



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



The 2017 Malawi Agriculture Extension Field Notebook as a Capacity Building Tool

A mixed method evaluation

Conducted by

Tiffany Freer, University of Florida

Hannah Ganunga, Lilongwe University of Agriculture and Natural Resources

Austen Moore, University of Illinois at Urbana-Champaign

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On behalf of:

The USAID Malawi Feed the Future Strengthening Agriculture Nutrition and Extension (SANE) and the Feed the Future Integrating Gender and Nutrition within Agricultural Extension (INGENAES) projects.

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Author Note

Tiffany J. Freer, Department of Agricultural Education and Communications, University of Florida is the lead author of the report. Freer conducted preliminary research, was responsible for overall study design, data collection tools, remotely monitored survey implementation, prepared and cleaned data, conducted field-based key informant interviews in Malawi and analyzed qualitative data. She wrote and revised the report. Hannah Ganunga, Lilongwe University of Agriculture and Natural Resources assisted in field-based data collection including translation services and note-taking. Ganunga transcribed key informant interviews and provided culturally relevant interpretations during qualitative data analysis and reporting. Austen Moore, AgReach, University of Illinois at Urbana-Champaign initiated the collaborative project, provided oversight on research and reporting activities, gave recommendations for draft revisions, and had final approval of related activities. Festus Amadu, AgReach, University of Illinois at Urbana-Champaign offered guidance on data reduction, conducted the statistical analysis, and provided recommendations on interpreting the results.

Austen Moore is now Catholic Relief Services, Baltimore, Maryland. Festus Amadu is now at the Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign.

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Table of Contents

Abbreviations	ii
Background and Justification.....	1
Actors, Location, and Timeline	4
Purpose and Objectives	5
Activities and Approaches	5
Agriculture Extension Field Notebook Distribution	5
Extension Methodologies Training-of-Trainers Workshop.....	6
Mixed Methods Field Study.....	6
Results and Impacts	8
Research Question 1.....	8
Program Planning.....	8
Extension Methodologies.....	10
Nutrition-Sensitive Extension.....	11
Gender-Responsive Extension Services.....	12
Agribusiness, Soil and Water, and Livestock	13
Research Question 2.....	16
Conclusions and Recommendations	19
Provide Capacity Building Workshops in Extension Methodologies.....	20
Distribute Appropriate and Well-Tested Extension Tools	21
Promote Innovative Platforms for Training, Learning, and Collaborating.....	21
References.....	22
Appendix I. DAESS Platforms	24
Appendix II. Activities.....	25
Appendix III. Pre/Post Questionnaire.....	26
Appendix IV. Semi-Structured Group Interview Guide	39



Abbreviations

ADC	Area Development Committee
ADD	Agricultural Development Division
AEDC	Agricultural Extension Development Coordinator
AEDO	Agricultural Extension Development Officer
ASP	Area Stakeholder Panel
DADO	District Agricultural Development Officer
DAECC	District Agricultural Extension Coordinating Committee
DAES	Department of Agricultural Extension Services
DAESS	District Agricultural Extension Services System
DADO	District Agricultural Development Officer
DAO	District Agricultural Office
DEC	District Executive Committee
DSP	District Stakeholder Panel
EMO	Extension Methodologies Officer
EPA	Extension Planning Area
FNB	Agriculture Extension Field Notebook
GAC	Group Agriculture Committee
INGENAES	Integrating Gender and Nutrition within Agricultural Extension Services
KAP	Knowledge, Attitudes, and Practices
MaFAAS	Malawi Forum for Agricultural Advisory Services
MoLGRD	Ministry of Local Government and Rural Development
SANE	Strengthening Agricultural and Nutrition Extension
SMS	Subject Matter Specialist
USAID	United States Agency for International Development
VAC	Village Agriculture Committee
VDC	Village Development Committee
ZoI	Zone of Influence



Background and Justification

The Strengthening Agricultural and Nutrition Extension (SANE) project was developed to strengthen the capacity of the Government of Malawi's Department of Agricultural Extension Services (DAES) to mobilize and work with service providers to deliver agricultural and nutrition extension services more effectively and in a coordinated manner in the USAID Feed the Future Zone of Influence. Extension services are largely provided by field-level extension workers who are regarded as the direct link to farmers, researchers, vendors, and input dealers. To be effective in their mandate, frontline workers must be equipped with the appropriate technical skills and functional competencies to meet both the production and consumption needs of rural farmers (Swanson & Rajalahti, 2010). The technical skills needed by frontline workers vary by specialization. Generalist competencies should include knowledge of crop varieties, pest and disease management, farm business planning, and market analysis (Suvedi & Kaplowitz, 2016). Functional competencies also include the "soft skills" needed to teach adult learners, facilitate group formation, community engagement, communication, and networking, which enable frontline workers to mobilize rural households and facilitate behavior change (Sulaiman & Davis, 2012). Frontline workers also need core competencies in key extension methodologies: program planning, program implementation, program evaluation, and communication and information technologies (Suvedi & Kaplowitz, 2016).

Extension advisory services can promote better nutrition through existing services if they incorporate nutrition education, diversified production, and off-farm income generation for women (Cramer & Wandira, 2010). To meet the consumption needs of smallholders, frontline agents need competencies that include technical knowledge of nutrition, communication and facilitation skills, management skills, and awareness of gender-sensitive nutrition practices (Fanzo et al., 2013).

In Malawi, the government extension service operates through a decentralized system organized around a four-tier administrative structure: national, agricultural development divisions (ADDs) (eight), districts (28), and extension planning areas (EPAs) (187). At the national level, DAES manages public sector extension service delivery and coordinates national stakeholders. Each of the ADDs oversee agricultural extension policy implementation and coordinate principal Subject Matter Specialists (SMS) across multiple districts. At the district level, District Agricultural Offices (DAOs) are managed by District Agricultural Development Officers (DADOs) and the Extension Methodologies Officer (EMO). They disseminate extension messages, facilitate in-service training, and provide technical backstopping to frontline extension workers. Each district is further divided into basic operational units or EPAs. At this level, Agricultural Extension Development Coordinators (AEDCs) supervise and coordinate the activities of a cohort of Agricultural Extension Development Officers (AEDOs). Frontline extension workers (AEDOs) function at the section levels, which are comprised of five to 15 villages each. AEDOs are responsible for providing extension services within their section and oversee Lead Farmers at the village level (GoM, 2000; MEAS, 2012). The exact number of AEDOs is difficult to establish due to high vacancy rates with geographic variability. Estimates from 2017 report approximately 2000 DAES extension workers in the country, against an established 3500 positions (Masangano, Kambewa, Bosscher, & Fatch, 2017). Vacancy rates at the AEDO level vary by district and range from 30% to 60% (MEAS, 2014), with disproportionate staffing of male extension workers at a ratio of 8 to 1 (Masangano & Mthinda, 2012).



At the national level, DAES is characterized by limited coordination across extension actors, underdeveloped human capacity, and a lack of effective messaging that limits the impact of extension advisory services on the public sector (MEAS, 2014). At the district level, AEDOs deliver services to farmers through coordination of the District Agricultural Extension Services System (DAESS) platforms within their service area. DAESS is a mechanism for enabling farmers to identify and organize their agricultural needs and demand services through village, district, or area level committees (Appendix I).

Prior research identified constraints on frontline extension workers, including limited opportunities for in-service training and professional development, insufficient operational resources, and a lack of standardized practices and structures for monitoring work plans and agent performance. (Chowa, Garforth, & Cardey, 2013; Ragasa, Berhane, & Taffesse, 2013). Training for AEDOs often comes from NGO-led projects where training is provided in relation to a specific program that funds their involvement. NGO-led training is often technical in nature and omits methodology skills.

Additionally, nutrition and gender extension services are hindered by limited nutrition knowledge and training of frontline workers combined with narrow programmatic focus on maize production. Barriers to nutrition extension service delivery are reinforced by gender and cultural norms that may restrict women's access to services and resources (MEAS, 2014). Consequently, the lack of consistent or effective in-service training to upgrade the knowledge, attitudes, and skills of field-staff has produced an extension workforce that is inadequately prepared to work with smallholder farmers to meet food security and nutrition goals (Rivera, 2011; IFPRI, 2018).

To address these limitations and develop capacity of frontline workers, the Feed the Future Strengthening Agriculture Nutrition and Extension (SANE) and the Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) projects facilitated a write shop review of the *2016 Agricultural Extension Field Diary*. The diary was meant to assist extension workers in program implementation. Stakeholder feedback established the need for an updated diary type tool with a focus on program planning, organizational management, and record keeping. Subsequently, the diary was updated and transformed into an agricultural Field Notebook (FNB) through a consultative process led by the SANE project and in partnership with DAES. A draft of the FNB was developed for 2017, which was circulated to different Departments to finalize their sections and include illustrations, stories, examples, and statistics. Before being finalized, the draft document was tested in the field by frontline workers from Chileka, Chiwamba, Mitundu, and Thawal EPAs as well as members of the Lilongwe DAECC. The *2017 Agriculture Extension Field Notebook* was finalized in August 2017.

The FNB is envisioned as a holistic tool to guide field-level extension officers in the shift from maize-based subsistence farming towards a year-round sustainable approach that will improve food and nutrition security in Malawi. The FNB is divided into monthly program planning sections that include suggested activities for each corresponding agricultural season. The FNB provides a structure to help the frontline extension worker effectively plan, track, and review plans, and discuss progress with supervisors. The reference annex contains technical guidance on nutrition, gender mainstreaming, agricultural production, animal husbandry, and agribusiness. The overall goal of the FNB is to improve the quality of extension services by providing frontline extension workers with the needed technical resources to teach farmers, while enhancing planning and tracking program progress (Appendix I).

