Africa RISING

Africa Research in Sustainable Intensification for the Next Generation

AFRICA RESEARCH IN SUSTAINABLE INTENSIFICATION FOR THE NEXT GENERATION (AFRICA RISING)

USAID'S SUSTAINABLE INTENSIFICATION IN AFRICA

MONITORING AND EVALUATION REPORT

(October 2013 – September 2014)

APRIL 2015

IFPRI 40 YEARS

HarvestChoice
BETTER CHOICES, BETTER LIVES

CGIAR

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

USAID
FROM THE AMERICAN PEOPLE

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three regional projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads the program's monitoring, evaluation and impact assessment. http://africa-rising.net/

This document is licensed for use under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License

Table of Content

List of Tables

List of Figures

Acknowledgments

This report was prepared by the HarvestChoice team at IFPRI (Environment and Production Technology Division). The report was prepared under the guidance of Carlo Azzarri (team leader) and Beliyou Haile (global M&E coordinator). Other authors who contributed to various chapters include Cleo Roberts (IFPRI), Melanie Bacou (IFPRI), Maria Comanescu (IFPRI), Patrice Howard (Independent consultant), Cecilia Tinonin (Independent consultant), and Ainsley Charles (Independent consultant). The report also benefited from valuable comments by Irmgard Hoeschle-Zeledon (IITA), Mateete Bekunda (IITA), Peter Thorne (ILRI), and Asamoah Larbi (IITA). Ivy Romero (IFPRI) provided excellent assistance in various aspects of the planning, management and administration of the M&E project.

1. Introduction

Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) is a research-for-development program designed to pilot potential interventions for sustainable intensification of mixed crop-tree-livestock systems and provide data and information that will lead to the better design of development projects. The program comprises three linked projects covering West Africa (Ghana and Mali), East and Southern Africa (Malawi, Tanzania and Zambia) and Ethiopian Highlands).[1] HarvestChoice team at the International Food Policy Research Institute (IFPRI) leads an associated project on monitoring and evaluation (M&E) while Wageningen University leads farming systems modeling efforts. HarvestChoice team has acquired work experience over the past four years in developing data and analysis systems to support investment decision targeted to enhancing agricultural productivity and increased value-chain participation by smallholder farmers in Sub-Saharan Africa.

The primary hypothesis of the Africa RISING Program is that sustainable intensification of mixed crop-tree-livestock systems leads to increased whole farm productivity, which in turn leads to development outcomes (improved welfare) such as improved livelihoods (income, assets, capacity etc.) and better food and nutrition security for those who depend on these systems. It is further hypothesized that a combination of relevant interventions is more likely to increase whole farm productivity than single interventions.

Africa RISING researchers are testing these hypotheses by implementing baskets of interventions in selected communities.[2] Within a community, interventions will be 'offered' to volunteers, with the type of interventions and delivery methods expected to vary across time, space, and local context. Interventions will also vary based on the farm/household typology that will classify farm households 'sufficiently similar' in relation to expected effects of the Program. Farming systems analysis and modelling will be used to help identify and target appropriate interventions across different farm types and to perform ex-ante impact analysis. Crop modeling analysis can also be applied.

This report summarizes M&E-related activities undertaken in fiscal year 2014 and discusses M&E activities planned for the fiscal year 2015. The rest of the report is organized as follows. Section 2 provides a brief overview of Africa RISING M&E goals and objectives. Section 3 summarizes M&E activities undertaken in Fiscal Year 2014. Section 4 outlines M&E activities planned for Fiscal Year 2015. Section 5 concludes the report.

---

[1] The three projects are the cereal-based farming systems in the guinea savannah zone of west Africa covering northern Ghana and southern Mali– led by the International Institute of Tropical Agriculture (IITA), cereal-based farming systems in East and Southern Africa covering Tanzania, Malawi, and Zambia – led by IITA and the crop-livestock systems to improve food security and farm income diversification in the Ethiopian highlands – led by International Livestock Research Institute (ILRI).

[2] Please note that the definition of a community varies between countries, depending on the local administrative and geographical arrangements.

2. M&E goals and objectives

Monitoring and evaluation of programs likes Africa RISING is crucial to support effective project management, provide data for timely reporting to project funders, and help all stakeholders to learn about program successes and failures. A robust M&E system that provides learning opportunities on what has worked and what has not will in turn inform the design and implementation of new interventions, as well as catalyze adjustments to ongoing activities that might enhance efficiency and effectiveness.

2.1 Monitoring

As the M&E component of USAID's FTF sustainable intensification flagship investment in Africa, Africa RISING is committed to achieving a number of specific goals in terms of its deliverables and approach.

