Ministry of Agriculture and Food Security

AGRICULTURAL DEVELOPMENT PROGRAM SUPPORT PROJECT

Impact Evaluation Manual

Purpose of the Implementation Manual

The following manual is meant to be a resource for all stakeholders and participants involved with the impact evaluation component of the ADP-SP. It explains in detail each component of the evaluation, and is meant to serve as a guide to the implementation of specific components, as well as an explanation of the evaluation as a whole.

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SECTION I: INTRODUCTION

The Agricultural Development Programme (ADP), prepared by the Ministry of Agriculture and Food Security, aims to improve food security and generate agricultural growth through increased productivity of food and cash crops, while ensuring sustainable use of natural resources. The World Bank and the Government of Norway are supporting the MoAFS through the Agricultural Development Programme – Support Project (ADP-SP).

One component of the ADP-SP is an impact evaluation, designed by a team from the Ministry of Agriculture with the assistance of economists at Yale University, the Millennium Challenge Corporation (MCC), and the World Bank. The ADP-SP Impact Evaluation uses state of the art techniques and will help the MoAFS to measure the effectiveness of certain components of the ADP-SP, and design future strategies accordingly. The evaluation specifically focuses on Agricultural Extension, testing different strategies to communicate information about new and improved agricultural technologies to farmers. The randomized evaluation will provide MoAFS with clear evidence as to what are the most effective ways to communicate the information necessary to improve smallholder productivity and increase the amount of farmland that is sustainably managed.

Motivation

Low productivity in agriculture and environmentally unsustainable farming practices are pressing development challenges for Malawi. Current crop yields are much lower than those that could be achieved using readily available technologies and farming techniques. Large growth in demand for food has meant that much land is now farmed intensively with mechanized soil tillage, and left fallow for less time, which leads to soil degradation, erosion and desertification. Technologies exist that would minimize the adverse environmental impacts of farming and improve longer-term agricultural yields for smallholder farmers. However, these technologies have yet to be adopted on a wide scale in Malawi.

Improving food security and agricultural incomes and reducing environmental degradation therefore depends on farmer adoption of these tools and techniques. A critical determinant of new technology adoption is the learning process through which information on these techniques is disseminated, understood, and applied. This evaluation aims to provide the MoAFS with evidence as to what strategies for communicating information about new technologies are effective and increase rates of adoption.

Although the importance of information flow through existing village and social networks in developing countries is well-documented, to what extent these networks can be used to disseminate new information from public sources—such as agricultural extension officers—remains unclear. Distance or disparity among individuals in either geographic or social space appear to be important determinants of communication and learning. Understanding how gender and relationship disparities affect communication between extension officers and farmers, and between one farmer and another is crucial to designing effective information-based interventions to promote technology adoption.

Overview

The evaluation will test different strategies for communicating information about agricultural technologies to smallholder maize farmers in 8 districts in Malawi. The objective is to provide information to the MoAFS as to how best to use its limited resources to increase rates of adoption of new technologies. There are four primary dimensions to the evaluation: *agricultural technologies, communication methods, incentives, and gender*. By using the "gold standard" of randomization, the evaluation design allows us to test each different element.

Agricultural technologies: The project will promote two different strategies to improve productivity and reduce environmental degradation: Conservation farming and nutrient management. Conservation farming will be promoted in villages in the drier districts: Balaka, Chikwawa, Neno and Rumphi. The specific conservation farming technology to be promoted is pit planting. Nutrient management will be promoted in villages in the remaining four districts, which represent Malawi's other agro-ecological zones: Dedza, Mchinji, Mzimba, and Zomba. The nutrient management technology of focus is composting.

Communication Methods: We will evaluate three different methods for disseminating information about these improved agricultural practices at the village level:

- Extension officers, working through their existing channels
- Extension officers collaborating with *lead farmers*
- Extension officers collaborating with *peer farmers*

All villages selected to participate in the evaluation will be randomly assigned to one of the three different communication strategies.

Incentives: We will test whether offering a results-based incentive has any effect on the effectiveness of the AEDO, the lead farmer, or the peer farmer. In 60 of the 120 "treatment" villages (randomly chosen), the communicators will be offered an incentive at the end of the season, conditional on observed changes in farmer behaviour with respect to the technology. If rates of adoption of the technology increase beyond the target, the communicator for that village (the AEDO, the lead farmer, or the five peer farmers) will receive the incentive as a reward for good performance.