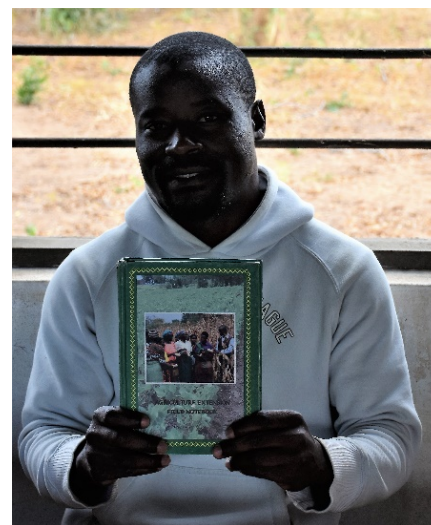


Figure 1. AEDO with Field Notebook, Mangochi District, July 2018

8

EXAMPLE OF FOOD AVAILABILITY CALENDAR BY FOOD GROUP AND MALAWI SEASON

Food Groups	Available Foods	October	November	December	January	February	March	April	May	June	July	August	September
1. Staples	Green Banana			✓	✓	✓	✓	✓	✓	✓	✓		
	Maize						✓	✓	✓	✓	✓		
	Sorghum						✓	✓	✓	✓	✓		
	Cassava	✓	✓					✓	✓	✓	✓	✓	✓
2. Fruits	Bananas							✓	✓	✓	✓		
	Pineapples	✓	✓									✓	
	Pawpaws							✓	✓	✓	✓		
	Mangoes			✓	✓	✓	✓						
3. Vegetables	Amaranthus		✓	✓	✓	✓							
	Sweet potato leaves						✓	✓	✓	✓	✓	✓	✓
	Rape	✓	✓				✓	✓	✓	✓	✓	✓	✓
	Tomato						✓	✓	✓	✓	✓	✓	✓
4. Legumes	Pumpkin leaves			✓	✓	✓	✓	✓	✓	✓	✓		
	Cow peas						✓	✓	✓	✓	✓	✓	✓
	Pigeon peas							✓	✓	✓	✓	✓	✓
	Groundnuts							✓	✓	✓	✓	✓	✓
5. Animal Foods	Beans					✓	✓	✓	✓	✓	✓		
	Soya beans						✓	✓	✓	✓	✓		
	Flying ants			✓	✓	✓	✓	✓	✓	✓	✓		
	Eggs (Chicken, ducks etc)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6. Fats and Oils	Milk				✓	✓	✓	✓	✓	✓	✓	✓	✓
	Meat (Rabbits, Chicken etc)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Crabs		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Small fish	✓	✓									✓	✓
	Avocado			✓	✓	✓	✓						
	Cocconut							✓	✓	✓	✓		
	Sunflower seeds							✓	✓	✓	✓		
	Pumpkin seeds							✓	✓	✓	✓		
	Sesame seeds							✓	✓	✓	✓		

KEY: ✓ Available Foods

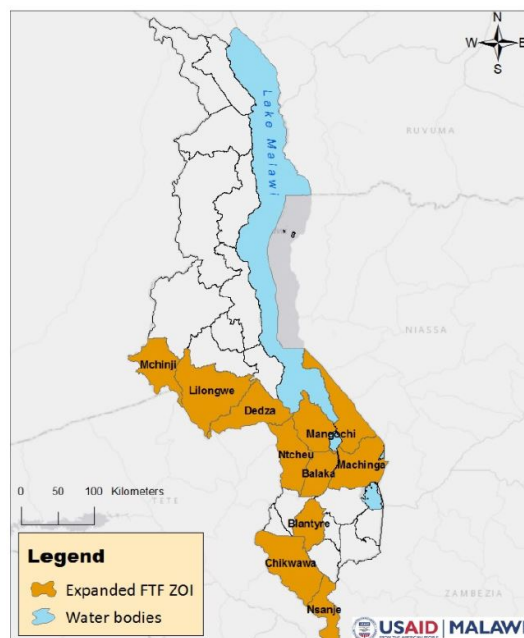
Figure 2. Food Calendar page in the FNB

Extension materials and training guides such as the FNB are produced to help extension professionals implement specific actions and gain competencies for working with farmers and communities. There are considerable resources spent on developing technical extension materials and training guides for extension workers. However, there is less information available on the effectiveness of such materials in building the professional capacity of frontline workers or if supplemental training and backstopping are necessary to improve agent competency. Additionally, whether training and extension resources or job aids translate to field-level integration of nutrition-sensitive and gender-responsive agricultural extension services is underexplored. Further investigation was therefore needed to determine the impacts of training materials and how development efforts can best build capacity around these tools.

Actors, Location, and Timeline

Participants in the 2016 Agricultural Extension Field Diary Write Shop identified the need to document how the updated extension tool would be implemented in the field to justify future investment in the a resource. They also recommended that field officers (AEDOs) should be oriented on how to effectively use the tool. These recommendations led to SANE and INGENAES designing a capacity development and research activity to evaluate the FNB. The study and related activities were carried out by SANE and INGENAES from January 2018 to September 2018.

The FNB study engaged 225 frontline government extension officers at the EPA or section level across all 10 districts¹ that form USAID/Malawi's Feed the Future Zone of Influence (Map 1).



Map 1: Districts that are in the E-ZOI

Three approaches (treatments) were used to assess the benefits experienced by AEDOs due to different types of programmatic support. Participants were grouped according to district into three treatment groups:

Treatment I (book and training)	75 participants	Dedza Mchinji Ntcheu Lilongwe
Treatment II (book only)	75 participants	Balaka Machinga Mangochi
Control Group (neither book nor training)	75 participants	Blantyre Chikwawa Nsanje

¹ The districts are: Mchinji, Lilongwe rural, Dedza, Ntcheu, Balaka, Machinga, Mangochi, Blantyre rural, Chikwawa, and Nsanje and are colored in orange in Map 1.

Purpose and Objectives

The purpose of the FNB evaluation was to assess the impact of the FNB on the knowledge, attitudes, and practices (KAP) of frontline extension workers in the USAID/Malawi's Feed the Future Zone of Influence.

The research objectives were to:

1. Explore extension agent perspectives on the FNB;
2. Assess the influence of the FNB with and without training on extension officer KAP.

Activities and Approaches

Implementation of the FNB evaluation study involved the following activities (Appendix II):

Agriculture Extension Field Notebook Distribution

The SANE project – with funding from the INGENAES project – printed 1,000 copies of the FNB. These were distributed through SANE interventions in all 10 Feed the Future districts. 225 FNBs were allocated to extension workers who participated in the study; the remaining FNBs were distributed to other stakeholders and frontline workers identified by SANE in consultation with the DAECs or with the DADO's Office. For the evaluation study, the FNB was distributed to study participants at various times in relation to the assigned study treatment group. Extension officers who participated in the extension methodologies training (Treatment I) received the book at the time of their district workshop in order to learn how to effectively use the tool. For participants who received the book without training (Treatment II), SANE specialists utilized their planned field activities to deliver the FNB. Participants in the control districts received the FNB after completing the post-survey at the end of the study.



Figure 3. AEDOs with FNB, Nsanje District, July 2018



Extension Methodologies Training-of-Trainers Workshop

The project held a training-of-trainers workshop on extension methodology competencies for four districts: Dedza, Lilongwe, Ntcheu, and Mchinji. The four-day workshop was designed to develop the professional capacity of frontline extension officers in key extension methodologies. During the training, participants were also oriented on the updated FNB to improve program planning, record keeping, and reporting. After the training, AEDOs were expected to conduct Lead Farmer trainings within their districts utilizing the same material. SANE conducted workshops on the DAESS platforms in FY2017-18, but those workshops did not include training on the FNB as it was still in-process.

Topics covered at the training and assessed in the evaluation were:

- Extension systems and approaches;
- Extension methodologies;
- Program planning and implementation;
- Conducting demonstrations and field days;
- Effective communication in extension.

Mixed Methods Field Study

A mixed methods evaluation was then conducted to explore the impacts of the different treatments of an intervention (FNB) with and without training on the KAP of frontline extension workers. A concurrent embedded design was used to obtain both quantitative and qualitative data in the study (Cresswell & Plano-Clark, 2011). For each segment, a purposive sample that was geographically stratified at the district level was used to gain representation for each of the project districts (Teddlie & Yu, 2007).

Evaluation activities included the following:

1. Pre- and Post- Questionnaire;
2. Key informant group interviews with AEDOs.

The quantitative segment utilized a quasi-experimental non-equivalent control group design to determine the effects of the Field Notebook with and without training on the KAP of frontline extension agents (Rossi, Lipsey, & Freeman, 2004).

The districts were divided into three equal groups for the study. Districts for each of the groups were chosen by SANE project specialists in Malawi based on their knowledge of agent and district needs, to build on prior capacity development efforts, and to utilize their pre-scheduled activities in remote and diverse areas to administer the surveys. Treatment group I (n=75) received only the intervention (FNB) and no additional training. Treatment group II (n =75) received the intervention (FNB) combined with training on extension methodologies. A subset of this group received additional backstopping through the WhatsApp platform. The control group (n=75) did not receive the intervention (FNB) or the extension methodologies training.

All three groups received the pre- and post- questionnaire designed to explore knowledge, attitudes, and practices in nutrition-sensitive and gender-responsive extension programming aligned thematically with the FNB. The questionnaire had the following sections: program planning, extension methodologies, nutrition extension, gender and HIV mainstreaming, agribusiness management, soil and water, livestock and fish, demographics, and background information (Appendix III).

The survey instrument was developed in collaboration with SANE project extension and nutrition specialists and reviewed by a panel of experts in extension worker competency at the University of Florida. Field-level validation was conducted through pre-testing in one district to establish the approximate time necessary to complete the survey and obtain feedback on the appropriateness of the content (Dillman et al., 2009).

Specifically, the questionnaire examined:

1. Does the Field Notebook change the KAP of frontline extension workers?
2. Does training on using the Field Notebook improve KAP of frontline extension workers?

