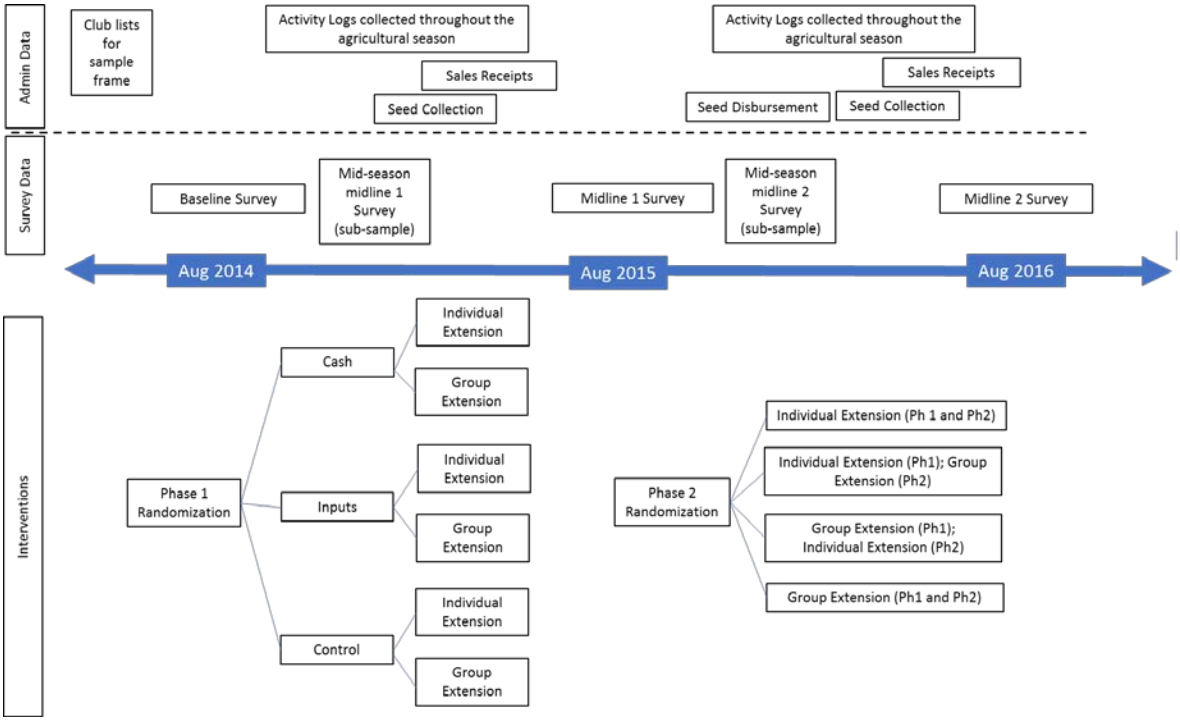
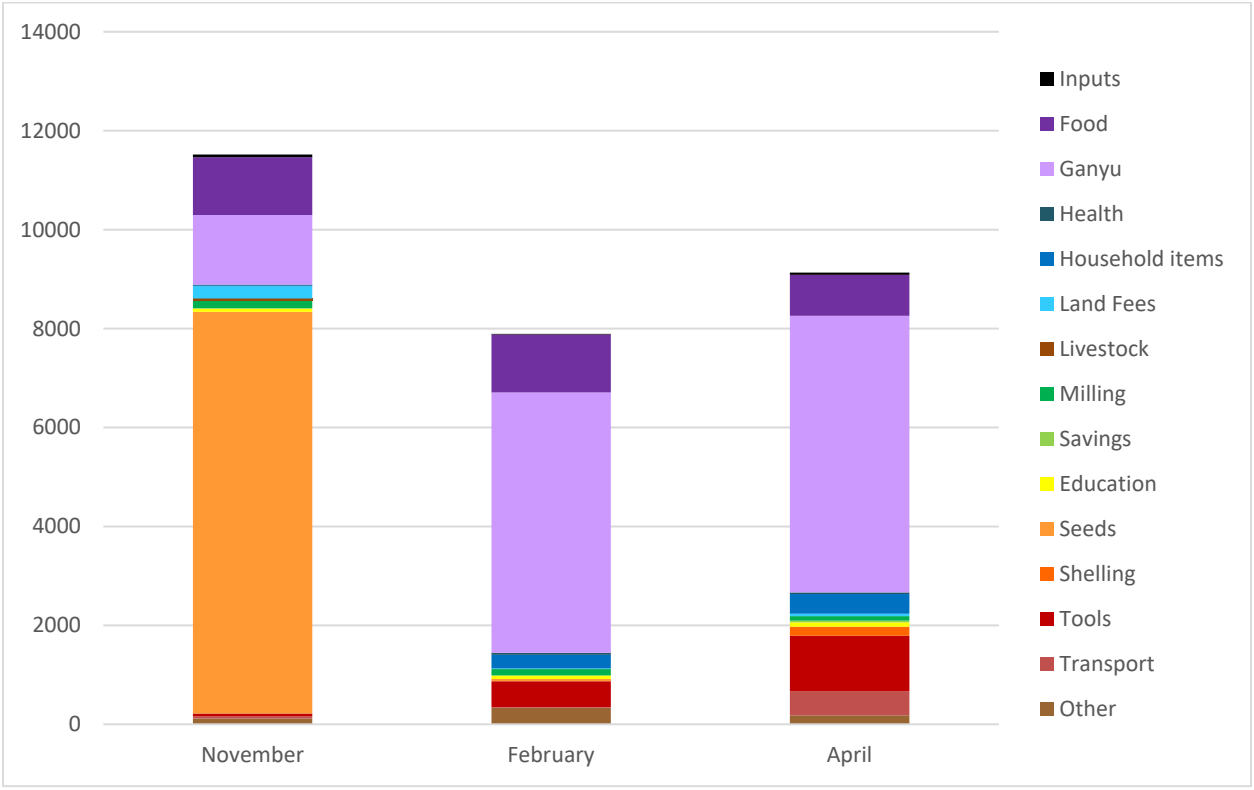
Figure 1: Timeline of Activities



Source: Authors

Figure 2: Self-Reported Use of Transfers



Source: Author's calculations from follow-up 1

Table 1: NASFAM member and household characteristics and balance

	Full Sample	NASFAM standard extension	Intensive extension	p-value: (2) = (3)	Control	Cash	Inputs	p-value for test: (5) = (6) = (7)
NASFAM Member Characteristics	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	41.4	41.3	41.5	0.9	41.0	41.1	42.0	0.703
Is female	0.64	0.67	0.61	0.27	0.64	0.66	0.61	0.773
Is married	0.82	0.84	0.81	0.20	0.80	0.83	0.84	0.535
No education	0.18	0.17	0.19	0.56	0.16	0.16	0.21	0.231
Some primary	0.54	0.55	0.53	0.39	0.51	0.55	0.56	0.435
Completed primary	0.16	0.15	0.16	0.62	0.19	0.15	0.13	0.239
Some secondary	0.08	0.08	0.08	0.96	0.09	0.09	0.05	0.187
Completed secondary or higher	0.05	0.05	0.05	0.87	0.05	0.05	0.04	0.866
Household Head Characteristics								
Age	44.5	44.4	44.6	0.9	44.4	44.2	45.0	0.797
Is female	0.15	0.15	0.15	0.83	0.16	0.14	0.15	0.765
Household Characteristics								
Household size	5.5	5.7	5.3	0.0	5.4	5.6	5.5	0.568
Land owned (Acres)	4.1	4.1	4.1	0.9	4.0	4.2	4.1	0.822
Agricultural Production and Agricultural Investments								
Number of crops	4.5	4.5	4.5	0.9	4.5	4.6	4.4	0.416
Value of soy and groundnut production (	162.24	169.94	155.15	0.61	155.68	176.07	154.73	0.803
GVAO (USD)	594.29	543.66	640.58	0.22	560.41	585.72	636.26	0.774
GVAO (USD) p/acre	126.46	111.74	139.94	0.05	123.56	121.65	134.16	0.823
Value of agricultural assets (USD)	37.21	33.36	40.73	0.31	31.12	44.79	35.52	0.336
Input expenditures (USD)	127.43	114.84	138.94	0.15	131.07	132.13	119.10	0.766
Livestock								
Livestock units	0.8	0.7	0.8	0.1	0.7	0.9	0.6	0.145
Value of total livestock (USD)	202.11	168.15	233.15	0.32	174.44	290.24	140.19	0.191
Attrition (relative to baseline)								
Followup survey 1	0.10	0.10	0.10	0.90	0.12	0.10	0.07	0.131
Followup survey 2	0.19	0.18	0.20	0.55	0.23	0.17	0.17	0.282

Notes: All values are from the baseline survey conducted in 2014. Sample is the 1,187 households interviewed at baseline. All money amounts expressed in USD.

Table 1: NASFAM member and household characteristics and balance (continued)

	No intensive extension	One year intensive (in Year 1)	One year intensive (in Year 2)	Two years intensive extension	p-value for test: (9) = (10) = (11) = (12)
NASFAM Member Characteristics	(9)	(10)	(11)	(12)	(13)
Age	41.9	41.2	41.0	41.3	0.946
Is female	0.54	0.68	0.68	0.66	0.217
Is married	0.83	0.85	0.78	0.83	0.274
No education	0.19	0.17	0.19	0.17	0.939
Some primary	0.54	0.55	0.51	0.55	0.734
Completed primary	0.16	0.14	0.16	0.16	0.930
Some secondary	0.05	0.07	0.10	0.08	0.298
Completed secondary or higher	0.05	0.06	0.04	0.03	0.397
Household Head Characteristics					
Age	44.7	44.3	44.6	44.5	0.997
Is female	0.14	0.15	0.17	0.15	0.841
Household Characteristics					
Household size	5.4	5.8	5.3	5.7	0.064
Land owned (Acres)	4.2	4.0	3.9	4.2	0.429
Agricultural Production and Agricultural Investments					
Number of crops	4.4	4.4	4.6	4.6	0.797
Value of soy and groundnut production (	177.32	179.38	132.00	161.22	0.44
GVAO (USD)	646.16	566.41	634.79	522.46	0.48
GVAO (USD) p/acre	134.11	115.03	145.92	108.68	0.19
Value of agricultural assets (USD)	43.07	31.40	38.31	35.18	0.76
Input expenditures (USD)	159.65	108.72	117.49	120.53	0.22
Livestock					
Livestock units	0.9	0.7	0.8	0.6	0.126
Value of total livestock (USD)	300.52	206.78	163.33	132.15	0.297
Attrition (relative to baseline)					
Followup survey 1					
Followup survey 2	0.21	0.20	0.15	0.20	0.349

Notes: All values are from the baseline survey conducted in 2014. Sample is the 1,187 households interviewed at baseline. All money amounts expressed in USD.