Gender: At all stages of the evaluation we will analyze the effects of gender. In order to test whether the gender of the communicator matters for a farmer's decision to adopt a new technology, we will randomly assign the gender of the lead and peer farmers. We will also look at communication patterns within and across gender lines by collecting data on a cross-section of both male and female farmers.

Schedule

The evaluation was originally designed at a World Bank workshop on agricultural impact evaluation in Addis Ababa, Ethiopia in April 2009, by a MoAFS team in consultation wit Dr. Mushfiq Mobarak of Yale University, Dr. David Rohrbach of the World Bank, and Dr. Ariel BenYishay of the Millenium Challenge Corporation. Design of the evaluation was finalized in June 2009, and implementation began in the same month.

In July, a team from the Department of Agricultural Planning Services (DAPS) began preparations for a baseline survey in all villages that will be involved with the evaluation; implementation of the survey finished in October 2009. In August, AEDOs from all 120 villages were trained in the nutrient management or conservation farming technologies by officials from the Departments of Agricultural Research Services (DARS) and Land Resources Conservation (DLRC), and were sensitized on how to select lead and peer farmers.

The impact evaluation is designed to cover a period of two agricultural seasons. During the first agricultural season (2009-2010), extension workers, lead farmers and peer farmers will teach farmers in the target villages about the new technologies. Increases in knowledge and understanding of the new technologies will be measured by monitoring visits during the season and a follow-up household survey at the end of the season. During the second season (2010-2011), extension workers, lead farmers and peer farmers will work to increase the number of farmers who are practicing the target technologies. Rate of adoption will be measured by on-farm monitoring visits throughout the season.

At the end of the second season (June – July 2011), there will be final follow-up survey in all of the villages involved with the impact evaluation. The final report on the impact evaluation is expected to be completed by December 2011.

SECTION II: RANDOM SAMPLING STRATEGY AND EXPECTED ANALYTICAL OUTCOMES

District Selection

Of the 12 districts scheduled to be included in the ADP-SP in 2009-10, we chose 8 as our evaluation sites. Four are dry districts where pit planting is relevant: Balaka, Chikwawa, Neno, and Rumphi. We will promote composting in the other four districts: Dedza, Mchinji, Mzimba, and Zomba. Together, these districts cover the major agro-ecological zones of Malawi and are spread through the South, Central and Northern regions. District selection was not random, rather, it was based on the schedule for ADP-SP and the relevance of the technologies we are interested in.

Randomization

Step 1: Randomized Selection of Sections

We create a list of all the sections in the 8 districts staffed by an extension worker. We randomly select 60 sections from the 4 districts assigned to conservation farming, and 60 sections from the 4 districts assigned to nutrient management. Because there are more districts staffed by AEDOs in the districts assigned to nutrient management, the probabilities of selection are not equal. For the CF districts, we chose 60 out of 176 possible districts. For the NM districts, we chose 60 out of a possible 281.

Step 2: Randomized Assignment of Incentives

To address selection bias, sections will be allocated to various treatment groups randomly. Of the120 sections, 60 are randomly assigned to an "incentive" condition. Those selected for the incentive will be offered (but will not necessarily receive) a performance-based incentive.

Step 3: Randomized Assignment of Communication Strategies

Next, we randomly assign the type of communication strategy for the section. 25 are randomly assigned to "extension worker" (AEDO) status, 50 to Lead Farmer (LF) status, and the final 45 to "Peer Farmer" (PF) status. Note that while extension workers will continue to be used in all areas (in some cases communicating directly to farmers and in others communicating through peer or lead farmers), the evaluation will *focus on* different communicators (AEDO or LF or PF) in different areas.

Step 4: Randomized Variation in Gender

For the 50 LF villages, we will randomly assign the gender of the lead farmer. 25 LF villages will be assigned to male lead farmers (LF-M), and 25 others will be assigned to female lead farmers (LF-F).[1]

[1] If pre-existing lead farmers are already selected in these villages and they are of a certain gender, it may be difficult to impose a new lead farmer of a different gender. In this case, we will have to proceed carefully, but we must encourage the village to choose a female lead farmer (e.g. if a male already exists) saying that the ministry is very interested in working with women for this project.

Of the 45 PF villages, 22 will be randomly assigned to have majority men among the set of peer farmers (PF-M), and the other 23 will be randomly assigned to have majority women (PF-F). In other words, we will encourage these villages to choose more peer farmers from the assigned gender rather than the other gender.