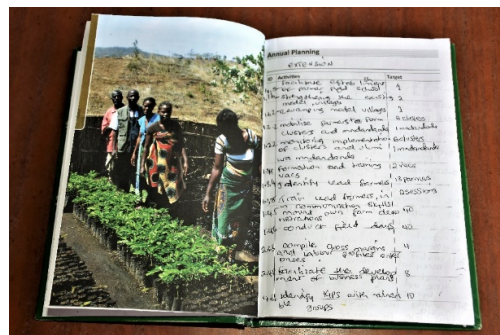


Figure 4. Annual Planning Work, FNB

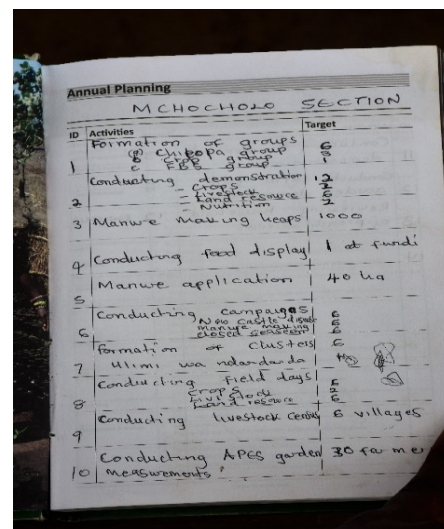
Statistical analysis was conducted using STATA to produce the results presented in this report.

Summary statistics were run to identify statistically significant mean differences between the treatment groups. Propensity score matching was used to estimate the average treatment effect of the FNB on AEDO knowledge, attitudes, and practices compared to the control group.

In the qualitative segment, data collection activities included a review of program records and documents related to the FNB, extension methodologies, and capacity-building activities conducted by SANE. A semi-structured interview guide was developed based on the goals of the project and aligned with the thematic content of the FNB. The guide was reviewed by project specialists and an expert panel before pilot testing in the field. The guide was further revised based on feedback from the panel and experience in the pilot test. Interviews covered the following topics: use of the field notebook in program planning, monitoring, and reporting; communication with farmers; and gender and nutrition practices in extension work (Appendix IV).

To conduct deeper analysis of topics explored in the surveys, group key-informant interviews were conducted with government extension professionals who completed the pre- and post- questionnaire. Key- informants were peer-selected by AEDOs in each district with the goal of having broad experience and perspectives represented in the data. Interviews were conducted with 12 groups across nine districts with a total of 60 AEDOs. Participants received a travel and meal stipend to account for transportation costs and time.

Data triangulation, member checking, and debriefing were used to establish rigor in qualitative data collection, analysis, and interpretation (Lincoln & Guba, 1985). Context-driven coding for changes in KAP and framework analysis were used to explore uptake and use of the FNB (Merriam, 1998; Krueger & Casey, 2000).



ID	Activities	Target
1	Formation of groups (8 groups)	8
2	Conducting demonstration groups (8 groups)	8
3	Manure making heaps	1000
4	Conducting feed display	1 at fundi
5	Manure application	40 ha
6	Conducting campaigns (8 groups)	8
7	Formation of clusters (8 clusters)	8
8	Conducting field days (8 groups)	8
9	Conducting livestock census	8 villages
10	Conducting APES garden measurements	30 farmers

Figure 5. FNB Annual Plan



Results and Impacts

Results of the pre- and post-questionnaire revealed many statistically significant effects of the Field Notebook both with and without training. Benefits of the FNB to frontline extension workers were also discovered during key-informant group interviews.

The data were broken down into thematic categories based on the FNB to answer the research questions. Results are presented below.



Figure 6. AEDOs with SANE Research Assistant, Mangochi District, 2018

Research Question 1

Does the Field Notebook change the knowledge, attitudes, and practices of frontline extension workers?

Program Planning

Agricultural Extension Development Officers who were using the FNB demonstrated improved practices around program planning. Significant effects were found in the use of needs assessments, developing program goals and objectives, and writing monthly work plans. Additionally, results demonstrate positive attitude changes related to time spent on planning, its connection to addressing local issues and building capacity, farmer-centered programming, and working with community leaders (Table 1).

Reported Benefits of the Field Notebook:

1. Simplifies planning of work
2. Guides monthly activities
3. Acts as a progress and monitoring tool
4. Reminder to include farmers and vulnerable groups
5. Reference book
6. Simplifies report writing
7. Improves confidence
8. Portable

These results were confirmed in the key informant group interviews where AEDOs reported their process for developing work plans and addressing community needs, and were able to describe coordination of the Village Agriculture Committees (VACs), Group Agriculture Committees (GACs), and Area Stakeholder Panels (ASPs) platforms. During group interviews, AEDOs reported using the suggested seasonal activities as the foundation for their monthly planning.

Table 1: Average treatment effect on the treated (ATT) for program planning, conditional on allocation of the Field Notebook

Program Planning Variables	Treatment Group		Control Group		Total (N)	Treatment Effect	
	Mean	Sample (n)	Mean	Sample (n)		Value	T-Stat
Conducted needs assessment	0.913	92	0.446	48	140	0.467***	4.320
Developed program goals and objectives	0.812	85	0.482	39	124	0.329***	3.030
Identified community resources	0.920	87	0.885	41	128	0.034	0.470
Created monthly work plan	0.910	89	0.742	43	132	0.169*	1.790
Created annual work plan	0.831	89	0.876	43	132	-0.045	0.500
Identified activities for objectives	0.866	82	0.744	37	119	0.122	1.270
Criteria for program success or failure	0.692	78	0.577	31	109	0.115	0.790
Collaborated with other extension workers	0.833	90	0.878	43	133	-0.044	0.540
Program and National priority aligned	0.820	89	0.652	45	134	0.169	1.610
Program planning time well spent	0.892	93	0.645	46	139	0.247**	2.380
Program planning helps solve local problems	0.979	94	0.681	45	139	0.298***	3.030
Program activities based on farmer needs	0.989	93	0.473	46	139	0.516***	4.990
Working with community leaders builds trust	0.926	94	0.351	48	142	0.574***	4.760

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.

The approaches and extension methods outlined within the FNB remind frontline workers to incorporate farmer needs to produce effective work. Additionally, interview participants described being led by the structure of the book to organize their daily activities in the field and to monitor progress. The activities, targets, and achievements recorded in the FNB help frontline workers identify gaps, accomplishments, or weaknesses in their extension programs. AEDOs described using the tool as both a record of their work and to compare their extension activities across locations within their EPA. Extension officers also conveyed an increase in future planning and in self-evaluation through use of the FNB.

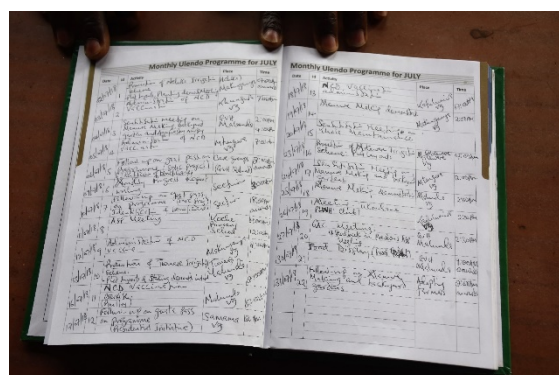


Figure 7. FNB Planning Schedule

I call it 'Agriculture Extension Field-Work-Made-Simple Diary'

-WhatsApp Participant

"All of our records are in that field notebook. If someone asks us activities that we did maybe in January, we just open the book and find every document."

-Treatment I interview participant, Mchinji District, Zulu EPA

Extension Methodologies

Use of the FNB increased the variety of methods used by AEDOs to deliver extension services. Results of the questionnaire reveal significantly different treatment effects for frontline workers using the FNB compared to the control group for the following types of service delivery: groups and clubs, demonstrations, individual visits, field days, model villages, and farming clusters. Additionally, attitudes related to implementing participatory approaches, demonstrations, information quality, and designing communication messages were also significantly different for the two treatment groups (Table 2). Moreover, interview participants reported targeting and outreach to vulnerable groups was improved by using the FNB.

Table 2: Average treatment effect on the treated (ATT) for Extension methods, conditional on allocation of the Field Notebook

Extension Methods Variables	Treatment Group		Control Group		Total (N)	Treatment Effect	
	Mean	Sample (n)	Mean	Sample (n)		Value	T-Stat
Groups and club	0.957	93	0.548	46	139	0.409***	4.120
Demonstrations	0.926	94	0.755	48	142	0.170*	1.790
Individual visits	0.903	93	0.462	47	140	0.441***	4.350
Farmer Field Schools	0.483	89	0.393	44	133	0.090	0.800
Field days	0.926	94	0.734	44	138	0.191**	1.970
Exchange visits, tours	0.614	88	0.466	40	128	0.148	1.210
Model Villages	0.848	92	0.565	44	136	0.283**	2.490
Farming clusters	0.967	92	0.620	46	138	0.348***	3.460
Lead Farmers	0.872	94	0.734	47	141	0.138	1.360
Agricultural shows	0.459	85	0.376	40	125	0.082	0.710
Mass media	0.476	84	0.429	43	127	0.048	0.410
Farmer Participatory Research	0.554	83	0.542	39	122	0.012	0.090
Value Chain market development	0.270	74	0.149	39	113	0.122	1.230
FFS are a participatory group-based approach	0.925	93	0.742	48	141	0.183*	1.810
Demonstrations showcase crops or practices	0.957	93	0.677	48	141	0.280***	2.820
Extension workers need current info on tech and markets	0.828	93	0.419	48	141	0.409***	3.910
Communication strategies can change attitudes/behavior	0.957	93	0.548	47	140	0.409***	4.000

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.



Nutrition-Sensitive Extension

Increases in nutrition knowledge, practices, and attitudes resulted from using the FNB. AEDOs in the two treatment groups had significantly different effects in several areas when compared to the control group. AEDOs in treatment districts were able to correctly identify the image of a balanced meal and the six Malawian Food Groups. Additionally, AEDOs were able to identify four out of the five choices on extension methods to fill gaps in food availability. However, results were insignificant for all groups on use of a seasonal food calendar as a method to produce a diversity of foods throughout the year (Table 3). During the focus group interviews, AEDOs were able to describe the food calendars but reports of actual use were scarce, confirming this finding.