Table 2: Treatment compliance

Panel A: Transfer Related

Receipt of Cash and Inputs	Control (1)	Cash (2)	Inputs (3)
Received first cash transfer	0.01	0.92	0.33
Amount received (1st transfer) (MWK)	109	12,472	3,441
Received second cash transfer	0.04	0.91	0.88
Amount received (2nd transfer) (MWK)	407	7,915	8,772
Received third cash transfer	0.04	0.89	0.67
Amount received (3rd transfer) (MWK)	352	9,273	6,777
Received hoe(s)	0.04	0.25	0.87
Number of hoes received	0.04	0.26	1.04
Received innoculant	0.07	0.18	0.87
Amount of innoculant received (kgs)	0.6	1.5	8.6
Received sacks	0.03	0.18	0.28
Number of sacks received	0.05	0.89	0.76
Received seed	0.64	0.24	0.83
Amount of seed received (kgs)	10.3	4.8	15.5

Panel B: Extension Related (Phase 1)

Services Received in Year 1:	NASFAM standard extension (1)	Intensive extension (2)
Any group extension services received	0.79	0.93
Number of group extension visits	3.80	6.31
Any individual extension services received	0.47	0.82
Number of individual extension visits	1.58	2.91

Panel C: Extension Related (Phase 2)

Services Received in Year 2:	No intensive extension (1)	One year intensive (Year 1) (2)	One year intensive (Year 2) (3)	Two years intensive (4)
Any group extension services received	0.78	0.81	0.90	0.91
Number of group extension visits	3.35	3.65	4.76	5.00
Any individual extension services received	0.42	0.53	0.70	0.81
Number of individual extension visits	1.18	1.41	1.80	2.50

Notes: All values are from the baseline survey conducted in 2014. Sample is the 1,187 households interviewed at baseline. All money amounts expressed in USD.

Table 3: Transfer treatment impacts on crop production

	Value of Groundnuts and Soy (IHST)	GVAO (IHST)	GVAO p/acre (IHST)	Value of agriculture assets (IHST)	Expenditures on all inputs (IHST)
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)
Received Cash Transfer	0.792***	0.251**	0.115	0.329***	0.681***
	(0.139)	(0.109)	(0.0849)	(0.120)	(0.146)
Received Input Package	0.524***	0.0646	0.0192	0.275***	0.489***
	(0.156)	(0.105)	(0.0830)	(0.0967)	(0.138)
Observations	1,138	1,144	1,143	1,143	1,144
R-squared	0.211	0.256	0.251	0.143	0.222
Control mean	10.83	12.64	11.39	9.427	10.53
Test of equality: Cash = Inputs	0.0415	0.0526	0.216	0.639	0.142
Panel B: Followup survey 2					
Received Cash Transfer	0.749***	0.305***	0.197***	0.224*	0.463***
	(0.197)	(0.0902)	(0.0664)	(0.130)	(0.120)
Received Input Package	0.764***	0.188**	0.115*	0.169	0.351***
	(0.195)	(0.0825)	(0.0591)	(0.123)	(0.122)
Observations	1,118	1,119	1,119	1,119	1,119
R-squared	0.145	0.176	0.194	0.072	0.204
Control mean	11.52	13.42	12.16	9.847	11.34
Test of equality: Cash = Inputs	0.887	0.107	0.0885	0.607	0.308

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Table 4: Extension treatment impacts on crop production

	Value of Groundnuts and Soy (IHST)	GVAO (IHST)	GVAO p/acre (IHST)	Value of agriculture assets (IHST)	Expenditures on all inputs (IHST)
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)
Intensive Extension in Year 1	0.0395	-0.146	-0.115	0.0927	0.0290
	(0.139)	(0.0922)	(0.0719)	(0.101)	(0.132)
Observations	1,138	1,144	1,143	1,143	1,144
R-squared	0.183	0.252	0.252	0.134	0.202
Control mean	11.31	12.69	11.44	9.518	10.86
Panel B: Followup survey 2					
One year of Intensive Extension Services (Yr 1)	-0.0511	0.242	0.278**	0.0281	0.00255
	(0.382)	(0.178)	(0.135)	(0.250)	(0.236)
One year of Intensive Extension Services (Yr 2)	-0.113	0.00329	0.0115	0.00929	-0.0733
	(0.192)	(0.0782)	(0.0562)	(0.113)	(0.117)
Two years of Intensive Extension Services	0.256	0.358*	0.310**	0.135	0.269
	(0.397)	(0.197)	(0.150)	(0.230)	(0.221)
Observations	1,118	1,119	1,119	1,119	1,119
R-squared	0.124	0.168	0.191	0.069	0.195
Control mean	12.24	13.57	12.27	9.889	11.61
1 Year (in Year 1) = 1 Year (in Year 2)	0.864	0.197	0.0589	0.943	0.763
1 Year (in Year 1) = 2 Years	0.0514	0.212	0.657	0.391	0.0633
1 Year (in Year 2) = 2 Years	0.335	0.0826	0.0550	0.606	0.153

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Table 5: Extension treatment impacts on knowledge of and use of agricultural practices

Panel A: Followup survey 1	Agricultural Practices index (knowledge) (1)	Agricultural Practices index (used) (2)	Labor intensive practices index (used) (3)	Capital intensive practices index (used) (4)	Cheap practices index (used) (5)	Correct knowledge (G/nut) index (6)	Correct action (G/nut) index (7)	Correct knowledge (soy) index (8)	Correct action (soy) index (9)	Received a visual aid (10)	Number of visual aids received (11)	Enumerator saw visual aid (12)
Intensive Extension in Year 1	0.125	0.0856	0.167**	-0.0755	-0.0155	-0.0115	-0.0357	0.107*	0.0985*			
	(0.0996)	(0.117)	(0.0818)	(0.0564)	(0.0411)	(0.0521)	(0.0621)	(0.0587)	(0.0583)			
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144			
R-squared	0.100	0.132	0.132	0.117	0.082	0.099	0.126	0.076	0.081			
Control mean	9.482	3.655	1.459	1.615	0.655	1.395	1.246	1.006	0.918			
Panel B: Followup survey 2												
One year of Intensive Extension	0.562**	-0.163	-0.157	-0.0137	0.0416	0.0497	0.325	-0.0922	-0.0279	0.132	0.0959	0.0972
Services (Yr 1)	(0.267)	(0.380)	(0.228)	(0.194)	(0.116)	(0.198)	(0.254)	(0.178)	(0.150)	(0.0819)	(0.104)	(0.0742)
One year of Intensive Extension	-0.0843	0.302*	0.224**	0.0550	0.0555	0.186**	0.200*	0.198**	0.0949	0.747***	0.838***	0.636***
Services (Yr 2)	(0.0995)	(0.155)	(0.0968)	(0.0829)	(0.0448)	(0.0825)	(0.110)	(0.0814)	(0.0863)	(0.0309)	(0.0387)	(0.0352)
Two years of Intensive Extension	0.458*	0.176	0.0655	0.0971	0.0672	0.149	0.487**	-0.0457	-0.0263	0.802***	0.880***	0.757***
Services	(0.272)	(0.352)	(0.221)	(0.199)	(0.110)	(0.202)	(0.240)	(0.183)	(0.157)	(0.0859)	(0.106)	(0.0823)
Observations	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,118	1,117	1,118
R-squared	0.126	0.111	0.106	0.083	0.070	0.177	0.200	0.089	0.121	0.581	0.497	0.526
Control mean	10.16	4.073	1.550	1.760	0.847	1.990	1.553	1.040	0.793	0.0467	0.0535	0.0233
1 Year (in Yr 1) = 1 Year (in Yr 2)	0.0123	0.215	0.0780	0.730	0.906	0.505	0.638	0.0925	0.411	1.06e-10	2.17e-10	1.17e-09
1 Year (in Yr 1) = 2 Years	0.409	0.0371	0.0291	0.176	0.638	0.288	0.165	0.578	0.985	0	0	0
1 Year (in Yr 2) = 2 Years	0.0400	0.718	0.449	0.838	0.917	0.863	0.258	0.173	0.432	0.534	0.692	0.167

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money
*** p<0.01, ** p<0.05, * p<0.10

Table 6: Extension treatment impacts on management practices

Panel A: Followup survey 1	Farm management plan (1)	Number of HH members involved in FMP (2)	Number of non-HH members involved in FMP (3)	Number of topics covered in discussion of FMP (4)	Did member follow FMP (5)	Goals written on V/aid (6)	Dates of activities completed (7)	Number of FMP objectives met (/3) (8)
Intensive Extension in Phase 1	0.143***	0.261***	0.148***	0.851***				
	(0.0359)	(0.0538)	(0.0395)	(0.191)				
Observations	1,144	1,144	1,144	1,144				
R-squared	0.096	0.101	0.084	0.087				
Control mean	0.289	0.382	0.261	1.124				
Panel B: Followup survey 2								
One year of Intensive Extension Services (Yr 1	0.0650	0.171	0.309***	1.469***	0.0873	0.0255	0.0245	0.225
	(0.0939)	(0.127)	(0.0819)	(0.348)	(0.0808)	(0.0797)	(0.0674)	(0.278)
One year of Intensive Extension Services (Yr 2	0.454***	0.590***	0.0281	0.643***	0.269***	0.469***	0.349***	1.345***
	(0.0373)	(0.0678)	(0.0440)	(0.215)	(0.0359)	(0.0419)	(0.0398)	(0.107)
Two years of Intensive Extension Services	0.472***	0.755***	0.257***	1.524***	0.416***	0.630***	0.483***	1.452***
	(0.0922)	(0.133)	(0.0882)	(0.363)	(0.0856)	(0.0839)	(0.0700)	(0.267)
Observations	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119
R-squared	0.268	0.198	0.085	0.108	0.170	0.457	0.331	0.283
Control mean	0.210	0.317	0.233	1.197	0.167	0.0133	0.0133	0.570
1 Year (in Year 1) = 1 Year (in Year 2)	4.94e-05	0.00167	0.000651	0.0129	0.0214	1.22e-06	2.99e-05	7.84e-05
1 Year (in Year 1) = 2 Years	0	0	0.414	0.842	0	0	0	0
1 Year (in Year 2) = 2 Years	0.841	0.234	0.00902	0.0123	0.0784	0.0679	0.0758	0.687