Step 5: Randomized Selection of Villages

DAES will provide a list of all the villages in the selected sections, along with approximate number of farm families.. From that list, we will select one village, using weighted random selection, with the number of farm families as the weight.

Analytical Outcomes

Based on the strategy above, each of the 120 treatment villages will be defined by 4 characteristics:

1. Type of technology: either conservation farming (pit planting) or nutrient management (composting)
2. Type of communicator: AEDO, lead farmer, or peer farmer
3. Whether the communicator's efforts are incentivized with a performance-based reward.
4. Gender of the communicator: male or female in the case of AEDOs and lead farmers, majority male or female in the case of peer farmers

SECTION III: ESTABLISHING A COUNTERFACTUAL

In order to differentiate the impact of the ADP-SP from what would have happened without the program, we will collect data on a set of control villages. In total, the study includes 48 control villages, from the following three categories:

Villages from treatment sections

In 20 of the treatment sections, we will randomly select a second village, in order to capture spillover effects. Of the 20 sections, 10 will be selected at random from a list of all the treatment sections in the nutrient management districts, and 10 from a list of treatment sections in the conservation farming districts. In each case, the 10 sections were selected according to the following strategy:

- 4 AEDO-focus (2 selected for incentive; 2 not)[2]
- 3 from lead farmer-focus sections (1 with a male lead farmer offered the incentive, 1 with a female lead farmer offered the incentive,1 not selected for the incentive)
- 3 from peer farmer-focus sections (1 with male peer farmers offered the incentive, 1 with female peer farmers offered the incentive, 1 not selected for the incentive)

Villages from additional (non-treatment sections)

We will select 12 sections from a list of sections not previously selected for the impact evaluation to serve as additional controls. Of the 12 sections, 6 will be from nutrient management districts, and 6 from conservation farming districts. From each section, we will randomly select 1 village. The 12 sections are divided equally among 6 districts (Dedza and Balaka were not included as additional villages are already included, as explained below).

Extra villages in Dedza and Balaka Districts

We will collect data in 16 extra villages in Dedza and Balaka at the request of the Millennium Challenge Corporation. The data collected in these villages will also be useful for research the MCC is conducting on farm management in the Shire watershed. We will randomly select 16 non-treatment sections; and from each section, one village. 8 of the 16 sections will be in Dedza, and 8 in Balaka; the specific allocation of the sections will be as follows:

- 5 treatment sections
  - 1 AEDO-focus
  - 2 Lead Farmer–focus (1 selected for incentive; 1 not)
  - 2 Peer Farmer-focus areas (1 selected for incentive; 1 not)

[2] We will have more controls in sections where the AEDO is assigned to be the primary communicator because we expect to see more spillover effects in these sections than in peer or lead farmer-focus sections. AEDOs are in charge of all villages in the section, whereas peer and lead farmers are only responsible for one village. The AEDOs may reduce effort in other villages if their efforts in the selected treatment village are intensified. We want to be able to pick up such spillover effects.

- 3 from non-treatment sections

SECTION IV: AGRICULTURAL TECHNOLOGIES

For this evaluation project, the following guidelines governed our choices of specific nutrient management and conservation farming technologies:

1. The technology should be narrowly and precisely defined. It is difficult to track outcomes (such as improvements in soil fertility or yield), and identify the true causes of changes in those outcomes when the technology is either defined broadly or when it constitutes a large package of different practices.
2. The technology should have high *potential* for adoption. So we should be able to demonstrate this potential to farmers considering the technology in the short-run (e.g. within 1-2 years).
3. It is possible to clearly define what constitutes adoption, since it is critical for the evaluation that we collect measurable data on changes in farmer knowledge and practices.
4. Adoption of the technology should be observable and monitor-able, since we will sometimes have to assign incentives based on those monitoring outcomes.
5. It should be possible to clearly communicate about the technology to extension agents, lead farmers and peer farmers, and the extension agent should be able to train LF and PF, and in turn, the lead and peer farmers should be able to train the other villagers.

Based on these criteria, we have chosen two farming technologies for the ADP-SP Impact Evaluation:

1. Conservation farming technology: Pit planting (to be allocated to the dry districts)
2. Nutrient Management technology: Compost manure, including proper preparation, application, and combination with inorganic fertilizers.

Implementation Strategy

The Department of Agricultural Research will plan and run trainings on compost manure for selected AEDOs in the NM districts. The Department of Land Resources Conservation will plan and run trainings on pit planting for the selected AEDOs in the CF districts. Trainings will take place in early August.