"Men were cooking. You could see for yourself that men were cooking. It was beautiful."

-AEDO, Lilongwe District

Table 3: Average treatment effect on the treated (ATT) for nutrition awareness, conditional on allocation of the Field Notebook

Nutrition Extension Variables	Treatment Group		Control Group		Total (N)	Treatment Effect	
	Mean	Sample (n)	Mean	Sample (n)		Value	T-Stat
Used seasonal food calendar	0.660	94	0.553	46	140	0.106	0.960
Correctly identify balanced meal	0.974	76	0.711	41	117	0.263**	2.300
Correctly identify the six Malawian Food groups	0.957	92	0.609	47	139	0.348***	3.250
Hungry season practices: Diversifying agricultural production	0.957	94	0.457	47	141	0.500***	4.880
Starting a home garden and orchards	0.936	94	0.362	48	142	0.574***	5.650
Irrigation	0.926	94	0.404	48	142	0.521***	5.200
Preservation methods such as drying	0.957	94	0.457	47	141	0.500***	4.860
Using high quality seeds	0.734	94	0.585	47	141	0.149	1.420
Follow Food Dietary Guidelines	0.904	94	0.809	46	140	0.096	0.970
It is good to grow a variety of crops	0.947	94	0.734	48	142	0.213**	2.270
Food processing improves income	0.979	94	0.723	47	141	0.255***	2.740
Agricultural activities reduce time for meal prep	0.277	94	0.319	47	141	-0.043	0.410

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.

Interview participants also described their perceived barriers to changing nutrition-related attitudes and behaviors regarding year-round production and diet diversity. The barriers described included: (a) cultural preference for maize-based diet; (b) low participation of men in nutrition training and activities; (c) cultural norms about male and female roles and activities; and (d) religious and cultural beliefs that hinder adoption of some innovations. Additionally, it was reported that extension programmatic focus on maize production through implementation of the Farm Input Subsidy Program (FISP) competes with extension messages promoting food calendars and diet diversity. The GoM continues to update the FISP program, which was expanded to include legume seed (beans, groundnuts, pigeon peas, soya beans, cowpeas) for the 2018-2019 season (GoM, 2018).



Gender-Responsive Extension Services

Results of the questionnaire on gender-responsive extension services revealed little treatment effects across the groups (Table 4). This contradicts reports from the group interview discussions in both treatment groups and the control group. In the qualitative interviews, AEDOs consistently reported using the Household Approach, conducting gender mainstreaming trainings, and using visioning tools to promote equitable involvement in extension activities. The results here may be due to problems in instrument design, lack of resources in the field to conduct the listed programs, or the interview participants may have over-reported their activities. Further analysis and discussion are necessary to correctly identify the extent of this issue.

Table 4: Average treatment effect on the treated (ATT) for gender and HIV awareness, conditional on allocation of the Field Notebook

Gender-Responsive Extension Variables	Treatment Group		Control Group		Total (N)	Treatment Effect	
	Mean	Sample (n)	Mean	Sample (n)		Value	T-Stat
Engendered Participatory Rural Appraisal	0.820	89	0.775	44	133	0.045	0.440
Labor saving tech. for vulnerable groups	0.783	83	0.747	43	126	0.036	0.310
Used Household Approach	0.685	89	0.697	43	132	-0.011	0.100
Income generating groups	0.852	88	0.557	44	132	0.295**	2.230
Agricultural inputs distributed to vulnerable groups	0.519	79	0.544	44	123	-0.025	0.200
Labor group formation	0.597	77	0.584	41	118	0.013	0.110
Agribusiness clubs _ youth, HIV, gender	0.310	87	0.230	41	128	0.080	0.740
Livelihood diversity _ vulnerable groups	0.580	81	0.568	40	121	0.012	0.100
Livestock pass-on programs	0.865	89	0.843	44	133	0.022	0.230
Deliver HIV info with Health Extension staff	0.747	87	0.724	44	131	0.023	0.210
Limited control over land, income, and technology	0.913	92	0.446	48	140	0.467***	4.540
Easy access to markets	0.237	93	0.183	47	140	0.054	0.560
Equal participation in decision making about agricultural production	0.312	93	0.108	48	141	0.204***	2.570
Higher labor towards farm, home, and childcare	0.968	93	0.677	48	141	0.290***	3.010

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.



Agribusiness, Soil and Water, and Livestock

Use of the FNB in the two treatment groups improved knowledge, attitudes, and practices of participants

in the broad topic areas of the FNB reference annex.

Perceived levels of knowledge showed improvements

in agribusiness, soil and water, and small livestock management (Table 5). Results of the questionnaire are significantly different for frontline workers using the FNB compared to the control group for knowledge on the following topics:

1. Agribusiness: business planning with farmers; gross margin budgeting and analysis;
2. Soil and Water: land preparation; intercropping; organic matter and compost; agroforestry; good agricultural practices;
3. Livestock Management: building appropriate shelters for chickens and goats; uses of goats on a farm.

"We study it then we go teach our farmers what to do."

Treatment I interview participant

Mchinji District, Zulu EPA

Table 5: Changes in rate of knowledge, by Field Notebook allocation versus control

Proxy/Indicator Variables	Pre-Intervention Period							Post-Intervention Period						
	Treatment Groups			Control Group			Mean Difference	Treatment Groups			Control Group			Mean Difference
	Mean	SD	(n)	Mean	SD	(n)		Mean	SD	(n)	Mean	SD	(n)	
Business planning with farmers	0.196	0.399	102	0.109	0.315	46	0.087	0.275	0.449	109	0.128	0.337	47	0.148**
Gross margin analysis	0.308	0.464	107	0.277	0.452	47	0.032	0.449	0.500	107	0.271	0.449	48	0.178**
Break-even analysis	0.284	0.453	102	0.255	0.441	47	0.029	0.383	0.488	107	0.250	0.438	48	0.133
Cash flow budgeting	0.245	0.432	102	0.174	0.383	46	0.071	0.286	0.454	105	0.188	0.394	48	0.098
Keeping farm business records	0.559	0.499	102	0.489	0.505	47	0.069	0.589	0.494	107	0.500	0.505	48	0.089
Soil management	0.490	0.502	104	0.422	0.499	45	0.068	0.565	0.498	108	0.447	0.503	47	0.118
Land preparation	0.788	0.410	104	0.556	0.503	45	0.233***	0.785	0.413	107	0.362	0.486	47	0.423***
Intercropping	0.702	0.460	104	0.533	0.505	45	0.169**	0.787	0.411	108	0.426	0.500	47	0.362***
Organic matter and compost	0.750	0.435	104	0.533	0.505	45	0.217***	0.815	0.390	108	0.522	0.505	46	0.293***
Continued...														

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.

Table 5 (continued): Changes in rate of knowledge, by Field Notebook allocation versus control

Proxy/Indicator Variables	Pre-Intervention Period							Post-Intervention Period						
	Treatment Groups			Control Group			Mean Difference	Treatment Groups			Control Group			Mean Difference
	Mean	SD	(n)	Mean	SD	(n)		Mean	SD	(n)	Mean	SD	(n)	
...continued														
Agroforestry	0.606	0.491	104	0.422	0.499	45	0.184**	0.630	0.485	108	0.447	0.503	47	0.183**
Rainwater harvesting techniques	0.471	0.502	104	0.386	0.493	44	0.085	0.570	0.497	107	0.500	0.506	46	0.070
Good Agricultural Practices	0.705	0.458	105	0.489	0.506	45	0.216**	0.792	0.407	106	0.574	0.500	47	0.218***
Building appropriate shelters for chickens	0.414	0.495	99	0.225	0.423	40	0.189**	0.398	0.492	108	0.217	0.417	46	0.181**
Uses of goats on a farm	0.551	0.500	98	0.447	0.504	38	0.104	0.645	0.481	107	0.500	0.506	46	0.145*
Building appropriate goat shelters	0.510	0.502	98	0.225	0.423	40	0.285***	0.519	0.502	106	0.348	0.482	46	0.171*
Prevention and treatment of farm animals' diseases	0.235	0.426	98	0.158	0.370	38	0.077	0.243	0.431	107	0.174	0.383	46	0.069
Locally available feed ingredients and their combinations	0.255	0.438	98	0.211	0.413	38	0.045	0.259	0.440	108	0.178	0.387	45	0.081
Using animals to manage farmland	0.303	0.462	99	0.200	0.405	40	0.103	0.343	0.477	108	0.217	0.417	46	0.125
Fish pond preparation techniques	0.082	0.275	98	0.103	0.307	39	-0.021	0.111	0.316	108	0.156	0.367	45	-0.044

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.

