Nepal Agriculture & Food Security Project (AFSP) Impact Evaluation

ENDLINE SURVEY REPORT

Development Impact Evaluation (DIME)
Global Agriculture & Food Security Program (GAFSP)

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List of Acronyms

AFSP Nepal Agriculture and Food Security Project
IE Impact Evaluation
DIME Development Impact Evalation
GAFSP Global Agriculture and Food Security Project
MoAD Ministry of Agricultural Development
MoH Ministry of Health
PAD Project Appraisal Document
PDO Project Development Objective
TDA Technology Dissemination and Adoption
FNSE Food and Nutrition Status Enhancement
FFS Farmer Field Schools
BCC Behavior Change Communication
FG Farmer Group
NARC Nepal Agricultural Research Council
VDC Village Development Committee
DID Difference-in-Differences
ANCOVA Analysis of Covariance
SAFANSI South Asia Food and Nutrition Security Initiative

1 Executive Summary

DIME and AFSP

The partnership between the Nepal Agriculture and Food Security Project (AFSP) and The World Bank's Development Impact Evaluation (DIME) team has spanned 5 years, 3 rounds of large-scale data collection and multiple consultations and results sharing events, all aimed at understanding the impact and sustainability of the project's interventions. This report brings together findings across the 3 rounds of surveys, the most recent of which concluded in January 2018. The report aims to (a) inform the project closing and related documentation and (b) work towards providing policy-lessons for the agriculture sector in Nepal, with a specific focus on future World Bank lending operations. Given the design and operationalization of the Food and Nutrition Security Project (FANSEP), the findings from AFSP presented in this report have an audience that can use and build on this evidence-base. The long-term partnership between the Government of Nepal, the World Bank operational team and research team is an excellent example of how research and implementation priorities can come together to generate operationally-relevant evidence.

The report aims to evaluate the impact of AFSP across a number of key indicators. Much of the analytical focus is based on the project's key goals of targeting food and nutrition security through increased farm productivity with a focus on crop cultivation and livestock-rearing. Given the complexity in separating inputs and outcomes from multiple sectors, the impact estimates focus on aggregate household income. Income is a plausible estimate of the impact of the program, since it succinctly captures the end-result of how farmers and livestock rearing households translate inputs into income. Further, it is plausible to imagine that farmers themselves consider income as the ultimate barometer when judging their participation in programs - the bottom line against which they make participation and production decisions. While effects on total income are presented as a top-line estimate, this is broken down into cropping income and livestock income, to mirror the two main productivity-enhancement channels through which AFSP is working. Further, the report dives into various indicators linked to income generation including production decisions, farmer group membership, input usage and expenditure and technology adoption practices, amongst others. Additionally, there is an investigation of how the program affected food security behavior and knowledge, alongside an examination of participating in womens and mother's groups.

The research team worked with the project to design an Impact Evaluation that aimed to understand how program exposure affected the impact of the program and particularly whether these impacts persist over time. The endline survey, 4 years after the baseline, allow us to posit conclusions about the impact of length of exposure. This is a credible estimate of program effects because the selection of which communities received the program early (and were thereby exposed to it for longer) was random. The randomness in the rollout entails that any observed differences in the changes in outcomes in these communities can be attributed to the program. In addition to the *long exposure* and *short exposure* communities, the research team also identified control communities where AFSP was not operating and tracked outcomes there as well. One additional piece of the analytical setup involves pooling together the long and short exposure communities, to unearth the total effect of the AFSP program relative to the set of communities not exposed to the program.

Program Impacts

Over the length of the AFSP interventions (i.e. from baseline to endline), **AFSP communities - pooling together long and short exposure - experienced an 18% increase in total income relative to control communities**. The same outcome saw an 11% increase between baseline and midline and a 14% increase between midline and endline. From baseline to endline, long-exposure communities witnessed a 16% increase in total income, while income in short exposure communities increased by 21% over that time. Farmers who reported membership in farmer groups reported a 16% increase in total income compared to those who did not, over the life of the project. The impacts are in a relatively small window - 16-21%, reinforcing the credibility of the point estimates.

While the point estimates of the impact of the program on both short and long exposure VDCs are not statistically distinguishable from zero, **individuals that report membership in Farmers Groups do witness increases of 11-20% relative to those who are not members of these organizations.** This effect is highest between baseline and midline - 20%. Despite the lack of statistically significant treatment effects, farmers in AFSP communities display higher crop production - both in kilograms and in Rupee-value. This is true even in cases when at baseline AFSP communities witnessed lower average production levels than control communities - potato and main paddy.

For income from livestock-rearing, farmers in AFSP communities experienced an 18% increase in income relative to control communities between baseline and endline. Households in long and short exposure communities saw increases at very similar rates - 18% and 19% respectively. This effect is likely driven by higher levels of chicken and goat ownership in AFSP communities relative to control - even as both sets of households started off at near identical levels of ownership.

Overall, reported experiences of food insecurity decreased between baseline and endline, but this effect was not specific to AFSP communities. Looking at households with pregnant and nursing women, health mother's group membership doubled in control communities and quadrupled in AFSP communities between baseline and endline. Dietary diversity and average maternal knowledge scores for pregnant and nursing mothers increased across AFSP and control communities.

Looking forward - building the evidence base

Across the board, it is clear that AFSP brought about improvements in productivity and income for farmers across a number of key indicators. Increasing incomes by almost 20% represents a significant achievement for the project, and initial evidence does point to these effects persisting over the medium run. We are less able to attribute overall improvements in nutrtition and nutrition related practices to the activities of AFSP.

One area where learning from the past project can be directly applied to planning for upcoming WB investments is the area of targeting. Targeting can be a complex and costly exercise and is too often imprecise, often relying on data that is either outdated, poorly suited to the populations of interest, or both. The FANSEP project provides the opportunity to learn from the experience of AFSP and create a proxy-means test from the AFSP population that can be used to select participants for interventions in FANSEP. Alongside the proxy means test, the project is a platform to build on the learnings of the Farmer Field School model implemented through AFSP, implementing and studying other technology adoption and adaptation strategies side-by-side. A continued partnership between the project team and DIME on a rigorous evaluation of FANSEP provides an opportunity to build of AFSP findings and push forward the frontier of evidence-based program delivery in Nepal's agriculture sector.

2 Background

2.1 Agriculture and Food Security Project

The Nepal Agriculture and Food Security Project (AFSP) seeks to improve the socioeconomic status of poor farmers by increasing agricultural production and improving nutritional practices. AFSP is funded by the Global Agriculture and Food Security Project (GAFSP), supervised by the World Bank, and implemented by the Ministries of Agricultural Development (MoAD) and Health (MoH). The AFSP includes 19 districts[1] of the mid- and far-western development regions of Nepal. It aims to benefit 162,000 people living in hill and mountain areas across the country.

The Project Development Objective (PDO) is to *enhance food and nutritional security of the targeted communities in select locations of Nepal*. The project hypothesizes the influence of increased productivity of on-farm income from both cultivation of crops and rearing of livestock on health and nutrition. The project focuses on these key indicators:

- Increase in the productivity of targeted crops
- Increase in the yield of targeted livestock products
- Increase in the proportion of pregnant and nursing mothers and children between 6-24 months' age adopting appropriate feeding practices.

The IE was designed to capture both the direct targets of the project, as well as its envisioned mechanism pathways.

In order to achieve its targets, AFSP consists of four components:

1. Technology Development and Adaptation
2. Technology Dissemination and Adoption (TDA)
3. Food and Nutrition Status Enhancement (FNSE)
4. Project Management

The Impact Evaluation (IE) of AFSP concentrates on components 2 and 3. Component 2, TDA, aims to introduce farmers to new production and management methods for both crops and livestock in order to improve their yields and income using a Farmer Field Schools (FFS) approach. Component 3, FNSE, aims to improve feeding practices of young children and of pregnant women,

[1] The 19 districts are: Achham, Baitadi, Bajhang, Bajura, Dadeldhura, Dailekh, Darchula, Dolpa, Doti, Humla, Jajarkot, Jumla, Kalikot, Mugu, Pyuthan, Rolpa, Rukum, Salyan, and Surkhet.

primarily through Behavior Change Communication (BCC).

2.1.1 Component 2 - Technology Dissemination and Adoption

The main aim of this component is to encourage and enable farmers to adopt agricultural technologies that will create an efficient change in their modes of production. Specifically, this technology spans the breadth of crop production and livestock development and aims to overcome existing constraints that farmers face related to availability of these improved technologies, limited knowledge on optimal usage, low levels of implementation and absorption capacity.

In order to release these constraints, AFSP employs the following intervention strategy under the TDA component:

1. Support crop production through the dissemination of improved seed varieties and training on agricultural practices
2. Support livestock production, encouraging rearing of specific species (poultry, goats, cattle) depending on the topographical conditions
3. Strengthen extension and outreach services including training farmers and service providers, and organize demonstrations through FFSs to boost adoption rates

One crucial aspect of this component is the mobilization of farmers into and identification of existing farmer groups (FGs). These groups are then used as the conduit through which AFSP communicates with, trains, and delivers technology to farmers using the FFSs demonstration approach. The FFS focuses on a single predominant crop in the area (either wheat, maize, rice or potato), and also draws on second and third crops in the training based on farmer choice. Farmers that participate in the FFS are given improved seeds and items such as irrigation sets and super grain bins to encourage adoption of improved crops and technologies.

Seeds, fertilizers and pesticides needed for conducting an FFS are supplied free of cost. Each member of the FFS receives bags of grain as required (or up to 300 bags per group) free of cost. Each member of FFS also gets seeds of the major crops as per their requirement at a 50% subsidy. Seed is supplied as per the requirement of the farmers, or for up to 100 ropani of land per group.

Seed is sourced from the Nepal Agricultural Research Council (NARC) for studies in crop production FFS and for seed production by FFS groups. Seed produced by FFS groups is then used for larger adoption by FFS groups and for other farmers in the VDC, outside of the FFS groups.

There were two activities under irrigation support, both provided at the group level: (1) support for FFS groups in the amount of Rs. 150000; (2) Co-op irrigation support in the amount of 300000 or less per cooperative group.

As of endline data collection, the project had supported 1408 crop-related FFS across all 19 districts - according to the project's monitoring data. In addition to FFS, crop production demonstrations were carried out in 1080 farmer groups, mainly on maize, potato, rice, wheat, barely, and buckwheat. Nutritious crop demonstration was carried out in 385 farmer groups on crops including bean, lentil, kidney bean, foxtail millet, sunflower, and soybean. A subset of crop-related FFS were dedicated to increasing seed replacement rates in 9 hill districts. In order to improve the yield of animal products, the project operated through (a) livestock-related FFSs as well as (b) other livestock groups outside of the FFS modality. According to the project's M&E data, there were a total of 1525 livestock groups operational as of endline data collection, including FFS, livelihoods improvement through goat program, goat productivity enhancement, and dairy goat promotion.

2.1.2 Component 3 - Food and Nutritional Status Enhancement

The aim of this component is to enhance food and nutrition security by increasing the availability of food as well as the information available to pregnant and nursing women related to feeding and child-care practices. One of the important elements of this component is behavior change communication (BCC) related to some of the improved practices that are implemented through existing or revitalized health mothers groups at the ward level. The project set out to create and disseminate this BCC information in a manner that would be practical, with the aim of providing usable information both to pregnant and nursing mothers. This was mainly an in-person training, but also consisted of audio spots and broadcasts. The trainings are based on best practices for Infant and Young Child Feeding (IYCF). In addition, the project aims to affect food security through the enhanced crop and livestock production mentioned in Component 2, as well as simple technologies for food preservation and preparation. At the time of endline data collection, 228 Village Model Farms, which serve as demonstration and training sites on vegetable cultivation and poultry rearing for mother's group members, had been established.

To combine the focus on agriculture production and nutrition goals, farmers groups were also provided training on nutrition. An important note is that the AFSP intervention took place during the same time as another project, called Suaahara, that focuses on similar themes.[2] To try to

[2] The Integrated Nutrition Project, a.k.a. Suaahara, is a USAID sponsored project that began in 2011 and covers 20 districts of Nepal. The project aims to improve the health of infant children and pregnant and nursing women through investments in water, sanitation, and hygiene; reproductive health services; and home-based gardens. More information on the Suaahara project can be found at: https://www.usaid.gov/nepal/fact-sheets/suaahara-project-good-nutrition

limit the influence of Suaahara's interventions on the findings of this impact evaluation, the survey oversampled mothers in districts where Suaahara had not yet expanded district-wide.

2.2 Impact Evaluation (IE) of AFSP

The AFSP Impact Evaluation (IE) aims to measure the effects of AFSP on agricultural income, crop productivity, and nutritional status. The IE methodology is a randomized phase-in of project components at the level of the Village Development Committee (VDC)[3]. Eligible VDCs were organized into clusters, following which half of the VDCs were randomly chosen to receive the project in the first phase.[4] The other half were then assigned to receiving the project in the second phase.

Comparing VDCs that benefit from AFSP in the first phase to VDCs that benefited in the second phase allows us to identify the causal impact of the duration of exposure to AFSP at the VDC level. The identifying assumption is that the only difference between VDCs who were selected into the first phase of the project (and exposed to the interventions for a longer time-period) and those that received the interventions in the next phase (and consequently for a shorter exposure period) was their random selection into this phase. Thus, outside of this randomization, the VDCs are otherwise equal, on average. The randomization design allows for the IE to measure how exposure to AFSP affects a series of outcomes, over a long period of time.

In each AFSP district, the IE follows four **long exposure** VDCs, four **short exposure** VDCs and four **control** VDCs. While long-exposure VDCs and short-exposure VDCs were assigned into their respective groups following the clustered randomization described above, the long-term external controls were not part of the randomization process. Instead, prior to implementation, 4 VDCs in each district that matched the following criteria were selected as external controls:

1. Adjacent to long exposure VDCs: with geographical proximity serving as a proxy for finding relatively similar and comparable VDCs
2. Not selected by KISAN - a project supported by another donor that focuses on themes that are closely linked to AFSP: in order to ensure that the outcomes being measured were being driven by AFSP, and not the other project
3. Less than a day's walk from the road head: so as to reduce logistical challenges associated with tracking households
4. Similar DAG scores to the long exposure VDCs: as an attempt to establish a control that has

[3] Nepal is administratively organized into units of decreasing size: regions, districts, sub-districts (illakas), municipalities (VDCs), and wards. Nepal has 75 districts, each of which is divided into a number of VDCs, the number depending on the population size. There are 3,914 VDCs nationwide and every VDC has 9 wards.

[4] The VDCs were clustered on the basis of geography, technical feasibility, food security and DAG score.

similar social dynamics to the treatment VDCs

These 4 VDCs in each district were followed in all three survey rounds by the research team, and did not receive any of the AFSP project interventions. **This report presents baseline, midline, and endline results comparing indicators across short-exposure VDCs, long-exposure VDCs and Control VDCs.**

3 Endline household survey

3.1 Data collection

New ERA conducted the AFSP endline survey from September to December 2017. The survey team used SurveyCTO - a cloud-based data collection software that delivers questionnaires through Android tablets - to gather information from each household in the sample. The questionnaire focused on agricultural production and food security, and contained modules on housing, labor, education, health, income and expenditures, assets, and rural finance. At baseline, 2280 household were surveyed, and this increased to 3157 households at midline. The sample was increased in 12 out of 19 districts to ensure that pregnant women and mothers of infants could be included in the sample since baseline households may not be guaranteed to have women with this profile. These 12 districts were purposefully chosen as the ones where Suaahara interventions had not yet expanded across the full district.

3.2 Household Sample

The AFSP project includes 10 VDCs in each of the 19 project districts - as mentioned in Section 2.1. As described in Section 2.2 above, 8 of the 10 project VDCs were selected for the impact evaluation, along with 4 VDCs per district not receiving AFSP[5], which serve as long-term controls. The AFSP Endline Survey was thus conducted in 228 VDCs.

The endline survey followed up with households that were interviewed at the baseline, as well some of the additional households sampled during the midline survey, one year prior. Before conducting the

[5] There were a few exceptions to this 4 external controls per district rule. Specifically, in 2 districts (Jajarkot, Dhadeldura) there were no suitable external controls found, so all 10 AFSP VDCs were surveyed. (For ex. in Dadeldhura there are only 20 VDCs, and KISAN was working in the 10 non-AFSP VDCs). In 2 districts (Pyuthan and Kalikot), all 10 AFSP VDCs plus 4 external controls were surveyed to make up for surveying only 10 VDCs in Jajarkot and Dadeldhura

baseline survey, the survey firm completed a household census in each VDC to identify households that meet eligibility criteria for AFSP interventions. The census included a list of questions on household composition, land and livestock ownership, and interest in participating in agricultural projects. The census data was used to establish eligibility for AFSP interventions, and to construct the sample frame for the IE. In each VDC, the team drew a random sample of 10 households to be tracked across the length of project implementation. The selection gave preference to households with young children, as they are most likely to benefit from both the nutrition and the agricultural interventions of AFSP. The household census and sampling were coordinated closely with the local officials responsible for forming AFSP groups to ensure that the sampled households were very likely to end up joining the groups.

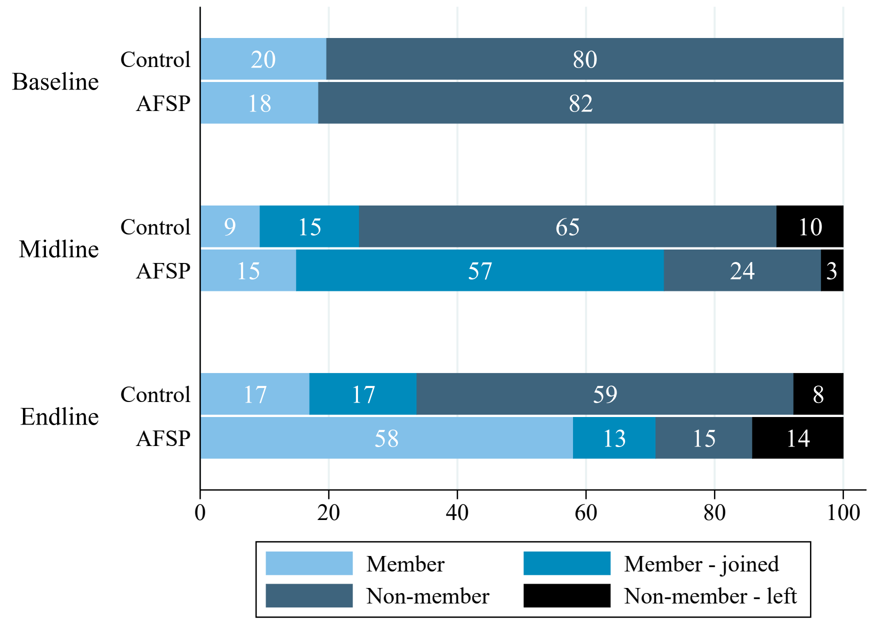
4 AFSP Impacts

Before analyzing programmatic impacts in section 4.2, we present findings from data on farmer group membership. Given that this was central to the AFSP model and is likely the channel through which much of the beneficiary population experienced impacts, it is quite plausible to imagine that data on farmer group membership and the patterns therein are central to all further analysis.

4.1 Farmer Group Membership

Looking at farmer group membership by treatment status for the 5,650 households in all three survey rounds, Figure 2 shows 52.8% of control households were not members of a farmer group (or cooperative) in any round compared to 13.7% of AFSP treated households. The share of households who were always in a farmer group is slightly higher for treated households than for control households (12.8% versus 7.2%). The data shows evidence of higher participation in the farmer groups in AFSP communities as opposed to the control, however sustained membership and participation does seem to be a concern. One thing to keep in mind, however, is that the 12.8% of farmers that reported membership in all 3 rounds necessarily includes those that were in farmers groups before the program began. It is therefore important to dig into the joining and leaving from one round to the next, and is done in the figures that follow.

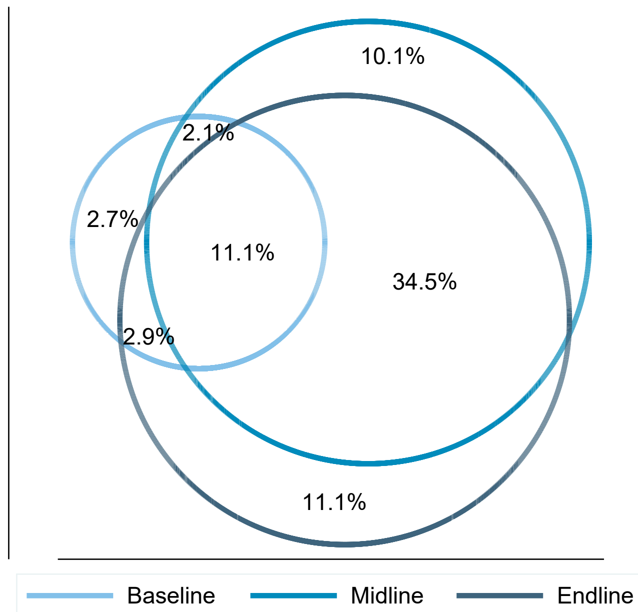
Figure 2: Farmer Group/Cooperative Membership by Treatment Status



Note: Share of households in all survey rounds.

Figure 3 shows how farmer group membership varies across rounds for households in all rounds. A small share of households were members of a farmer group at baseline, with many joining at midline and remaining in through endline (34.5%). While 10.1% of households joined at midline and subsequently left at endline, another 11.1% joined at endline. An additional 11.1% of households were in a farmer group in every round, and 25.6% were not in a farmer group in any survey round. The figure depicts that a large proportion of farmers who joined at midline saw the value in continuing membership through the endline with a very small proportion choosing to exit the group in the year between the midline and endline survey.

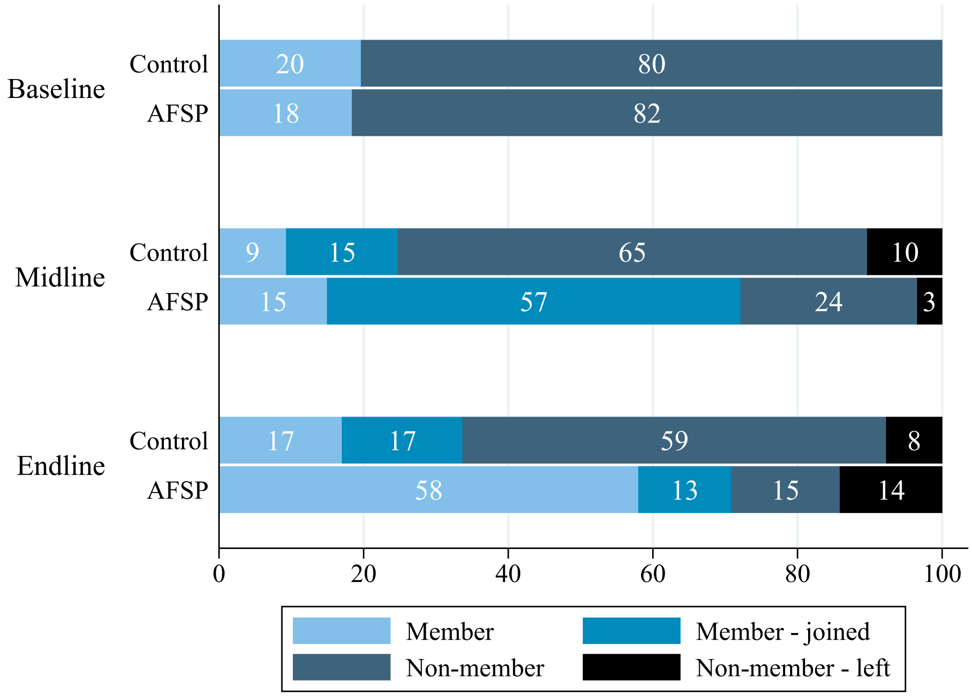
Figure 3: Farmer Group/Cooperative Membership across Rounds



Note: Share of households in all survey rounds. 25.6% of these households are not members of a farmer group or cooperative in any round.