Guidelines for Pit Planting

Pit planting is a conservation farming technology that increases a soil's capacity for storing water while at the same time allowing for minimum soil disturbance. This is because when planting pits are excavated in a field, they may be used for at least two seasons before farmers have to reshape the pits. Planting pits enable farmers to use small quantities of water and

manure very efficiently, and are cost and time efficient (although labor to construct the pits can be a constraint). Pits are ideal in areas where rainfall is limited.

The following are the guidelines for pit planting that the project will employ. These guidelines were developed by the MoAFS Department of Land Resources Conservation Conservation.

Step 1: Site Selection
Identify a plot with relatively moderate slopes. If possible the site should be secure from livestock to protect the crop residues.

Step 2: Land Preparation
Mark out the pit position using a rope, and excavate the pits following the recommended dimensions (as shown in the table below). These should be dug along the contour. The soil should be placed on the down slope side. Stones may be placed on the upslope side of the pit to help control run off, but this is optional. If available, crop residues from the previous harvest should be retained in the field so there is maximum ground cover.

Pit dimension and spacing:

Spacing between pits	70cm
Spacing between rows	90cm
Depth	20cm
Length	30cm
Width	30cm

At this spacing, there will be 15,850 pits per hectare (158 pits per 0.1ha). Where rainfall is limited, pits can be made deeper and wider to make maximum use of rainwater.

Step 3: Planting, Manure and Fertilizer Application
The pit can be planted to maize crop at the spacing below:

Crop	Seeds/pit	Plants/ha
Maize	4	63,492

It is recommended that farmers apply 2 handfuls of manure in each pit. Two weeks before rainfall, apply manure and cover the pit with earth. If basal fertilizer is available, it can also be applied at the same time. When manure has been applied, the pits should be covered with soil. A shallow depression should still remain on top. If top dressing is available, it should be applied when the maize is knee high. In some areas, it may be after 21 days.

Step 4: Weed Control and Pest Management
The pits must be kept free of weeds at all times. Weed as soon as the weeds appear and just before harvesting. This will reduce the amount of weeds in the following season. Use of herbicides to control weeds is optional.

Step 5: Harvesting
Remove the crop. Cut plants at base, leaving stems and leaves on the soil. The roots should not be uprooted; they should be left to decompose within the pit.

Increasing the Efficiency of the Pits
It is important to realize that the use of these pits alone will not produce the highest yields. For best results:

- Always incorporate crop residues, leaving a minimum of 30% of crop residue on the field.
- Apply manure generously.
- Protect crops from weeds, pests, and diseases.
- Always plant with the first productive rains.
- Grow crops in rotation; at least 30% of the cropped land should be planted to legumes.
- Using a cover crop / ground cover in conjunction with pits will give best results

Monitoring and Evaluation Indicators
The following indicators will be used to monitor adoption of pit planting:

1. Number of seeds planted per pit
2. Proper spacing of the pits (measured by the number of pits / size of the plot)
3. Quantity of fertilizer applied
4. Use of crop residues
5. Use of a ground cover / cover crop

Guidelines for Nutrient Management

The following are the guidelines to the nutrient management strategy the project will employ. These guidelines were developed by the MoAFS Department of Agricultural Research.

Step 1: Materials for compost
The following materials are appropriate for making compost: leguminous crop residues (Groundnuts and Soyabean), fresh leaves of leguminous trees, chopped maize stover (about 6 inches long), animal or chicken manure (optional)

Step 2: Preparation of compost

Mix three parts of leguminous biomass (crop residues and/or fresh leaves) to two parts maize stover.

Put a layer of legume crop residue followed by a layer of stover then a layer of green leaves of legume tree repeat making the layers until the heap is 120 cm high. After constructing a set of three layers add 5 liters of water to moisten the materials.

After constructing the heap smear the wet earth around the heap covering the biomass. The materials should be kept moist throughout the composting period. After 60 days the manure is ready, remove the manure and keep them under shade.

Step 3: Application method
Apply the manure at least two weeks before planting. Apply 3 kg of manure applied per 10 m ridge. Split open the ridge about 4 cm deep, spread the manure on the open ridge then bury the manure thus reconstituting the ridge.

Step 4: Planting

At the rain onset plant maize, one maize seed per planting hole on the ridge at a distance of 25 cm between planting holes.