Attitude changes are also evident in the questionnaire results. AEDOs reported improved confidence in teaching farmers. The results also show significant differences in several areas by the FNB treatment groups (Table 6). Interview participants explained that the FNB references assist them in areas where they have limited knowledge or lack training. One participant described their perspective:

"The field notebook is useful because it has got necessary notes on the back pages. If we go back to our courses at school, some of us we specialized in nutrition so there are so many topics to cover like livestock, maybe fisheries. We have got low knowledge on that but because of the field notebook we are able to read and refer to it. We study and then we go to teach our farmers what to do. So, what I can say is, it is like an all in one. It is like our references. It helps us in referencing and planning." [Treatment I interview participant, Mchinji District, Zulu EPA]

Table 6: Changes in skills (confidence in teaching), by Field Notebook allocation versus control

Proxy/Indicator Variables	Pre-Intervention Period							Post-Intervention Period						
	Treatment Groups			Control Group			Mean Difference	Treatment Groups			Control Group			Mean Difference
	Mean	SD	(n)	Mean	SD	(n)		Mean	SD	(n)	Mean	SD	(n)	
Gross margin analysis	0.366	0.484	101	0.255	0.441	47	0.111	0.411	0.494	107	0.292	0.459	48	0.120
Break-even analysis	0.297	0.459	101	0.239	0.431	46	0.058	0.364	0.484	107	0.250	0.438	48	0.114
Cash flow budgeting	0.270	0.446	100	0.191	0.398	47	0.079	0.290	0.456	107	0.191	0.398	47	0.098
Keeping farm business records	0.515	0.502	101	0.468	0.504	47	0.047	0.557	0.499	106	0.479	0.505	48	0.077
Soil management	0.553	0.500	103	0.409	0.497	44	0.144	0.596	0.493	109	0.404	0.496	47	0.192**
Land preparation	0.728	0.447	103	0.600	0.495	45	0.128	0.771	0.422	109	0.468	0.504	47	0.303***
Intercropping	0.748	0.437	103	0.556	0.503	45	0.192**	0.734	0.444	109	0.413	0.498	46	0.321***
Organic matter and compost	0.706	0.458	102	0.533	0.505	45	0.173**	0.771	0.422	109	0.457	0.504	46	0.314***
Agroforestry	0.618	0.488	102	0.356	0.484	45	0.262***	0.593	0.494	108	0.468	0.504	47	0.125
Rainwater harvesting techniques	0.485	0.502	103	0.444	0.503	45	0.041	0.537	0.501	108	0.435	0.501	46	0.102
Good Agricultural Practices	0.702	0.460	104	0.477	0.505	44	0.225***	0.761	0.428	109	0.574	0.500	47	0.187**
Building appropriate shelters for chickens	0.450	0.500	100	0.128	0.339	39	0.322***	0.355	0.481	107	0.217	0.417	46	0.138*
Uses of goats on a farm	0.515	0.502	97	0.410	0.498	39	0.105	0.486	0.502	107	0.348	0.482	46	0.138
Building appropriate goat shelters	0.411	0.494	107	0.179	0.389	39	0.232***	0.505	0.502	109	0.304	0.465	46	0.200**
Prevention and treatment of farm animals' diseases	0.293	0.457	99	0.053	0.226	38	0.240***	0.243	0.431	107	0.174	0.383	46	0.069
Locally available feed ingredients and their combinations	0.263	0.442	99	0.132	0.343	38	0.131	0.238	0.428	105	0.174	0.383	46	0.064
Using animals to manage farmland	0.278	0.451	97	0.194	0.401	36	0.084	0.321	0.469	106	0.217	0.417	46	0.103
Fish pond preparation techniques	0.093	0.291	108	0.063	0.245	48	0.030	0.385	0.489	109	0.417	0.498	48	-0.031
Where to get fingerlings/fish seed	0.101	0.303	99	0.053	0.226	38	0.048	0.106	0.309	104	0.044	0.208	45	0.061
Pond water quality	0.091	0.289	99	0.053	0.226	38	0.038	0.086	0.281	105	0.111	0.318	45	-0.025
Harvesting and selling fish	0.153	0.362	98	0.053	0.226	38	0.100	0.105	0.308	105	0.089	0.288	45	0.016

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

7. ANIMALS (LIVESTOCK & FISH)

Indigenous Chickens

Indigenous chickens are the most common form of poultry found in rural parts of Malawi. Indigenous chickens are an important source of income, animal protein, and can be used to fulfill cultural obligations. Performance of chickens is currently poor as a result of poor housing, poor disease control, poor feeding, and general lack of skills in management of the chickens.

► What kind of khola should I build for my chickens?

Kodi ndingamange khola lotani la nkhuu zanga?

- Provide decent housing to protect the chickens from rain, heat, cold, wind, thieves and predators.
- The chickens must be provided with perches for comfort.
- There are two types of chicken houses: the pigeon type and the deep litter system. The pigeon type is recommended because it keeps the floor clean as chicken manure falls to the ground instead of piling up inside the house. The pigeon type also allows for easy collection of manure.
- An adult chicken needs an average of 30cm X 30 cm floor space plus space for smaller birds.



► How do I feed my chickens?

Kodi nkhuu zanga ndizidzidzetsa motani?

- Indigenous chickens should be provided with clean water all times.
- Indigenous chickens need supplementary feed in order to grow faster and produce more meat and eggs.
- You can use ingredients such as: maize, madeya, soya bean and salt to make your supplement feed.

Figure 8: Excerpt from FNB Annex

Research Question 2

Does training on using the FNB improve KAP of frontline extension workers?

Results of the study indicate that training combined with use of the FNB have significant effects on AEDO knowledge, attitudes, and practices. There are significant differences for the Treatment I group in key planning areas: needs assessments, setting goals and objectives, identifying community resources, and creating monthly and annual work plans (Table 7). Additionally, significant effects were revealed for extension methodology practices used, including:

"Sometimes we do not have confidence to see the farmers because we do not have some knowledge. Previously we had fortnight's sessions where we gather together and share knowledge. But due to the economy, those issues are gone so we do lack some knowledge"

*-Control Group Interview Participant
Nsanje District*

"We have made discussions with farmers using this field notebook on types of kholas to build for chickens...farmers formed a group known as chitopa group to discuss on new castle disease."

*-Treatment II interview participant
Mangochi District*

AEDOs reported improved confidence and professionalism because of the training. Conversely, interview participants from the control group described having low-confidence to deliver extension services:

Table 7: Changes in KAP on program planning, by Field Notebook allocation versus control

Program Planning Variables	Pre-Intervention Period							Post-Intervention Period						
	Treatment I			Treatment II			Mean Difference	Treatment I			Treatment II			Mean Difference
	Mean	SD	(n)	Mean	SD	(n)		Mean	SD	(n)	Mean	SD	(n)	
Conducted needs assessment	0.811	0.395	53	0.978	0.149	45	-0.166***	1.000	0.194	54	0.827	0.382	52	0.173***
Developed program goals and objectives	0.800	0.404	50	0.878	0.331	41	-0.078	0.902	0.300	51	0.761	0.431	46	0.141*
Identified community resources	0.962	0.192	53	0.911	0.288	45	0.051	0.981	0.139	52	0.867	0.344	45	0.114**
Created monthly work plan	0.907	0.293	54	1.000	0.000	47	-0.093**	1.000	0.000	54	0.796	0.407	49	0.204***
Created annual work plan	0.769	0.469	52	0.755	0.585	53	0.015	0.833	0.376	54	0.837	0.373	49	-0.003
Identified activities for objectives	0.788	0.412	52	0.878	0.331	41	-0.090	0.920	0.274	50	0.833	0.377	42	0.087
Criteria for program success/failure	0.653	0.481	49	0.568	0.502	37	0.085	0.755	0.434	49	0.632	0.489	38	0.124
Collaborated with other extension staff	0.942	0.235	52	0.932	0.255	44	0.010	0.815	0.392	54	0.896	0.309	48	-0.081
Program and national priorities aligned	0.745	0.440	51	0.596	0.496	47	0.149	0.827	0.382	52	0.771	0.425	48	0.056
Program planning time well spent	0.963	0.191	54	0.863	0.348	51	0.100*	0.964	0.189	55	0.788	0.412	52	0.175***
Program planning helps solve local problems	0.906	0.295	53	0.961	0.196	51	-0.055	0.982	0.135	55	0.962	0.192	53	0.020
Program activities based on farmer needs	0.981	0.136	54	0.960	0.198	50	0.021	0.982	0.135	55	1.000	0.000	51	-0.018
Working with community leaders	0.964	0.189	55	0.907	0.293	54	0.056	0.964	0.189	55	0.907	0.293	54	0.056

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.

Table 8: Changes in KAP on extension methodologies, by Field Notebook allocation versus control

Program Planning Variables	Pre-Intervention Period							Post-Intervention Period						
	Treatment I			Treatment II			Mean Difference	Treatment I			Treatment II			Mean Difference
	Mean	SD	(n)	Mean	SD	(n)		Mean	SD	(n)	Mean	SD	(n)	
Groups and clubs	0.755	0.434	49	0.643	0.485	42	0.112	0.982	0.135	55	0.940	0.240	50	0.042
Demonstrations	0.000	0.000	55	0.019	0.136	54	-0.019	0.964	0.189	55	0.852	0.359	54	0.112**
Individual visits	0.981	0.136	54	0.918	0.277	49	0.063	0.944	0.231	54	0.833	0.376	54	0.111*
Farmer Field Schools	0.463	0.503	54	0.511	0.506	45	-0.048	0.549	0.503	51	0.462	0.503	52	0.087
Field days	0.945	0.229	55	0.963	0.191	54	-0.018	0.909	0.290	55	0.926	0.264	54	-0.017
Exchange visits, tours	0.673	0.474	55	0.682	0.471	44	-0.009	0.577	0.499	52	0.660	0.479	50	-0.083
Model Villages	0.849	0.361	53	0.915	0.282	47	-0.066	0.873	0.336	55	0.820	0.388	50	0.053
Farming clusters	0.926	0.264	54	0.939	0.242	49	-0.013	0.945	0.229	55	0.961	0.196	51	-0.015
Lead Farmers	0.923	0.269	52	1.000	0.000	51	-0.077**	0.964	0.189	55	0.774	0.423	53	0.190***
Agricultural shows	0.623	0.489	53	0.630	0.488	46	-0.008	0.480	0.505	50	0.521	0.505	48	-0.041
Mass media	0.593	0.496	54	0.761	0.431	46	-0.168*	0.360	0.485	50	0.630	0.488	46	-0.270***
Farmer Participatory Research	0.547	0.503	53	0.676	0.475	37	-0.129	0.612	0.492	49	0.523	0.505	44	0.090
Value Chain market development	0.380	0.490	50	0.306	0.467	36	0.074	0.333	0.477	45	0.289	0.460	38	0.044
FFS are participatory group-based approach	0.926	0.264	54	0.923	0.269	52	0.003	0.963	0.191	54	0.902	0.300	51	0.061
Demonstrations showcase crops or practices	0.943	0.233	53	0.962	0.194	52	-0.018	0.962	0.192	53	0.940	0.240	50	0.022
Extension workers need current info tech and markets	1.000	0.000	53	0.902	0.300	51	0.098**	1.000	0.000	54	0.673	0.474	52	0.327***

Note: Scored with yes=1, no=0; * significant at 10%, ** significant at 5%, ***significant at 1%.