Continuing to look at the households we can track across the three survey rounds, in Figure 4 we see a significant portion of AFSP treated households joined a farmer group at the time of the midline survey (57.2%) compared to control households (15.4%), contributing to much higher overall shares of treated households in farmer groups at midline and endline. A higher portion of control households left farmer groups at midline compared to treated households, but a relatively higher share of treated households left farmer groups at endline. Overall, farmer group membership for treated households was similar across the midline and endline surveys (72.2% and 70.8% respectively), but these shares reflect a somewhat different group of households as roughly the same proportions of treated households joined as left farmer groups at endline.

Figure 4: Farmer Group/Cooperative Membership by Round and Treatment Status



Note: Share of households in all survey rounds.

4.2 Analytical Setup - Evaluating Key Outcomes

In order to measure the impact of the program and assess whether the impact grows or fades over time, we first compare the experience of households in all AFSP communities with that of households in external controls; and then separate this comparison to assess whether the treatment effect mostly arises through the long- or the short-exposure VDCs.

There are multiple ways to compare changes in areas that received AFSP to areas that did not. Two common approaches are a Difference-in-Differences model and an ANCOVA model. Both of these approaches use similar assumptions to measure changes in VDCs between AFSP VDCs and external VDCs. These two models give similar estimates but have different advantages. The primary advantage of differences-in-differences is that these results are simple to interpret. ANCOVA estimates do are not quite as straightforward to interpret, but for the outcomes under study in this evaluation are likely to have better statistical power (McKenzie, 2012).

Since differences-in-difference models are simple to interpret and often familar to those with experience in impact evaluation, we first show using a difference-in-difference model how to understand program impact.

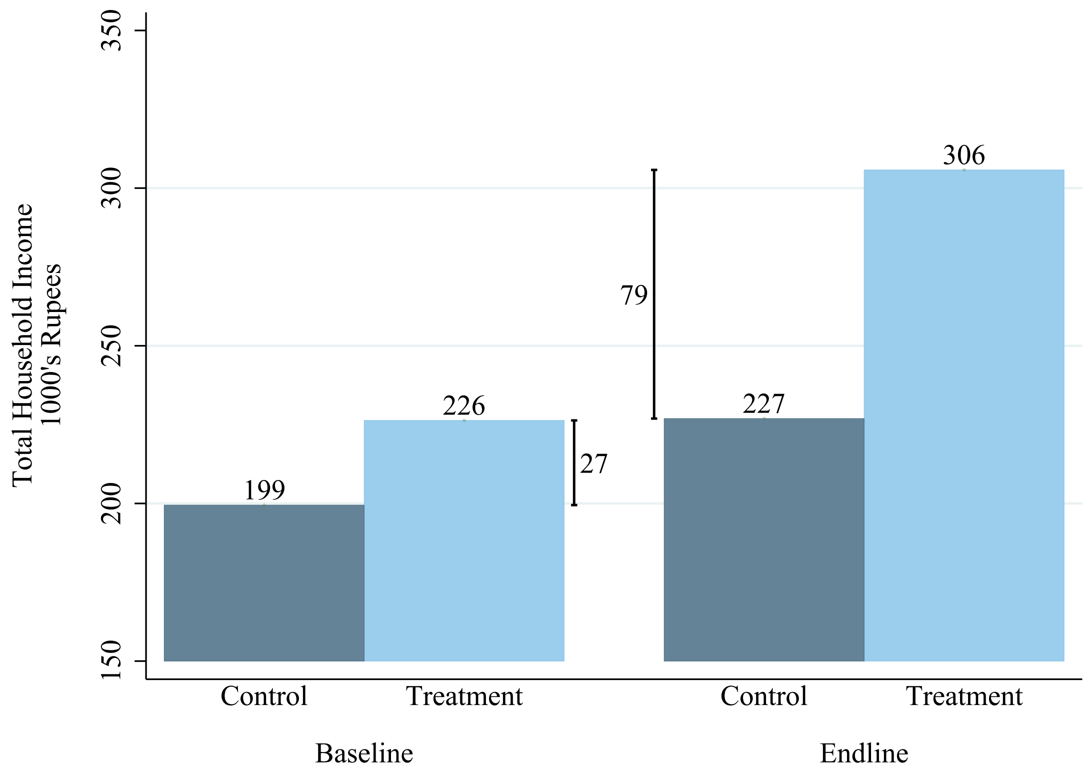
The difference-in-difference model compares differences in the average for an outcome (say income) between treated and control households at endline and with the difference between these two groups at baseline. If the difference is greater at endline than at baseline, we conclude that the program had an impact.[6] This comparison has a simple interpretation that can be demonstrated graphically. The figure below shows average total household income from all sources at baseline and midline for four groups: households in external controls at baseline, external controls at midline, AFSP households[7] at baseline and AFSP households at midline. The comparison is between 4 numbers of interest. The first is average income of all households in the external controls, shown by the first bar. The second is the change in income from baseline to midline among control households, or the difference between the first and the second bar. The third is difference between average income in treatment and external controls at baseline, the difference between the first and the third bar. Finally, the last coefficient is the difference between the change in income from the baseline to midline in incomes in the AFSP VDCs and the control VDCs. This is the difference in between the change from the third and fourth bars and the change in the first and second.

Figure 5 shows why a simple comparison of the treated communities with the control communities does not give an accurate estimate the program effect. It's true that average income is higher in AFSP VDCs, but this was also true at the baseline, before the program was even introduced. However, even though VDCs in the control group started at a different point than VDCs in the treated group, it may be reasonable to that is the project had not taken any action, the treated households would have had an income that was higher at endline as it was at baseline. In other words, if we assume that whatever growth in income happened among control households is the same as what would have happened in treated households, any extra growth is the impact of the project. This extra growth is 52,000 rupees (79,000-27,000). As a percentage of the baseline, we can say using this method that income in treated areas was about 25% higher than it would have been.

[6] In a regression framework, differences-in-differences estimates are achieved by estimating the regression $y_{igt} = \alpha + \beta * treatment_g + \delta * post_t + \gamma * post_t * treatment_g + \epsilon_{igt}$, where y_{igt} is an outcome of interest for person i in group g and survey round t (such as household income), $treatment_g$ is the treatment status of VDC g, $post_t$ indicates whether the data point is collected in a period after the intervention began. The program impact is statistically significant if the p-value for the test of $\gamma \neq 0$ is less than .1 or .05.

[7] In the most simple case, we pool long- and short-exposure households into the same category of "Treated" by AFSP

Figure 5: Difference-in-Difference of Total Household Income Between AFSP & Controls



The analysis in this report uses a modified version of an approach that is similar to the differences-in-differences model, called an ANCOVA model. The model has similar statistical assumptions, and is estimated by a similar stastical specification.[8] However, For the outcomes used in this report allows us to have greater statistical power. This gain in statistical power is important for distinguishing between effects among different types of households such as early versus late starters or those who primarily earn income from livestock rearing rather than crop cultivation.

In the coming sections, we present impact estimates of the regressions across a series of outcomes. These estimates are displayed graphically. An example of this graph is in Figure 6 below. The points to note when reading off impact estimates:

[8]Formally, the specification is: $y_{igt} = \alpha + \beta * treatment_g + \rho * y_{igt-1} + \epsilon_{igt}$ where y_{igt-1} is the the outcome (in this case generally household income) at the baseline. rho gives the average rate of growth from baseline to followup for a household with a given baseline value of y. The treatment effect is then given my β, the additional contribution to average income growth that arises from being in the in the treated group.

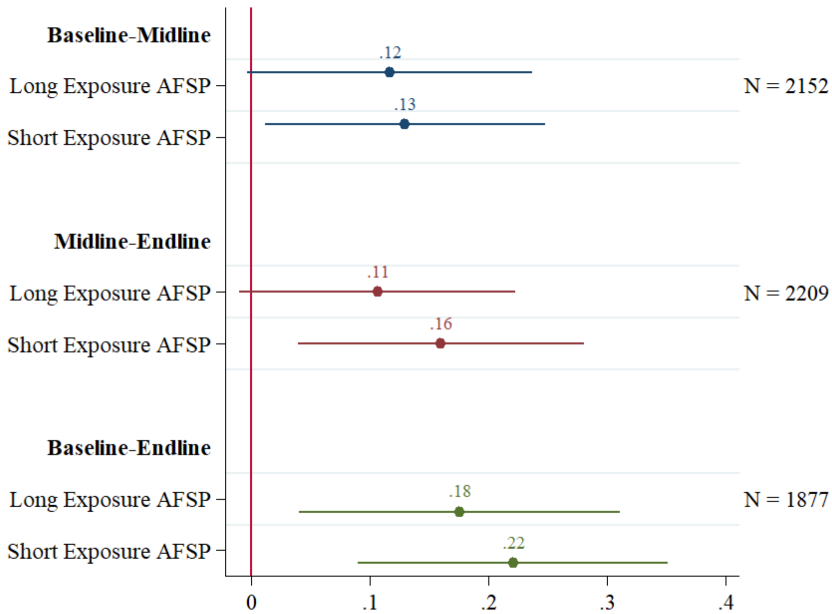
- Emboldened in the left panel are the two rounds across which the analysis is being carried out, and for which changes are being observed: baseline to midline, midline to endline, and baseline to endline.

- Below this, the group for which the conclusion is being made is presented. In this figure, it is for two sets of households: those in short-exposure VDCs and those in long-exposure VDCs. For both, the graph depicts average increases relative to households in control VDCs.

- The right panel shows the sample size for each regression

- In the graph itself, the circle depicts the point estimate for the effect size, with horizontal bars on each side depicting the 90% confidence interval. The red line is the zero-axis, and signals the threshold for statistical significance. In other words, if the confidence interval bar for a given estimate crosses the zero-axis, that estimate is statistically indistinguishable from zero. In the example below, the point estimate for the increase in household income for the Long-Exposure VDCs from baseline to midline is 12%. However, since the confidence interval for the estimate crosses the vertical bar, we cannot conclude that this effect is statistically distinguishable from zero. On the other hand, the 13% estimate for the average increase in household income for Short Exposure VDCs from baseline to midline can be concluded to be statistically significant, since the confidence interval bar does not cross the vertical axis.

Figure 6: Treatment Effect (Short/Long Exposure) on Total Household Ln(Income), no Covariates

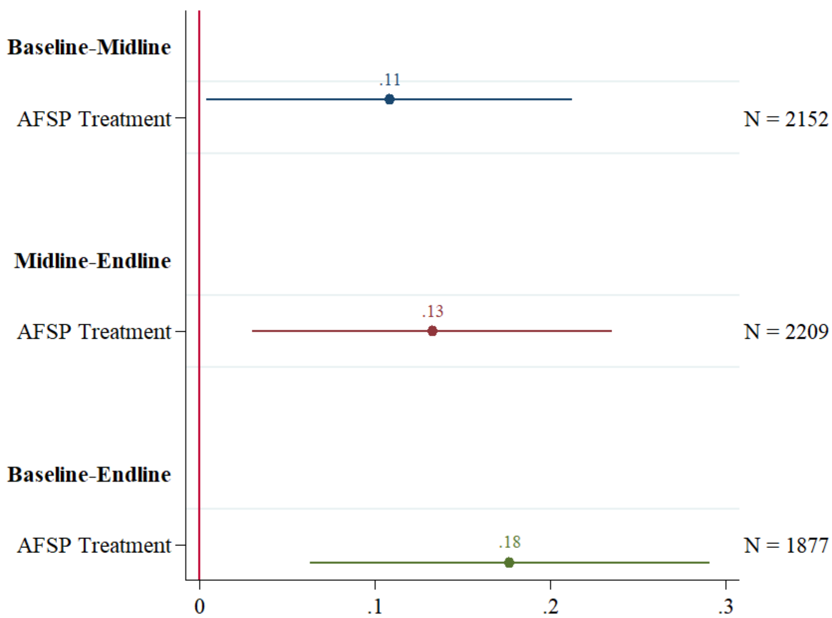


As discussed previously, the ANCOVA specification was expected to be the most statistically precise from a theoretical perspective. The team tested this out by producing impact estimates in both the ANCOVA and more simplified differences-in-differences forms. Additionally, robustness was checked through testing the impact estimates through models that included a number of important covariates, and those that did not. While estimates do not change drastically one way or another, it was found that **the ancova specification that controls for covariates** was the most statistically precise model. The related graphs are presented in the body of the report, with the related tables as well as the graphs and tables for the other specifications in the appendix.

4.3 Total Household Income

The first outcome of interest is total household income. In a program like AFSP with a large number of interrelated interventions, household income is a key indicator of success. Households make a variety of optimization decisions that affect income through several channels, and total household income captures the net effect of all these decisions, the related actions and the consequent impacts. Figure 7 depicts an 11% increase in average total income between baseline and midline, and a 14% effect between midline and endline, relative to control VDCs, project VDCs witness increases that are rising over time. The baseline to endline increase of 18% in AFSP VDCs relative to control VDCs paints the picture of the overall time trend. One point to note here is that total income consists of a number of data points that can be quite noisy. This is reflected in the large error bars across all 3 specifications. Overall however, the average income increase of 11-18% relative to control communities is a substantial change, and points at the transformation in lives that the AFSP is bringing about.

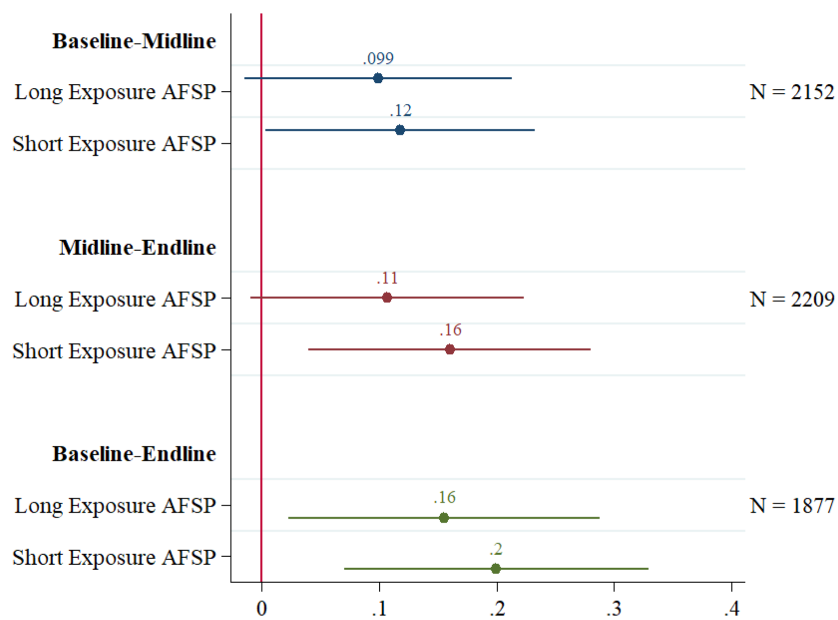
Figure 7: Treatment Effect (AFSP) on Total Household (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

While comparing AFSP villages to control villages paints an important overall picture of the program's effect, the experimental setup of this IE allows us to glean insights into how effects are driven by length of program exposure, and consequently into the mechanisms that might drive AFSP. Depicted in Figure 8, the VDC's that were introduced to the program earliest (thereby having the longest exposure) do not witness on average, increases in total income that can be statistically distinguished from zero from baseline to midline and from midline to endline. However, in both cases, the recently exposed villages see increases - 12% from baseline to midline and 17% from midline to endline relative to control villages. Overall, i.e. from baseline to endline, both long exposure and short exposure communities witness large and statistically significant gains relative to control communities (16% and 21% respectively, on average). This pattern suggests a pathway of large initial increases as a result of being introduced to AFSP that begin to taper off in the medium run (i.e. in within the first year or so). However, even with this reduction, there is a relatively large improvement relative to the control group in the longer-run (represented in the changes persisting across the baseline-to-endline analysis)

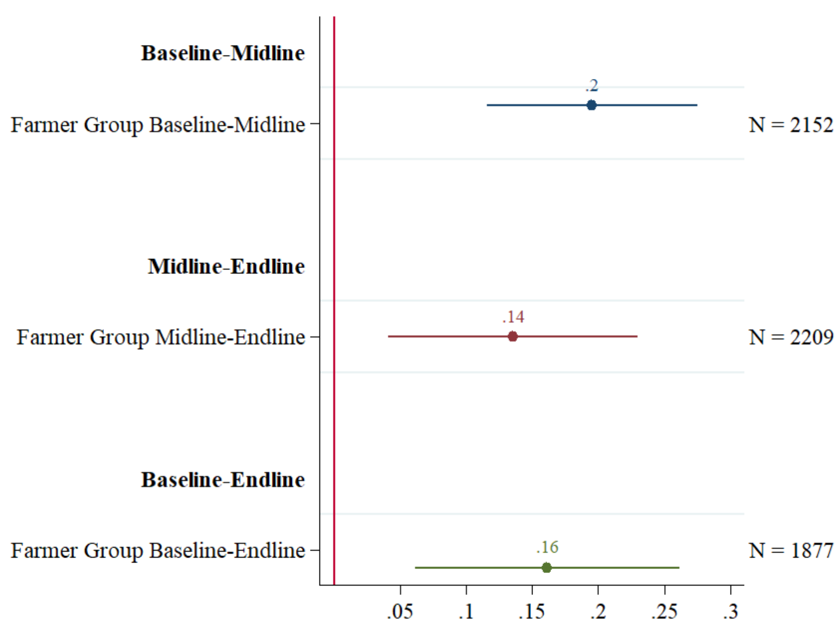
Figure 8: Treatment Effect (Short/Long Exposure) on Total Household (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

Given that the main operating model of the AFSP is to work through farmer groups and cooperatives, the analysis expands from the assignment of the program at the village level to account for those individuals who report being members of farmers groups and cooperatives, compared to the outcomes of individuals who do not. A very important limitation of this approach however, is that farmers select-into farmers groups. This violates the main identifying assumption of the IE, where treatment is assigned at the village level. Despite this key detail, the regression still points at potentially important lessons on the impact of AFSP given how central this operational modality is to the program. The impact estimates range from 14% to 20% depending on which round-to-round analysis we look at. The largest effect of being in a farmers group is when comparing households at baseline to midline, indicating that the gains from the group formation come from early enrollment. Further, as discussed previously, there was some reported attrition from farmers groups, implying that individuals reacted in line with the outcomes suggest - i.e. witnessing early gains, and then dropping out of groups once these drop off. It is also possible that the correlation moves in the opposite direction, with outcomes dropping off, causing individuals to exit from farmers groups.

Figure 9: Treatment Effect (Farmer Group) on Total Household Ln(Income)



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

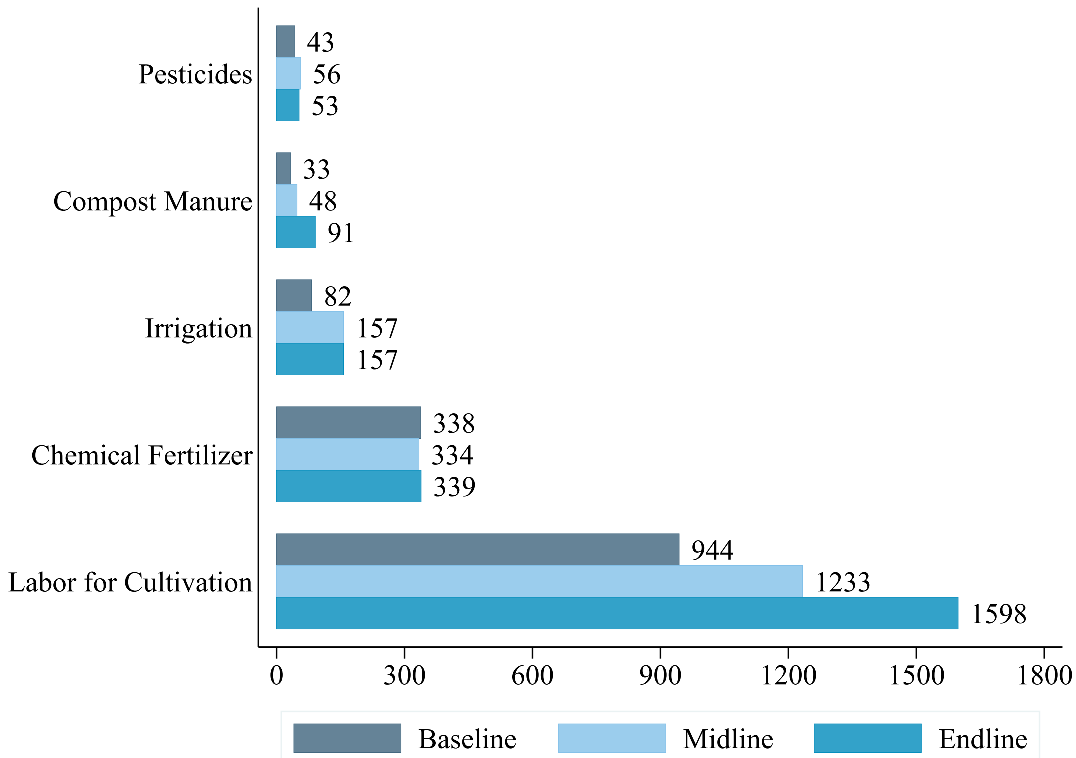
4.4 Total Agricultural/Crop Income

Given the substantial increases in total household income presented in Section **??** above, an important next-step in the analytical process is to try and uncover the channels through which these might be acting. The analysis follows AFSP's operational model, with an investigation into two of the main channels through which the program delivers outcomes - agricultural income (i.e. crop and related technology advocacy) and livestock promotion. The income across these two categories are aggregated and analyzed in the following sections.

4.4.1 Key Descriptive Statistics - Crop Income

Agricultural Inputs Expenditure: As demonstrated in Figure 10, agricultural input expenditures rose modestly for most inputs over the period of study, with particularly notable increases in expenditures on labor employed for cultivation. Continuing the growth pattern seen at midline, rising expenditures on labor for cultivation of crops may reflect rising incomes being used in productive ways, but also could represent the channel through which their incomes are increasing (i.e. the direction of causation is unclear). Spending on compost is not large relative to other input expenditures (Rs. 90 on average per household at endline), but did see a large increase relative to reported expenditure in previous rounds - almost double. While AFSP treated households had higher usage rates and higher average levels of expenditure for most agricultural inputs relative to control households, both treated and control households experienced rising input expenditures across the survey rounds.

Figure 10: Spending on Agricultural Inputs (Rupees) - All Households



Agricultural Production: Figure 11 shows the share of households growing the top 10 most common crops by endline share. Baseline shares exceeded midline and endline shares for most crops, suggesting households shifted to grow a more concentrated group of crops. Wheat was consistently the most popular crop planted - with over 80% of households deciding to do so in each round. Maize and paddy followed suit - with 65-70% of households growing these crops in any given round. While the share of control households growing main paddy decreased by 2.4 percentage points from baseline to endline, the AFSP treated household share growing main paddy increased by 0.5 percentage points. The choice to grow a certain crop-mix only paints a partial picture of households optimizing farm choices however, and points at the need to further investigate how planting decisions translated into production outcomes.