Step 5: Use of Inorganic Fertilizer (optional, depends on availability)

Use 23:21:0+4S for basal dressing. Apply fertilizer as dollop; make a hole about 3 cm deep between the maize planting hills.

- Apply 23 kg N/ha of 23:21:0+4S at a rate 2.5g per hole (cups to be calibrated to measure 2.5 g fertilizer).
- Apply 37 kg N/ha of Urea at a rate of 2g per hole (cups to be calibrated to measure 2g fertilizer)

Apply the inorganic fertilizer one (1) week after maize germination. Note that cups must be carefully calibrated; using a bottle cap will result in fertilizer overdose.

Monitoring and Evaluation Indicators:

The following indicators will be used to determine farmer's adoption of NM technology:

- Compost materials used (should exclude grass)
- Time and method of manure application
- Quantity of inorganic fertilizer applied
- Number of compost heaps per farmer (should increase in the second season)
- Expansion of area of land planted using the intervention (land area should increase in the second season)

SECTION V: COMMUNICATION STRATEGIES

To determine how best to maximize the effectiveness of the MoAFS Agricultural Extension staff, we will evaluate three alternative methods for disseminating information:

1. *Extension Workers* (*AEDOS*), working through their existing channels.
2. Extension workers collaborating with *lead farmers* (one per village)
3. Extension officers collaborating with *peer farmers*, a group of 5 farmers per village representing *average* farmers spatially dispersed throughout the village.

Each village will be assigned one of these three communication strategies; the communication strategy they are assigned should be the dominant means of conveying information about pit planting or composting. In 25 villages, the AEDO will be the primary communicator. In 50 villages, the lead farmer will be the primary communicator. In 45 villages, the groups of peer farmers will be primarily responsible for communicating about the new technology.

Lead Farmer Concept

Definition of a Lead Farmer
A lead farmer is an individual famer who has been elected by the community to perform technology-specific farmer-to-farmer extension and is trained in the technology. Sensitization meetings to orient the village on the Lead Farmer concept are done before electing Lead Farmers to assist in the technology transfer.

Role of a Lead Farmer
There are various roles that lead farmers perform. These include:

- Teaching others
- Implementing the new technology
- Facilitating formation and implementation of action plans with farmers
- Liaising with the Extension Workers
- Multiplying extension technologies through farmer training, field days, extension meetings, demonstrations and local field tours.
- Encouraging other farmers to adopt technologies through follow-ups, field days, local tours, and by being a role model.
- Giving feedback on problems faced during adoption of extension technologies through reports to the AEDO.

Empowerment of Lead Farmers
The AEDO will support the lead farmer by training them on the specific technology, mobilizing them to formulate workplans with the community, supervising the workplan, distributing technical resource materials (leaflets, posters, and booklets) and orienting the lead farmers on those resources.

Advantages of Lead Farmers

- Easier and faster dissemination of technical information since the lead farmer lives in the community
- Enhanced communication because the lead farmer shares the same cultural beliefs and language as the community
- Easy adoption of agricultural technologies because the learning is from fellow farmers
- Farmers' problems are easily identified, understood, and addressed since the lead farmer stays in the village
- The workload of the AEDO is reduced because the lead farmer covers some of the technologies and areas that would have been the responsibility of the AEDO.
- The problems related to shortage of staff are eased because lead farmers cover some areas not readily reached by the AEDO.
- Farmer coverage is improved because the lead farmer assists in imparting technologies.
- Encourages community ownership of agricultural programs since the lead farmers are from within.

Why introduce the new concept of the Peer Farmer?

A critical determinant of new technology adoption is the learning process through which information on these techniques is disseminated, understood, and applied. When making decisions, people tend to be influenced by others who are part of the same social networks or are geographically close to them. Peer influence is important when people make a decision about adopting new technologies. Seeing that someone in your family has adopted a new technology and is having success with it can be more persuasive to a farmer than being told by an expert that the technology would be good for him or her.

By working with "peer farmers," extension workers will be able to take advantage of existing channels of social networks to convey information about new technologies. This may make their message more effective. Focusing on peer farmers rather than lead farmers in some villages will allow us to test the idea that some people might not adopt a new technology that they see a lead farmer using because they think that farmer has more resources, better luck or more skills, or is in some other way different from themselves. If instead farmers see a neighbor using a certain technology, they might be more convinced to adopt that technology on their own farm. Conversely, peer farmers may not be trusted as much as lead farmers due to differences in their expertise levels.