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Table 7: Transfer and extension treatment impacts on crop production

	Value of Groundnuts and Soy (IHST)	GVAO (IHST)	GVAO p/acre (IHST)	Value of agriculture assets (IHST)	Expenditures on all inputs (IHST)
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)
Intensive Extension in Phase 1	-0.252	-0.550***	-0.248*	-0.320*	-0.919***
	(0.241)	(0.168)	(0.135)	(0.166)	(0.285)
Received Cash or Input Transfer	0.524***	-0.0819	0.000873	0.0308	-0.0181
	(0.187)	(0.125)	(0.0972)	(0.155)	(0.174)
Intensive Extension X Cash or Input Transfer	0.329	0.600***	0.193	0.594**	1.379***
	(0.329)	(0.211)	(0.159)	(0.255)	(0.381)
Observations	1,138	1,144	1,143	1,143	1,144
R-squared	0.209	0.263	0.254	0.147	0.232
Control mean	10.83	12.64	11.39	9.427	10.53
Panel B: Followup survey 2					
Intensive Extension (in Year 1)	-0.908**	0.0400	0.173*	-1.277***	-0.0517
	(0.421)	(0.111)	(0.0890)	(0.214)	(0.145)
Received Cash or Input Transfer	0.814**	0.142	0.109	0.0168	0.277**
	(0.326)	(0.0945)	(0.0779)	(0.158)	(0.117)
Intensive Extension (in Year 1) X Cash or Input Transfer	-0.119	0.143	0.0718	0.269	0.161
	(0.354)	(0.134)	(0.108)	(0.208)	(0.189)
				0	
Observations	1,118	1,119	1,119	1,119	1,119
R-squared	0.159	0.267	0.232	0.187	0.259
Control mean	11.60	13.47	5.630	9.856	11.39

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Table 8: Transfer treatment impacts on consumption, assets and expenditures

	Total assets (IHST)	TLSUs	TLSUs (IHST)	Total savings (IHST)	Total expenditures (IHST) on… Food	Non-Food	Total
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Received Cash Transfer	0.194**	-0.0702	0.549	1.224***	0.0764	0.222***	0.119**
	(0.0821)	(0.133)	(0.354)	(0.384)	(0.0464)	(0.0735)	(0.0496)
Received Input Package	0.142	-0.172	-0.0980	1.037***	0.116**	0.185***	0.125**
	(0.0935)	(0.128)	(0.340)	(0.376)	(0.0482)	(0.0702)	(0.0499)
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144
R-squared	0.189	0.074	0.103	0.092	0.148	0.189	0.189
Control mean	10.92	1.089	2.201	7.727	13.72	12.69	14.09
Test of equality: Cash = Inputs	0.198	0.199	0.0500	0.409	0.442	0.615	0.914
Panel B: Followup survey 2							
Received Cash Transfer	0.248**	0.0543	1.561***	0.450	0.0709*	0.0208	0.0459
	(0.121)	(0.122)	(0.533)	(0.503)	(0.0417)	(0.0724)	(0.0453)
Received Input Package	0.143	-0.0265	0.664	-0.254	0.0645	0.116	0.0723
	(0.121)	(0.118)	(0.436)	(0.480)	(0.0450)	(0.0727)	(0.0471)
Observations	1,119	893	1,119	1,119	1,119	1,119	1,119
R-squared	0.162	0.075	0.088	0.049	0.136	0.140	0.154
Control mean	11.17	0.868	1.852	8.053	14.10	13.18	14.50
Test of equality: Cash = Inputs	0.247	0.428	0.0251	0.106	0.880	0.168	0.553

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.
*** p<0.01, ** p<0.05, * p<0.10

Table 9: Extension treatment impacts on consumption, assets, and expenditures

	Total assets		Value of	Total savings	Total expenditures (IHST) on…		
	(IHST)	TLSUs	TLSUs	(IHST)	Food	Non-Food	Total
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intensive Extension in Phase 1	0.0879	-0.0626	-0.944***	-0.337	0.0203	0.154**	0.0593
	(0.0725)	(0.105)	(0.306)	(0.344)	(0.0390)	(0.0600)	(0.0410)
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144
R-squared	0.184	0.074	0.106	0.082	0.143	0.186	0.184
Control mean	10.85	0.929	2.309	8.379	13.77	12.73	14.14
Panel B: Followup survey 2							
One year of Intensive Extension Services (Yr 1)	0.192	0.431*	0.0289	-0.548	0.0120	0.366**	0.124
	(0.253)	(0.234)	(0.951)	(1.183)	(0.0942)	(0.176)	(0.107)
One year of Intensive Extension Services (Yr 2)	0.0748	-0.211*	-0.293	-0.593	0.0399	0.0289	0.0282
	(0.112)	(0.126)	(0.497)	(0.470)	(0.0375)	(0.0693)	(0.0428)
Two years of Intensive Extension Services	0.388*	0.463*	0.377	-0.163	0.0396	0.455***	0.165
	(0.222)	(0.241)	(0.979)	(1.168)	(0.0993)	(0.170)	(0.111)
Observations	1,119	893	1,119	1,119	1,119	1,119	1,119
R-squared	0.162	0.084	0.077	0.049	0.135	0.144	0.155
Control mean	11.24	0.711	2.377	8.405	14.15	13.28	14.56
1 Year (in Year 1) = 1 Year (in Year 2)	0.630	0.0222	0.748	0.971	0.772	0.0493	0.365
1 Year (in Year 1) = 2 Years	0.0984	0.771	0.418	0.480	0.548	0.230	0.404
1 Year (in Year 2) = 2 Years	0.141	0.0198	0.516	0.723	0.998	0.0105	0.213

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Table 10: Treatment impacts on consumption, assets, and expenditures

	Total assets		Value of TLSUs	Total savings	Total expenditures (IHST) on…		
	(IHST)	TLSUs	(IHST)	(IHST)	Food	Non-Food	Total
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intensive Extension in Phase 1	-0.500***	-0.445**	-1.778**	-0.882	-0.122	-0.218*	-0.125
	(0.147)	(0.180)	(0.687)	(0.675)	(0.0814)	(0.117)	(0.0836)
Received Cash or Input Transfer	-0.239**	-0.390**	-0.177	0.922	0.00221	-0.0584	-0.00358
	(0.120)	(0.179)	(0.494)	(0.567)	(0.0747)	(0.0973)	(0.0780)
Intensive Extension X Cash or Input Transfer	0.897***	0.624**	1.242	0.626	0.206	0.549***	0.268**
	(0.202)	(0.242)	(0.879)	(0.928)	(0.127)	(0.159)	(0.128)
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144
R-squared	0.203	0.080	0.110	0.093	0.151	0.198	0.194
Control mean	10.92	1.089	2.201	7.727	13.72	12.69	14.09
Panel B: Followup survey 2							
Intensive Extension (in Year 1)	-0.175	-1.413***	-7.197***	-2.309	-0.139**	-0.609***	-0.297***
	(0.155)	(0.124)	(1.106)	(1.819)	(0.0703)	(0.114)	(0.0690)
Received Cash or Input Transfer	0.0426	-0.196	1.097	-0.391	0.0608	0.0137	0.0270
	(0.119)	(0.156)	(0.669)	(0.589)	(0.0502)	(0.0841)	(0.0519)
Intensive Extension (in Year 1) X Cash or Input	0.154	0.259	-0.328	0.675	0.0175	0.114	0.0674
Transfer	(0.175)	(0.179)	(0.809)	(0.853)	(0.0770)	(0.124)	(0.0816)
Observations	1,119	1,119	1,119	1,119	1,119	1,119	1,119
R-squared	0.355	0.347	0.137	0.083	0.137	0.140	0.156
Control mean	11.23	0.939	2.013	8.139	14.12	13.24	14.53

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 1: Attrition by NASFAM and household characteristics (followup survey #1 attrition)

	`variable'	Intensive extension	Intensive extension X `variable'	`variable'	Cash	Inputs	Cash X `variable'	Inputs X `variable'
NASFAM Member Characteristics	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)
Age	-0.002	-0.018	0.0004	-0.002	-0.064	-0.033	0.001	-0.0005
Is female	-0.013	0.009	-0.0168	-0.010	-0.035	-0.028	0.01	-0.045
Is married	0.014	-0.039	0.0438	0.101	0.047	0.038	-0.092**	-0.1149**
No education	-0.086	-0.010	0.0361	-0.107	-0.036	-0.061	0.051	0.066
Some primary	-0.006	0.000	-0.0063	0.021	-0.018	-0.016	-0.02	-0.0703
Completed primary	0.023	-0.007	0.0258	-0.005	-0.033	-0.067	0.03	0.0929
Some secondary	0.115	0.005	-0.0953	0.061	-0.025	-0.057	-0.041	0.086
Completed secondary or higher	0.036	-0.004	0.0084	0.080	-0.027	-0.049	-0.037	-0.0918
Household Head Characteristics								
Age	-0.001	0.012	-0.0003	-0.001	-0.099	-0.057	0.002	0.0001
Is female	-0.039	0.001	-0.028	-0.106	-0.041	-0.067	0.08*	0.0853*
Household Characteristics								
Household size	0.005	0.013	-0.0031	0.004	-0.033	-0.053	0.001	-0.0003
Land owned (Acres)	0.006	-0.007	0.0009	0.008	-0.041	-0.023	0.002	-0.0077
Agricultural Production and Agricultural Investments								
Number of crops	0.000	0.018	0***	0.000	-0.032	-0.058	0	0
Value of soy and groundnut production (USD)	0.000	0.008	0	0.000	-0.057	-0.073	0	0
GVAO (in USD)	0.000	-0.010	0	0.000	-0.084	-0.089	0***	0**
GVAO p/acre	0.000	0.002	0	0.000	-0.033	-0.061	0	0*
Value of agricultural assets (in USD)	0.000	0.006	0	0.000	-0.044	-0.074	0	0
Input expenditures (in USD)	0.001	-0.002	0	-0.004	-0.030	-0.070	0.001	0.024
Livestock								
Livestock units	0.000	-0.002	0	0.000	-0.034	-0.066	0**	0*
Value of total livestock (USD)	1.000	0.000	0	1.000	0.000	0.000	0	0

Notes: Sample is the 1,187 households interviewed at baseline. All money amounts expressed in USD.