Figure 11: Share of Households Growing Common Crops by Round (Percent)

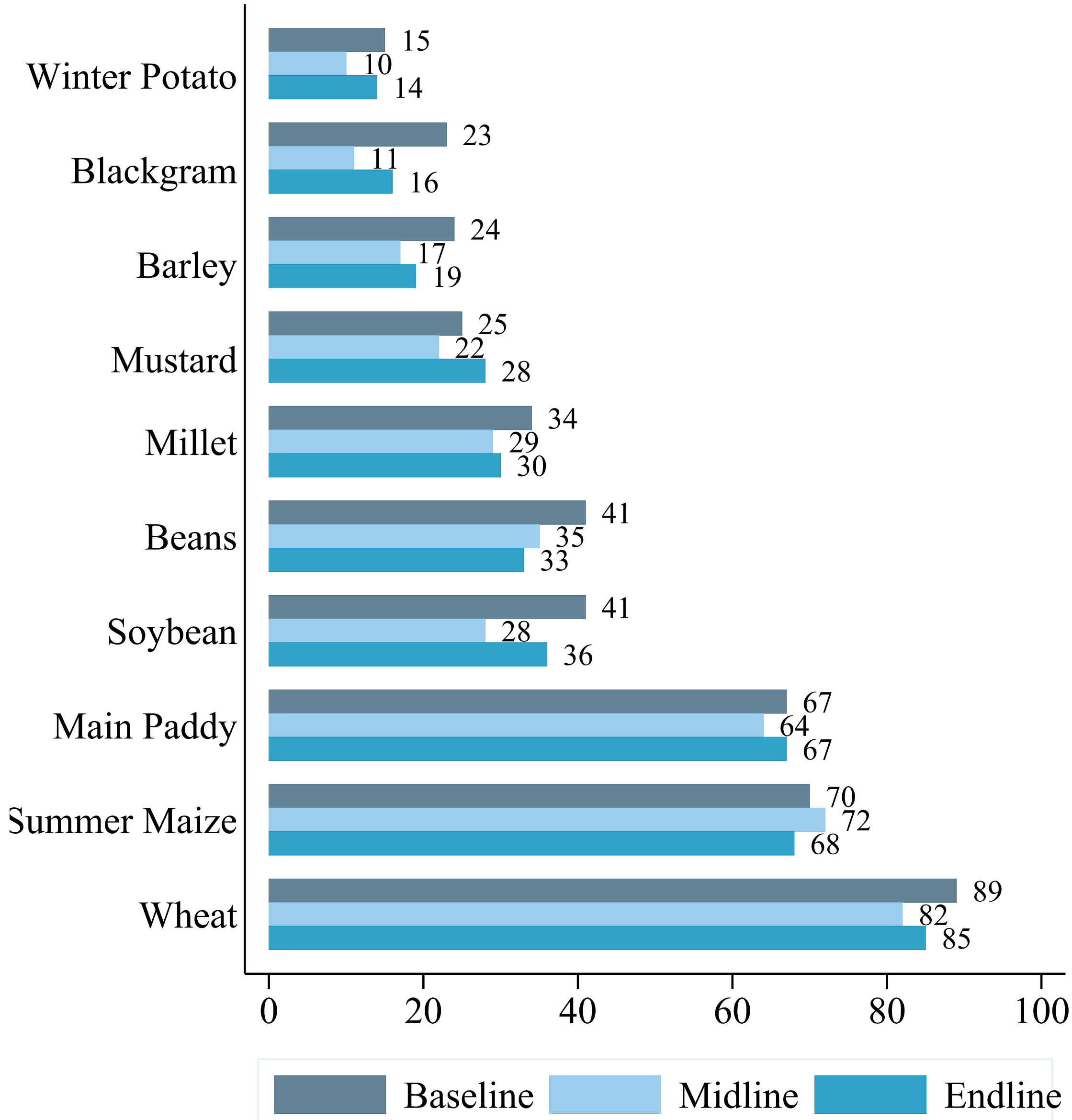
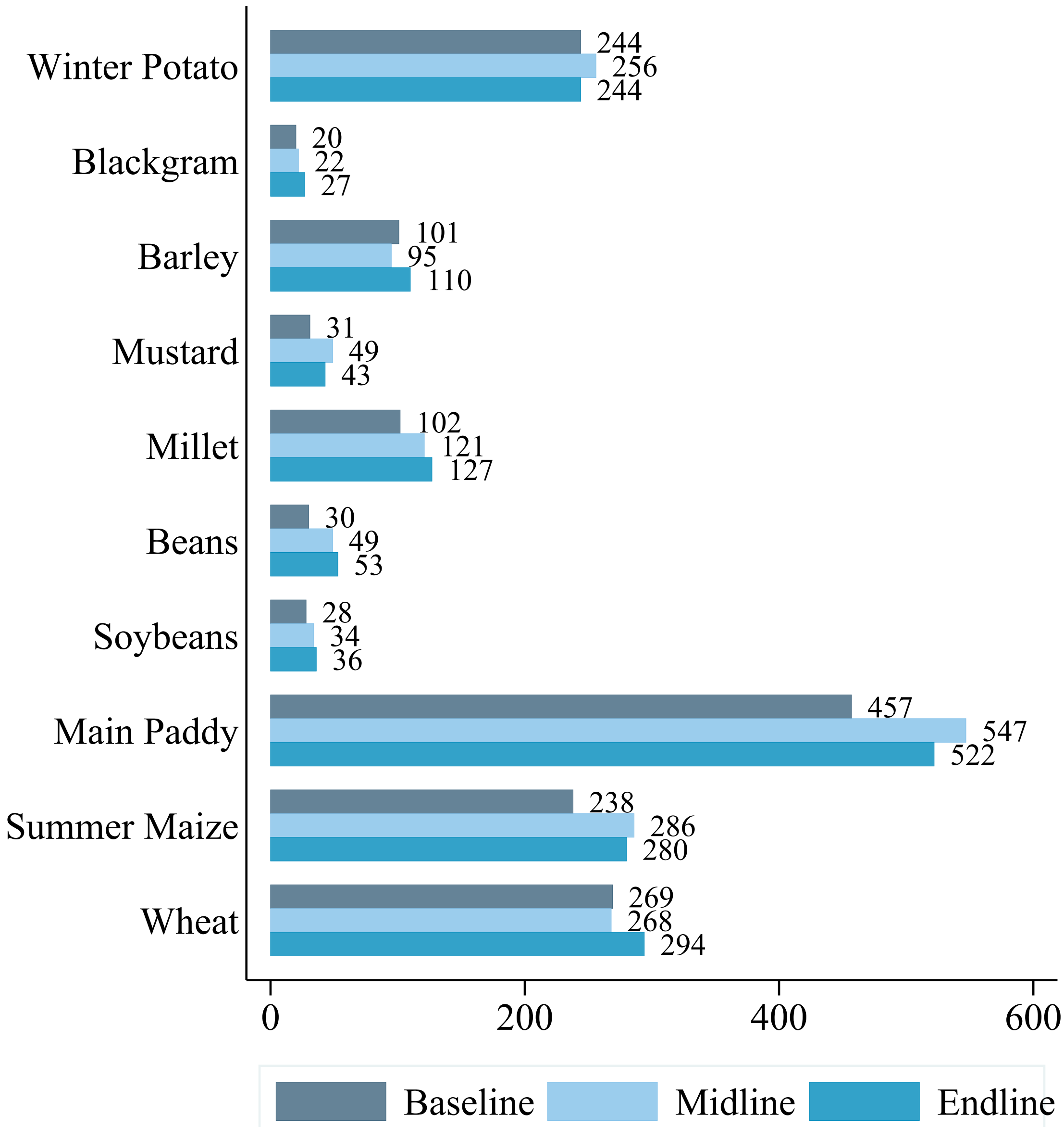


Figure 12 below builds on Figure 11 by looking into production values for the most commonly grown crops. For most of the 10 most common crops grown at endline (winter potato, black gram, barley, millet, beans, soybean, main paddy, summer maize and wheat), there was a higher proportion of households reporting growing these crops at baseline. Production, on the other hand paints a different story. Across the board, the trajectory for production values increases over time. This provides further evidence to support the previously posited hypothesis that farmers are consolidating the number of crops and focusing on increasing productivity on a smaller subset. From an efficiency perspective, this approach might yield greater dividends as farmers (a) begin to specialize on a subset of crops (b) begin to see returns from those crops and therefore don't see the need to go back/diversify into other areas (c) continue improving production on this smaller set of crops through a learning-by-doing approach. In fact, given the impact estimates on cropping income presented in Section 4.4.2, the hypothesis that consolidation leads to overall gains does come through.

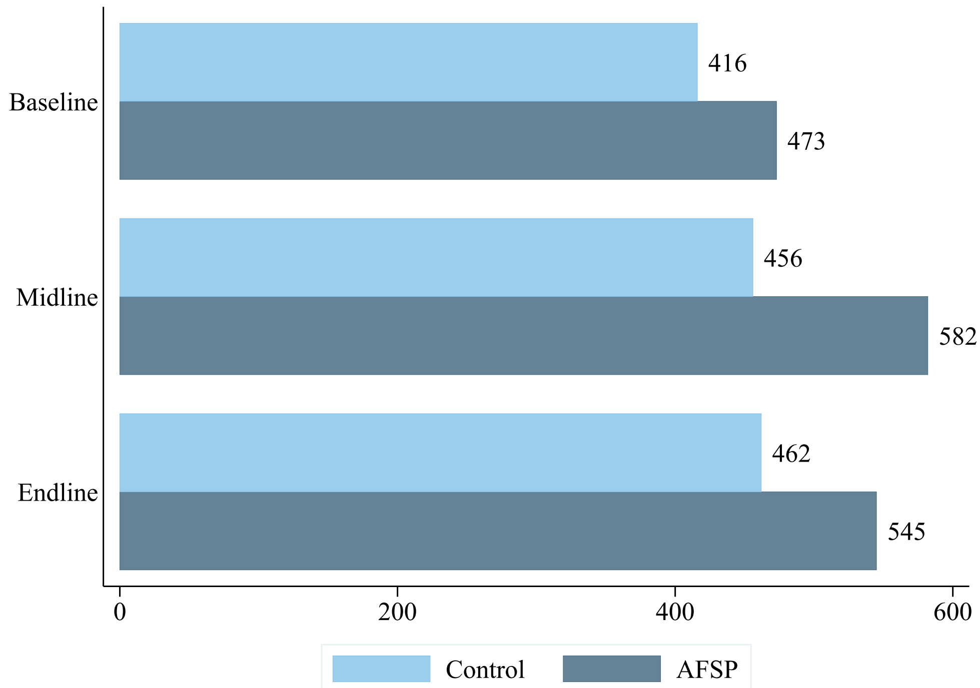
Figure 12: Average Annual Production of Common Crops (kg/Household)



Examining production of four of the main AFSP crops, increases appear to be at a greater rate in treated households relative to control households, as shown in Figure 13. Main paddy production increased by 15% from baseline to endline in AFSP treated households compared to an 11% increase in control households, though production decreased marginally between midline and endline for treated households. Wheat production increased by 12% in treated households versus 4% in control households, while summer maize production grew strongly from baseline to endline in both treated and control households (18% and 17% increases, respectively) shown in figure 14. Winter potato production increased by 6% in treated households between the baseline and endline surveys compared to a 9% decrease for control households. For main paddy and wheat, treatment households had higher production in all 3 rounds than control households, with the largest difference between the two groups being main paddy. Given that these 4 crops were a major focus for the AFSP program, the differential increase between the two sets of households is not surprising, and should be expected to drive the impact of the program on cropping income.

Figure 13: Average Annual Production of Common Crops (kg/Household) by AFSP Status

(a) Main Paddy



(b) Wheat

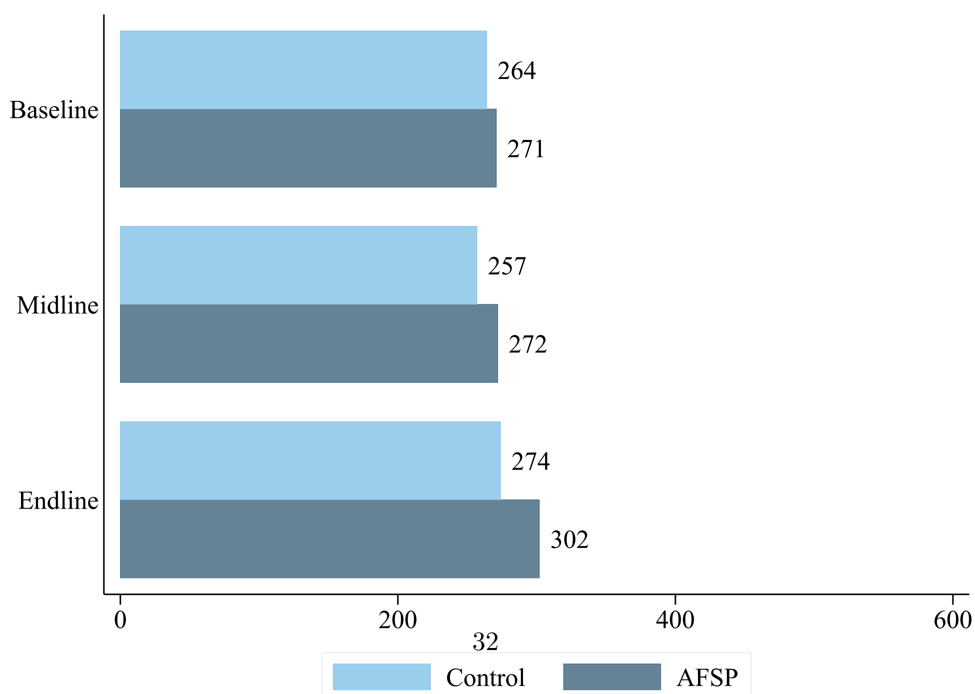
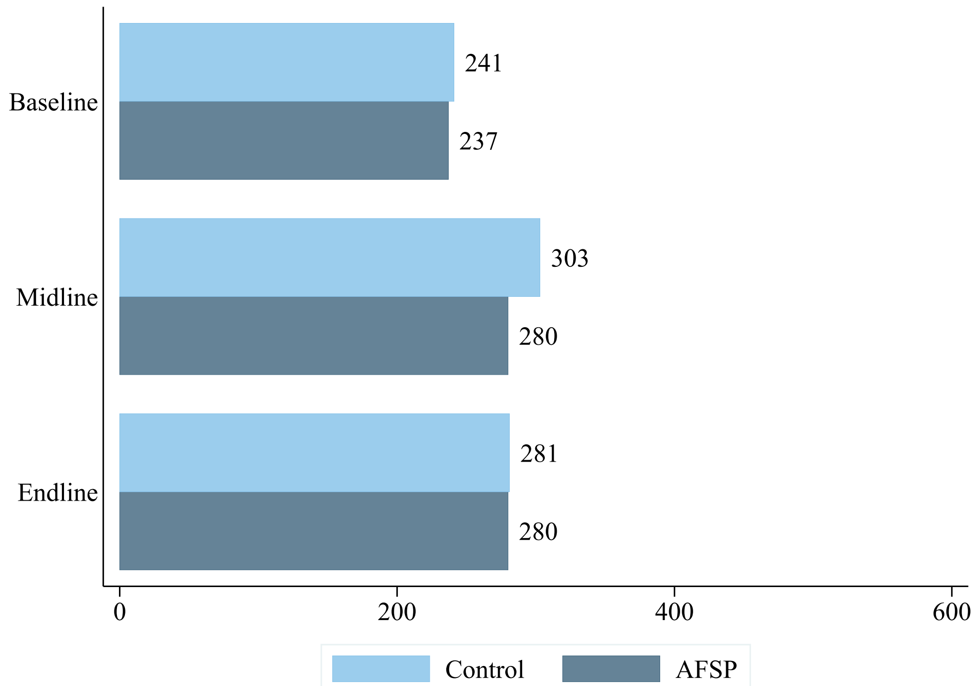
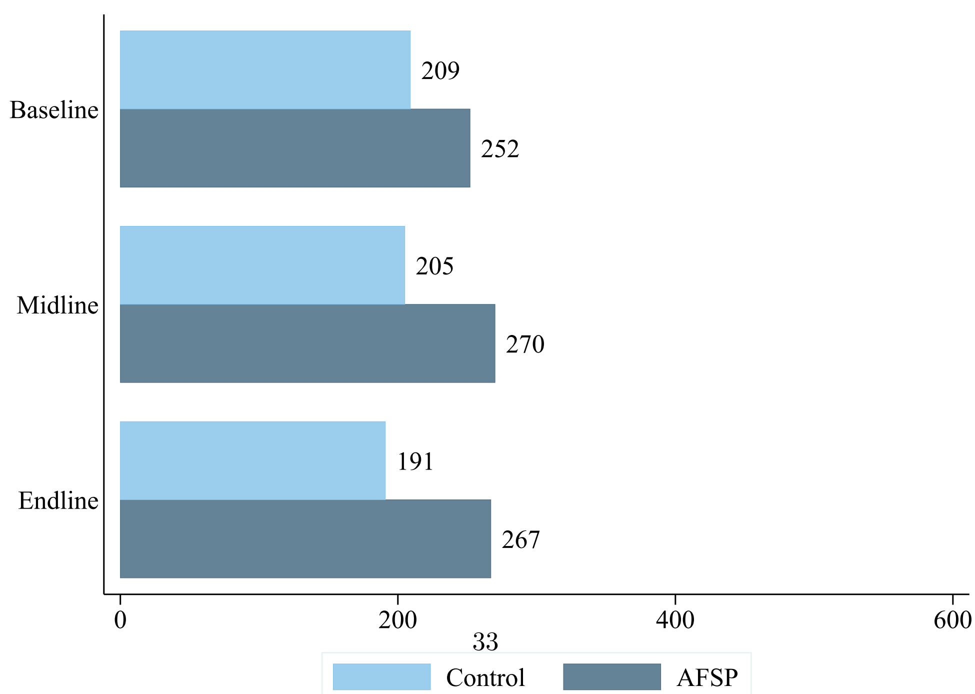


Figure 14: Average Annual Production of Common Crops (kg/Household) by AFSP Status

(a) Summer Maize

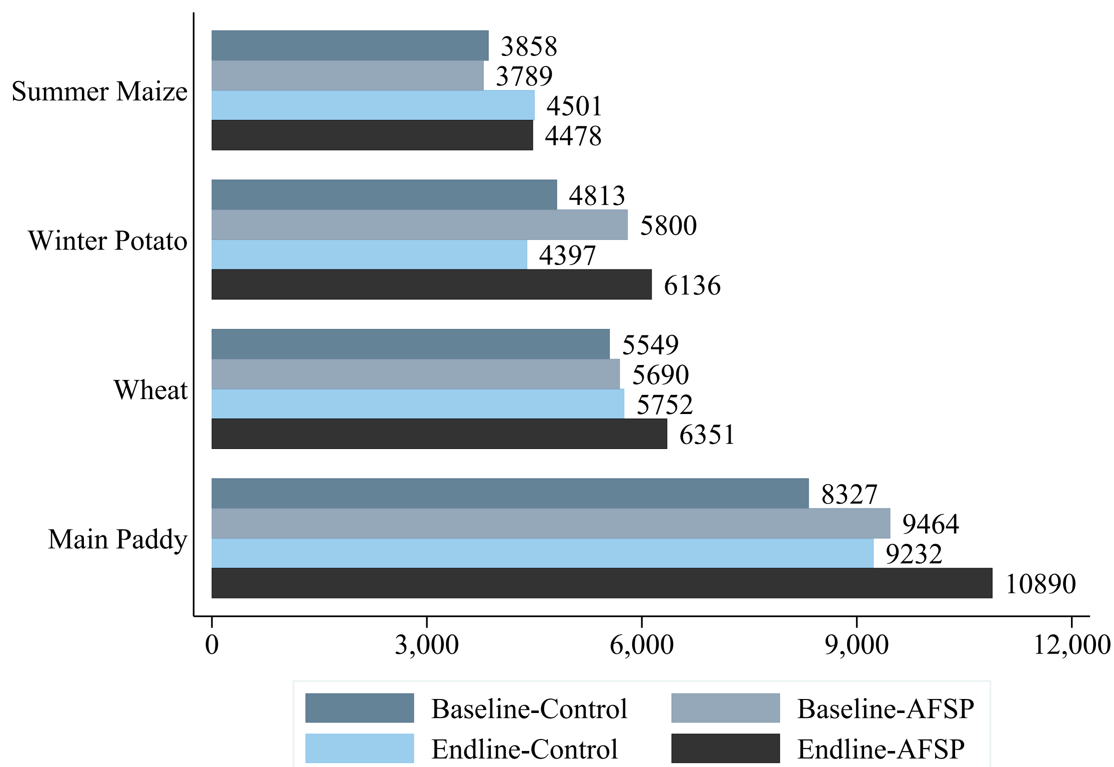


(b) Winter Potato



In Figure 15 below, the production value for 4 of the main crops are analyzed. In the graph, it is clear that AFSP households at endline are witnessing higher production values than control households, and relative to their own status at baseline. Each of the 4 crops presents a unique story: (a) For summer maize, treatment and control began at similar production values and saw comparable increases (18% for treatment and 17% for control). (b) In the case of winter potato, the treatment group started off with a higher production value but saw an increase of 6% compared to a 9% decrease for the control group. (c) For wheat, treatment and control started off at a very similar production value, but the treatment group saw an increase of approximately 14% (Rs. 5549 to Rs. 6350), whereas the control group only increased by 1.09%. (d) Finally, for main paddy, the treatment group had 10% higher production value than the control group at baseline, and increased by 13% relative to an increase in the control group of 10%.

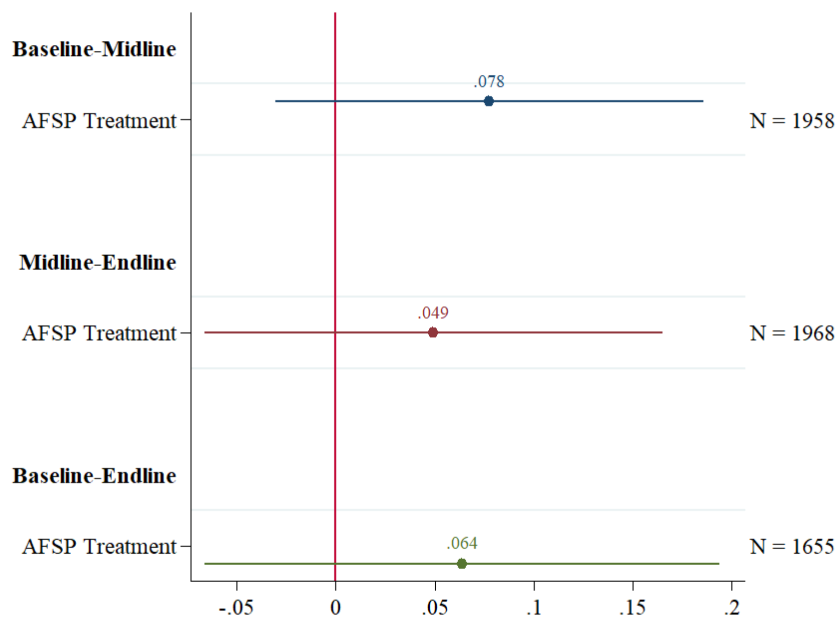
Figure 15: Average Annual Production Value of Common Crops (Rupees/Household)



4.4.2 Impact Estimates - Crop Income

Figure 16 below portrays the point estimates of the difference between average incomes between AFSP communities and control communities. However, since the confidence-interval bars cross the vertical axis, none of these point estimates can be statistically differentiated from zero. In other words, while the 7.9% average difference between households in AFSP communities relative to control communities between baseline and midline, for example, is indeed the most precise estimate from the model; we cannot distinguish this estimate from zero, and conclude that there is no statistical difference between the two sets of households.