With this evaluation, we will be able to test out the concept of the peer farmer. At the end of the evaluation, we will have hard evidence as to whether or not working with peer farmers is an effective way to increase rates of adoption of new technologies. Comparing the relative importance of these different components of influence will be useful for designing extension policy in the future both in Malawi and abroad.

Peer Farmer Concept

While the concept of the lead farmer is well understood, and AEDOs have experience working with lead farmers in many villages, the concept of "peer farmer" is new to the

Department of Extension. This section explains the concept of the peer farmer in detail. The following section elaborates on the differences between peer and lead farmers.

Description of a Peer Farmer
Peer farmers are ordinary farmers. As a group, they are socially and geographically dispersed throughout a village, and represent different social groups. They are average farmers, with similar resources and status to most others in the village. They are not necessarily known to be progressive farmers.

Peer farmers will intentionally be selected to reflect the diversity of the village. As such, the group of peer farmers must meet the following characteristics:

1. Peer farmers should represent different social groups in the village, such as savings clubs, irrigation groups, support groups, or church groups.

2. Each peer farmer in a village must live in different parts of the village. Peer farmers must not live next door to each other.

3. Peer farmers must not all be the same age.

Roles of a Peer Farmer
- Implement the new technology on their own farm, with the assistance and advice of the AEDO
- Teach friends, neighbours, and members of their social groups about the new technology
- Promote the new technology by demonstrating it on their own farms and by talking to their peers about what they are doing.
- Try to convince people in their neighbourhood and social groups to adopt the new technology
- Although peer farmers are expected to influence adoption, no targets will be set for them, as they will naturally mingle with their peers to pass information.

Empowerment of the Peer Farmer
The AEDO will support the peer farmers by training them on the specific technology, supervising the implementation of the new technology, helping them with any problems or troubles that arise in implementation, and providing training resources.

Advantages of the Peer Farmer
The peer farmers share the same advantages as the lead farmers, however their responsibilities are fewer. They have the additional advantage of being "peers" rather than "leaders," which may increase their ability to persuade others to adopt the new technology.

The Distinction Between Lead and Peer Farmers

Similar Characteristics of Lead and Peer Farmers
Both lead and peer farmers should have the following characteristics:

- Willing to share information with others
- Honest, trustworthy, and humble
- Originates from the village and
- Socially accepted by the community
- Cooperative

Different Characteristics of Lead and Peer Farmers

Lead Farmer	**Peer Farmer**
Identified by the community as a "leader"	Thought of by the community as an ordinary, average farmer
Early adopter of technology	Must be willing to try the new technology, but is not necessarily considered a progressive farmer
Literate	Not necessarily literate
May have more resources at his disposal than other farmers (oxcart, access to chemical fertilizers or pesticides, more land)	Does not necessarily have more resources than the average farmer in the village

Another important distinction is the role of peer and lead farmers. Lead farmers have more responsibilities than peer farmers. There is only one lead farmer per village to work with all the farmers in a village, but there are five peer farmers who can share the responsibility.

Selection of Lead and Peer Farmers

In each of the 120 villages involved in the evaluation, the AEDO will work with the community to select one lead farmers and a set of peer farmers for the assigned technology (either nutrient management or conservation farming).

Selection of the Lead Farmer
In many of the villages, lead farmers will already have been selected. In that case, it is appropriate for the AEDo to continue working with the identified lead farmer. However, if there are no lead farmers, or if it is necessary to choose a different lead farmer for the specific technology being focused on in the area (either conservation farming or nutrient management), the AEDO should identify a new lead farmer through the following process:

1. The AEDO facilitates a meeting with local leaders and identifies a shortlist of potential lead farmers for the technology.
2. In consultation with the community, the AEDO and the local leaders choose one of the farmers on the shortlist to be the lead farmer.
3. The community endorses the newly selected lead farmer.

If the village has been assigned to have a lead farmer of a different gender than the current lead farmer, the AEDO should encourage the community to select a new lead farmer. For example, if the village is randomly assigned to a female lead farmer strategy, but currently

has a male lead farmer, the AEDO should emphasize that the MoAFS is particularly interested in working with women for this project and encourage the community to identify a female lead farmer. For more information on this, please refer to Section VII: Gender Considerations.