Conclusions and Recommendations

Results of the field study indicate that the *2017 Agriculture Extension Field Notebook* and extension methodologies trainings are indeed effective means for increasing capacity of frontline extension workers. In all districts that received the FNB, AEDOs reported positive changes in program planning, record keeping, reporting, and message harmonization. Extension service delivery was also improved through developed capacity to coordinate, collaborate across the DAESS platforms, and conduct effective presentations; and demonstrated knowledge and confidence when organizing Lead Farmers and conducting meetings and trainings.

In particular, AEDOs' knowledge and understanding of the DAESS platforms improved after the extension methodologies training. Results showed this in all districts. For example, during group interviews, AEDOs were able to detail the process of forming Village Agriculture Committees. They described the utility of working "hand-in-hand" with VACs to develop annual work plans that address the needs of their local area.

In this case, improvement in the control group reinforces the impact of the extension methodologies training on developed professional capacity. SANE conducted workshops on the DAESS platforms in FY2017-18, but those workshops did not include training on the FNB as it was still in-process. Thus, reported improvements in coordinating the DAESS platforms across all districts may be a cumulative outcome of ongoing professional development or evidence of knowledge-sharing between frontline workers. However, improvements in program planning, activity monitoring, and record keeping are attributable to the FY2017-18 extension methodologies training-of-trainers, which covered these competencies specifically in relation to using the FNB.

The FNB was also shown to be a critical tool for planning and organizing coordination and collaboration efforts across the DAESS platforms. Frontline extension workers can follow the structure of the tool when planning activities and are prepared when they conduct meetings with farmers or groups. By tracking activities, AEDOs monitor program progress, success, or failure. This provides an important feedback loop that improves professional capacity and provides for continuity in service delivery because activities are documented in one resource over time.



Figure 9. FNB distribution, Mangochi District, July 2018

For example, AEDOs in some districts reported that before using the FNB, they wrote activities and notes on loose paper or did not monitor their work so there was no way to identify or repeat successes. Moreover, use of the FNB increased the variety of methods used by AEDOs to deliver extension services. Group-based teaching methods such as demonstrations and clubs are participatory in nature and provide opportunities for hands-on learning, thus attending to the needs of smallholders as adult learners and overcoming challenges related to low literacy (Swanepoel, Ofir, & Stroebel, 2014).



Additionally, SANE provided supplemental backstopping to a subset of participants in the Treatment 1 group (FNB + training) through the WhatsApp platform on group dynamics and transmitted manuals on conducting VAC meetings. This supplemental training and backstopping provided a cost-effective method to follow-up and support participants as they used the FNB to plan their Lead Farmer training and practice the methodological skills – group formation, demonstrations, conflict management – gained in the training. Backstopping through the platform enabled peer-to-peer learning on planning, monitoring, and reporting practices through sharing and discussion of platform posts. Moreover, AEDOs reported that the instant nature of the platform allowed group members to quickly provide remote support to improve extension practice.

There is also evidence that service delivery is improving due to updated knowledge and skills in coordinating the DAESS platforms. This benefits farmers as they are empowered to demand services and participate in the decision-making and problem-solving process. Improved coordination facilitates diffusion of extension messages across large EPAs. For example, AEDOs conveyed their ability to work through Group Agriculture Committees (GACs) to disseminate information and to coordinate the activities of VACs and Village Development Committees (VDCs) to meet a common goal. This, in turn, promotes adoption at both the household and village level furthering the mission of DAES to achieve food, nutrition, and income security.

Based on these conclusions, results suggest the following recommendations:

Provide Capacity Building Workshops in Extension Methodologies

The extension methodologies training provided by SANE developed professional competency in program planning, implementation, evaluation, communication, and establishing and managing DAESS platforms. The training, combined with the FNB, had significant effects on AEDO knowledge, attitudes, and practices. In this study, control group districts reported a reliance on outdated knowledge learned from certificate or diploma programs, and knowledge gaps in agribusiness, marketing, and nutrition led to inadequate message delivery. This lack of hands-on experience and consistent in-service training is a barrier to effective extension service-delivery (Landini, Brites, & Rebolé, 2017; Rivera, 2011). The most frequently reported benefit of attending the SANE training was improved professionalism. When frontline extension workers have the requisite knowledge and skills, their motivation to address community needs increases and service delivery is improved (Leeuwis & van den Ban, 2004). One participant reported:

“The training helped to understand and appreciate a lot of things. I am adjusting my behavior and attitude towards the communities where I am working. Simply, I am becoming an effective Extension Worker.”

-WhatsApp participant



Distribute Appropriate and Well-Tested Extension Tools

Extension materials and job aids are developed to guide extension professionals through specific actions to achieve competencies for working with rural farmers. The FNB is an effective tool for planning, tracking, and reporting extension programs. AEDOs who use the resource to guide their extension activities demonstrate changes in knowledge, attitudes, and practices in these areas. Moreover, frontline workers who adopt the FNB provide services through a larger variety of methodologies, thus increasing their professional capacity to meet farmer demands, target vulnerable groups, and improve rural livelihoods.

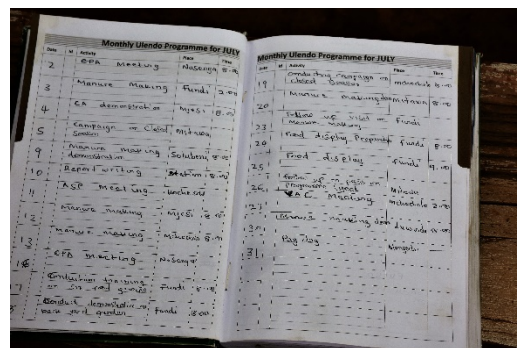


Figure 10. FNB Monthly Work Program

Group interview participants who received the FNB provided recommendations for future enhancements with the hope that DAES will continue to provide this necessary resource:

1. Need new Field Notebooks every year before the new agricultural calendar begins;
2. Keep updating technical information as solutions are found. Locally available solutions that are affordable to rural farmers are especially needed;
3. Include more coverage for crop pest and animal disease identification and remedies;
4. More planning pages for the Annual Work Plan and a column of the activity tracker to check what items have been accomplished;
5. More training for AEDOs in extension methodologies;
6. Implementation of new resources should follow the DAES chain of command so that junior officers are not responsible for instructing their supervisors on how to use extension materials.

Promote Innovative Platforms for Training, Learning, and Collaborating

The SANE project utilized the WhatsApp platform to provide support and technical backstopping after the extension methodologies training. Project facilitators posed questions to AEDOs through the platform to learn more about how they were using the FNB and conducting their Lead Farmer trainings. The project was able to identify and attend to training needs in gender-responsive programming through pictures and discussion. The platform provided an apparatus to challenge cultural norms and promote behavior change, such as seating women on the ground and men in chairs, which fosters inclusivity in extension services by promoting the practice of male and female equality.

Backstopping on the WhatsApp platform also provided the opportunity to discuss the strengths and weaknesses of ICT platforms in extension service delivery with frontline workers during group interviews. AEDOs favor electronic platforms like WhatsApp for camaraderie in the field, as a reminder for activities, and to collaborate with other extension professionals, including using the app to submit reports to AEDCs. Frontline workers described belonging to a variety of extension-related forums on WhatsApp because the platform provides a cost-effective way to receive instant information in the field. AEDOs reported its value for improving service delivery:



AEDOs often work in geographical isolation due to large coverage areas, high vacancy rates, and limited transportation. Therefore, adopting innovative and cost-effective avenues to provide support, technical information, and the opportunity for peer-to-peer learning is a necessary step for projects that aim to develop the professional capacity of extension staff.

"If a farmer asks you a question and you don't know the answer, instead of telling the farmer to come back to you, you can just pose your question to your friends on WhatsApp and they can give you the answer right there."

*-Control Group Interview Participant,
Blantyre District*

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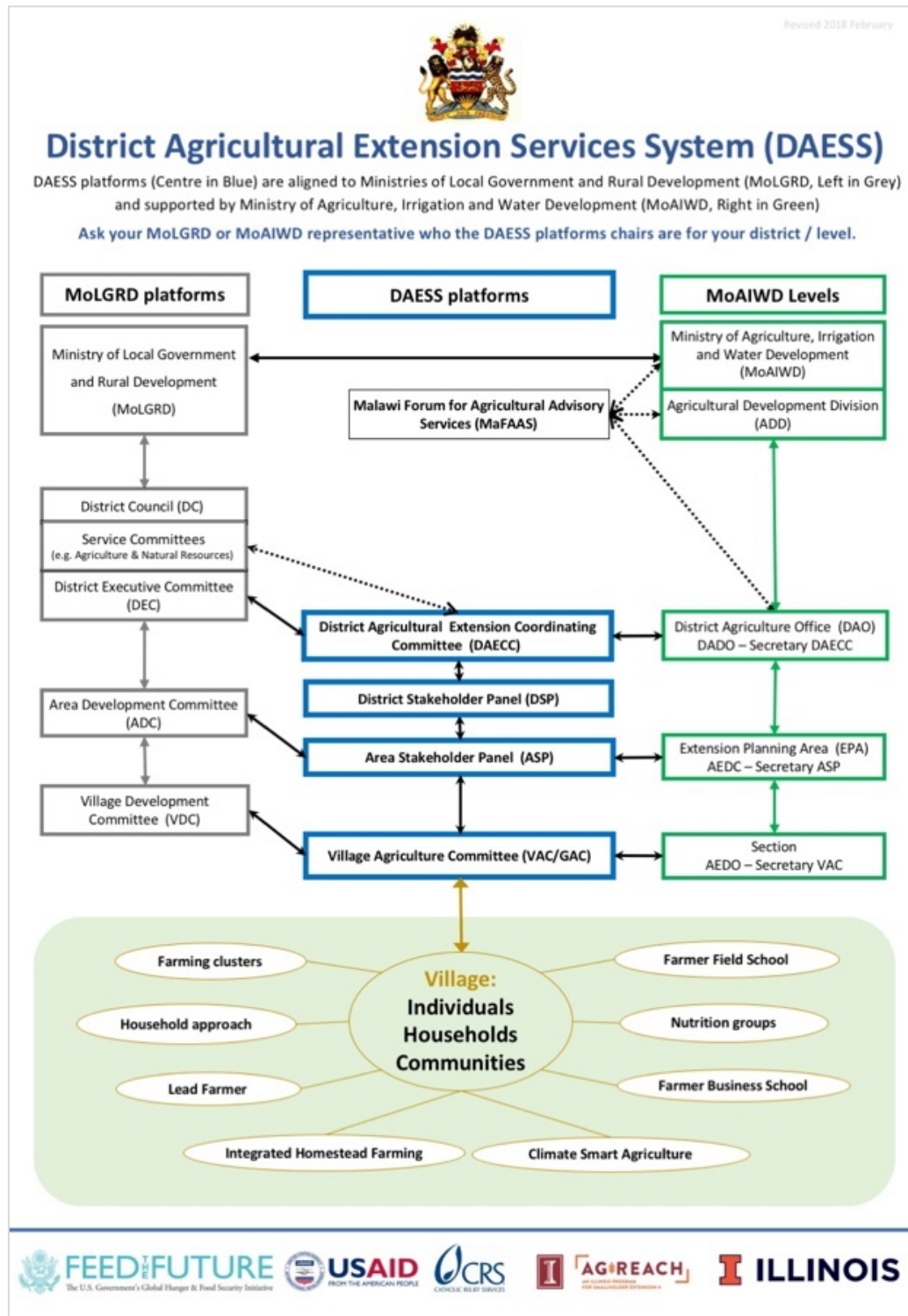
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Appendix I. DAESS Platforms