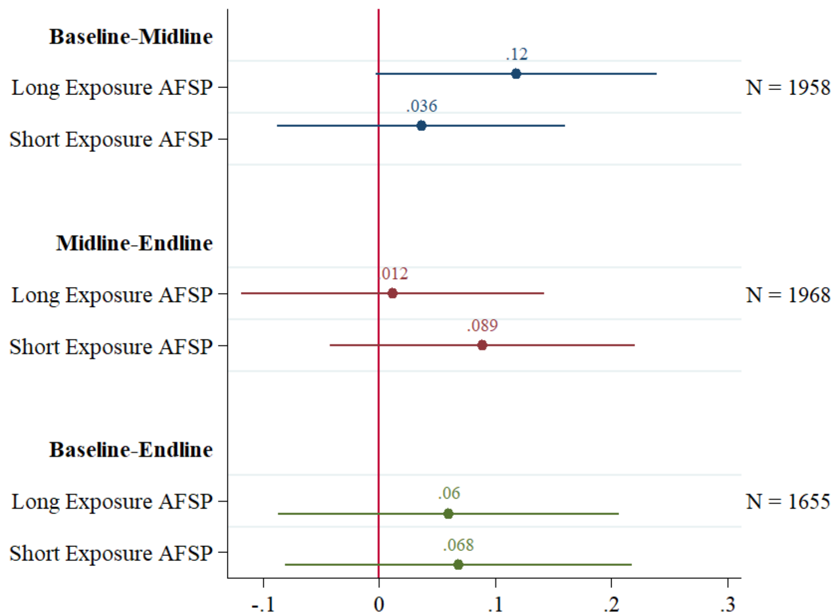
Figure 16: Treatment Effect (AFSP) on Crop (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

Following the same pattern as Figure 16 displayed previously, Figure 17 has relatively small effect estimates, most of which are not statistically distinguishable from zero. The one exception to the small effect sizes in this specification is Long Exposure VDCs - where the point estimate indicates a 12% increase in these VDCs relative to control communities between baseline and midline. The coefficient is still not significant, but is very close, with the confidence interval bar just about crossing the zero-axis. This points at further evidence of a story that was portrayed when analyzing total income - that gains from the program appear to be driven in its early stages, as farmers see substantial income gains from being the initial introduction to the new varieties of seeds and agricultural technology that the program brings.

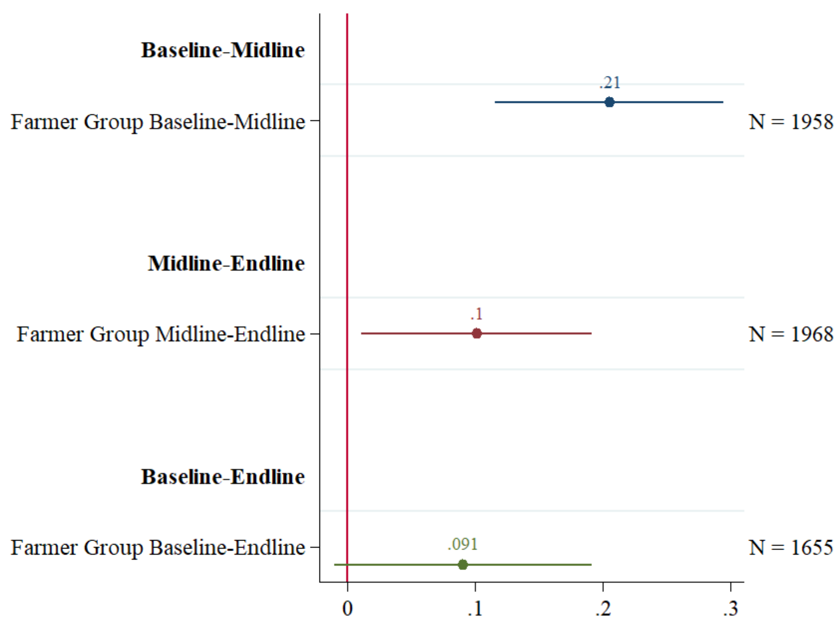
Figure 17: Treatment Effect (Short/Long Exposure) on Crop (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

When limiting the analysis to individuals that reported joining farmer groups, the impact estimates that were suggested in Figures 16 and 17 (but could not statistically be distinguished from zero) are borne out and do see statistically significant gains. Households that reported membership in farmer groups report average income gains of 20% from baseline to midline, 11% from midline to endline and 10% overall i.e. from basline to endline; relative to households in control communities. The effect is largest between baseline and midline, suggesting a pattern of early realizations from this suite of interventions. One potential explanation is as follows: given AFSP's emphasis of farmer recruitment in early stages of the project, we might have expected large increases, on average, for all those who signed up. These farmers being exposed to new seed varieties and technologies likely led to a large initial increase - almost a one-time shock in the production function. As the number of farmers in a given community who could be signed up reduced, the probability that the one-time shock be picked up in later survey rounds gradually reduced too.

Figure 18: Treatment Effect (Farmer Group) on Crop (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

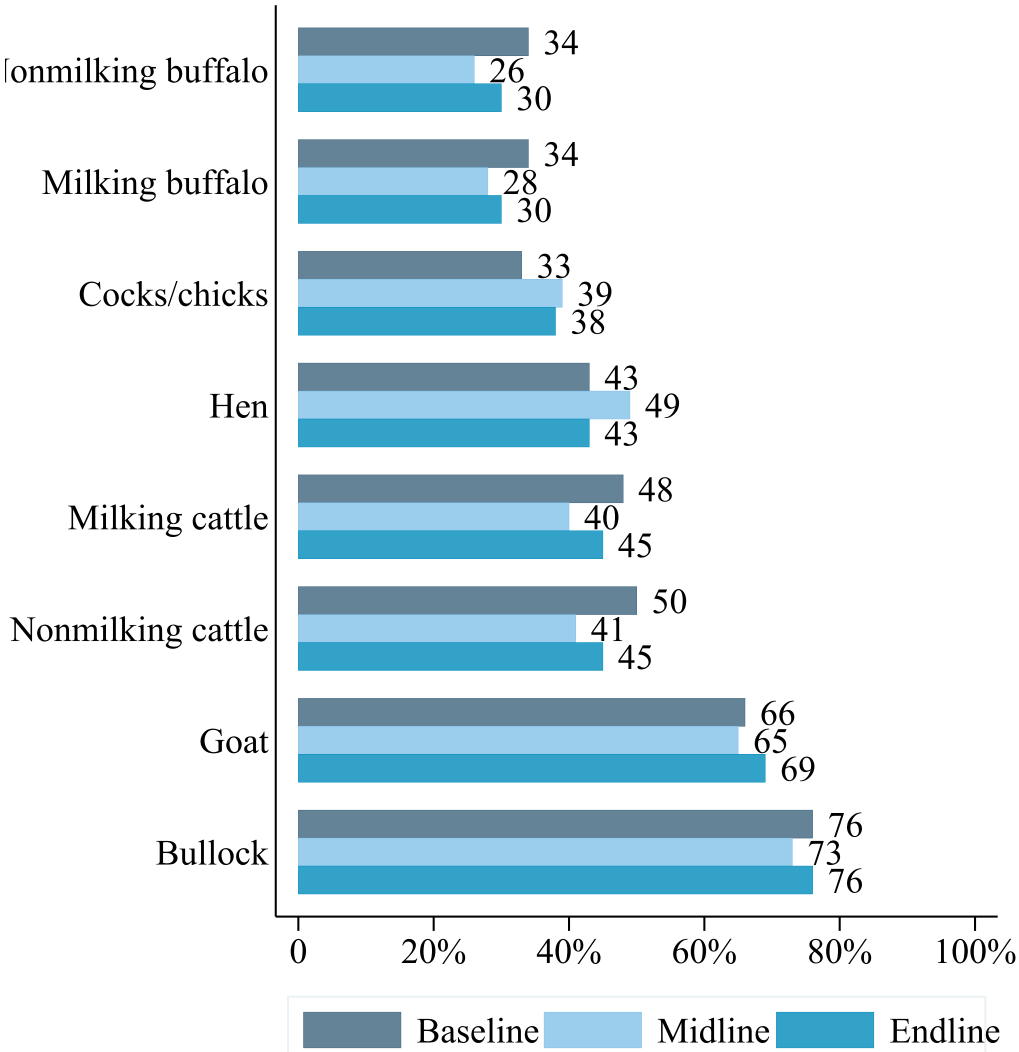
4.5 Livestock Income

Livestock income was a key focus of AFSP in the second half of the project. With a strong emphasis on milk production and cattle/goat-rearing, the research team was keen to understand the impacts of this part of the program. One aspect about livestock that is inherently different from agricultural income is the immediacy of the effect it has the potential for. Owning livestock can be a transformative endeavor for a farmer. Unlike improved agricultural practices, going from owning no cows to owning 1 (i.e. a change on the extensive margin) can have dramatic effects that play out in the very short run as the cow begins producing milk. As with anything, the gains are not automatic, and appropriate livestock-rearing techniques and technologies that are at the center of AFSP could help in making these effects sustainable and magnified.

4.5.1 Key Descriptive Statistics - Livestock Income

Bullocks and goats were the most commonly owned livestock across the three survey rounds, as shown in Figure 19. For most animals, ownership shares remained the same or decreased slightly between baseline and endline, but ownership of goats and male chickens both increased modestly.

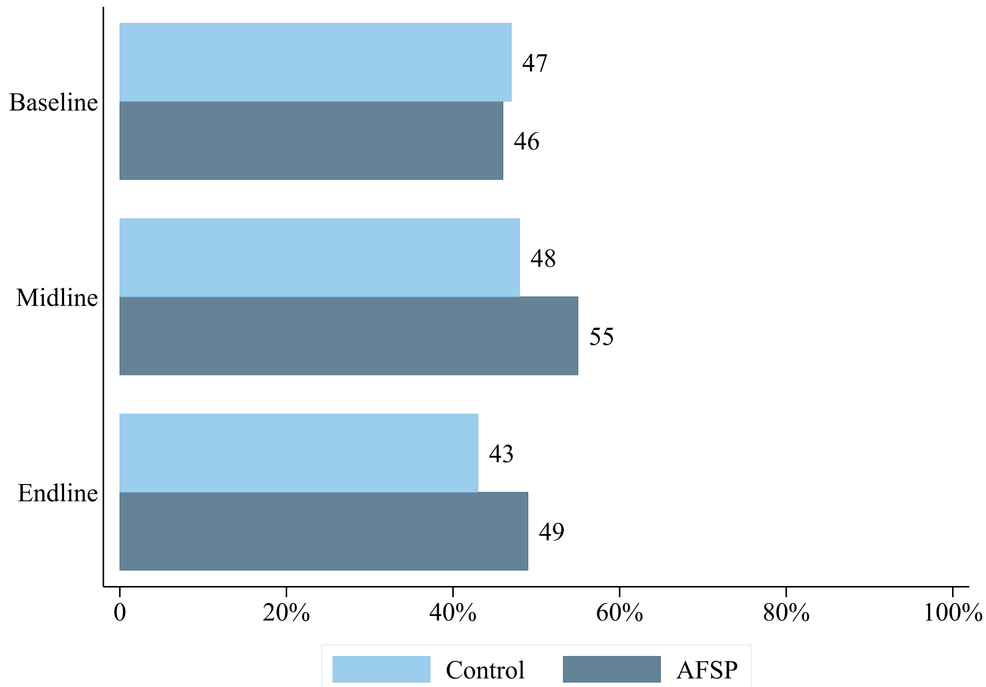
Figure 19: Share of Households Owning Livestock by Round



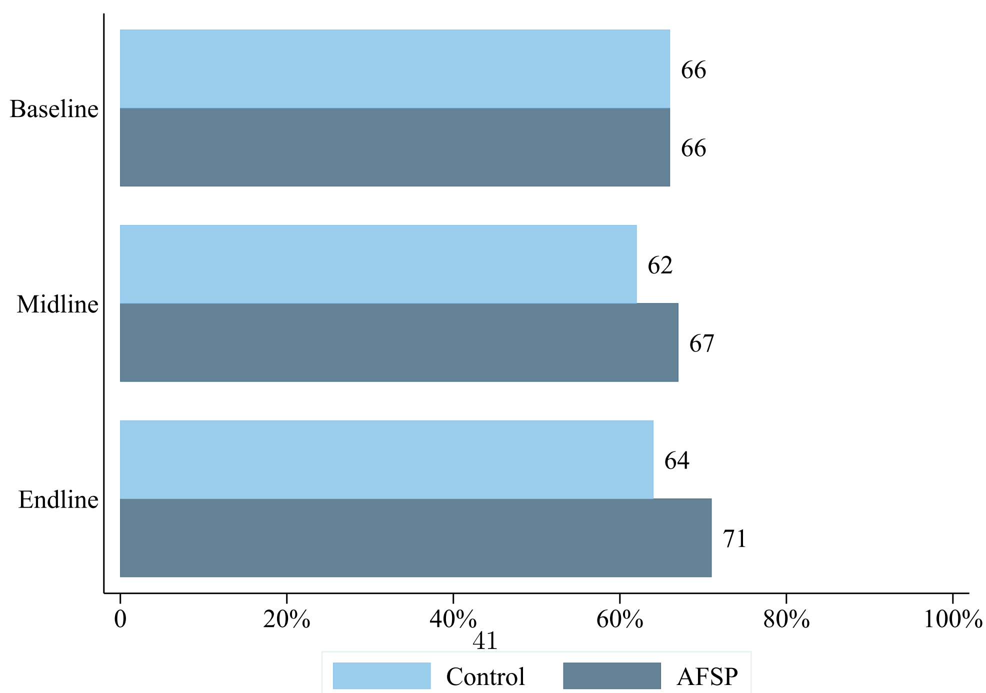
Breaking out ownership by treatment status in Figure 20 shows treated households are driving the overall increases reported in Figure 19, with the share of households owning chickens and goats increasing for treated households. For both types of animals, the control group witnessed modest declines from baseline to endline. Overall, the number of households reporting owning any goats is high - with over 70% of sampled households in AFSP communities reporting goat ownership. As with crop choice vs. crop production, the ownership of cattle is not sufficient in understanding welfare gains. How these livestock were taken care of, and how production was handled and marketed are likely to be better indicators of how much farmers benefited from the same.

Figure 20: Share of Households Owning Livestock by AFSP Status

(a) Chickens

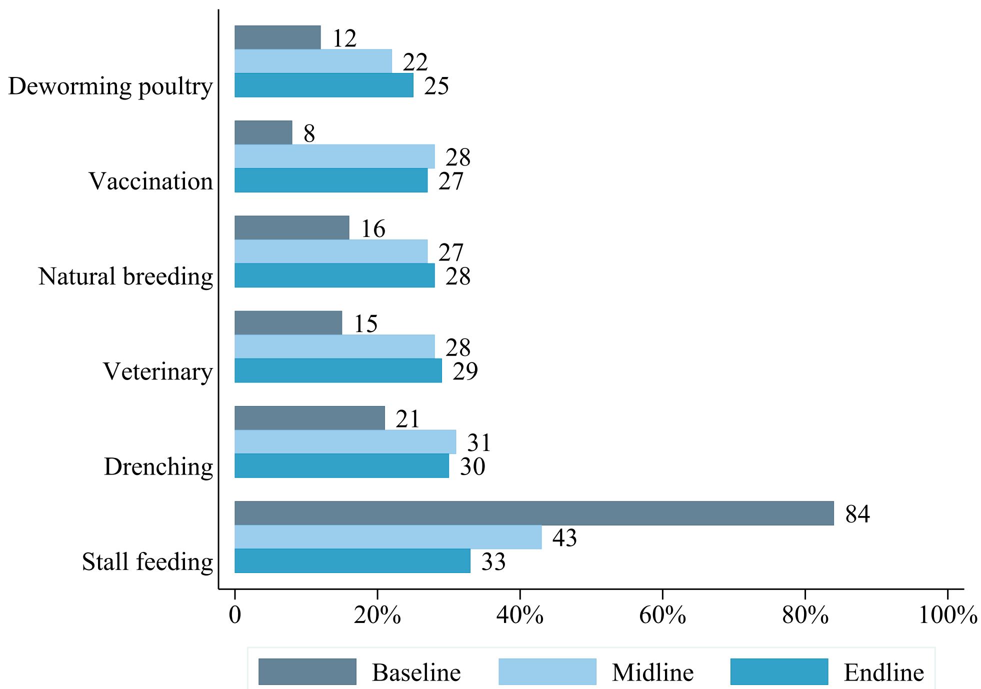


(b) Goats



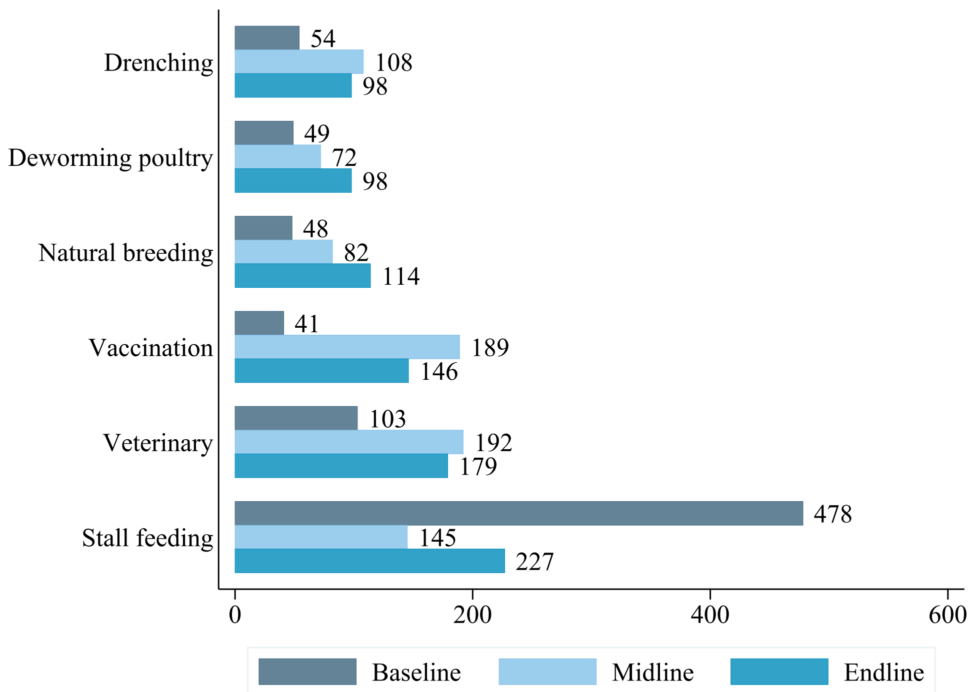
Use of most livestock technologies increased considerably between baseline and midline, and these higher rates were maintained through the endline survey, as Figure 21 shows. However, this pattern does not hold for stall feeding, for which household usage decreased substantially over the period of study. Similarly, Figure 22 shows spending on livestock technologies in the past year increased between the baseline and endline surveys (with the exception of stall feeding). While these livestock technology expenditures increased on average for both treated and control households across the three rounds, treated households experienced relatively greater increases. The increases in technology usage were likely a contributing factor in allowing farmers to realize the gains from increased livestock ownership.

Figure 21: Share of Households Using Livestock Technology by Round



Note: Shares among households who owned relevant animals.

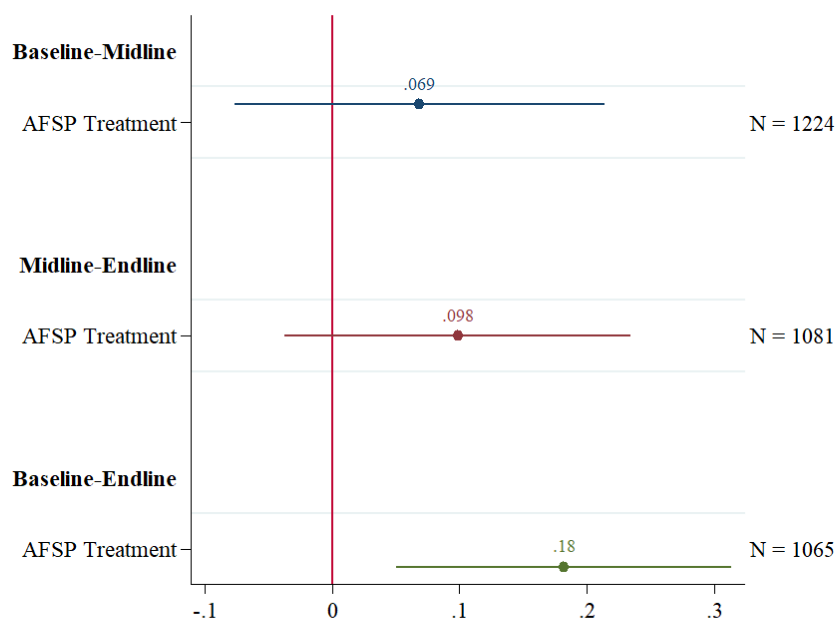
Figure 22: Spending on Livestock Technology by Round (Rupees)



4.5.2 Impact Estimates - Livestock Income

The baseline-to-midline and midline-to-endline specifications have point estimates of 7% and 9.9% for households in AFSP communities relative to control communities, but neither of these are statistically distinguishable from zero. However, the baseline-to-endline specification indicates a large and significant impact estimate: i.e. livestock income in AFSP communities was 18% higher than in control communities, on average. This overall effect points to a large average effect that was building over time. In other words, while the increase in the two shorter time periods (baseline-midline and midline-endline) cannot be statistically detected, the change from the start of the program to the endline was drastic. Given the fact that livestock income can materialize relatively quickly, the timing of the survey is a key factor in this case. If the midline survey was not timed to perfectly pick up those gains, it is possible that the effect was missed altogether. However, the endline survey does not rely on such timing, since it covers the overall effect of the program - and hints at strong effects of the program through this income channel.

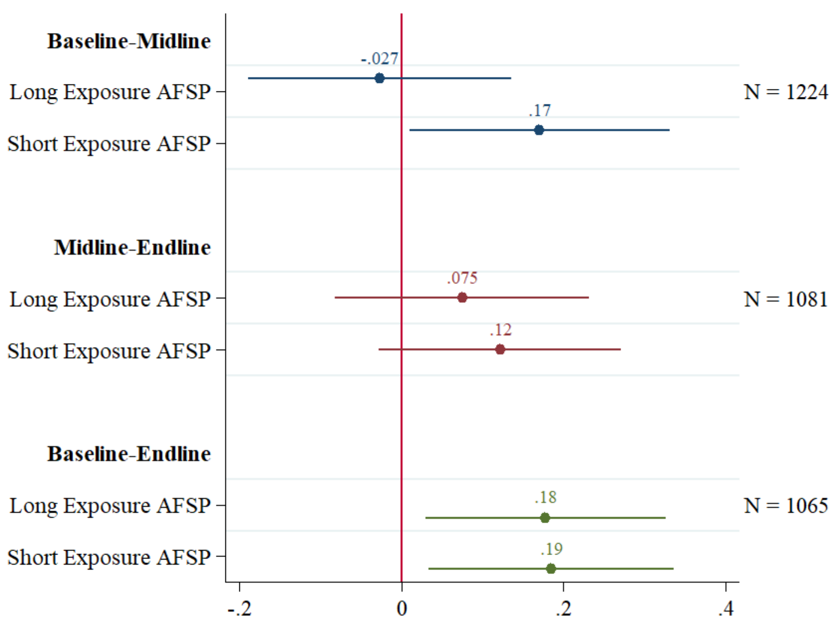
Figure 23: Treatment Effect (AFSP) on Livestock (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

The pattern in Figure 24 follows a nearly identical pattern to the findings of Figure 23. Once again, for both short exposure and long exposure communities, the baseline-to-endline changes reflect large and statistically significant impact estimates, relative to control communities. Disregarding length of exposure in Figure 23 above, AFSP communities witnessed an 18% increase in livestock income, and Figure 24 below shows that this effect was felt almost identically by both sets of communities in the long-run (i.e. in the 3 years between the baseline and endline). An interesting point of note here is that short exposure VDCs - those that had been introduced to AFSP later - saw a 17% increase in livestock income from baseline to midline, on average, relative to control communities. This points at one of the earlier mentioned theoretical observations on the short time horizons under which such livestock programs can materialize. Further, this 17% effect is substantively close to the overall 18% effect in these communities, suggesting that the large early gains in the program sustain, but do not drastically grow, over time.