Selection of the Peer Farmers

Although we will only instruct AEDOs to specifically work with peer farmers in 45 of the villages, in order to collect accurate, unbiased data, we will need to identify peer farmers in every village. AEDOs will be responsible for identifying the peer farmers. They will be trained to do so at the same time as they receive training on either nutrient management or conservation farming. The following is the strategy they will be trained to follow:

1. The AEDO will facilitate a community meeting. Invite all farmers in the village to attend. Explain that the Ministry wants to try new strategies for disseminating information about new agricultural technologies. The purpose of the meeting will be to identify five farmers that represent different social groups in the village, and who are willing to try out a new technology. It is very important to assure that the meeting is well attended, and that many different farmers attend (not just those who may work with the extension agent most often). There should be representatives from all the different social groups in the village (males, females, elders, adolescents, people from different clubs or church groups, etc).

2. If the village has been assigned to a specific gender, the AEDO will need to explain that at least three of the representatives should be women (or men).

3. Participants at the meeting identify the different important social groups in the village.

4. Each group nominates one representative. From the group of people nominated as potential peer farmers, meeting participants working together with the AEDO and village leaders will narrow it down to five, making sure that the five all represent different groups (and the majority are of the assigned gender).

5. The farmers nominated by the community agree that they understand what the peer farmer's role is and are willing to be a peer farmer.

6. The community endorses the five representatives as the new peer farmers.

SECTION VI: INCENTIVES COMPONENT (REWARDS PROGRAMME)

We will test whether offering results-based incentives affects the effectiveness of any of the three communication methods explained above. We will randomly select half of the AEDOS, peer farmers, and lead farmers to participate in a "Rewards Programme." The selected individuals will be eligible to receive a reward at the end of the season, if their performance meets specific criteria. To receive the reward, the selected communicators will have to meet specific targets of set increases in the number of people in their village that understand and adopt either composting or pit planting. The rewards offered under this programme are completely separate from any basic support that is given to all communicators (e.g. training, assistance with demonstrations, bicycles for lead farmers) that allows them to carry out their task.

60 (out of the 120) treatment villages will participate in the rewards programme. In these 60 randomly selected villages, the communicators will be informed about the Rewards Programme through District-level briefings by staff from DAES and DAPS. For each village, it is the communicator assigned primary responsibility for conveying information who is eligible to receive the reward, i.e. in AEDO-focus village, the AEDO is eligible, in lead farmer-focused villages the lead farmer is eligible, and in peer farmer-focused villages the 5 peer farmers are eligible. During the briefings at the beginning of the season, participatns will be provided with clear guidelines and rules for the Rewards Programme.

The Rewards Programme will be offered for two seasons (2009-10 and 2010-11). Rewards will be given to qualifying participants at the end of each season (August 2010 and August 2011). The progress of participants in the rewards programme will be tracked by on-farm monitoring visits, follow-up household surveys at the end of each season, and qualitative interviews.

Note that not all Rewards Programme participants will necessarily receive a reward, as it depends on their performance. It is possible to receive a reward twice, if the communicator meets the set targets during both the first and second season. Performance in the first year will not change eligibility for the second year; farmers who do not receive a reward in the first season can still receive a reward after the second season if they are more successful. The specific performance targets differ by season, as explained below.

Definition of Success

We have to have a clear definition of "success", such that the reward will be given only if participants' performance meets or exceeds the targets. Perforamnce targets differ across the two seasons; in the first season, the focus is on improving knowledge and understanding of the new technologies, and in the second season on increasing rates of adoption of the technologies.

- Criteria for 2009/10 season: the number of people in the village that know of and understand the specific recommendations for pit planting must increase by 20 percentage points relative to the baseline

- *Example:* If 25% of the people understood how to prepare and apply compost manure at the baseline, the focus communicator would receive a reward if at least 45% of people understand by the end of the first season.

- Criteria for 2010/11 season: the amount of people in the village who are practising pit planting must increase by 20 percentage points relative to the baseline

  - *Example:* If no-one (0%) in the village was using the technology at the baseline, the focus communicator will receive a reward if at least 20% of households have adopted the technology by the end of the 2010/11 season.

Reward Packages

The reward size should be sustainable from a long-term perspective. The total reward size will have to be roughly constant across types of communicators; however, the nature of the incentives package will vary. After discussions with the Department of Planning and the Department of Extension, it was concluded that a 12,000mk award per village is sustainable. The reward will be assigned in the following way:

1. A "successful" AEDO (using the definition of success explained above) will be given a new bicycle for personal use (value roughly equivalent to 12,00mk).