Appendix Table 2: Attrition by NASFAM and household characteristics (followup survey #2 attrition)

	`variable'	Intensive extension	Intensive extension X `variable'	`variable'	Cash	Inputs	Cash X `variable'	Inputs X `variable'
NASFAM Member Characteristics	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)
Age	-0.003	-0.036	0.0014	-0.003	-0.069	-0.082	0	0.0006
Is female	-0.086	0.008	0.0242	-0.127	-0.104	-0.117	0.069	0.0904
Is married	0.040	0.111	-0.1058	0.060	-0.004	0.042	-0.072	-0.1224
No education	-0.061	0.021	-0.0111	-0.132	-0.069	-0.077	0.05	0.138*
Some primary	-0.027	-0.001	0.0396	0.004	-0.070	-0.033	0.014	-0.0444
Completed primary	0.031	0.016	0.0281	0.030	-0.060	-0.062	-0.01	0.0447
Some secondary	0.128	0.033	-0.1473*	0.144	-0.049	-0.042	-0.138	-0.1501
Completed secondary or higher	0.021	0.021	-0.0139	-0.030	-0.068	-0.058	0.095	0.0347
Household Head Characteristics								
Age	-0.002	0.013	0	-0.002	-0.076	-0.099	0	0.001
Is female	-0.070	0.004	0.117*	-0.050	-0.068	-0.068	0.027	0.074
Household Characteristics								
Household size	-0.016	-0.014	0.007	-0.013	-0.034	-0.115	-0.004	0.011
Land owned (Acres)	0.000	0.031	-0.003	0.001	-0.032	-0.065	-0.007	0.002
Agricultural Production and Agricultural Investments								
Number of crops	-0.004	0.002	0.004	0.000	-0.123	0.031	0.013	-0.02
Value of soy and groundnut production (USD)	0.000	0.034	0	0.000	-0.033	-0.036	0	0
GVAO (in USD)	0.000	0.023	0	0.000	-0.028	-0.034	0	0
GVAO p/acre	0.000	0.005	0	0.000	-0.065	-0.047	0	0
Value of agricultural assets (in USD)	0.000	0.027	0	0.000	-0.069	-0.075	0	0.001
Input expenditures (in USD)	0.000	0.022	0	0.000	-0.027	-0.024	0*	0*
Livestock								
Livestock units	-0.002	0.019	0	0.000	-0.055	-0.063	-0.007	0.009
Value of total livestock (USD)	0.000	0.019	0	0.000	-0.063	-0.060	0	0

Notes: Sample is the 1,187 households interviewed at baseline. All money amounts expressed in USD.

Appendix Table 3: Transfer treatment impacts on crop production (by crop, in kgs)

	Total quantity of production (IHST) of …			
	Maize	Groundnuts	Soy	Tobacco
Panel A: Followup survey 1	(1)	(2)	(3)	(4)
Received Cash Transfer	-0.0248	0.633***	0.472*	-0.163
	(0.113)	(0.217)	(0.254)	(0.266)
Received Input Package	0.0332	0.797***	-0.113	-0.445*
	(0.0974)	(0.253)	(0.261)	(0.261)
Observations	1,138	1,140	1,142	1,127
R-squared	0.214	0.348	0.194	0.222
Control mean	7.073	4.140	3.752	2.844
Test of equality: Cash = Inputs	0.552	0.491	0.0246	0.256
Panel B: Followup survey 2				
Received Cash Transfer	0.242***	0.648**	-0.0621	0.114
	(0.0904)	(0.275)	(0.269)	(0.342)
Received Input Package	0.202**	1.170***	-0.269	-0.113
	(0.0913)	(0.282)	(0.279)	(0.341)
Observations	1,118	1,118	1,118	1,115
R-squared	0.160	0.333	0.190	0.179
Control mean	7.375	4.313	4.461	3.138
Test of equality: Cash = Inputs	0.632	0.0752	0.470	0.448

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.
*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 4: Transfer treatment impacts on agricultural investments (extensive and intensive margins)

	Midline use of…				Total expenditures (IHST) on…		
	Irrigation	Pesticides	Fertilizer	Ganyu	Pesticides	Fertilizer	Ganyu
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Received Cash Transfer	-0.0160	0.116***	0.0160	0.337***		0.183	3.519***
	(0.0327)	(0.0373)	(0.0211)	(0.0304)		(0.286)	(0.320)
Received Input Package	-0.0200	0.0822**	-0.00275	0.303***		-0.0281	3.173***
	(0.0305)	(0.0366)	(0.0270)	(0.0303)		(0.315)	(0.321)
Observations	1,142	1,144	1,144	1,143		1,125	1,142
R-squared	0.067	0.116	0.159	0.218		0.220	0.228
Control mean	0.327	0.221	0.858	0.496		8.734	4.952
Test of equality: Cash = Inputs	0.904	0.414	0.453	0.278		0.507	0.286
Panel B: Followup survey 2							
Received Cash Transfer	0.0541	0.0460	0.0732*	0.164***	0.447	0.789*	1.812***
	(0.0487)	(0.0362)	(0.0400)	(0.0386)	(0.306)	(0.470)	(0.408)
Received Input Package	-0.00162	0.0312	0.0720	0.140***	0.277	0.735	1.596***
	(0.0469)	(0.0328)	(0.0435)	(0.0366)	(0.266)	(0.503)	(0.382)
Observations	1,119	1,119	1,118	1,119	1,110	1,107	1,119
R-squared	0.092	0.037	0.094	0.098	0.041	0.131	0.116
Control mean	0.495	0.128	0.821	0.490	1.038	9.079	4.942
Test of equality: Cash = Inputs	0.180	0.642	0.971	0.469	0.547	0.896	0.557

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 5: Transfer treatment impacts on ganyu use and expenditures by crop

	Extensive Margin: Use of ganyu on…						Intensive Margin: Total expenditures (IHST) on…					
	Maize	Groundnuts	Soy	Groundnuts and/or Soy	Tobacco	Other Crops	Maize	Groundnuts	Soy	Groundnuts and/or Soy	Tobacco	Other Crops
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Received Cash Transfer	0.132***	0.292***	0.261***	0.427***	0.0328	0.00858	1.274***	2.928***	2.504***	4.337***	0.238	0.0328
	(0.0349)	(0.0446)	(0.0472)	(0.0345)	(0.0332)	(0.0124)	(0.354)	(0.430)	(0.451)	(0.335)	(0.321)	(0.112)
Received Input Package	0.142***	0.302***	0.170***	0.381***	0.00661	0.0123	1.351***	3.032***	1.628***	3.849***	0.0268	0.123
	(0.0418)	(0.0432)	(0.0512)	(0.0350)	(0.0279)	(0.00974)	(0.415)	(0.413)	(0.486)	(0.336)	(0.280)	(0.0928)
Observations	1,143	1,142	1,144	1,143	1,144	1,144	1,143	1,144	1,144	1,144	1,143	1,144
R-squared	0.130	0.309	0.196	0.243	0.090	0.055	0.129	0.323	0.199	0.260	0.090	0.057
Control mean	0.305	0.270	0.212	0.394	0.106	0.0398	2.965	2.537	1.969	3.731	1.025	0.370
Test of equality: Cash = Inputs	0.798	0.834	0.0821	0.173	0.362	0.738	0.844	0.821	0.0789	0.143	0.462	0.356
Panel B: Followup survey 2												
Received Cash Transfer	0.0995**	0.139***	0.0957**	0.194***	0.0470	0.0440	1.076***	1.339***	0.868**	1.864***	0.523*	0.460
	(0.0422)	(0.0420)	(0.0453)	(0.0413)	(0.0291)	(0.0293)	(0.405)	(0.400)	(0.429)	(0.404)	(0.292)	(0.282)
Received Input Package	0.105***	0.159***	0.0293	0.152***	0.0412	0.00641	1.169***	1.560***	0.281	1.565***	0.440	0.0741
	(0.0358)	(0.0448)	(0.0397)	(0.0411)	(0.0269)	(0.0293)	(0.343)	(0.439)	(0.372)	(0.401)	(0.271)	(0.278)
Observations	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119
R-squared	0.074	0.191	0.117	0.122	0.048	0.048	0.080	0.205	0.118	0.137	0.049	0.048
Control mean	0.367	0.235	0.184	0.337	0.0918	0.128	3.511	2.224	1.692	3.209	0.869	1.192
Test of equality: Cash = Inputs	0.892	0.641	0.0761	0.253	0.824	0.117	0.812	0.603	0.0989	0.415	0.757	0.0928

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 6a: Transfer treatment impacts (male subsample)