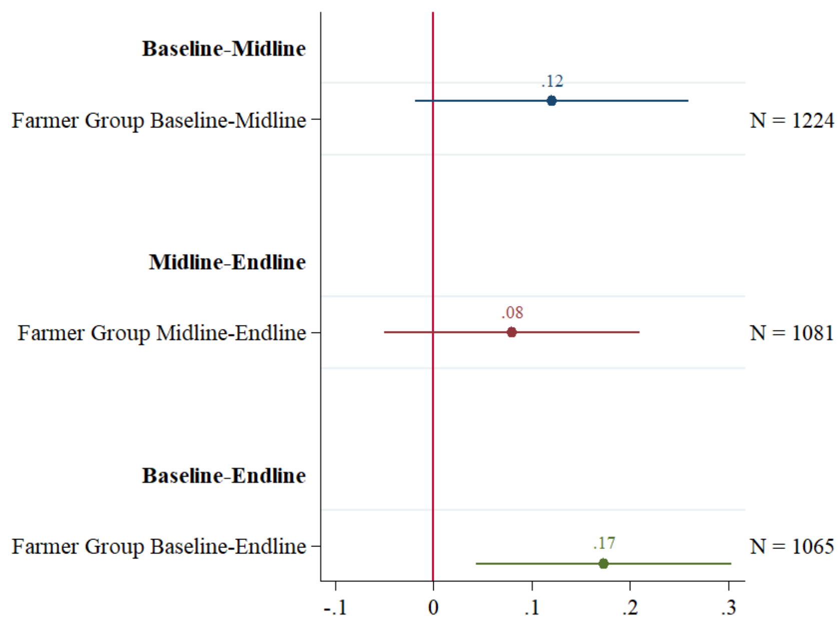
Figure 24: Treatment Effect (Short/Long Exposure) on Livestock (Ln)Income



Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

Households that report farmer group membership witness an overall increase in livestock income of 17%, on average, relative to those who do not - between baseline and endline. This estimate is substantively very close to both the pooled (AFSP treatment) specification and the early-late comparison. One take-away from this is that the similarity in point estimates and significance levels for the baseline-to-endline specifications allows us to confidently state the effect of the livestock program. While all three specifications had a few different stories to tell, the 17-18% average effect from baseline to endline holds true. This is a substantively large effect and is statistically significant across regression specifications and treatment-definitions.

Figure 25: Treatment Effect (Farmer Group) on Livestock (Ln)Income



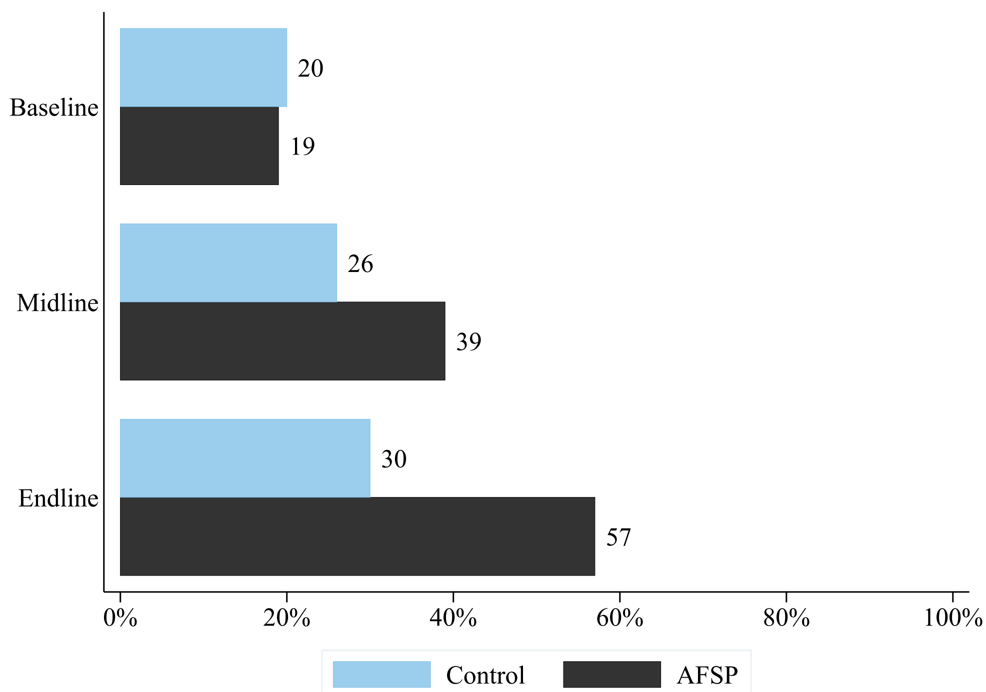
Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC

5 Health & Nutrition

5.1 Mothers Health Group Membership

In Figure 26, we show the share of households with pregnant or nursing women surveyed who had female household members in a health mother's group by treatment status and survey round. Both treated and control households with pregnant and nursing mothers saw increases in health mother's group membership, but treated households experienced a substantially greater increase (201% versus 51% for control households). Thus, the AFSP program appears to have been quite effective at promoting health mother's group membership.

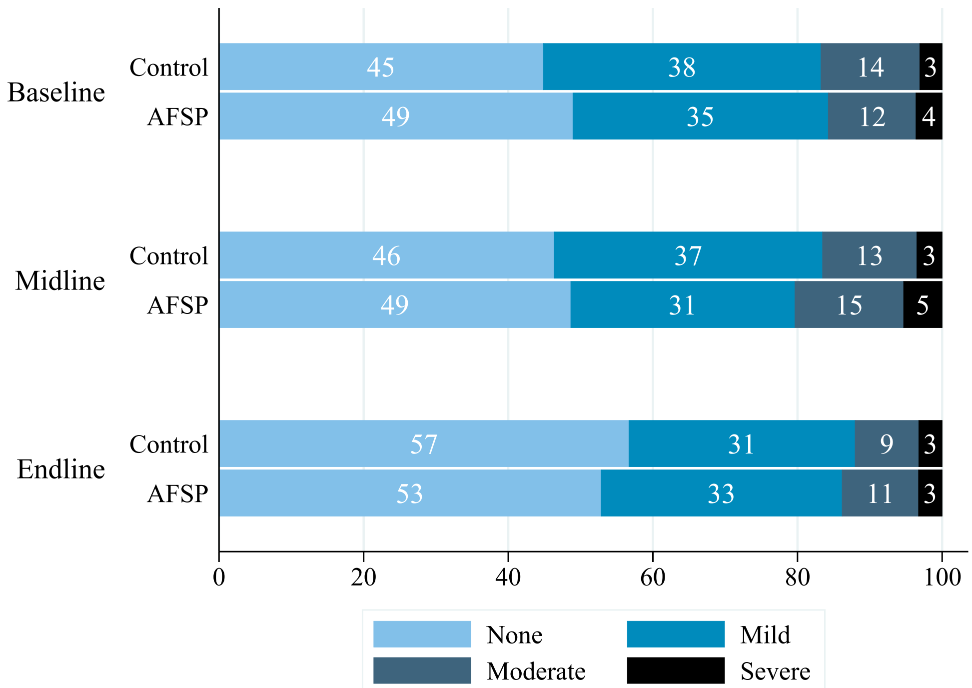
Figure 26: Share of Households with Pregnant/Nursing Women with Member in Health Mother's Group



5.2 Food Security

Figure 27 looks at the degree to which households report experiencing food insecurity by AFSP treatment status and round. Food insecurity is measured on a 9-point scale based on responses to 9 questions on household hunger and food availability over the past 30 days (responses to each questions are shown in Figure 28 below). At baseline, 44.9% of control households and 48.9% of treated households do not report any food insecurity in the past 30 days based on their responses to 9 questions. This increases to 56.7% for control households and 52.8% for treated households at endline, with the control group seeing a greater increase in their share of food-secure households. Thus, while overall reported food security is increasing, the improvements can not be attributed to the interventions of the AFSP since they are also experienced by the control group.

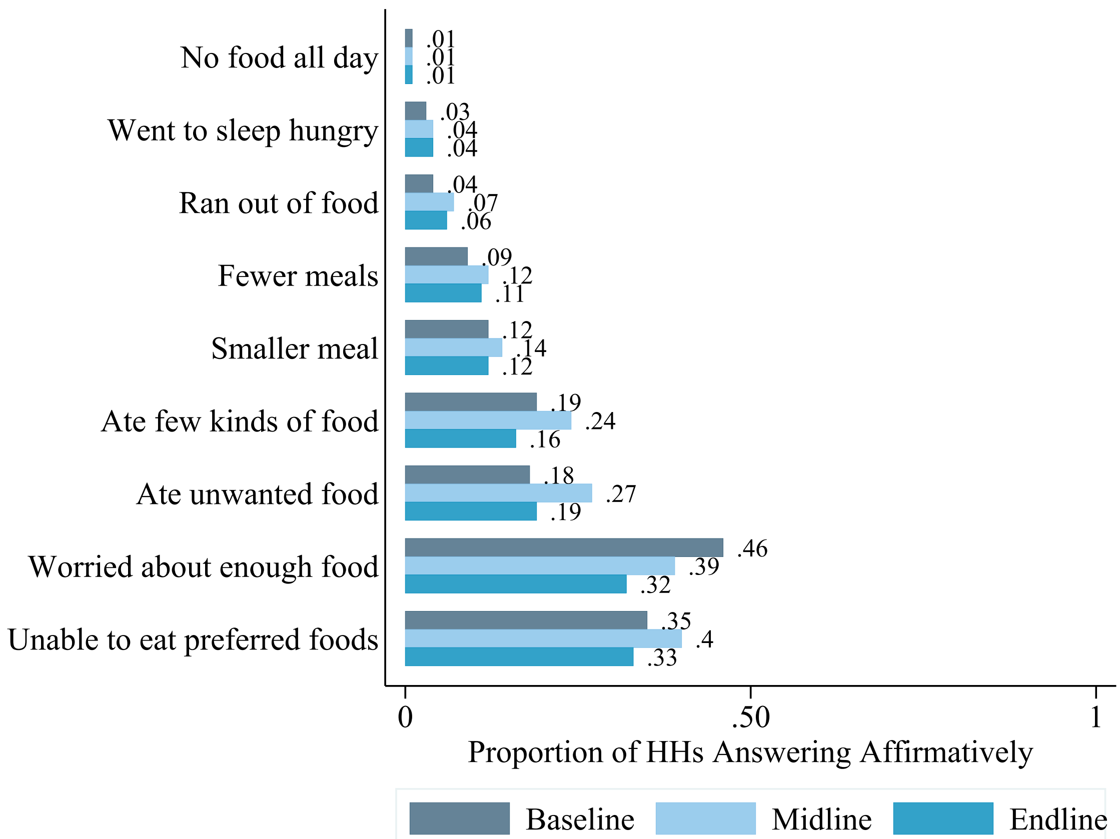
Figure 27: Food Insecurity Status in Past 30 Days



Notes: Food insecurity status is on a 0 to 9 scale based on responses to 9 food insecurity questions. Scale severity: 0 None, 1-3 Mild, 4-6 Moderate, 7-9 Severe.

Figure 28 shows each of the 9 questions on household hunger and food availability over the past 30 days that comprise the food insecurity scale shown above. It is important to note that these responses may be sensitive to the time of year each survey round took place. Overall, just 1% of households reported a member going all day without food, and this remains constant across rounds. Similarly, few households reported a member going to sleep hungry. The share of households reporting running out of food or consuming fewer meals increased slightly from baseline to endline, but overall these proportions remained quite low. Households fared somewhat worse at midline in terms of the kinds of foods they ate (more households ate unwanted foods, ate fewer foods, and were unable to eat their preferred foods), but at endline these responses returned to their baseline levels. The share of respondents who report worrying about having enough food decreased considerably from 46% at baseline to 32% at endline. Thus, while we see little change in most reported food insecurity experiences between baseline and endline, fewer households seem to be concerned about food insecurity, driving the improvements in the food insecurity status shown above.

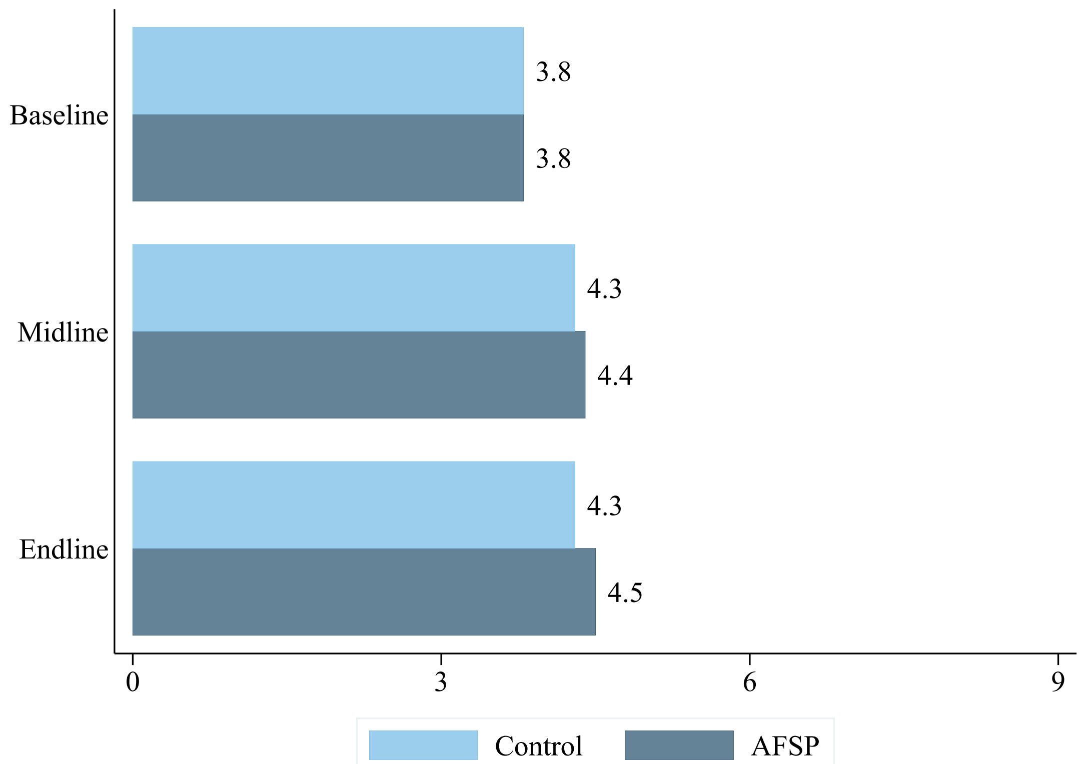
Figure 28: Food Insecurity Responses (Past 30 Days)



5.3 Dietary Diversity Score

Figure 29 shows the average dietary diversity scores for households with pregnant or nursing women surveyed by AFSP treatment status and survey round. This dietary diversity score ranges from 0 to 9, with each point indicating an additional food group consumed.[9] We see gains in pregnant and nursing women's dietary diversity between baseline and endline across the treatment and control groups (18% for treated households and 13% for control households). Thus, while we see gains in pregnant and nursing women's dietary diversity overall, we don't see major comparative gains from the program in terms of pregnant and nursing women's capacity to consume a more diverse set of foods.

Figure 29: Pregnant/Nursing Women Average Dietary Diversity Score

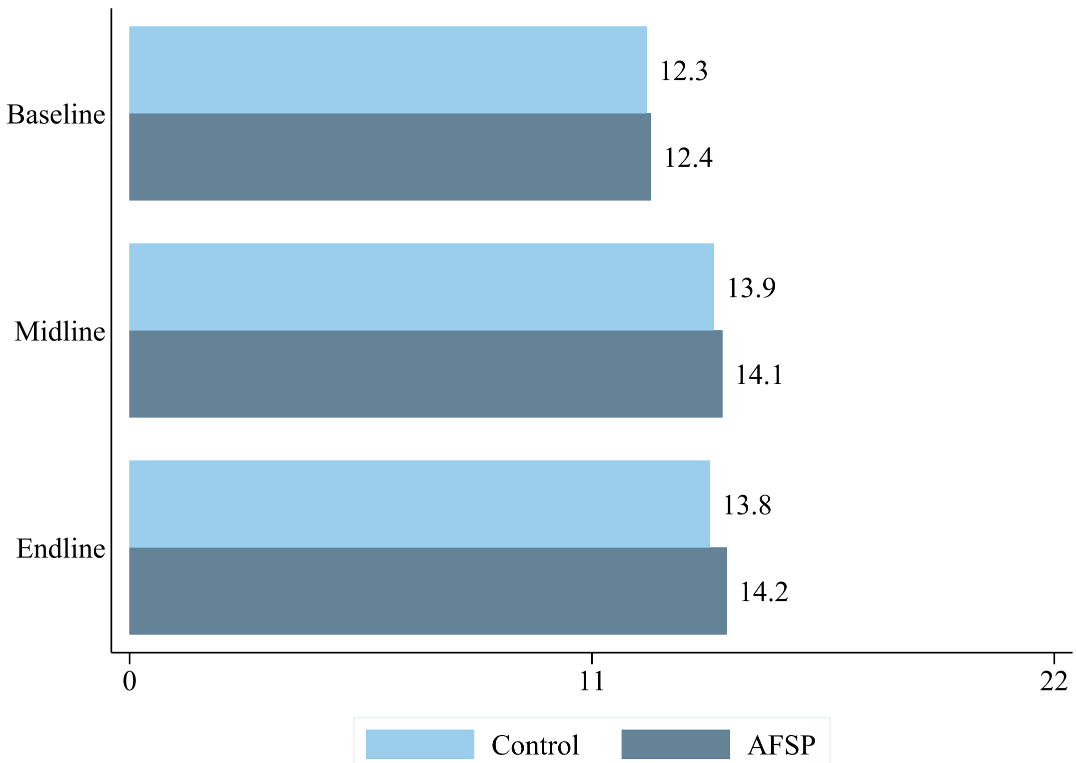


Notes: Dietary diversity score ranges from 0 to 9 based on consumption of 9 food groups. Food groups include staples, legumes, dark greens, vitamin A rich vegetables, other vegetables, dairy, eggs, meat, and organ.

[9] The 9 food groups included are: staples, legumes, dark greens, Vitamin A rich vegetables, other vegetables, meat, organ, eggs, and dairy.

Continuing to look at pregnant and nursing mothers, Figure 30 displays average maternal knowledge scores by treatment status and survey round. This maternal knowledge score ranges from 0 to 22 based on responses to questions on health and nutrition for young children, with 1 point for each response that aligns with best practices. As Figure 30 shows, the knowledge scores of mothers with infants is increasing overall, with treated and control households seeing comparable score increases between baseline and endline (15% and 12% respectively). The improvement in maternal health knowledge is only marginally higher in AFSP and control areas, and is not statistically significantly different. Unless the improvement in the control arises from spillovers of knowledge from treated areas to control areas, we can not say that treated areas are out-performing control areas on this measure.

Figure 30: Pregnant/Nursing Women Average Maternal Knowledge Score



Notes: Maternal knowledge score ranges from 0 to 22 based on responses to 22 questions on best practices.

6 Estimating AFSP's contribution to income on farmers who join farmer's groups

The previous sections of the report describe average treatment effects of the AFSP intervention on the communities in which farmers join. Although the baseline survey was collected among households who said that at least one of their members would be interested in joining a farmers group, in practice, not everyone does ultimately join. The advantage of average treatment effects is that they can relatively safely be interpreted as causal. The disadvantage is that they summarize the effect of the program on the people who mostly likely benefited (those who join the farmers group) and those who would likely not have any large impact (those who did not join.)

Trying to estimate the impact of the AFSP only on those who did join the farmers group is challenging. We directly observe the average income of a farmer who is a member of a farmers group at baseline, midline, and endline. But the challenge lies in estimating what the average income of these farmers would have been in AFSP were not active in their communities. The basic problem is that in communities where AFSP did not intervene, we don't know which farmers in the survey would have joined the farmers group and which farmers would not have joined.

One way to this comparison is to estimate the effect of being in a farmers group in two stages. First, we estimate the following regression:

$$FG_{igt} = \pi * AFSP_g * Post_t + \alpha * post_t + \psi_i + \epsilon_{igt}$$

where FG_{igt} is the total income in the past year of household i in VDC g and survey round t. The paramters psi_i capture whether the household was a member of a farmers group at baseline. The parameter π tells us how much more likely a household in an AFSP VDC was to join a farmers group between baseline and endline.

From the above regression, we can estimate $\hat{FG}$, the predicted likelihood that farmer i joins a farmers group based on whether AFSP worked in their VDC, controlling for whether they were already in a farmers group. The next step is to estimate a second regression:

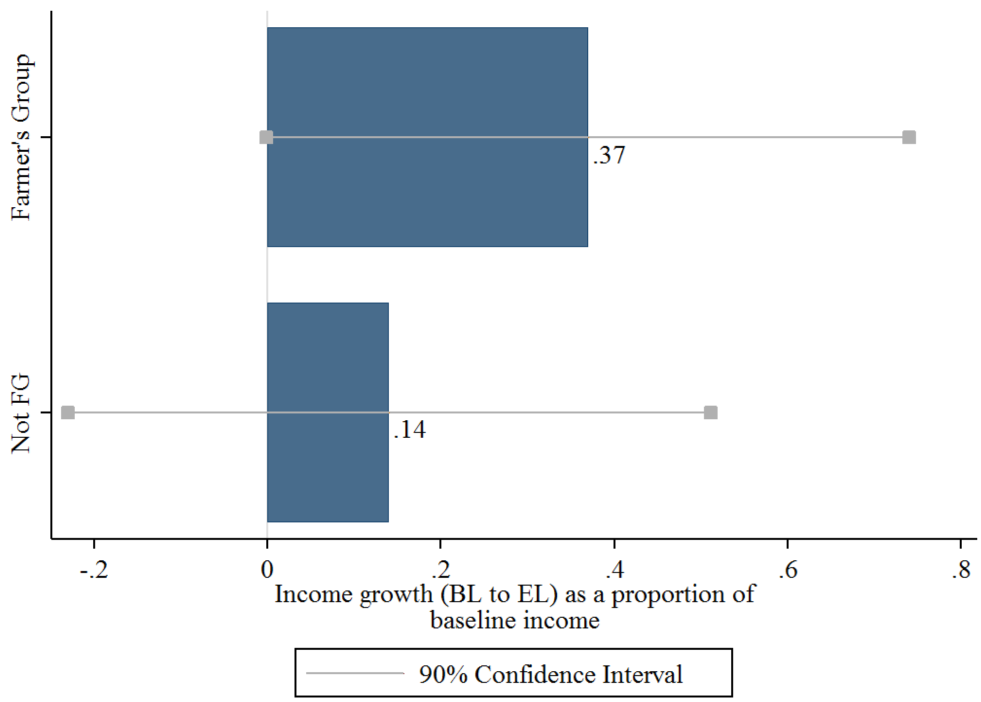
$$y_{igt} = \beta * \hat{FG}_{igt} + \delta * post_t + \phi_i + \mu_{igt}$$

y_{igt} is the total income in the past year of household i in VDC g and survey round t. This "second stage" regression yields two key parameters. The average growth in income from baseline to midline among all people who were not induced by AFSP to join a farmers group is given by δ, while β gives the change income among people who were convinced by AFSP to join a farmers group.