2. A "successful" lead farmer will receive a bag of basal dressing, a bag of urea, and a 10kg bag of maize seed (value roughly equivalent to 12,000mk)

3. Each "successful" group of peer farmers will receive 5 10kg bags of legume seed (value roughly equivalent to 12,000mk). As there are 5 peer farmers per village, each peer farmer will receive one bag of seed.

SECTION VII: GENDER CONSIDERATIONS

The gender of both the provider and the recipient of agricultural information can affect the degree to which the recipient receives, understands, and applies the information. We will induce randomized variation in the gender of lead and peer farmers and combine it with existing natural variation in extension officer gender and the gender composition of farmers to explicitly evaluate communication within and across gender lines. By examining differential adoption rates between male and female farmers, and how that matches up with the message sender's gender, we can learn who talks to whom and who influences whom. The results can thus inform other projects whose aim is to deliver informational content to women living in rural communities.

Random Assignment of Gender to Peer and Lead Farmers

In the lead farmer and peer farmer villages, the extension workers will be given some specific instructions on the gender of the lead or peer farmers.

In the 25 villages assigned to have a male lead farmer, the AEDO will be asked to identify a male Lead Farmer, and follow the procedure for lead farmer selection outlined in the manual below. To these 25 AEDOs, we will not need to give any instructions on the gender of the peer farmers they select.

In the 25 villages assigned to have a female lead farmer, the AEDO will be asked to identify a female Lead Farmer, and follow the procedure for lead farmer selection outlined in the manual below. To these 25 AEDOs, we will not need to give any instructions on the gender of the peer farmers they select. If the community already has an identified lead farmer, but that lead farmer is male, we will encourage the community to identify a female lead farmer who will work with the AEDO for the purposes of this project.

In the 22 villages assigned to have a male-dominated group of peer farmers, the AEDO will be asked to identify peer farmers in such a way that at least 3 of the selected farmers are male. In other words, between 3 and 5 of the group of 5 identified peer farmers should be male. They will follow the procedure for peer farmer selection outlined in Section IV: Communication Strategies. To these 22 AEDOs, we will not need to give any instructions on the gender of the lead farmer they select.

In the 23 villages assigned to have a female-dominated group of peer farmers, the AEDO will be asked to identify peer farmers in such a way that at least 3 (between 3 and 5) of the selected farmers are female. They will follow the procedure for peer farmer selection outlined in Section IV. To these 23 AEDOs, we will not need to give any instructions on the gender of the lead farmer they select.

SECTION VII: MONITORING STRATEGY

Monitoring strategy

During the first season, the focus will be more on improvements in knowledge about the new technologies (while also monitoring farmer trials of the new technologies). During the second season, the focus will be on actual changes in farmer practices (while also monitoring retention of knowledge). Data will be collected through on-farm monitoring visits in a subset of the villages, and household surveys in all of the villages.

Outcomes of Interest

1) Conservation farming:
    a) Rate of adoption
    b) Total hectares of smallholder area on which CF techniques are used
    c) AEDO knowledge of CA
    d) Lead farmer and peer farmer knowledge of CA
    e) Farmer knowledge of CA

2) Nutrient management
    a) Rates of adoption
    b) Total hectares of smallholder area on which NM is employed
    c) AEDO knowledge of NM
    d) Lead farmer and peer farmer knowledge of NM
    e) Farmer knowledge of NM

3) Access to extension services (number of farmers receiving advice / training)

4) Maize yields (tons / ha)

5) Soil fertility (level of soil organic matter)

Monitoring Schedule

1. Baseline household and farm-level survey (to be completed July-September 2009)
2. Midline household and farm-level survey (to be completed June-July 2010)
3. Endline household and farm-level survey (to be completed June-July 2011)
4. On-farm data collection 2009-10 season (3 visits to each monitored farm each season, scheduled for December, February and April)

5. On-farm data collection 2010-11 season (3 visits to each monitored farm each season, scheduled for December, February and April)

6. Follow-up household survey at the end of the ADP-SP, in 2013

On-farm Monitoring

In 70 randomly selected, on-farm monitoring visits will be done by District M&E officers throughout the season. The M&E officers are expected to visit each farm three times throughout the season, in December, February and May. The farm visits will give us concrete data on rates of adoption and adherence to the recommendations for the target technologies. The M&E officers will be trained on key indicators for monitoring pit planting or composting by staff from the DLRC and DARS before the first monitoring visits.

APPENDIX A: ADP-SP Impact Evaluation Treatment Villages