Panel A: Followup survey 1	Groundnuts and Soy (IHST) (1)	GVAO (IHST) (2)	GVAO p/acre (IHST) (3)	Value of agriculture assets (IHST) (4)	s on all inputs (IHST) (5)	Agricultural Practices index (used) (6)	action (G/nut) index (7)	Correct action (soy) index (8)	Farm management plan (9)	Did member follow FMP (10)
Received Cash Transfer	0.659***	0.199	0.160*	0.0152	0.391**	0.396*	0.273**	0.153	0.0523	0.0494
	(0.163)	(0.129)	(0.0956)	(0.102)	(0.160)	(0.229)	(0.124)	(0.109)	(0.0704)	(0.0622)
Received Input Package	0.458***	0.0407	0.125	0.337***	0.332**	0.304	0.222*	-0.0408	0.0504	0.0931
	(0.163)	(0.191)	(0.115)	(0.110)	(0.158)	(0.210)	(0.120)	(0.133)	(0.0673)	(0.0576)
Observations	386	388	387	388	388	388	388	388	388	388
R-squared	0.373	0.395	0.342	0.440	0.410	0.196	0.187	0.166	0.195	0.204
Control mean	11.28	12.93	11.68	9.618	10.74	3.662	1.297	0.831	0.203	0.189
Test of equality: Cash = Inputs	0.182	0.275	0.719	0.00148	0.705	0.671	0.711	0.160	0.978	0.464
Panel B: Followup survey 2										
Received Cash Transfer	0.945**	0.187	0.110	-0.0414	0.517**	0.421	0.0676	0.0393	-0.126	-0.0667
	(0.373)	(0.114)	(0.0842)	(0.158)	(0.217)	(0.290)	(0.240)	(0.160)	(0.0778)	(0.0727)
Received Input Package	0.736**	0.0950	0.0386	-0.191	0.526*	0.236	-0.0642	0.120	0.0838	0.0535
	(0.359)	(0.125)	(0.102)	(0.165)	(0.267)	(0.272)	(0.217)	(0.156)	(0.0777)	(0.0711)
Observations	333	333	333	333	333	333	333	333	333	333
R-squared	0.262	0.360	0.342	0.270	0.273	0.181	0.263	0.155	0.190	0.153
Control mean	11.50	13.65	12.38	10.08	11.71	4.053	1.772	0.912	0.386	0.246
Test of equality: Cash = Inputs	0.194	0.423	0.408	0.218	0.962	0.313	0.491	0.557	0.00915	0.0608

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 6b: Transfer treatment impacts (female subsample)

Panel A: Followup survey 1	Groundnuts and Soy (IHST) (1)	GVAO (IHST) (2)	GVAO p/acre (IHST) (3)	agriculture assets (IHST) (4)	s on all inputs (IHST) (5)	Agricultural Practices index (used) (6)	action (G/nut) index (7)	Correct action (soy) index (8)	Farm management plan (9)	Did member follow FMP (10)
Received Cash Transfer	0.766***	0.238**	0.137	0.340***	0.848***	0.341*	0.0491	0.219***	0.0296	0.0315
	(0.166)	(0.102)	(0.0870)	(0.113)	(0.209)	(0.195)	(0.0833)	(0.0762)	(0.0583)	(0.0580)
Received Input Package	0.496**	0.0814	0.0214	0.273**	0.616***	0.00346	0.107	0.147*	0.0641	0.0551
	(0.196)	(0.102)	(0.0850)	(0.108)	(0.210)	(0.169)	(0.0988)	(0.0885)	(0.0481)	(0.0468)
Observations	752	756	756	755	756	756	756	756	756	756
R-squared	0.214	0.374	0.298	0.288	0.201	0.159	0.132	0.105	0.098	0.087
Control mean	10.61	12.49	11.25	9.333	10.42	3.539	1.138	0.789	0.250	0.224
Test of equality: Cash = Input	0.0862	0.0969	0.162	0.605	0.220	0.0502	0.552	0.391	0.538	0.667
Panel B: Followup survey 2										
Received Cash Transfer	0.577***	0.260**	0.205**	0.240*	0.474***	0.484**	0.237*	0.0810	0.0733	0.0459
	(0.189)	(0.111)	(0.0832)	(0.132)	(0.132)	(0.202)	(0.125)	(0.0958)	(0.0801)	(0.0690)
Received Input Package	0.704***	0.199**	0.142**	0.266*	0.300**	0.220	0.401***	-0.0756	0.108	0.128*
	(0.176)	(0.0984)	(0.0708)	(0.139)	(0.119)	(0.201)	(0.122)	(0.0911)	(0.0748)	(0.0653)
Observations	785	786	786	786	786	786	786	786	786	786
R-squared	0.151	0.236	0.194	0.171	0.206	0.145	0.181	0.150	0.091	0.078
Control mean	11.53	13.33	12.08	9.749	11.18	4.338	1.266	0.763	0.504	0.302
Test of equality: Cash = Input	0.416	0.461	0.300	0.828	0.168	0.113	0.156	0.0526	0.656	0.209

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 7: Extension treatment impacts on agricultural investments (extensive and intensive margins)

	Midline use of…				Total expenditures (IHST) on…		
	Irrigation	Pesticides	Fertilizer	Ganyu	Pesticides	Fertilizer	Ganyu
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intensive Extension in Phase 1	-0.0270	0.0570*	0.00117	0.0607		0.0382	0.741*
	(0.0269)	(0.0342)	(0.0194)	(0.0407)		(0.251)	(0.422)
Observations	1,142	1,144	1,144	1,143		1,125	1,142
R-squared	0.067	0.110	0.159	0.125		0.219	0.136
Control mean	0.291	0.252	0.840	0.703		8.538	7.089
Panel B: Followup survey 2							
One year of Intensive Extension Services (Yr 1)	0.0482	-0.00717	0.0307	0.0719	-0.151	0.303	0.664
	(0.0935)	(0.0624)	(0.0566)	(0.0797)	(0.550)	(0.713)	(0.847)
One year of Intensive Extension Services (Yr 2)	0.0347	0.0475*	0.0368	-0.0274	0.337	0.283	-0.283
	(0.0458)	(0.0286)	(0.0350)	(0.0385)	(0.236)	(0.412)	(0.411)
Two years of Intensive Extension Services	0.0537	0.0681	0.109**	0.103	0.477	1.101	1.045
	(0.0968)	(0.0670)	(0.0536)	(0.0833)	(0.584)	(0.706)	(0.875)
Observations	1,119	1,119	1,118	1,119	1,110	1,107	1,119
R-squared	0.091	0.041	0.096	0.087	0.044	0.131	0.103
Control mean	0.457	0.133	0.827	0.593	1.123	9.186	6.122
1 Year (in Year 1) = 1 Year (in Year 2)	0.891	0.412	0.918	0.215	0.412	0.978	0.265
1 Year (in Year 1) = 2 Years	0.915	0.0444	0.0761	0.506	0.0596	0.129	0.445
1 Year (in Year 2) = 2 Years	0.855	0.772	0.189	0.123	0.824	0.260	0.136

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 8: Extension treatment impacts on ganyu use and expenditures by crop

	Extensive Margin: Use of ganyu on…					
	Maize	Groundnuts	Soy	Groundnuts and/or Soy	Tobacco	Other Crops
Panel A: Followup survey 1	(1)	(2)	(3)	(4)	(5)	(6)
Intensive Extension in Phase 1	0.0752**	0.0273	0.0998**	0.0793	0.0680***	-0.00170
	(0.0333)	(0.0442)	(0.0493)	(0.0483)	(0.0253)	(0.00904)
Observations	1,143	1,142	1,144	1,143	1,144	1,144
R-squared	0.121	0.244	0.161	0.113	0.096	0.055
Control mean	0.363	0.470	0.292	0.629	0.104	0.0336
Panel B: Followup survey 2						
One year of Intensive Extension Services (Yr 1)	0.00672	0.0634	-0.0514	0.0619	-0.0612	0.0197
	(0.0870)	(0.0848)	(0.0700)	(0.0815)	(0.0716)	(0.0640)
One year of Intensive Extension Services (Yr 2)	-0.00707	0.000407	-0.0333	-0.0122	-0.0575*	0.00407
	(0.0383)	(0.0467)	(0.0353)	(0.0439)	(0.0314)	(0.0269)
Two years of Intensive Extension Services	0.0244	0.108	-0.0299	0.128	-0.0500	0.0416
	(0.0963)	(0.0850)	(0.0729)	(0.0839)	(0.0726)	(0.0599)
Observations	1,119	1,119	1,119	1,119	1,119	1,119
R-squared	0.068	0.179	0.112	0.107	0.050	0.046
Control mean	0.403	0.357	0.217	0.467	0.137	0.123
1 Year (in Year 1) = 1 Year (in Year 2)	0.878	0.479	0.790	0.359	0.955	0.800
1 Year (in Year 1) = 2 Years	0.715	0.353	0.661	0.194	0.669	0.477
1 Year (in Year 2) = 2 Years	0.755	0.237	0.961	0.0980	0.912	0.522

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 8: Extension treatment impacts on ganyu use and expenditures by crop (continued)

	Intensive Margin: Total expenditures (IHST) on…					
Panel A: Followup survey 1	Maize (7)	Groundnuts (8)	Soy (9)	Groundnuts and/or Soy (10)	Tobacco (11)	Other Crops (12)
Intensive Extension in Phase 1	0.766**	0.298	0.957**	0.842*	0.700***	-0.0386
	(0.330)	(0.430)	(0.470)	(0.476)	(0.250)	(0.0824)
Observations	1,143	1,144	1,144	1,144	1,143	1,144
R-squared	0.120	0.255	0.164	0.124	0.098	0.057
Control mean	3.506	4.520	2.751	6.104	0.990	0.311
Panel B: Followup survey 2						
One year of Intensive Extension Services (Yr 1)	0.0253	0.746	-0.404	0.731	-0.653	0.156
	(0.868)	(0.801)	(0.659)	(0.777)	(0.749)	(0.630)
One year of Intensive Extension Services (Yr 2)	-0.0504	0.103	-0.277	-0.0657	-0.549*	0.0401
	(0.376)	(0.451)	(0.331)	(0.430)	(0.318)	(0.253)
Two years of Intensive Extension Services	0.253	1.248	-0.227	1.425*	-0.579	0.322
	(0.978)	(0.811)	(0.686)	(0.820)	(0.756)	(0.579)
Observations	1,119	1,119	1,119	1,119	1,119	1,119
R-squared	0.073	0.194	0.113	0.123	0.050	0.046
Control mean	3.942	3.380	2.008	4.513	1.357	1.172
1 Year (in Year 1) = 1 Year (in Year 2)	0.933	0.449	0.841	0.306	0.879	0.847
1 Year (in Year 1) = 2 Years	0.640	0.284	0.700	0.162	0.783	0.580
1 Year (in Year 2) = 2 Years	0.767	0.193	0.939	0.0746	0.966	0.618