The estimates produced by this method of the effect of being prompted by AFSP to join a farmers group on income is shown below. Farmers who did not join groups through AFSP interventions had average income gains of .14 log points (approximately 14% of average income). Meanwhile, farmers who were induced to gain a farmers goup by AFSP was approximately 37%. This taken be taken as evidence for the idea that most of the income gains identified from the average treatment effect analysis are coming from gains experienced by the farmers who were convinced to join farmers groups.

The advantage of this method is that it controls for the bias that could result from different types of farmers choosing whether or not to join The drawback of this procedure is that it produces estimates with wide confidence intervals. Therefore, we can not claim that conventional statistical significance tests (at the 10% level or less) reject the hypothesis that those who joined farmers groups did not have a gain income.

Figure 31: Income growth among households joining a farmers group because of AFSP interventions



Notes: The bars show the coefficient estimated by regressing the natural log of total annual household income on an indicator being a member of a farmers group, where the farmers group membership is instrumented by AFSP X Post.

7 Discussion and Conclusion

By tracking participants and a comparison population across 4 years of AFSP's implementation, the IE documents improvements among households who participated in AFSP programs. The clearest gains were seen in average household income, which grew by 18% more in communities where AFSP was active than in comparable communities where it was not. These gains were largest among households who earned income from rearing livestock. The dynamics of the gains show that the increase in income is largest immediately after households join the project activities. Encouragingly, most of the gains are sustained 3-5 years after households were introduced to the program. Since the order of phase in from years 1-3 and after year 3 was randomly assigned, these results about persistance are rigorously founded.

Outcomes related to food security and nutrition portray a more mixed picture. Measures of food insecurity and application of best practices for maternal and infant nutrition showed improvements from the baseline survey to the endline survey. However, while the rate of improvement on these indicators was greater in AFSP areas than non-AFSP areas, this difference was not statistically significantly different. A strict interpretation of this finding is that AFSP areas did no better on food security and nutrition indicators than non-AFSP areas. Part of the explanation likely lies in the timing and focus of the attention on activities devoted to agricultural income relative to behavior change messaging for nutrition. The agriculture interventions started earlier and were intensively focused, while nutrition programming began only relatively late in the project's timeline. But the lack of difference between AFSP and non-AFSP areas could also arise because of spillovers in knowledge and practices. If the AFSP improved nutrition practices in AFSP VDCs that were observed and copied by households in non-AFSP VDC's, the non-AFSP VDCs could see improvements as well. One activity that makes such spillovers especially likely was the addition after project design of messages spread by radio rather than through physical materials. Since radio messages spread beyond project intervention areas more easily than physical materials like informational posters or flip charts, this could cause spillovers to non-AFSP that were not anticipated during the design of the IE.

One of the core questions of the IE as originally designed was to investigate whether nutrition sensitive behavioral change leverages the impacts of livelihood programs on nutrition, and vice versa. The most intriguing finding from the report is that the AFSP communities had much bigger increases in income than the non-AFSP communities, but the increases in food security indicaters were no bigger. In a sense, this finding presents an opportunity. Conventional wisdom might suggest that food security and nutrition can not be improved until the worst effects of poverty are eliminated and that income growth is a necessary prior condition for nutrition to improve. The results of this evaluation hint that this conjecture might not be true. The non-AFSP communities experienced nutrition and food security improvements, even without the income gains experienced by AFSP households.

The government of Nepal and the GAFSP are planning a second investment in Nepal to build on the results of the AFSP project. The new project will involve regions other than the ones initially covered by AFSP, including earthquake affected zones. The approaches will also be adjusted, including for example, the use of nutrition gardens to increase the availability of nutritious food. Planning for that project will benefit from the results and data made available by this impact evaluation, because the data available to evalaute and target approaches is much richer than is often the case during project planning. As an initial application of the AFSP evaluation data for planning, DIME has constructed a proxy means test (PMT) that can be used by the upcoming project to target its interventions, and the research team aims to continue engaging with the project team to build evidence and future learning.

Annex A: Regression Tables

Table 1: Treatment Effect (AFSP) on Total Household Income Without Covariates: Diff-in-Diff

	(1)	(2)	(3)
	Baseline - Midline	Midline - Endline	Baseline - Endline
AFSP X Round 2	0.056		
	(0.083)		
AFSP X Round 3		0.074	0.130
		(0.082)	(0.079)
AFSP Treatment	0.096	0.139*	0.085
	(0.071)	(0.071)	(0.070)
Round 2	0.320***		
	(0.072)		
Round 3		-0.095	0.224***
		(0.071)	(0.064)
Has District FE	YES	YES	YES
Observations	4701	4773	4460
R-squared	0.11	0.09	0.10

Table 2: Treatment Effect (Short/Long Exposure) on Total Household Income Without Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Long Exposure X Round 2	0.036		
	(0.095)		
Long Exposure X Round 3		0.075	0.111
		(0.089)	(0.094)
Short Exposure X Round 2	0.079		
	(0.091)		
Short Exposure X Round 3		0.073	0.152*
		(0.095)	(0.089)
Long Exposure AFSP	0.084	0.102	0.070
	(0.081)	(0.078)	(0.080)
Short Exposure AFSP	0.109	0.177**	0.100
	(0.080)	(0.077)	(0.078)
Round 2	0.320***		
	(0.072)		
Round 3		-0.095	0.224***
		(0.071)	(0.064)
Has District FE	YES	YES	YES
Observations	4701	4773	4460
R-squared	0.11	0.09	0.10

Table 3: Treatment Effect (Farmer Group) on Total Household Income Without Covariates: Diff-in-Diff

	(1)	(2)	(3)
	Baseline - Midline	Midline - Endline	Baseline - Endline
Farmer Group/Cooperative X Round 2	0.054		
	(0.067)		
Farmer Group/Cooperative X Round 3		-0.021	-0.023
		(0.059)	(0.069)
Farmer Group/Cooperative at Midline	0.185***		
	(0.060)		
Farmer Group/Cooperative at Endline		0.162***	0.164***
		(0.051)	(0.057)
Round 2	0.346***		
	(0.057)		
Round 3		-0.039	0.330***
		(0.049)	(0.054)
Has District FE	YES	YES	YES
Observations	4701	4773	4460
R-squared	0.11	0.09	0.10

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 4: Treatment Effect (AFSP) on Total Household Income With Covariates: Diff-in-Diff

	(1)	(2)	(3)
	Baseline - Midline	Midline - Endline	Baseline - Endline
AFSP X Round 2	0.100		
	(0.083)		
AFSP X Round 3		0.061	0.153**
		(0.081)	(0.077)
AFSP Treatment	0.029	0.132*	0.025
	(0.062)	(0.069)	(0.061)
Round 2	0.426***		
	(0.093)		
Round 3		-0.004	0.591***
		(0.070)	(0.089)
Has District FE	YES	YES	YES
Observations	4633	4577	4332
R-squared	0.25	0.18	0.25

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 5: Treatment Effect (Short/Long Exposure) on Total Household Income With Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Long Exposure X Round 2	0.093		
	(0.093)		
Long Exposure X Round 3		0.050	0.134
		(0.088)	(0.091)
Short Exposure X Round 2	0.108		
	(0.091)		
Short Exposure X Round 3		0.074	0.175**
		(0.093)	(0.088)
Long Exposure AFSP	0.018	0.108	0.012
	(0.070)	(0.076)	(0.069)
Short Exposure AFSP	0.041	0.157**	0.038
	(0.070)	(0.076)	(0.068)
Round 2	0.427***		
	(0.093)		
Round 3		-0.004	0.590***
		(0.070)	(0.089)
Has District FE	YES	YES	YES
Observations	4633	4577	4332
R-squared	0.25	0.18	0.26

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 6: Treatment Effect (Farmer Group) on Total Household Income With Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Farmer Group/Cooperative X Round 2	0.262***		
	(0.067)		
Farmer Group/Cooperative X Round 3		-0.077	0.061
		(0.062)	(0.064)
Farmer Group/Cooperative at Midline	0.058		
	(0.051)		
Farmer Group/Cooperative at Endline		0.192***	0.070
		(0.051)	(0.052)
Round 2	0.458***		
	(0.077)		
Round 3		0.076	0.680***
		(0.049)	(0.085)
Has District FE	YES	YES	YES
Observations	4633	4577	4332
R-squared	0.26	0.18	0.25

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 7: Treatment Effect (AFSP) on Total Household Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP Treatment	0.123*	0.133**	0.198***
	(0.066)	(0.062)	(0.070)
Lagged Log Household Total Income(bl) at Baseline	0.314***		0.250***
	(0.023)		(0.023)
Lagged Log Household Total Income(bl) at Midline		0.358***	
		(0.023)	
Has District FE	YES	YES	YES
Observations	2152	2209	1877
R-squared	0.21	0.23	0.16

Table 8: Treatment Effect (Short/Long Exposure) on Total Household Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Long Exposure AFSP	0.117	0.107	0.176**
	(0.073)	(0.070)	(0.082)
Short Exposure AFSP	0.130*	0.160**	0.221***
	(0.072)	(0.073)	(0.079)
Lagged Log Household Total Income(bl) at Baseline	0.314***		0.250***
	(0.023)		(0.023)
Lagged Log Household Total Income(bl) at Midline		0.357***	
		(0.023)	
Has District FE	YES	YES	YES
Observations	2152	2209	1877
R-squared	0.21	0.23	0.16

Table 9: Treatment Effect (Farmer Group) on Total Household Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Farmer Group/Cooperative at Midline	0.238***		
	(0.049)		
Farmer Group/Cooperative at Endline		0.136**	0.186***
		(0.057)	(0.060)
Lagged Log Household Total Income(bl) at Baseline	0.308***		0.248***
	(0.023)		(0.023)
Lagged Log Household Total Income(bl) at Midline		0.356***	
		(0.023)	
Has District FE	YES	YES	YES
Observations	2152	2209	1877
R-squared	0.21	0.23	0.16

Table 10: Treatment Effect (AFSP) on Total Household Income With Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP Treatment	0.108*	0.133**	0.177**
	(0.063)	(0.062)	(0.069)
Lagged Log Household Total Income(bl) at Baseline	0.229***		0.174***
	(0.025)		(0.026)
Lagged Log Household Total Income(bl) at Midline		0.358***	
		(0.023)	
Has District FE	YES	YES	YES
Observations	2152	2209	1877
R-squared	0.25	0.23	0.19

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 11: Treatment Effect (Short/Long Exposure) on Total Household Income With Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Long Exposure AFSP	0.099	0.107	0.155*
	(0.069)	(0.070)	(0.080)
Short Exposure AFSP	0.118*	0.160**	0.200**
	(0.069)	(0.073)	(0.079)
Lagged Log Household Total Income(bl) at Baseline	0.229***		0.174***
	(0.025)		(0.026)
Lagged Log Household Total Income(bl) at Midline		0.357***	
		(0.023)	
Has District FE	YES	YES	YES
Observations	2152	2209	1877
R-squared	0.25	0.23	0.19

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 12: Treatment Effect (Farmer Group) on Total Household Income With Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Farmer Group/Cooperative at Midline	0.196***		
	(0.048)		
Farmer Group/Cooperative at Endline		0.136**	0.162***
		(0.057)	(0.061)
Lagged Log Household Total Income(bl) at Baseline	0.227***		0.173***
	(0.025)		(0.026)
Lagged Log Household Total Income(bl) at Midline		0.356***	
		(0.023)	
Has District FE	YES	YES	YES
Observations	2152	2209	1877
R-squared	0.26	0.23	0.19

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 13: Treatment Effect (AFSP) on Household Crop Income Without Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP X Round 2	0.068		
	(0.112)		
AFSP X Round 3		0.092	0.167
		(0.088)	(0.109)
AFSP Treatment	0.008	0.068	-0.018
	(0.083)	(0.073)	(0.076)
Round 2	0.487***		
	(0.095)		
Round 3		-0.265***	0.234***
		(0.070)	(0.089)
Has District FE	YES	YES	YES
Observations	4475	4446	4181
R-squared	0.16	0.21	0.10

Table 14: Treatment Effect (Short/Long Exposure) on Household Crop Income Without Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Long Exposure X Round 2	0.095		
	(0.127)		
Long Exposure X Round 3		0.045	0.139
		(0.103)	(0.122)
Short Exposure X Round 2	0.040		
	(0.132)		
Short Exposure X Round 3		0.144	0.199
		(0.103)	(0.133)
Long Exposure AFSP	0.018	0.098	-0.012
	(0.095)	(0.082)	(0.089)
Short Exposure AFSP	-0.001	0.035	-0.024
	(0.093)	(0.085)	(0.086)
Round 2	0.487***		
	(0.095)		
Round 3		-0.265***	0.234***
		(0.070)	(0.089)
Has District FE	YES	YES	YES
Observations	4475	4446	4181
R-squared	0.16	0.21	0.10

Table 15: Treatment Effect (Farmer Group) on Household Crop Income Without Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Farmer Group/Cooperative X Round 2	0.269***		
	(0.088)		
Farmer Group/Cooperative X Round 3		-0.052	0.065
		(0.062)	(0.077)
Farmer Group/Cooperative at Midline	0.056		
	(0.066)		
Farmer Group/Cooperative at Endline		0.169***	0.106**
		(0.050)	(0.053)
Round 2	0.402***		
	(0.079)		
Round 3		-0.180***	0.320***
		(0.056)	(0.069)
Has District FE	YES	YES	YES
Observations	4475	4446	4181
R-squared	0.17	0.21	0.10

Table 16: Treatment Effect (AFSP) on Household Crop Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP Treatment	0.082	0.049	0.083
	(0.067)	(0.070)	(0.078)
Lagged Log Household Crop Income at Baseline	0.328***		0.277***
	(0.027)		(0.036)
Lagged Log Household Crop Income at Midline		0.258***	
		(0.032)	
Has District FE	YES	YES	YES
Observations	1958	1968	1655
R-squared	0.33	0.29	0.26

Table 17: Treatment Effect (AFSP) on Household Crop Income With Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP Treatment	0.078	0.049	0.064
	(0.066)	(0.070)	(0.079)
Lagged Log Household Crop Income at Baseline	0.213***		0.205***
	(0.031)		(0.043)
Lagged Log Household Crop Income at Midline		0.258***	
		(0.032)	
Has District FE	YES	YES	YES
Observations	1958	1968	1655
R-squared	0.37	0.29	0.30

Notes: Covariates included: Total crops grown, marital status, primary education completion, literacy of HH head, number of plots cultivated, number of plots owned, landholdings, livestock holdings, total number of male adults, total number of children, fertilizer expenditure, pesticide expenditure, time off from farmwork, paid labor used on crops, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 18: Treatment Effect (AFSP) on Household Livestock Income Without Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP X Round 2	0.140		
	(0.122)		
AFSP X Round 3		0.073	0.207*
		(0.099)	(0.117)
AFSP Treatment	-0.026	0.088	-0.009
	(0.098)	(0.080)	(0.101)
Round 2	0.269**		
	(0.105)		
Round 3		0.044	0.309***
		(0.084)	(0.100)
Has District FE	YES	YES	YES
Observations	3407	3116	3219
R-squared	0.09	0.08	0.10

Table 19: Treatment Effect (Short/Long Exposure) on Household Livestock Income Without Covariates: Diff-in-Diff

	(1)	(2)	(3)
	Baseline - Midline	Midline - Endline	Baseline - Endline
Long Exposure X Round 2	0.117		
	(0.142)		
Long Exposure X Round 3		0.117	0.229*
		(0.109)	(0.136)
Short Exposure X Round 2	0.166		
	(0.131)		
Short Exposure X Round 3		0.024	0.183
		(0.115)	(0.128)
Long Exposure AFSP	-0.051	0.035	-0.032
	(0.117)	(0.093)	(0.119)
Short Exposure AFSP	0.001	0.144	0.017
	(0.106)	(0.091)	(0.109)
Round 2	0.269**		
	(0.105)		
Round 3		0.044	0.309***
		(0.084)	(0.100)
Has District FE	YES	YES	YES
Observations	3407	3116	3219
R-squared	0.09	0.08	0.10

Table 20: Treatment Effect (Farmer Group) on Household Livestock Income Without Covariates: Diff-in-Diff

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Farmer Group/Cooperative X Round 2	-0.007		
	(0.090)		
Farmer Group/Cooperative X Round 3		0.027	0.005
		(0.085)	(0.095)
Farmer Group/Cooperative at Midline	0.193**		
	(0.079)		
Farmer Group/Cooperative at Endline		0.127**	0.156*
		(0.064)	(0.080)
Round 2	0.382***		
	(0.078)		
Round 3		0.074	0.451***
		(0.065)	(0.080)
Has District FE	YES	YES	YES
Observations	3407	3116	3219
R-squared	0.09	0.08	0.10

Table 21: Treatment Effect (AFSP) on Household Livestock Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
AFSP Treatment	0.079	0.098	0.187**
	(0.088)	(0.082)	(0.080)
Lagged Log Household Livestock Income at Baseline	0.151***		0.141***
	(0.026)		(0.024)
Lagged Log Household Livestock Income at Midline		0.097***	
		(0.031)	
Has District FE	YES	YES	YES
Observations	1224	1081	1065
R-squared	0.11	0.16	0.14

Table 22: Treatment Effect (Short/Long Exposure) on Household Livestock Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Long Exposure AFSP	-0.018	0.075	0.185**
	(0.098)	(0.095)	(0.090)
Short Exposure AFSP	0.184*	0.122	0.189**
	(0.098)	(0.090)	(0.091)
Lagged Log Household Livestock Income at Baseline	0.152***		0.141***
	(0.026)		(0.024)
Lagged Log Household Livestock Income at Midline		0.096***	
		(0.031)	
Has District FE	YES	YES	YES
Observations	1224	1081	1065
R-squared	0.11	0.16	0.14

Table 23: Treatment Effect (Farmer group) on Household Livestock Income Without Covariates: ANCOVA

	(1) Baseline - Midline	(2) Midline - Endline	(3) Baseline - Endline
Farmer Group/Cooperative at Midline	0.144*		
	(0.082)		
Farmer Group/Cooperative at Endline		0.080	0.177**
		(0.079)	(0.077)
Lagged Log Household Livestock Income at Baseline	0.147***		0.141***
	(0.026)		(0.024)
Lagged Log Household Livestock Income at Midline		0.097***	
		(0.030)	
Has District FE	YES	YES	YES
Observations	1224	1081	1065
R-squared	0.11	0.16	0.14

Table 24: Treatment Effect on Maternal Health Knowledge Score With Covariates: Diff-in-Diff

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
AFSP Treament X Round 2	-0.0757		
	(0.429)		
Round 2	1.823***		
	(0.415)		
AFSP Treatment	0.174	0.153	0.0635
	(0.286)	(0.280)	(0.354)
AFSP Treament X Round 3		-0.207	-0.0645
		(0.434)	(0.477)
Round 3		1.645***	-0.503
		(0.517)	(0.421)
Constant	12.81***	12.40***	14.39***
	(0.417)	(0.448)	(0.399)
Observations	1,030	1,030	710
R-squared	0.159	0.129	0.067

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 25: Treatment Effect on Dietary Diversity Score With Covariates: Diff-in-Diff

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
AFSP Treament X Round 2	0.0449		
	(0.198)		
Round 2	0.726***		
	(0.191)		
AFSP Treatment	-0.0507	-0.0447	-0.0354
	(0.116)	(0.118)	(0.159)
AFSP Treament X Round 3		0.330	0.328
		(0.265)	(0.304)
Round 3		0.585**	-0.191
		(0.284)	(0.287)
Constant	3.540***	3.464***	4.176***
	(0.168)	(0.207)	(0.197)
Observations	1,030	1,030	710
R-squared	0.117	0.114	0.051

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 26: Treatment Effect on Animal Protein Consumption With Covariates: Diff-in-Diff

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
AFSP Treament X Round 2	-0.00993		
	(0.0682)		
Round 2	0.129*		
	(0.0688)		
AFSP Treatment	-0.00314	-0.00784	-0.0239
	(0.0471)	(0.0474)	(0.0588)
AFSP Treament X Round 3		0.205**	0.222***
		(0.0805)	(0.0815)
Round 3		-0.0722	-0.155**
		(0.0937)	(0.0775)
Constant	0.519***	0.542***	0.617***
	(0.0696)	(0.0820)	(0.0828)
Observations	1,031	1,031	710
R-squared	0.048	0.061	0.040

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 27: Treatment Effect on Vegetables/Fruits Consumption With Covariates: Diff-in-Diff

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
AFSP Treament X Round 2	0.0260		
	(0.0678)		
Round 2	0.249***		
	(0.0664)		
AFSP Treatment	0.0166	0.0173	0.0351
	(0.0506)	(0.0510)	(0.0554)
AFSP Treament X Round 3		0.0339	0.0201
		(0.0958)	(0.100)
Round 3		0.222**	-0.0633
		(0.105)	(0.0952)
Constant	0.389***	0.339***	0.646***
	(0.0716)	(0.0818)	(0.0733)
Observations	1,031	1,031	710
R-squared	0.066	0.044	0.031

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 28: Treatment Effect on Meal Frequency For Child With Covariates: Diff-in-Diff

	(1)	(2)	(3)
VARIABLES	Baseline - Midline	Baseline - Endline	Midline - Endline
AFSP Treament X Round 2	-0.0266		
	(0.0610)		
Round 2	-0.0248		
	(0.0650)		
AFSP Treatment	-0.00367	-0.00152	-0.0247
	(0.0331)	(0.0328)	(0.0575)
AFSP Treament X Round 3		0.0397	0.0615
		(0.0699)	(0.0929)
Round 3		-0.0278	-0.0964
		(0.0818)	(0.0790)
Constant	0.793***	0.780***	0.884***
	(0.0585)	(0.0653)	(0.0764)
Observations	600	602	398
R-squared	0.033	0.047	0.048

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 29: Treatment Effect on Meal Frequency For Mother With Covariates: Diff-in-Diff

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
AFSP Treament X Round 2	-0.00794		
	(0.0460)		
Round 2	0.0472		
	(0.0430)		
AFSP Treatment	-3.65e-05	-0.00262	-0.00291
	(0.0298)	(0.0297)	(0.0344)
AFSP Treament X Round 3		0.0611	0.0607
		(0.0612)	(0.0598)
Round 3		-0.0316	-0.0450
		(0.0643)	(0.0540)
Constant	0.871***	0.869***	0.838***
	(0.0436)	(0.0516)	(0.0526)
Observations	1,031	1,031	710
R-squared	0.024	0.024	0.031

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 30: Treatment Effect on HFIAS With Covariates: Diff-in-Diff

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
AFSP Treament X Round 2	0.145		
	(0.201)		
Round 2	-0.0658		
	(0.190)		
AFSP Treatment	0.0372	0.0486	0.182
	(0.0977)	(0.0999)	(0.198)
AFSP Treament X Round 3		0.0962	-0.0667
		(0.189)	(0.266)
Round 3		-0.192	-0.103
		(0.208)	(0.240)
Constant	2.056***	1.985***	1.865***
	(0.164)	(0.170)	(0.250)
Observations	867	874	521
R-squared	0.126	0.096	0.142

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 31: Treatment Effect on Maternal Health With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged Maternal Health Score at Baseline	0.216***	0.129**	
	(0.0452)	(0.0596)	
AFSP Treatment	0.243	0.396	0.187
	(0.299)	(0.345)	(0.246)
Lagged Maternal Health Score at Midline			0.118***
			(0.0357)
Constant	11.09***	11.63***	12.21***
	(0.784)	(0.954)	(0.542)
Observations	676	350	724
R-squared	0.099	0.079	0.069

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 32: Treatment Effect on Dietary Diversity Score With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged Dietary Diversity Score at Baseline	0.208***	0.132*	
	(0.0448)	(0.0766)	
AFSP Treatment	0.0298	0.367**	0.141
	(0.108)	(0.149)	(0.116)
Lagged Dietary Diversity Score at Midline			0.159***
			(0.0354)
Constant	2.929***	2.774***	3.374***
	(0.277)	(0.390)	(0.205)
Observations	676	350	724
R-squared	0.102	0.101	0.080

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 33: Treatment Effect on Animal Protein Consumption With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged Animal Proteins Consump. at Baseline	0.0901**	0.0634	
	(0.0407)	(0.0476)	
AFSP Treatment	-0.0155	0.0798	0.0389
	(0.0407)	(0.0613)	(0.0395)
Lagged Animal Proteins Consump. at Midline			0.141***
			(0.0351)
Constant	0.484***	0.406***	0.522***
	(0.0912)	(0.121)	(0.0684)
Observations	677	350	724
R-squared	0.064	0.094	0.061

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 34: Treatment Effect on Vegetables/Fruits Consumption With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged Vegetables/Fruits Consump. at Baseline	0.106***	0.0268	
	(0.0388)	(0.0572)	
AFSP Treatment	0.0250	0.0546	0.0234
	(0.0421)	(0.0642)	(0.0410)
Lagged Vegetables/Fruits Consump. at Midline			-0.0118
			(0.0356)
Constant	0.466***	0.532***	0.551***
	(0.0897)	(0.118)	(0.0687)
Observations	677	350	724
R-squared	0.034	0.046	0.032

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 35: Treatment Effect on Meal Frequency For Child With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged Meal Freqency for Child at Baseline	0.111	0.163	
	(0.0920)	(0.117)	
AFSP Treatment	-0.0881	0.0794	0.0609
	(0.0629)	(0.0749)	(0.0628)
Lagged Meal Freqency for Child at Midline			-0.0791
			(0.0754)
Constant	0.825***	0.445**	0.737***
	(0.115)	(0.184)	(0.116)
Observations	242	131	175
R-squared	0.073	0.145	0.163

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 36: Treatment Effect on Meal Frequency For Mother With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged Meal Freqency for Mother at Baseline	0.138***	0.135**	
	(0.0493)	(0.0611)	
AFSP Treatment	0.0235	0.0742*	0.0172
	(0.0314)	(0.0416)	(0.0318)
Lagged Meal Freqency for Mother at Midline			0.149***
			(0.0456)
Constant	0.709***	0.755***	0.703***
	(0.0812)	(0.103)	(0.0690)
Observations	677	350	724
R-squared	0.054	0.131	0.051

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 37: Treatment Effect on HFIAS With Covariates: ANCOVA

VARIABLES	(1) Baseline - Midline	(2) Baseline - Endline	(3) Midline - Endline
Lagged HFIAS Category at Baseline	0.200***	0.120	
	(0.0617)	(0.0867)	
AFSP Treatment	0.106	0.387**	0.150
	(0.157)	(0.183)	(0.130)
Lagged HFIAS Category at Midline			0.358***
			(0.0592)
Constant	2.349***	2.022***	1.148***
	(0.296)	(0.415)	(0.223)
Observations	440	237	454
R-squared	0.198	0.189	0.192

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: None, district FE = YES, SE Clustered = VDC ***sig. at 1%, **sig. at 5%, *sig. at 10%.