Appendix II. Activities

Activity	Date	Location		Participants
Extension Methodologies Workshop & Pre-Tests	January 9-12, 2018	Mponela Agriculture Conference Room		Mchinji field staff (25) 18 male 7 female
	March 12-16, 2018	Nkhande Residential Training Centre		Dedza field staff (10) 6 male 4 female
				Ntcheu field staff (14) 9 male 5 female
	May 6-10, 2018	Dedza Residential Training Center		Lilongwe field staff (26) 12 male 14 female
Key-informant Group Interviews & Post Tests	July 10, 2018	Lilongwe	Lilongwe RTC	8 male (16) 8 female
	July 12, 2018	Mchinji	Tembwe EPA	2 male (4) 2 female
			Mkanda EPA	2 male (3) 1 female
	July 13, 2018	Dedza	Dedza RTC	2 male (4) 2 female
	July 16, 2018	Nsanje	Nyandewere EPA	2 male (3) 1 female
	July 17, 2018	Chikwawa	Mitole EPA	2 male (4) 2 female
			Mbewe EPA	2 male (4) 2 female
	July 18, 2018	Blantyre	Lunzu RTC	2 male (4) 2 female
	July 19, 2018	Machinga	Mtubwi EPA	2 male (4) 2 female
	July 20, 2018	Mangochi	Mbwadzulu EPA	2 male (3) 1 female
			Nasenga EPA	2 male (7) 5 female
	July 23, 2018	Balaka	Bazale EPA	2 male (4) 2 female
Presentation of Preliminary Findings	July 27, 2018	Department of Agriculture Extension Services - Ministry of Agriculture, Lilongwe		DAES Reps (10) Radio Officer, SANE Admin & Specialists, SANE Researchers



Appendix III. Pre/Post Questionnaire

ID: _____

Dear Extension Professional,

We are going to ask you a few questions about training and competency in different areas. The purpose of these questions is to understand what kinds of experience extension workers have and how you are conducting your programs. The goal is to provide relevant training and support to extension workers and to improve extension programming. Therefore, please answer these questions to the best of your abilities. Please give your honest opinion on each question. Your responses should reflect your own feelings and beliefs about your extension work. Results of individual surveys will be shared with interested participants.

Program Planning: Program planning refers to the strategies or tools used to develop your extension program.

1. Have you ever received training on extension program planning and coordination? (check one)

☐ Yes ☐ No

If yes, please briefly answer the following questions about the previous training.

1a. Describe the content of the training.				
1b. What was the length of the training? (number of days, weeks, or months)				
1c. What year did you receive the training?				
1d. Who provided the training?				
1e. How useful was the training? (check one)	Very Useful <input type="checkbox"/>	Useful <input type="checkbox"/>	Not Useful <input type="checkbox"/>	Not Sure <input type="checkbox"/>

2. Have you ever used any of the following strategies or tools in program planning or coordination? (check one box for each row)

Strategy /Tool	Yes	No	Not Sure
Gathered information on specific needs of your farmers / stakeholders			



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Developed program goals and objectives			
Assessed available local /community resources			
Developed a monthly work plan			
Collaborated with stakeholders to design and implement a program			
Developed an annual plan of work			
Identified specific tasks and activities to achieve program objectives			
Established criteria for judging the success or failure of a program			
Worked with other extension professionals to develop activities			

3. Please circle the appropriate number to indicate the extent that you agree or disagree with the following statements about program planning. (circle one number for each statement)

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
I align program priorities at the local level with national priorities.	1	2	3	4	5
The time spent on program planning is time well spent.	1	2	3	4	5
Program planning can help solve local problems and develop local potential.	1	2	3	4	5
Program activities should be based on the learners' needs, interests, and problems.	1	2	3	4	5
It is important to work with community leaders to help build trust with the target audience.	1	2	3	4	5

Extension Methodologies: Extension methods are the means used to deliver content to clientele.

4. Have you ever received training on extension methodologies? (check one)

☐ Yes ☐ No

If yes, please briefly answer the following questions about the previous training.

4a. Describe the content of the training.	
---	--



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4b. What was the length of the training?	
4c. What year did you receive the training?	
4d. Who provided the training?	
4e. How useful was the training? (check one)	<div>Very Useful</div> <div><input type="checkbox"/></div> <div>Useful</div> <div><input type="checkbox"/></div> <div>Not Useful</div> <div><input type="checkbox"/></div> <div>Not Sure</div> <div><input type="checkbox"/></div>

5. Have you used any of the following extension methodologies? (check one box for each row)

Extension Method	Yes	No	Not Sure
Group methods (groups/clubs)			
Demonstrations			
Individual Visits			
Farmer Field Schools			
Field Days			
Exchange visits or tours			
Model Villages			
Farming Clusters			
Lead Farmers (farmer-to-farmer)			
Agricultural shows			
Mass Media (radio, ICT)			
Farmer Participatory Research			
Value Chain and Market Development Approach			

6. Please circle the appropriate number to indicate the extent that you agree or disagree with the following statements about extension methods. (circle one number for each statement)

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
--	-------------------	----------	---------------------------	-------	----------------



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Farmer field schools are a participatory group-based approach.	1	2	3	4	5
Demonstrations showcase crops or practices in a farmer's field or research station.	1	2	3	4	5
Extension professionals should have up-to-date information about technologies and market opportunities.	1	2	3	4	5
A communication strategy can be designed to change a negative attitude to support technology adoption.	1	2	3	4	5

Nutrition

7. Have you ever received training on nutrition? (check one)

☐ Yes ☐ No

If **yes**, please briefly answer the following questions about the previous training.

7a. Describe the content of the training.				
7b. What was the length of the training?				
7c. What year did you receive the training?				
7d. Who provided the training?				
7e. How useful was the training? (check one)	Very Useful <input type="checkbox"/>	Useful <input type="checkbox"/>	Not Useful <input type="checkbox"/>	Not Sure <input type="checkbox"/>

8. Have you ever used a seasonal food availability calendar? (check one)

☐ Yes ☐ No

If yes, please briefly describe the ways you have used a food availability calendar.

--



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9. Please circle the appropriate number to indicate the extent that you agree or disagree with the following statements about gaps in food availability. (circle one number for each statement)

Gaps in food availability can be filled by:	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
Diversifying agricultural production	1	2	3	4	5
Starting a home garden and orchards	1	2	3	4	5
Irrigation	1	2	3	4	5
Preservation methods such as drying	1	2	3	4	5
Using high quality seeds	1	2	3	4	5

10. Please circle the appropriate number to indicate the extent that you agree or disagree with the following statements about nutrition-related practices.

Nutrition-related attitudes	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
It is important to follow the Malawian Food Based Dietary Guideline	1	2	3	4	5
It is good to grow a variety of crops	1	2	3	4	5
Food processing can contribute to improved income	1	2	3	4	5
Agricultural activities can reduce the amount of time available for meal preparation	1	2	3	4	5

11. Please circle the picture that shows a balanced meal.

A

B



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12. How many food groups are included in the Malawian Food Based Dietary Guideline?

- ☐ 3
- ☐ 6
- ☐ 9
- ☐ Not Sure

12 a) Please name the food groups that you know.

12 b) Please list two examples of foods from each food group listed above.

Gender and HIV Mainstreaming in Agriculture

13. Have you had any training on gender, HIV, and AIDS issues in agricultural development?

(check one)

- ☐ Yes ☐ No

If **yes**, please briefly answer the following questions about the previous training.

13a. Describe the content of the training.	
--	--



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13b. What was the length of the training?	
13c. What year did you receive the training?	
13d. Who provided the training?	
13e. How useful was the training? (check one)	Very Useful Useful Not Useful Not Sure <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

14. Please circle the appropriate number to indicate the extent that you agree or disagree with the following statements about the experiences of women in the agricultural sector.