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 9: Extension treatment impacts on crop production (by crop, in kgs)

	Total quantity of production (IHST) of …			
	Maize	Groundnuts	Soy	Tobacco
Panel A: Followup survey 1	(1)	(2)	(3)	(4)
Intensive Extension in Phase 1	-0.121	-0.167	0.296	-0.0396
	(0.0808)	(0.196)	(0.225)	(0.222)
Observations	1,138	1,140	1,142	1,127
R-squared	0.215	0.333	0.189	0.219
Control mean	7.071	4.574	3.917	2.565
Panel B: Followup survey 2				
One year of Intensive Extension Services (Yr 1)	-0.149	0.771	0.139	-0.286
	(0.226)	(0.507)	(0.448)	(0.679)
One year of Intensive Extension Services (Yr 2)	-0.149	0.0945	-0.509*	0.0698
	(0.0909)	(0.291)	(0.290)	(0.297)
Two years of Intensive Extension Services	-0.0988	1.061**	0.179	-0.172
	(0.230)	(0.499)	(0.429)	(0.644)
Observations	1,118	1,118	1,118	1,115
R-squared	0.157	0.317	0.194	0.179
Control mean	7.527	5.148	4.695	2.764
1 Year (in Year 1) = 1 Year (in Year 2)	0.999	0.194	0.144	0.607
1 Year (in Year 1) = 2 Years	0.605	0.342	0.882	0.767
1 Year (in Year 2) = 2 Years	0.820	0.0602	0.106	0.714

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.
*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 10a: Extension treatment impacts (male subsample)

Panel A: Followup survey 1	Value of Groundnuts and Soy (IHST) (1)	GVAO (IHST) (2)	GVAO p/acre (IHST) (3)	Value of agriculture assets (IHST) (4)	Expenditures on all inputs (IHST) (5)	Agricultural Practices index (used) (6)	Correct action (G/nut) index (7)	Correct action (soy) index (8)	Farm management plan (9)	Did member follow FMP (10)
Intensive Extension in Phase 1	-0.0203	-0.210	-0.0285	-0.0359	0.0340	0.108	0.0208	-0.0144	0.115*	0.0871
	(0.145)	(0.152)	(0.0991)	(0.101)	(0.132)	(0.197)	(0.114)	(0.104)	(0.0595)	(0.0527)
Observations	386	388	387	388	388	388	388	388	388	388
R-squared	0.352	0.396	0.337	0.424	0.399	0.190	0.174	0.160	0.203	0.205
Control mean	11.67	12.99	11.66	9.791	11.23	3.822	1.358	0.961	0.311	0.292
Panel B: Followup survey 2										
One year of Intensive Extension	-0.335	-0.0117	-0.262*	0.309	-0.769**	0.334	-0.261	0.627	0.422**	0.245
Services (Yr 1)	(0.907)	(0.226)	(0.143)	(0.231)	(0.361)	(0.855)	(0.662)	(0.442)	(0.183)	(0.158)
One year of Intensive Extension	-0.266	0.167	0.162*	0.166	0.206	0.671**	0.130	0.0299	0.418***	0.237***
Services (Yr 2)	(0.364)	(0.124)	(0.0950)	(0.151)	(0.177)	(0.275)	(0.223)	(0.140)	(0.0627)	(0.0519)
Two years of Intensive Extension	-0.0148	0.193	-0.193	0.345*	-0.464**	0.512	0.0842	0.792*	0.630***	0.368***
Services	(0.845)	(0.193)	(0.120)	(0.189)	(0.215)	(0.803)	(0.616)	(0.402)	(0.166)	(0.127)
Observations	333	333	333	333	333	333	333	333	333	333
R-squared	0.241	0.365	0.347	0.268	0.263	0.190	0.268	0.156	0.263	0.180
Control mean	12.57	13.69	12.36	9.938	11.65	4.162	1.820	0.883	0.225	0.198
1 Year (in Year 1) = 1 Year (in Year 2)	0.952	0.427	0.00408	0.564	0.0105	0.700	0.562	0.172	0.980	0.962
1 Year (in Year 1) = 2 Years	0.179	0.0290	0.384	0.808	0.318	0.549	0.118	0.362	0.0111	0.179
1 Year (in Year 2) = 2 Years	0.816	0.890	0.00453	0.380	0.00509	0.846	0.941	0.0554	0.210	0.315

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 10b: Extension treatment impacts (female subsample)

Panel A: Followup survey 1	Value of Groundnuts and Soy (IHST) (1)	GVAO (IHST) (2)	GVAO p/acre (IHST) (3)	Value of agriculture assets (IHST) (4)	Expenditures on all inputs (IHST) (5)	Agricultural Practices index (used) (6)	Correct action (G/nut) index (7)	Correct action (soy) index (8)	Farm management plan (9)	Did member follow FMP (10)
Intensive Extension in Phase 1	0.00904	-0.0787	-0.119	0.177	-0.0368	0.0599	-0.0698	0.180***	0.147***	0.150***
	(0.161)	(0.0895)	(0.0720)	(0.107)	(0.190)	(0.147)	(0.0797)	(0.0677)	(0.0430)	(0.0418)
Observations	752	756	756	755	756	756	756	756	756	756
R-squared	0.190	0.369	0.298	0.283	0.176	0.154	0.131	0.104	0.115	0.106
Control mean	11.10	12.52	11.31	9.358	10.65	3.559	1.181	0.892	0.277	0.242
Panel B: Followup survey 2										
One year of Intensive Extension	0.0415	0.311	0.296*	-0.0545	-0.0339	-0.374	0.300	-0.0449	-0.00612	0.0549
Services (Yr 1)	(0.432)	(0.194)	(0.151)	(0.274)	(0.240)	(0.425)	(0.266)	(0.159)	(0.102)	(0.0849)
One year of Intensive Extension	0.0940	0.0334	-0.000991	-0.0924	-0.247*	0.273	0.243**	0.107	0.478***	0.308***
Services (Yr 2)	(0.193)	(0.0874)	(0.0697)	(0.137)	(0.130)	(0.197)	(0.112)	(0.0909)	(0.0419)	(0.0378)
Two years of Intensive Extension	0.331	0.441**	0.348**	0.0645	0.209	0.0108	0.319	-0.101	0.489***	0.469***
Services	(0.462)	(0.216)	(0.168)	(0.244)	(0.252)	(0.409)	(0.243)	(0.165)	(0.0999)	(0.0932)
Observations	785	786	786	786	786	786	786	786	786	786
R-squared	0.135	0.235	0.193	0.167	0.200	0.145	0.176	0.149	0.304	0.204
Control mean	12.04	13.50	12.22	9.861	11.59	4.021	1.397	0.741	0.201	0.148
1 Year (in Year 1) = 1 Year (in Year 2)	0.903	0.163	0.0505	0.895	0.409	0.109	0.841	0.346	3.79e-06	0.00312
1 Year (in Year 1) = 2 Years	0.103	0.223	0.521	0.388	0.0916	0.0502	0.870	0.586	0	0
1 Year (in Year 2) = 2 Years	0.609	0.0650	0.0379	0.542	0.0966	0.499	0.769	0.207	0.912	0.0855

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.

*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 11: Transfer and extension treatment impacts on crop production (by crop, in kgs)

	Total quantity of production (IHST) of …			
	Maize	Groundnuts	Soy	Tobacco
Panel A: Followup survey 1	(1)	(2)	(3)	(4)
Intensive Extension in Phase 1	-0.173	0.0754	-0.520	-0.787*
	(0.172)	(0.386)	(0.468)	(0.403)
Received Cash or Input Transfer	-0.0152	0.981***	-0.405	-0.848**
	(0.152)	(0.354)	(0.394)	(0.348)
Intensive Extension X Cash or Input Transfer	0.0774	-0.528	1.258*	1.234**
	(0.239)	(0.590)	(0.708)	(0.530)
Observations	1,138	1,140	1,142	1,127
R-squared	0.216	0.351	0.195	0.225
Control mean	7.073	4.140	3.752	2.844
Panel B: Followup survey 2				
Intensive Extension (in Year 1)	0.0562	-1.135***	0.231	-2.716***
	(0.152)	(0.419)	(0.422)	(0.765)
Received Cash or Input Transfer	0.314**	1.534***	-0.216	-0.212
	(0.125)	(0.390)	(0.331)	(0.421)
Intensive Extension (in Year 1) X Cash or Input	-0.111	-1.109**	0.116	0.532
Transfer	(0.167)	(0.465)	(0.489)	(0.654)
Observations	1,016	1,016	1,016	1,013
R-squared	0.172	0.339	0.190	0.183
Control mean	7.375	4.313	4.461	3.138

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.
*** p<0.01, ** p<0.05, * p<0.10

Appendix Table 12a: Transfer and extension treatment impacts (male subsample)