Table 38: Treatment Effect on Wasting With Covariates: AFSP Treatment

VARIABLES	(1) Midline - Endline
AFSP Treament X Round 3	0.241
	(0.170)
Round 3	-0.178
	(0.161)
AFSP Treatment	-0.154
	(0.125)
Took Iron/Folic acid Supplement	0.0249
	(0.155)
Took Deworming Pills	0.0495
	(0.115)
Constant	-0.604***
	(0.204)
Observations	1,085
R-squared	0.023

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: dietary diversity score, maternal knowledge health score, Buy iron/folic acid supplements, and deworming pills, district FE = YES, SE Clustered = VDC.

Table 39: Treatment Effect on Underweight With Covariates: AFSP Treatment

	(1)
VARIABLES	Midline - Endline
AFSP Treament X Round 3	0.320
	(0.208)
Round 3	-0.0135
	(0.190)
AFSP Treatment	-0.0339
	(0.135)
Took Iron/Folic acid Supplement	-0.0679
	(0.176)
Took Deworming Pills	0.161
	(0.150)
Constant	-2.156***
	(0.237)
Observations	1,029
R-squared	0.034

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: dietary diversity score, maternal knowledge health score, Buy iron/folic acid supplements, and deworming pills, district FE = YES, SE Clustered = VDC.

Table 40: Treatment Effect on Stunting With Covariates: AFSP Treatment

	(1)
VARIABLES	Midline - Endline
AFSP Treament X Round 3	0.188
	(0.232)
Round 3	0.112
	(0.212)
AFSP Treatment	-0.00282
	(0.150)
Took Iron/Folic acid Supplement	-0.0307
	(0.206)
Took Deworming Pills	0.242
	(0.158)
Constant	-2.511***
	(0.296)
Observations	938
R-squared	0.021

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: dietary diversity score, maternal knowledge health score, Buy iron/folic acid supplements, and deworming pills, district FE = YES, SE Clustered = VDC.

Table 41: Treatment Effect on Wasting With Covariates: Farmer Mothers Group Treatment

	(1)
VARIABLES	Midline - Endline
Farmer & Mother's Group X Round 3	0.144
	(0.168)
Farmer Group at Endline	0.0668
	(0.121)
Mothers Health Group	-0.0523
	(0.115)
Took Iron/Folic acid Supplement	0.00284
	(0.156)
Took Deworming Pills	0.0445
	(0.116)
Constant	-0.729***
	(0.167)
Observations	1,085
R-squared	0.023

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: dietary diversity score, maternal knowledge health score, Buy iron/folic acid supplements, and deworming pills, district FE = YES, SE Clustered = VDC.

Table 42: Treatment Effect on Underweight With Covariates: Farmer Mothers Group Treatment

	(1)
VARIABLES	Midline - Endline
Farmer & Mother's Group X Round 3	-0.181
	(0.183)
Farmer Group at Endline	0.0741
	(0.128)
Mothers Health Group	0.252**
	(0.125)
Took Iron/Folic acid Supplement	-0.0970
	(0.178)
Took Deworming Pills	0.144
	(0.149)
Constant	-2.093***
	(0.218)
Observations	1,029
R-squared	0.031

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: dietary diversity score, maternal knowledge health score, Buy iron/folic acid supplements, and deworming pills, district FE = YES, SE Clustered = VDC.

Table 43: Treatment Effect on Stunting With Covariates: Farmer Mothers Group Treatment

	(1)
VARIABLES	Midline - Endline
Farmer & Mother's Group X Round 3	-0.356
	(0.221)
Farmer Group at Endline	0.0564
	(0.155)
Mothers Health Group	0.276**
	(0.137)
Took Iron/Folic acid Supplement	-0.0365
	(0.205)
Took Deworming Pills	0.237
	(0.159)
Constant	-2.407***
	(0.276)
Observations	938
R-squared	0.020

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Covariates included: dietary diversity score, maternal knowledge health score, Buy iron/folic acid supplements, and deworming pills, district FE = YES, SE Clustered = VDC.

Table B1: Balance Test - Sample of Panel Households at Baseline

	(1)		(2)		(3)			T-test	
	External Control		Early AFSP Treatment		Delayed AFSP Treatment			Difference	
Variable	N	Mean/SE	N	Mean/SE	N	Mean/SE	(1)-(2)	(1)-(3)	(2)-(3)
Total Number of Crops HH Planted	661	10.507	801	10.132	734	10.215	0.374	0.292	-0.083
		(0.231)		(0.197)		(0.208)			
Marital Status	661	0.914	801	0.913	734	0.902	0.001	0.012	0.011
		(0.011)		(0.010)		(0.011)			
HH head completed primary school education	661	0.421	801	0.468	734	0.446	-0.048*	-0.025	0.023
		(0.019)		(0.018)		(0.018)			
Literacy of HH head: read & write	661	0.619	801	0.617	734	0.602	0.002	0.017	0.015
		(0.019)		(0.017)		(0.018)			
Total number of plots cultivated by HH	661	4.393	801	4.275	734	4.454	0.119	-0.060	-0.179
		(0.099)		(0.086)		(0.104)			
Total number of plots owned by HH	661	1.823	801	1.713	734	1.677	0.110	0.146**	0.036
		(0.055)		(0.046)		(0.047)			
Total landholdings of HH	661	0.027	801	0.029	734	0.027	-0.001	-0.000	0.001
		(0.006)		(0.006)		(0.006)			
Livestock holdings of HH	661	8.315	801	8.411	734	7.478	-0.096	0.836	0.933
		(0.946)		(0.692)		(0.399)			
Total number of male adults (age 15-55)	661	1.590	801	1.597	734	1.594	-0.007	-0.004	0.003
		(0.036)		(0.032)		(0.035)			
Total number of children (age¡15)	661	2.720	801	2.648	734	2.591	0.072	0.129	0.057
		(0.057)		(0.052)		(0.055)			
Annual expenditure of fertilizer	661	247.989	801	374.333	734	392.560	-126.344***	-144.571***	-18.227
		(25.645)		(33.569)		(37.810)			
Annual expenditure of pesticide	661	24.448	801	57.141	734	44.939	-32.693**	-20.491	12.202
		(9.440)		(9.765)		(9.319)			
Months spent on off-farm work	661	2.605	801	3.236	734	2.872	-0.631***	-0.267	0.364*
		(0.138)		(0.137)		(0.136)			
Total HH paid labor on all HH crops	661	686.082	801	897.358	734	1081.403	-211.277*	-395.322***	-184.045
		(83.700)		(88.078)		(107.647)			
Total land area(hectares)	661	0.320	801	0.325	734	0.326	-0.005	-0.006	-0.000
		(0.008)		(0.007)		(0.008)			
HH Income from all crops (1000s Rs)	661	9.253	801	10.329	734	9.085	-1.076*	0.168	1.244**
		(0.350)		(0.407)		(0.309)			
HH Total income from livestock (1000s Rs)	661	19.188	801	18.397	734	17.852	0.791	1.336	0.545
		(1.750)		(0.933)		(0.997)			
Total HH income from labor (1000s Rs)	661	92.682	801	103.629	734	116.796	-10.947	-24.114*	-13.166
		(8.470)		(7.849)		(9.331)			
Total income from other sources (1000s Rs)	661	79.783	801	82.723	734	95.256	-2.939	-15.473*	-12.533*
		(4.793)		(3.992)		(6.568)			
Total Income, all sources (1000s Rs)	661	200.906	801	215.078	734	238.989	-14.171	-38.083**	-23.911
		(11.849)		(10.837)		(13.597)			

Notes: The value displayed for t-tests are the differences in the means across the groups. ***, **,

Annex B: Selected Indicators Requested by FAO

Table B2: Agriculture - Indicator

	Endline Value
% of HHs that use at least one improved-HYV variety of a major crop	0.176
% of HHs using compost or farm yard manure	0.982
% of HHs using chemical fertilizers	0.328
Average expenditure on chemical fertilizers per HH*	364.489
% of HHs using bio-pesticide	0.017
% of HHs using irrigation	0.699
% of HHs having a kitchen garden	0.934
Average number of vegetable crops produced in one year	5.044
N	1590

Values with* are winsorized at upper 1% tail

Annex C: Additional Descriptive Figures

Agriculture

Figure 1: Types of Irrigation

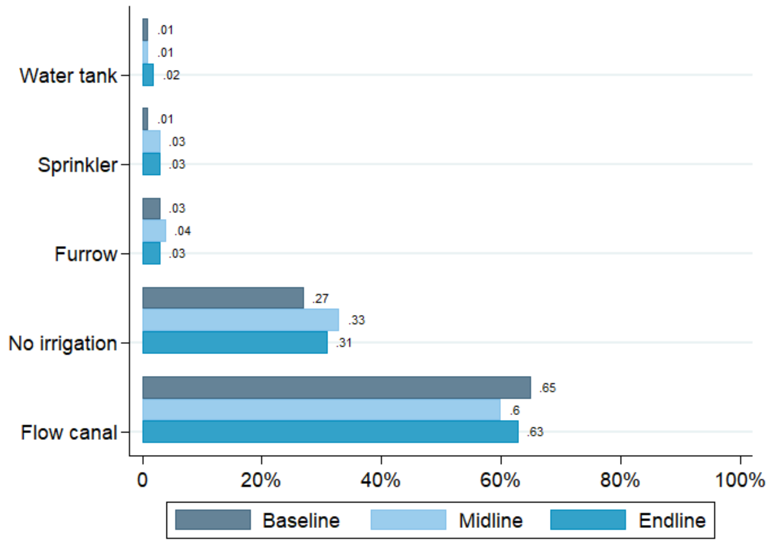


Figure 2: Use of Agricultural Inputs

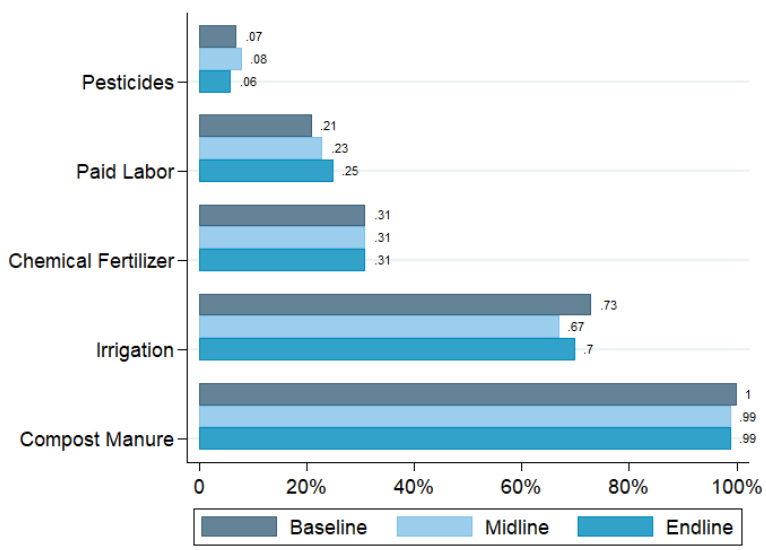


Figure 3: Use of Agricultural Inputs by AFSP Status

(a) AFSP households (b) Control households

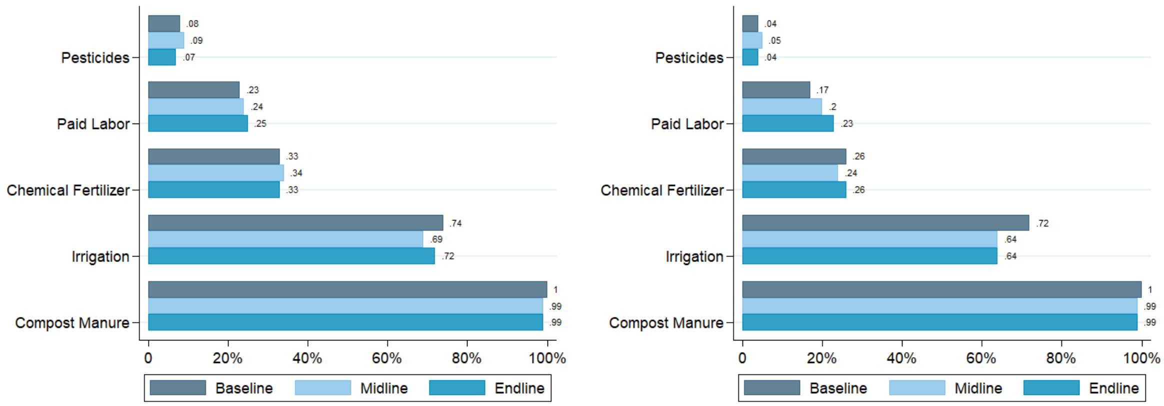


Figure 4: Agricultural Input Expenditure by AFSP Status

(a) AFSP households (b) Control households

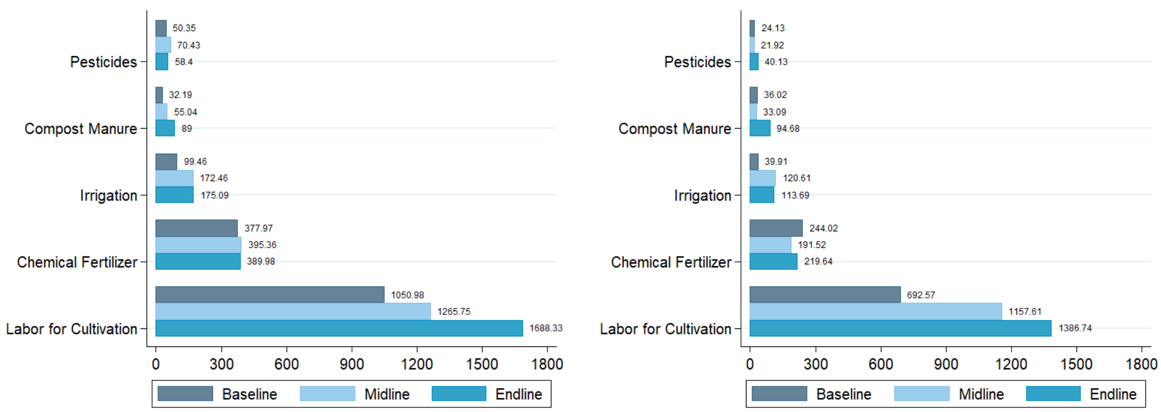


Figure 5: Use of Agricultural Inputs by Household Head Gender

(a) Female-headed households (b) Male-headed households

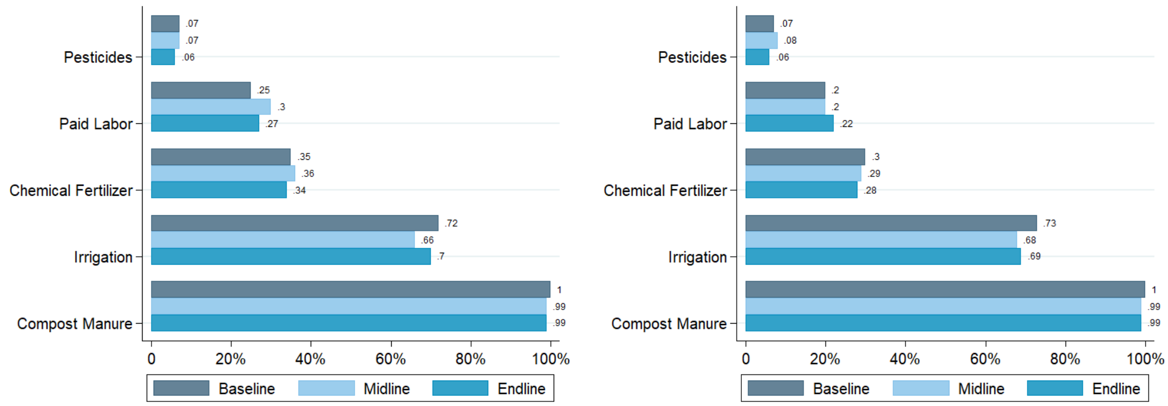


Figure 6: Agricultural Input Expenditure by Household Head Gender

(a) Female-headed households (b) Male-headed households

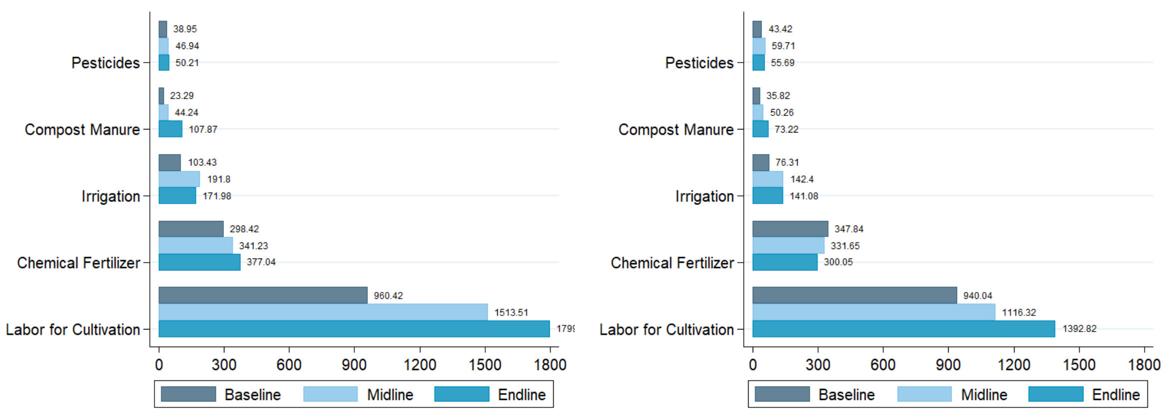


Figure 7: Share of Households Growing Common Crops by Region

(a) Hill region (b) Mountain region

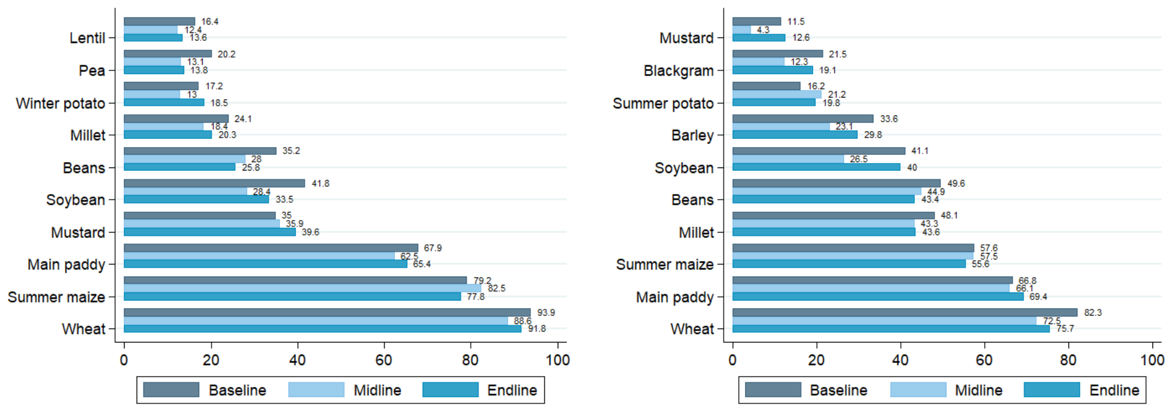
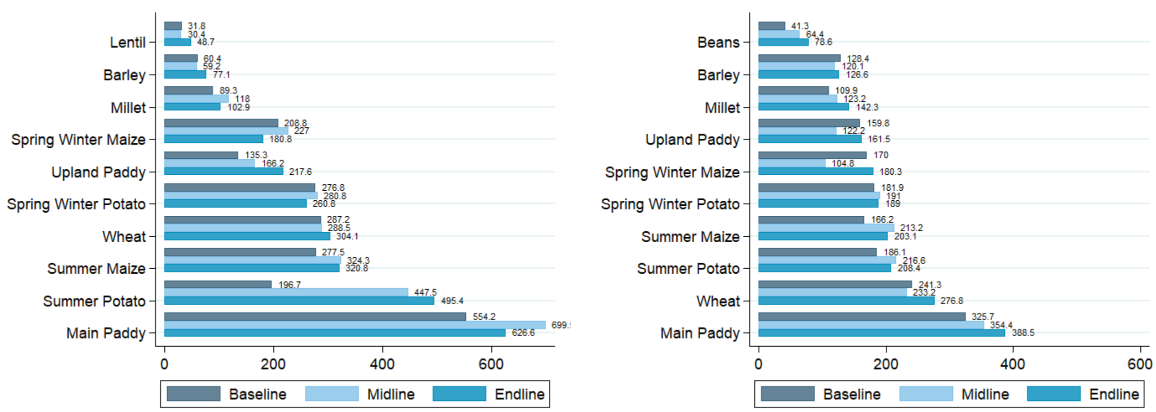


Figure 8: Production of Crops by Region (kg/household)

(a) Hill region (b) Mountain region

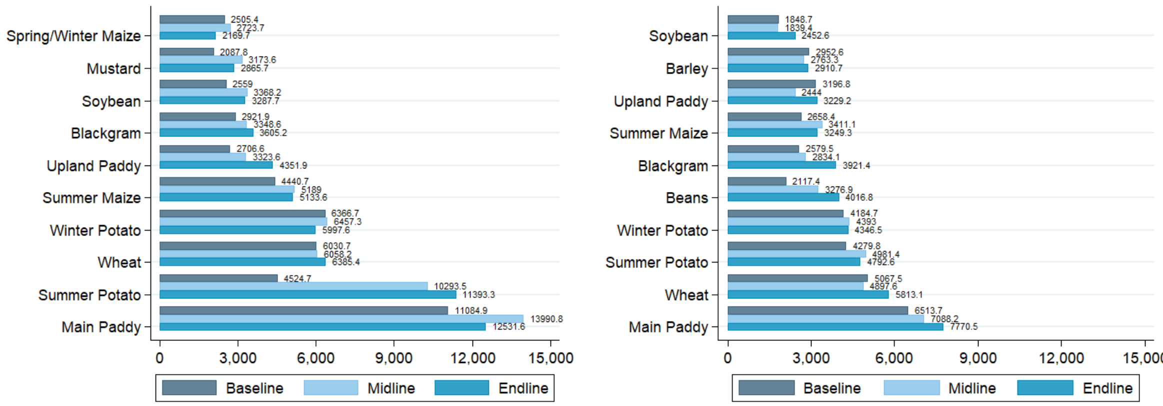


Note: Average production among households producing relevant crops.