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
In agriculture, women experience					
Limited access to, ownership, and control over land, income, and technology resources	1	2	3	4	5
Easy access to markets	1	2	3	4	5
Equal participation in decision making about agricultural production	1	2	3	4	5
Higher labor responsibilities for farm work, household chores (fetching water), cooking, and taking care of children	1	2	3	4	5

15. Have you used any of the following extension approaches to mainstream gender and/or HIV into your extension work. (check one box for each)

Extension Practice used:	Yes	No	Not Sure
Engendered Participatory Rural Appraisals (PRAs)			
Introduced labor saving technologies and practices for vulnerable groups			
Conducted Household Approach			
Organized farmers into small income generating activity groups			
Held agricultural input distribution and fairs for vulnerable groups			



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Organized farmers into labor groups			
Formed youth agribusiness clubs for gender and HIV			
Promoted small and medium agribusiness enterprises to diversify farmer livelihoods for vulnerable groups			
Organized farmers into livestock pass on programs			
Linked with health extension or community health workers to provide HIV information to farmers			

Agribusiness Management

16. Have you had any training in business planning with farmers? (check one)

☐ Yes ☐ No

If **yes**, please briefly answer the following questions about the previous training.

16a. Describe the content of the training.				
16b. What was the length of the training?				
16c. What year did you receive the training?				
16d. Who provided the training?				
16e. How useful was the training? (check one)	Very Useful <input type="checkbox"/>	Useful <input type="checkbox"/>	Not Useful <input type="checkbox"/>	Not Sure <input type="checkbox"/>

17. Please circle the appropriate number to indicate your level of knowledge about the following topics.

How do you rate your knowledge about:	Very Low	Low	Moderate	High	Very High
Business planning with farmers	1	2	3	4	5
Gross Margin Budgeting/Analysis	1	2	3	4	5
Break-even budgeting / Analysis	1	2	3	4	5
Cash Flow Budgeting	1	2	3	4	5



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Keeping farm business records	1	2	3	4	5
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18. How would you describe your confidence in teaching the following agribusiness topics to farmers? (circle one for each box)

	Very Low	Low	Moderate	High	Very High
Gross Margin Budgeting/Analysis	1	2	3	4	5
Break-even budgeting / Analysis	1	2	3	4	5
Cash Flow Budgeting	1	2	3	4	5
Keeping farm business records	1	2	3	4	5

Soil & Water

19. Have you had any training in agricultural production? (check one)

☐ Yes ☐ No

If yes, please briefly answer the following questions about the previous training.

19a. Describe the content of the training.	
19b. What was the length of the training?	
19c. What year did you receive the training?	
19d. Who provided the training?	
19e. How useful was the training? (check one)	Very Useful <input type="checkbox"/> Useful <input type="checkbox"/> Not Useful <input type="checkbox"/> Not Sure <input type="checkbox"/>

20. Please circle the appropriate number to indicate your level of knowledge about the following topics.



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How do you rate your knowledge about:	Very Low	Low	Moderate	High	Very High
Soil management	1	2	3	4	5
Land preparation	1	2	3	4	5
Intercropping	1	2	3	4	5
Organic matter and compost	1	2	3	4	5
Agroforestry	1	2	3	4	5
Rain water harvesting techniques	1	2	3	4	5
Good Agricultural Practice	1	2	3	4	5

21. How would you describe your confidence in teaching the following topics to farmers?
(circle one for each box)

Confidence teaching:	Very Low	Low	Moderate	High	Very High
Soil management	1	2	3	4	5
Land preparation	1	2	3	4	5
Intercropping	1	2	3	4	5
Organic matter and compost	1	2	3	4	5
Agroforestry	1	2	3	4	5
Rain water harvesting techniques	1	2	3	4	5
Good Agricultural Practice	1	2	3	4	5

Livestock & Fish

22. Have you ever received training on animal husbandry (livestock or fish farming)?
(check one)

☐ Yes ☐ No

If yes, please briefly answer the following questions about the previous training.

22a. Describe the content of the training and for what animals.	
22b. What was the length of the training?	



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22c. What year did you receive the training?	
22d. Who provided the training?	
22e. How useful was the training? (check one)	Very Useful Useful Not Useful Not Sure <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

23. Please circle the appropriate number to indicate your level of knowledge about the following topics.

How do you rate your knowledge about:	Very Low	Low	Moderate	High	Very High
Building appropriate housing for chickens	1	2	3	4	5
Uses for goats on a farm	1	2	3	4	5
Building appropriate housing for goats	1	2	3	4	5
Prevention and treatment of diseases in farm animals	1	2	3	4	5
Locally available feed ingredients and their combinations	1	2	3	4	5
Use of animals to manage farm land	1	2	3	4	5
Fish pond preparation techniques	1	2	3	4	5
Where to get fish fry or fingerlings (fish seed)	1	2	3	4	5
Pond water quality	1	2	3	4	5
Harvesting and selling fish	1	2	3	4	5

24. How would you describe your confidence in teaching the following topics to farmers?
(circle one for each box)

How do you rate your confidence teaching:	Very Low	Low	Moderate	High	Very High
Building appropriate housing for chickens	1	2	3	4	5
Uses for goats on a farm	1	2	3	4	5
Building appropriate housing for goats	1	2	3	4	5
Prevention and treatment of diseases in farm animals	1	2	3	4	5



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Locally available feed ingredients and their combinations	1	2	3	4	5
Use of animals to manage farm land	1	2	3	4	5
Fish pond preparation techniques	1	2	3	4	5
Where to get fish fry or fingerlings (fish seed)	1	2	3	4	5
Pond water quality	1	2	3	4	5
Harvesting and selling fish	1	2	3	4	5

25). Have you provided extension services on any of the following topics? (check one for each)

Extension Service Provided:	Yes	No	Not Sure
Building appropriate housing for chickens			
Uses for goats on a farm			
Building appropriate housing for goats			
Prevention and treatment of diseases in farm animals			
Locally available feed ingredients and their combinations			
Use of animals to manage farm land			
Fish pond preparation techniques			

Demographics and Background Information

1. Location of work

--

2. Position (check one)

- ☐ Field staff AEDO
- ☐ Field Assistant
- ☐ AEDC

3. Years of experience in extension

_____ years

4. How long have you been in your current position?

_____ (years)



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5. What is your program area / specialization

--

6. Highest level of education (check one)

- ☐ Certificate
- ☐ Diploma
- ☐ Degree

7. Sex

- ☐ Male
- ☐ Female

8. Year of birth

--	--	--	--

9. Were you part of the SANE extension methodologies WhatsApp group? (check one)

- ☐ Yes
- ☐ No

If yes, please write the WhatsApp number you used to participate.

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Zikomo!



Appendix IV. Semi-Structured Group Interview Guide

Semi-Structured Group Interview Guide

First, let's find out more about each other by introducing ourselves. Please tell us your name and your extension planning area.

Program Planning

1. How are you using the field notebook in your extension work?
 - Will you share an example of programs you've developed using the field notebook? Please describe
2. Think back to before you had the field notebook.
 - How did you plan your activities? Are there any differences before and after receiving the field notebook? Please describe
3. Will you describe how you plan your extension programs and develop the activities?
 - What sort of strategies or tools do you use for planning and delivering programs?
 - o Example: needs assessment
4. How do you monitor or track the progress of your programs?
 - What sort of methods or strategies do you use?
5. How do you report on your activities?
 - Are there any differences in how you prepare your reports now that you have the field notebook? Please describe
6. How do you communicate with your supervisor about your activities?
 - Do you use the field notebook to communicate with your supervisor?
7. Did you participate in the WhatsApp group?
 - How did you like the backstopping group? Was it helpful for your extension work?
 - Think about how you plan your programs. Is there a difference after participating in the WhatsApp group?

Extension Methodologies

1. What types of agricultural extension services do you provide?
 - What topics do you cover? What specific things do you do?
 - o Example: trainings, field days, livestock vaccinations
2. How do you deliver extension messages to farmers?
 - Can you describe what types of farmers you interact with most?
 - Do you reach out to male and female farmers in different ways?
 - o Please explain.
3. How do you target vulnerable groups to participate in extension programs?
 - o Can you describe the vulnerable groups you work with? (PLHIV, young, elderly, disabled)
4. Think about how you were reaching out to farmers before you had the field notebook.
 - Has the field notebook influenced the way you reach out to farmers?
 - o In what ways? Describe the difference.
5. How do you identify a need in your community?
 - What are the challenges to changing attitudes or behaviors around identified needs?
 - How do you address those challenges in your extension work?
6. What would you do if a farmer came to you with a problem you couldn't solve?
 - How do you collaborate with other extension providers to meet farmer needs?
 - Did the extension methodologies training influence how you collaborate with other providers? Explain



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7. Do you think the extension methodologies training influenced your ability to use the field notebook? Explain
8. What aspect of the training gave the greatest benefit?
9. Describe something you learned at the training that you are already using in your extension practices.

Nutrition, Gender, & HIV Mainstreaming

1. Do you provide any nutrition-related services to farmers?
 - What topics do you cover?
 - What types of nutrition-related services do you provide?
 - Who attends nutrition programs?
2. Think about the area where you work.
 - Are there hungry seasons in your area?
 - When and how severe are they?
 - How and where do people get food during the hungry season?
3. What approaches do you use to help increase the supply of diverse foods year-round?
 - What can extension do to reduce the hungry season?
4. Do you work with the whole household in your extension activities?
 - o Provide an example of your approach
5. Who is responsible for decision-making about agricultural production and food distribution within the households where you work?
 - How do you address these constraints in your extension programs? Strategies used?
6. When planning extension programs, how do you address women's time-demands, decision-making power, and income?
 - Are there ways that you account for child care needs when working with female farmers?
7. What are the challenges to changing attitudes and behaviors around production or diet diversity?
 - How do you address those challenges?
 - Is the field notebook a useful tool for helping farmers plan for year-round crop production? Tell me more...
8. Think about your extension programs or practices before you took the extension methodologies training.
 - Are there any differences in the ways you work with farmers on nutrition-related issues since you participated in the training?
 - o Please describe.
 - o Example: cooking demonstrations, taste tests, preservation & storage
 - How helpful was the extension methodologies training in terms of planning nutrition-related services?

Conclusion

1. Are there any challenges to using the field notebook?
2. Is there one thing you would change or add to the field notebook that would make it better for you to use?