Panel A: Followup survey 1	Value of Groundnuts and Soy (IHST) (1)	GVAO (IHST) (2)	GVAO p/acre (IHST) (3)	Value of agriculture assets (IHST) (4)	Expenditures on all inputs (IHST) (5)	Agricultural Practices index (used) (6)	Correct action (G/nut) index (7)	Correct action (soy) index (8)	Farm management plan (9)	Did member follow FMP (10)
Intensive Extension in Year 1	0.0328	-0.275	-0.0472	0.0935	-0.117	-0.0840	0.0544	-0.0646	0.209*	0.168*
	(0.270)	(0.286)	(0.215)	(0.178)	(0.222)	(0.436)	(0.192)	(0.211)	(0.108)	(0.0919)
Received Cash or Input Transfer	0.635***	0.101	0.140	0.283*	0.276	0.228	0.287*	0.0260	0.111	0.125*
	(0.211)	(0.191)	(0.146)	(0.147)	(0.170)	(0.272)	(0.149)	(0.138)	(0.0838)	(0.0737)
Intensive Extension X Cash or Input Transfer	-0.162	0.0855	0.0122	-0.233	0.193	0.261	-0.0882	0.0727	-0.157	-0.138
	(0.387)	(0.351)	(0.272)	(0.219)	(0.247)	(0.531)	(0.250)	(0.281)	(0.151)	(0.123)
Observations	386	388	387	388	388	388	388	388	388	388
R-squared	0.372	0.398	0.343	0.430	0.410	0.196	0.187	0.161	0.207	0.210
Control mean	11.28	12.93	11.68	9.618	10.74	3.662	1.297	0.831	0.203	0.189
Panel B: Followup survey 2										
Intensive Extension in Year 1	-0.0872	0.105	0.129	-0.154	-0.0290	1.183*	0.312	0.0548	0.411***	0.306***
	(0.406)	(0.256)	(0.209)	(0.199)	(0.400)	(0.686)	(0.409)	(0.241)	(0.146)	(0.0960)
Received Cash or Input Transfer	0.879	0.0664	0.0415	-0.450*	0.207	0.926	0.215	0.104	0.0321	0.104
	(0.544)	(0.294)	(0.228)	(0.232)	(0.412)	(0.630)	(0.436)	(0.268)	(0.152)	(0.0938)
Intensive Extension X Cash or Input Transfer	-0.0884	0.120	0.0655	0.438*	0.445	-0.644	-0.257	-0.0179	0.0179	-0.0911
	(0.442)	(0.292)	(0.230)	(0.246)	(0.478)	(0.716)	(0.455)	(0.289)	(0.147)	(0.107)
Observations	333	333	333	333	333	333	333	333	333	333
R-squared	0.261	0.365	0.348	0.275	0.281	0.197	0.263	0.154	0.248	0.176
Control mean	12.21	13.70	12.40	9.972	11.62	4.226	1.821	0.911	0.316	0.237

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, *** p<0.01, ** p<0.05, * p<0.10

Appendix Table 12b: Transfer and extension treatment impacts (female subsample)

Panel A: Followup survey 1	Value of Groundnuts and Soy (IHST) (1)	GVAO (IHST) (2)	GVAO p/acre (IHST) (3)	Value of agriculture assets (IHST) (4)	Expenditures on all inputs (IHST) (5)	Agricultural Practices index (used) (6)	Correct action (G/nut) index (7)	Correct action (soy) index (8)	Farm management plan (9)	Did member follow FMP (10)
Intensive Extension in Year 1	-0.516*	-0.683***	-0.391***	-0.454**	-1.665***	-0.263	0.240	0.162	0.0541	0.0836
	(0.301)	(0.152)	(0.123)	(0.182)	(0.404)	(0.318)	(0.150)	(0.142)	(0.0800)	(0.0766)
Received Cash or Input Transfer	0.382*	-0.203	-0.0611	-0.118	-0.256	-0.0190	0.317**	0.163	-0.0452	-0.0312
	(0.223)	(0.128)	(0.106)	(0.169)	(0.250)	(0.330)	(0.124)	(0.119)	(0.0743)	(0.0712)
Intensive Extension X Cash or	0.641	0.890***	0.393**	0.911***	2.337***	0.456	-0.510**	-0.0146	0.141	0.101
Input Transfer	(0.399)	(0.211)	(0.174)	(0.306)	(0.562)	(0.502)	(0.207)	(0.210)	(0.117)	(0.111)
Observations	752	756	756	755	756	756	756	756	756	756
R-squared	0.214	0.388	0.304	0.297	0.228	0.157	0.140	0.109	0.117	0.107
Control mean	10.61	12.49	11.25	9.333	10.42	3.539	1.138	0.789	0.250	0.224
Panel B: Followup survey 2										
Intensive Extension in Year 1	0.198	0.0454	0.100	-0.155	-0.0486	0.146	0.432***	0.148	0.432***	0.333***
	(0.352)	(0.147)	(0.117)	(0.257)	(0.187)	(0.402)	(0.142)	(0.118)	(0.0813)	(0.0570)
Received Cash or Input Transfer	0.694*	0.173	0.230*	0.129	0.520**	0.264	0.521***	0.0930	0.0971	0.134**
	(0.393)	(0.148)	(0.122)	(0.301)	(0.229)	(0.431)	(0.166)	(0.150)	(0.0790)	(0.0665)
Intensive Extension X Cash or	-0.0579	0.0855	-0.0638	0.152	-0.184	0.152	-0.235	-0.101	0.0414	-0.0286
Input Transfer	(0.427)	(0.170)	(0.137)	(0.306)	(0.246)	(0.463)	(0.185)	(0.164)	(0.0940)	(0.0701)
Observations	785	786	786	786	786	786	786	786	786	786
R-squared	0.152	0.237	0.194	0.172	0.206	0.145	0.187	0.147	0.208	0.135
Control mean	11.88	13.44	12.21	9.739	11.41	4.008	1.415	0.769	0.358	0.249

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, *** p<0.01, ** p<0.05, * p<0.10

Appendix Table 13: Transfer treatment impacts on FCS, CSI, and other dietary indicators

Panel A: Followup survey 1	FCS (1)	CSI (2)	Any month insufficient food (12 months) (3)	# months insufficient food (4)	# months insufficient food (lean months) (5)	FCS (of respondent) (6)
Received Cash Transfer	0.167	-0.278	-0.0382	-0.0853	-0.110	1.720
	(0.114)	(0.555)	(0.0412)	(0.164)	(0.0932)	(1.230)
Received Input Package	0.201*	0.347	0.0368	-0.0406	0.0534	1.072
	(0.108)	(0.587)	(0.0376)	(0.168)	(0.0927)	(1.090)
Observations	1,144	1,141	1,144	1,144	1,144	1,142
R-squared	0.133	0.175	0.189	0.211	0.203	0.154
Control mean	-2.522	-7.677	0.602	1.805	1.301	42.66
Test of equality: Cash = Inputs	0.759	0.297	0.0389	0.754	0.0465	0.608
Panel B: Mid-year followup survey 1 (subsample)						
Received Cash Transfer	0.182	-1.005	-0.0356	-0.122	-0.145	
	(0.163)	(1.214)	(0.0656)	(0.222)	(0.148)	
Received Input Package	0.192	-1.401	-0.0494	-0.400**	-0.315**	
	(0.188)	(1.219)	(0.0572)	(0.199)	(0.145)	
Observations	325	325	325	325	325	
R-squared	0.266	0.362	0.399	0.440	0.427	
Control mean	-3.239	-11.12	0.597	1.701	1.209	
Test of equality: Cash = Inputs	0.957	0.727	0.827	0.265	0.287	
Panel C: Followup survey 2						
Received Cash Transfer	0.200	0.0679	-0.117***	-0.137	-0.177**	2.103*
	(0.130)	(0.841)	(0.0329)	(0.139)	(0.0890)	(1.144)
Received Input Package	-0.0859	-0.738	-0.0693**	0.0495	-0.0398	0.877
	(0.134)	(0.786)	(0.0304)	(0.138)	(0.0903)	(1.139)
Observations	1,119	1,118	1,119	1,119	1,119	1,119
R-squared	0.101	0.087	0.121	0.139	0.123	0.176
Control mean	-2.133	-6.579	0.735	1.944	1.520	48.43
Test of equality: Cash = Inputs	0.0146	0.270	0.125	0.221	0.124	0.217

Notes: Robust standard errors clustered by farmer club. All specifications include baseline covariates that includes household size, whether the household head is polygamous, whether the NASFAM member is female, and a series of education indicators for the NASFAM member's level of education. We also control, when possible, for the baseline value of the outcome variable. All money expressed in USD equivalent.
*** p<0.01, ** p<0.05, * p<0.10

National Smallholder Farmers' Association of Malawi

Farmer First Name: _____

Farmer Surname: _____

GAC: _____

Club Code: | | | |

Farmer ID: | | | | | | | | | |

FARM BUSINESS PLAN

1.0 Crop Production

Crop	Estimated Area available (Ha)	Actual Area Available (Ha)	Estimated yield per unit area (Kg/ha)	Total production expected (Kg) (A x C)	Quantity expected to sell (Kg)	Expected price (MK/Kg)	Expected sales revenue (MK) (ED~~D~~xFE~~E~~)
	A	B	C	D	E	F	G
Maize							
Tobacco							
Soya							
Groundnuts							
Other, specify: _____							
Other, specify: _____							
Other, specify: _____							

TOTAL EXPECTED INCOME FROM CROP PRODUCTION: _____MK

National Smallholder Farmers' Association of Malawi

Farmer First Name: _____

Farmer Surname: _____

GAC: _____

Club Code: | | | |

Farmer ID: | | | | | | | | |

2.0 Livestock production

Animal	Number Owned	Number expected to be born	Number expected to be consumed	Number expected to buy	Number to be sold	Expected price per animal (MK/animal)	Expected sales revenue (MK) (E x F)	Number of animals owned next year
	A	B	C	D	E	F	G	H
Chickens								
Goats								
Pigs								
Other, specify: _____								
Other, specify: _____								

TOTAL EXPECTED INCOME FROM LIVESTOCK PRODUCTION: _____MK

3.0 **EXPECTED REVENUE FROM LIVESTOCK BY-PRODUCTS**

Animal by-product A	Amount/Number of by-Product B	Price per By-product C	Expected Annual Revenue (MK) D
Eggs			
Honey			
Milk			

TOTAL EXPECTED INCOME FROM LIVESTOCK BY-PRODUCTS: _____MK

National Smallholder Farmers' Association of Malawi

Farmer First Name: _____

Farmer Surname: _____

GAC: _____

Club Code: | | | |

Farmer ID: | | | | | | | | |

4.0 CROP PRODUCTION EXPENSES

Expense	MAIZE A	TOBACCO B	SOYA C	GROUNDNUTS D	Amount (MWK) E	Source of funds F
Hoes						
Panga-Knifes/Machete						
Slashers						
Seed (CG 7 or Nsinjilo)						
Inoculants						
Fertilizer: Basal dressing						
Fertilizer: Top dressing						
Pesticides (Pest Control) Herbicides (Pre planting, Pre emergence and Post emergence).						
Land clearing						
Tilling						
Ridge making						
Planting						
Weeding						
Harvesting						
Storage place						
Sacks						
Sawing wool for sacks						
Land rent						
Transportation						