Figure 9: Value of Production of Crops by Region (Rupees/household)

(a) Hill region

(b) Mountain region

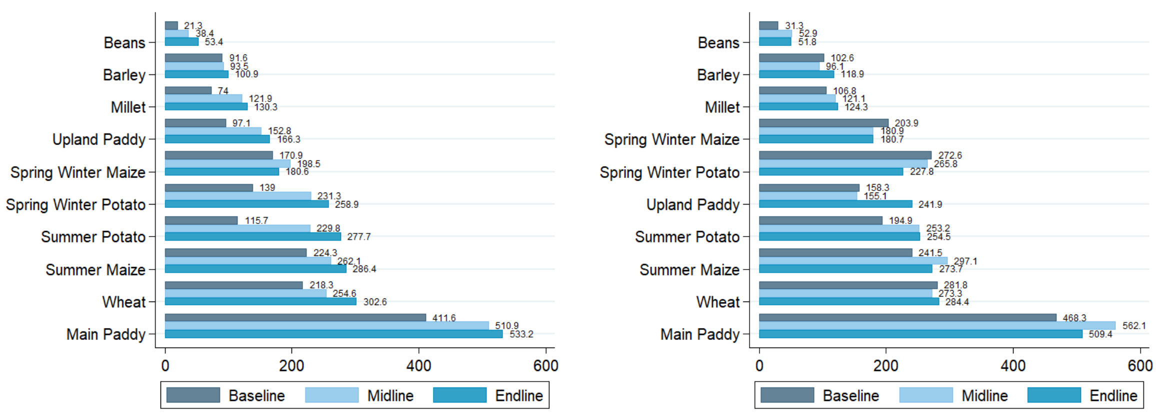


Note: Average value of production among households producing relevant crops.

Figure 10: Production of Crops by Household Head Gender (kg/household)

(a) Female-headed households

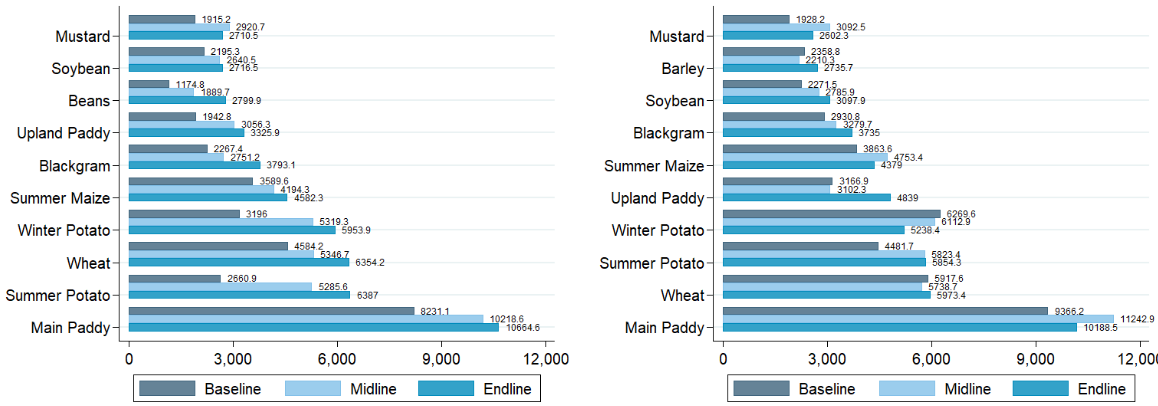
(b) Male-headed households



Note: Average production among households producing relevant crops.

Figure 11: Value of Production of Crops by Household Head Gender (Rupees/household)

(a) Female-headed households (b) Male-headed households



Note: Average value of production among households producing relevant crops.

Livestock

Figure 12: Share of Households Selling Livestock

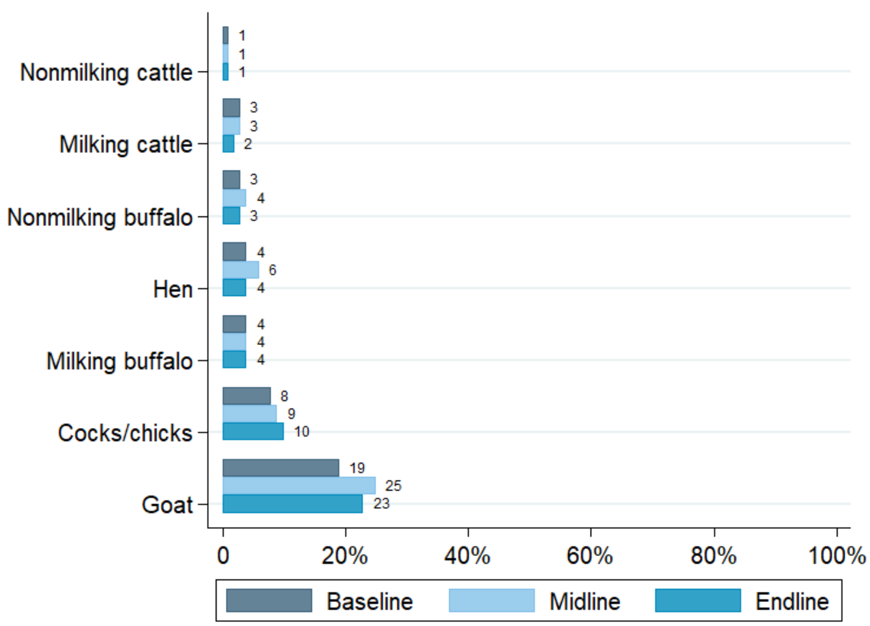
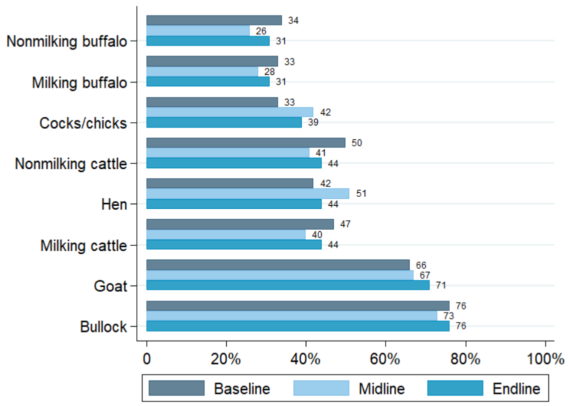


Figure 13: Share of Households Owning Livestock by AFSP Status

(a) AFSP Communities



(b) Control Communities

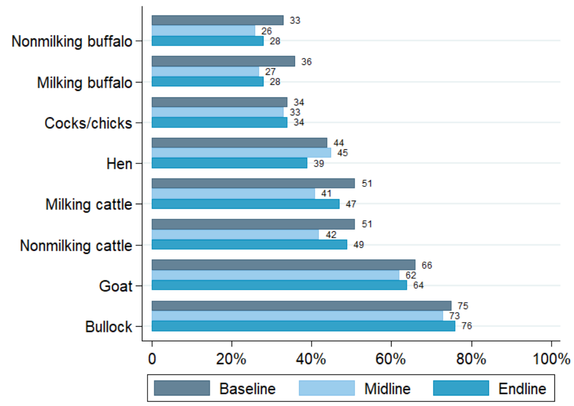
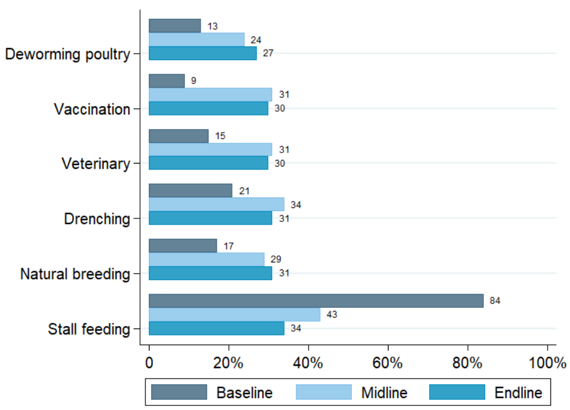
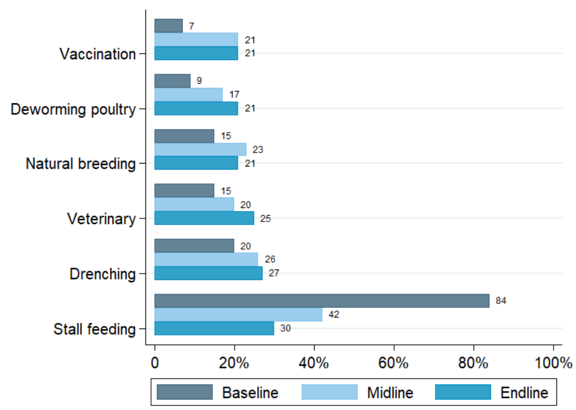


Figure 14: Share of Households Using Livestock Technology by AFSP Status

(a) AFSP Communities



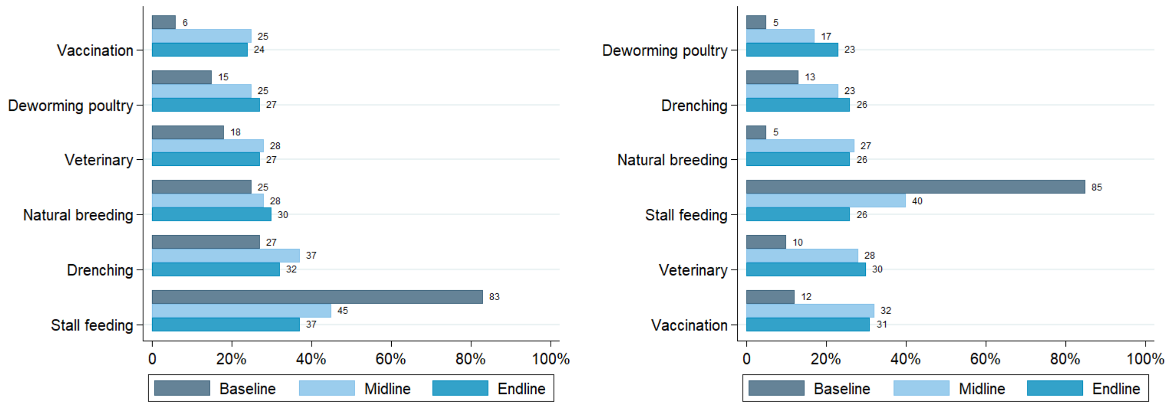
(b) Control Communities



Note: Shares among households who owned relevant animals.

Figure 15: Share of Households Using Livestock Technology by Region

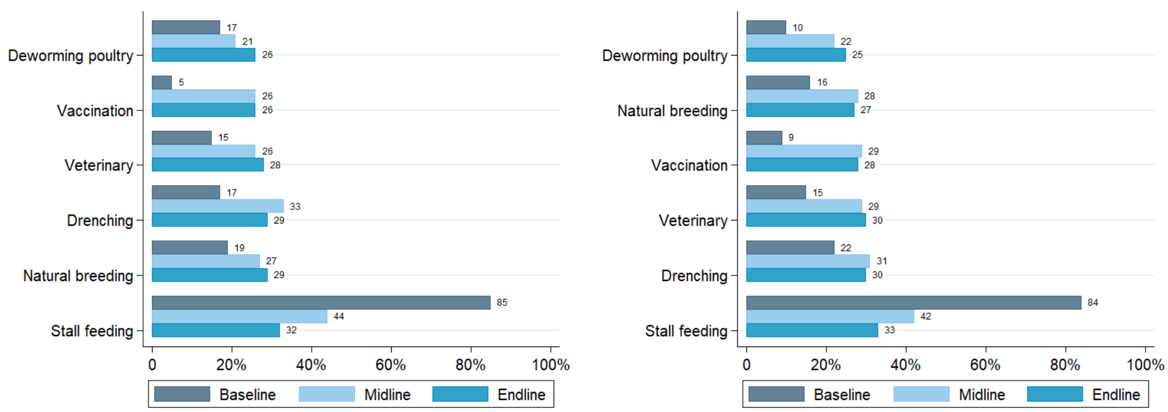
(a) Hill region (b) Mountain region



Note: Shares among households who owned relevant animals.

Figure 16: Share of Households Using Livestock Technology by Household Head Gender

(a) Female-headed households (b) Male-headed households



Note: Shares among households who owned relevant animals.

Figure 17: Spending on Livestock Technology by AFSP Status (Rupees)

(a) AFSP Communities

(b) Control Communities

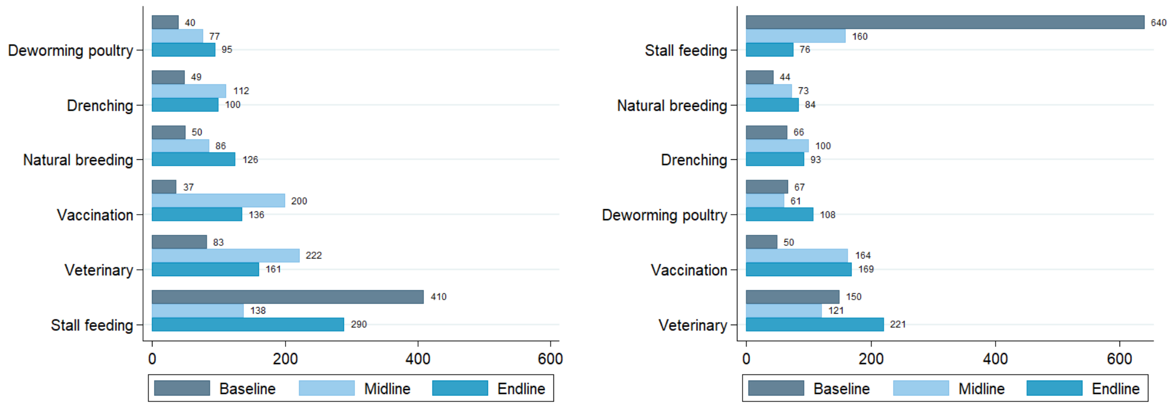


Figure 18: Spending on Livestock Technology by Region (Rupees)

(a) Hill region

(b) Mountain region

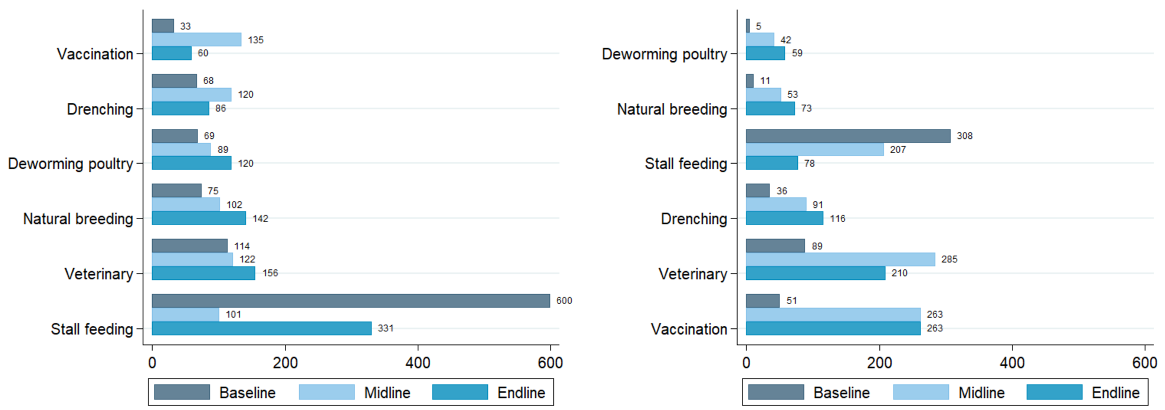
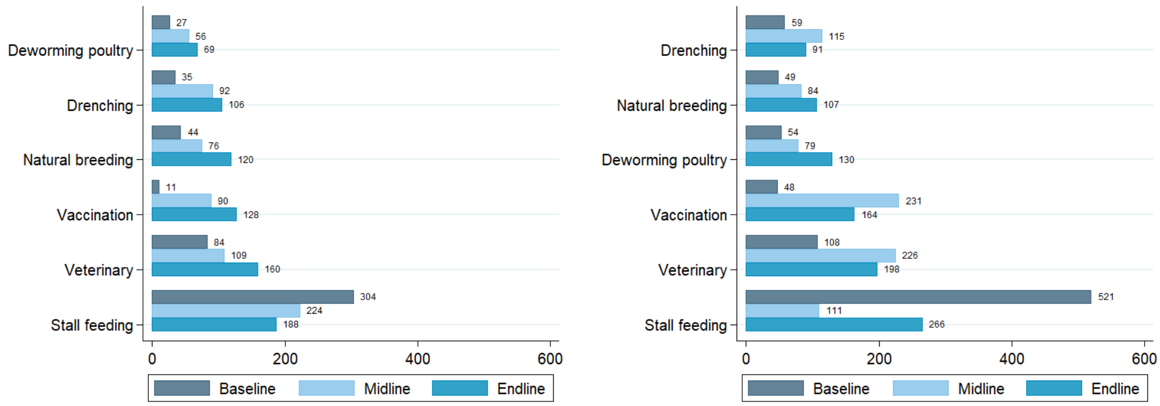


Figure 19: Spending on Livestock Technology by Household Head Gender (Rupees)

(a) Female-headed households (b) Male-headed households



Health and Nutrition

Figure 20: Pregnant and Nursing Women Food Group Consumption

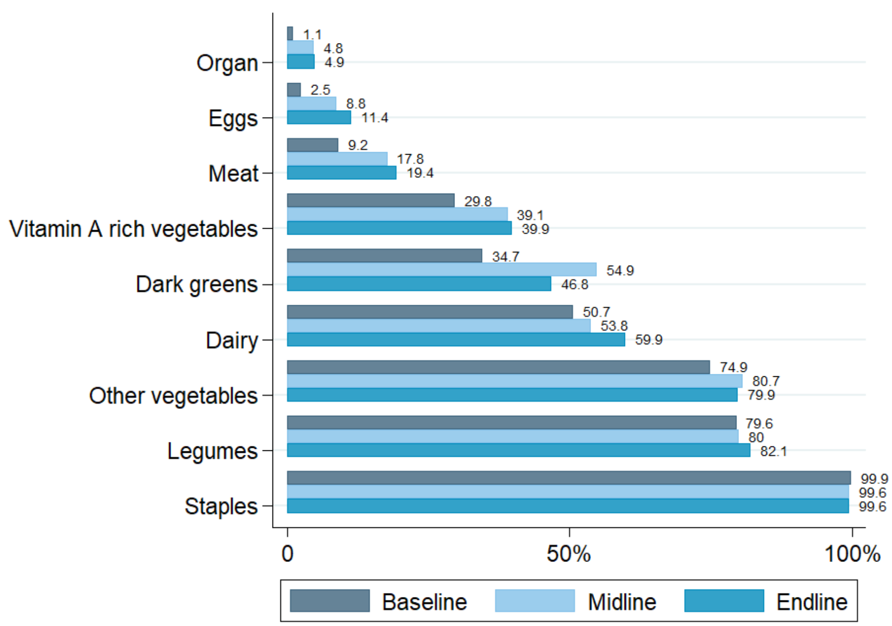
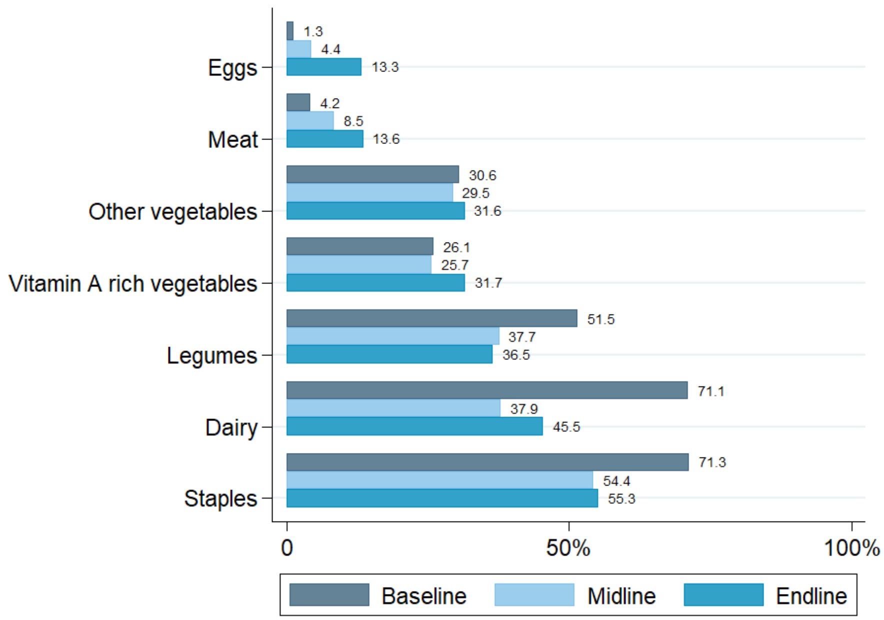
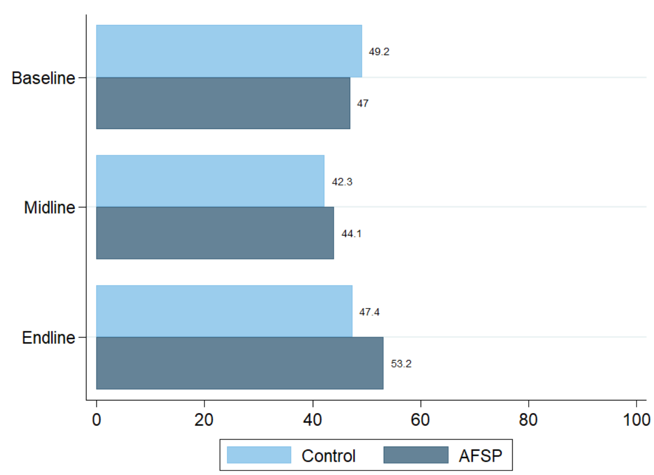


Figure 21: Young Children Aged 6-23 Months Food Group Consumption



Note: The food groups shown here differ slightly from those in Figure 20, with meat including organ and vitamin A rich vegetables including dark greens.

Figure 22: Share of Young Children Aged 6-35 Months Consuming Four or More Food Groups



Note: Food groups include staples, legumes, dairy, eggs, meat (including organ), vitamin A rich vegetables (including dark greens), and other vegetables.