Income source codes

1 Ganyu
2 Crop sales
3 Livestock sales
4 By-product sales
5 NASFAM
6 NASFAM seed loan
7 FISP
8 Business
9 Credit
99 Other, specify

National Smallholder Farmers' Association of Malawi

Farmer First Name: _____
Farmer Surname: _____

GAC: _____

Club Code: | | | |

Farmer ID: | | | | | | | | |

TOTAL EXPECTED CROP PRODUCTION EXPENSES: _____MK

5.0 LIVESTOCK EXPENSES

Expense	Chickens A	Goats B	Pigs C	Other: _____ D	Amount (MWK) E	Source of Funds F
Cost of maintenance/Construction of place for livestock (Khola/Khraah)						
Feed for livestock						
Drugs for livestock						
Labour costs						

TOTAL EXPECTED LIVESTOCK PRODUCTION EXPENSES: _____MK

6.0 NET FARM INCOME (D-G)

Crop Sales (MK)	Livestock Sales (MK)	Livestock by-product Sales(MK)	**TOTAL REVENUE (MK)**	Crop Expenses (MK)	Livestock Expenses (MK)	**TOTAL EXPENSES (MK)**	**TOTAL INCOME (MK)**
A	B	C	**A+B+C=D**	E	F	**E+F=G**	**D-G=H**

National Smallholder Farmers' Association of Malawi

Farmer First Name: _____

Farmer Surname: _____

GAC: _____

Club Code: | | | |

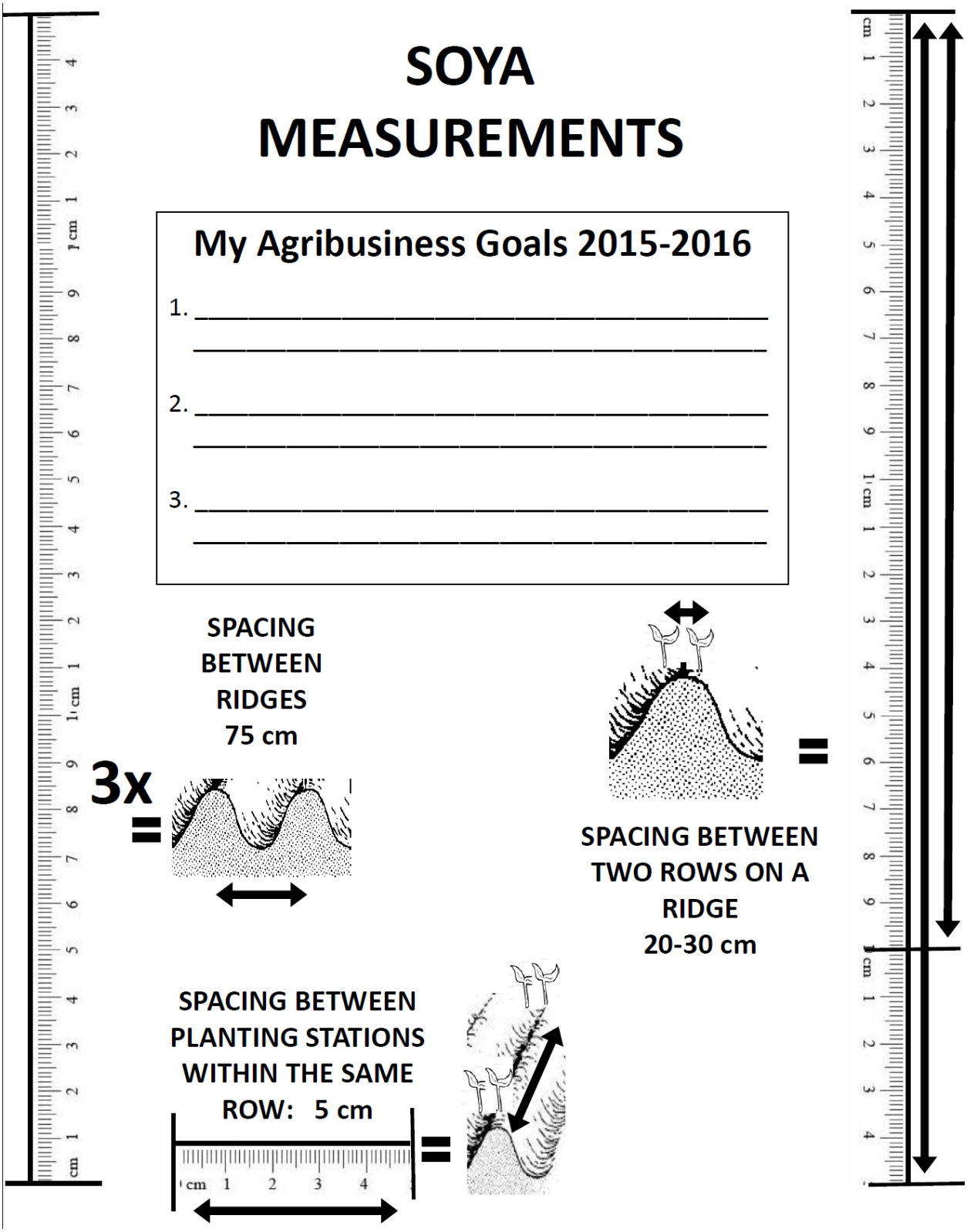
Farmer ID: | | | | | | | | |

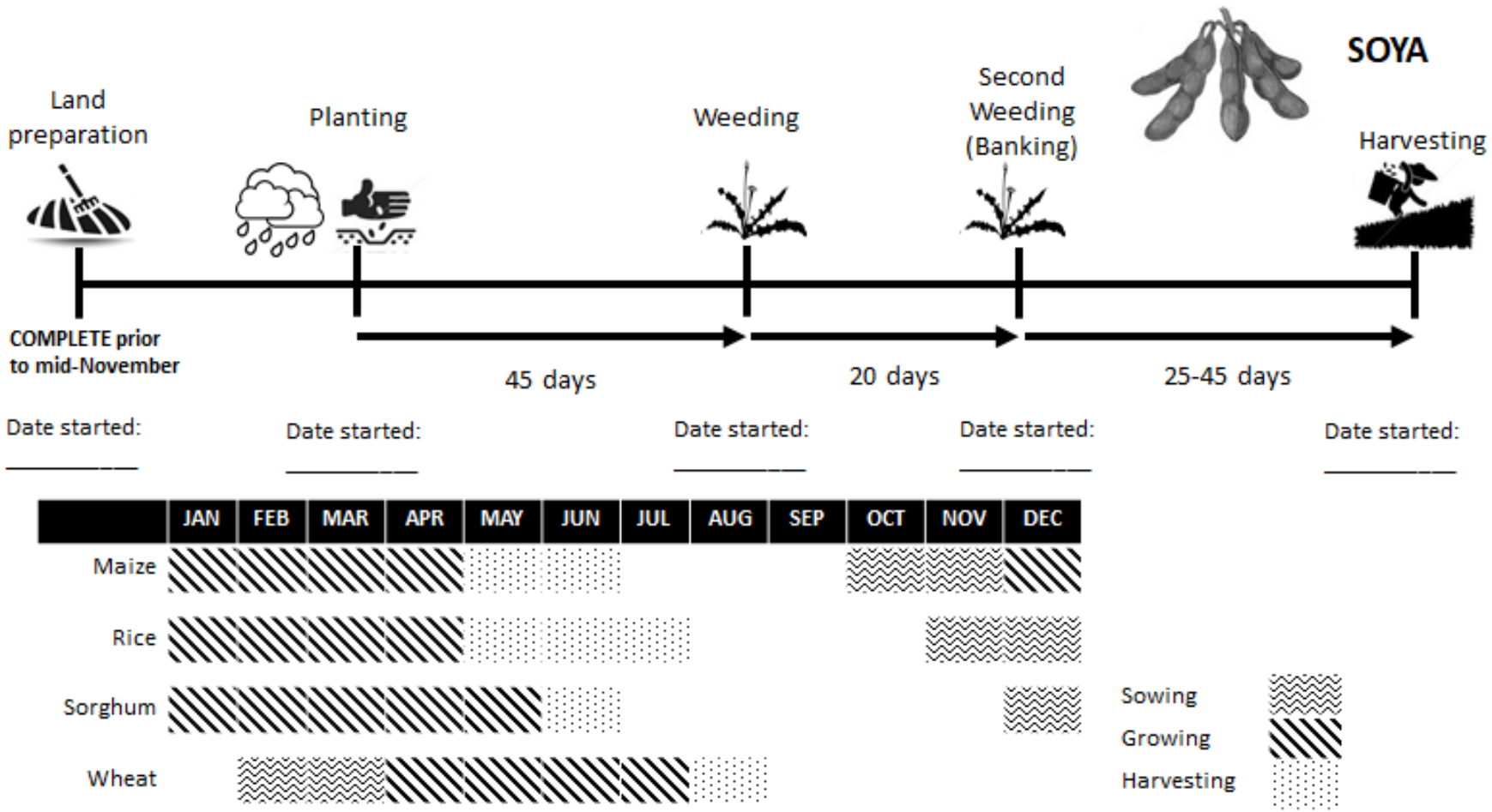
7.0 ACTIVITY SCHEDULE

ACTIVITY		TIMELINE (Months)											
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1.0	Land preparation • Clearing. • Tilling • Ridge making if not adopting CA. • Putting of maize Stover in the field for CA.												
2.0	Input procurement												
3.0	Planting with the first rains												
4.0	• Weeding (Weeding in groundnuts should happen the first 20 days then after 40 days) • Applying herbicides in the field												
5.0	Resupplying/in-filling the field												
6.0	Fertilizer application												

7.0	Weed control												
8.0	Harvesting												
9.0	Shelling g/nuts												
10.0	Grading and Sorting g/nuts												
11.0	Marketing												

Appendix B: Visual aid example provided in second phase of intensive extension




SOYA
Land preparation
Planting
Weeding
Second Weeding (Banking)
Harvesting
COMPLETE prior to mid-November
45 days
20 days
25-45 days
Date started:
Date started:
Date started:
Date started:
Date started:
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Maize
Rice
Sorghum
Wheat
Sowing
Growing
Harvesting

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