- **FTF compliance:** Africa RISING M&E will conform to the overarching M&E standards, best practices, and core indicators established for the FTF initiative.[3]
- **Open-access platform:** Africa RISING M&E activities will deliver and maintain an open-access, M&E data management and analysis platform to serve the needs of research scientist and other stakeholders. Open data access is mandated by both US Government regulations and the CGIAR Consortium.
- **Scaling up and out of potential outcomes and impacts**: To inform planning and longer-term projections of potential innovation impact at scales beyond the actual action research sites, forward-looking analysis will explore the productivity and sustainability consequences of a range of adoption scenarios and geographic/system spillover pathways across broader landscapes and regions.
- **Multi-scale reporting:** To meet different stakeholders' needs, and to provide the capability to support multi-scale monitoring and evaluation, the Africa RISING M&E platform will be designed to report at several scales and levels of aggregation:

2.2 Evaluation

Programs like Africa RISING provide great opportunities to learn about what works and what does not, along with the 'why' and 'how' of it. Information collected as part of the program can support various types of evaluation, especially if evaluation designs are carefully considered at the outset of the program. USAID's evaluation policy also specifies an independent (and rigorous) evaluation, with the recognition that much valuable learning can also be achieved through evaluations carried out by program implementers. Discussions have been ongoing on the kind of credible evaluation that can be devised

[3] http://www.feedthefuture.gov/sites/default/files/resource/files/ftf_monitoringevalfaqs_feb2012.pdf

within Africa RISING and the requirements for impact assessment, given the scale and type of research activities and available resources.

Previous studies that attempted to quantify the impact of systems-based technologies find evidence of positive impacts and highlight the difficulties involved in accurately measuring the underlying agronomic and socioeconomic determinants of adoption of these technologies and subsequent effects (see Bennett and Franzel (2013) on conservation agriculture, Erenstein (2010) on minimum tillage systems, Kato et al. (2011) on integrated soil fertility management, Barrett et al. (2002) on system of rice intensification, and Franzel and Scherr (2002) on agroforestry for example). Most do a decent job in measuring the technology and parsing out its marginal effects on productivity and welfare, although their results still attract criticism and controversy (e.g., Sumberg and Thompson, 2012). Still such studies are relatively rare, indicating that empirical evidence remains in short supply on topics such as farm-level costs and benefits, determinants of adoption within heterogeneous populations, and adoption dynamics. There is also limited evidence on the role of wealth, education, market access, information asymmetries, and individual preferences on farmers' willingness to adopt. The resources and the considerable effort that went into the planning and implementation of ARBES surveys is in an attempt to provide the strongest empirical evidence possible, given all the constraints and challenges faced.

To test the hypothesis that Africa RISING interventions lead to improved whole farm productivity and development outcomes, one would need to answer the counterfactual question of "how would farm productivity and development outcomes have fared for farmers who are offered (and accepted) the intervention(s) in the absence of the intervention(s)?". Since it is impossible to know the answer to this question, one needs to establish a credible group of farmers who would have had characteristics (farm productivity, welfare, etc.) similar to those who were exposed to the intervention(s) but who were not treated by the intervention(s). The specific approach to be pursued for testing the above hypothesis will be guided by the scale, nature, and timing of (planned) interventions by individual research teams, especially since site- and context-specificity and own-adaptation by beneficiaries are integral parts of the Program. While randomized control trials (RCTs) are becoming the standard way by which the impacts of a new technology can be assessed, RCTs are not applicable in the context of Africa RISING, except in some specific cases limited to the delivery mechanisms, rather than the type of intervention *per se*. The M&E team is aware that:

- Beneficiary households[4] are not selected at random but volunteers (therefore, self-selected) or selected purposively by the researchers,

[4] *Beneficiary households* are households in the target communities to which Africa RISING interventions are directly applied.

- Interventions are not unique, but multiple integrated technologies are being tested, which additionally vary from community to community and even from household to household,
- Attribution of impact to specific actors or actions is not possible given the multiplicity of actors and partnerships as well as on-going interventions.

To accurately estimate the extent to which changes in outputs and outcomes of interest, if any, can be attributed to Africa RISING research activities, the M&E team has been highlighting the need for designing and implementing an evaluation strategy that ensures robust measurement of these economic phenomena. A carefully designed impact evaluation is also necessary for well-informed decisions about program scaling up. Unlike project monitoring, which examines and tracks whether targets have been achieved, impact assessment examines how outcomes of Africa RISING beneficiaries have changed as a direct (and, if modelled explicitly, indirect) effect of the Program. It seeks to provide cause-and-effect evidence and quantifies changes in (development) outcomes that are *directly or indirectly attributable* to Africa RISING, and not to other confounding factors. When there is a non-random selection of target communities and households, various non-experimental designs could be explored to construct a plausible counterfactual group. For example, if selection determinants are known (or believed to be observable), then various regression-based approaches (e.g., matching) can be employed to construct an acceptable comparison group and mitigate selection bias. If selection determinants are (believed to be) unobserved but are thought to be time invariant, panel data approaches (including simple differences-in-differences) can be employed. When none of the above is possible, the problem of selection bias cannot be addressed and any "impact evaluation" effort will have to rely heavily on the program theory. Qualitative and participatory approaches would therefore build an argument towards plausible association (but not causality). These different approaches are of course not mutually exclusive. It should also be noted that the internal validity of the causal evidence will depend on the quality of the match between target and comparison groups, while the external validity of the results will depend on the representativeness of the sample from which the evidence is drawn.[5]

Irrespective of the specific evaluation design, however, target households and communities need to be selected[6] to be statistically representative of households and communities within the IFPRI-delineated 'development domains.'[7] Representativeness is necessary (but not sufficient) to ensure external validity of results and assist in informed decision making on scaling up.[8] In addition, an intervention would need

[5] Internal validity refers to the accuracy of the evidence, while external validity refers to the generalizability of the evidence to the population from which the sample is drawn or to another "similar" sample or population.

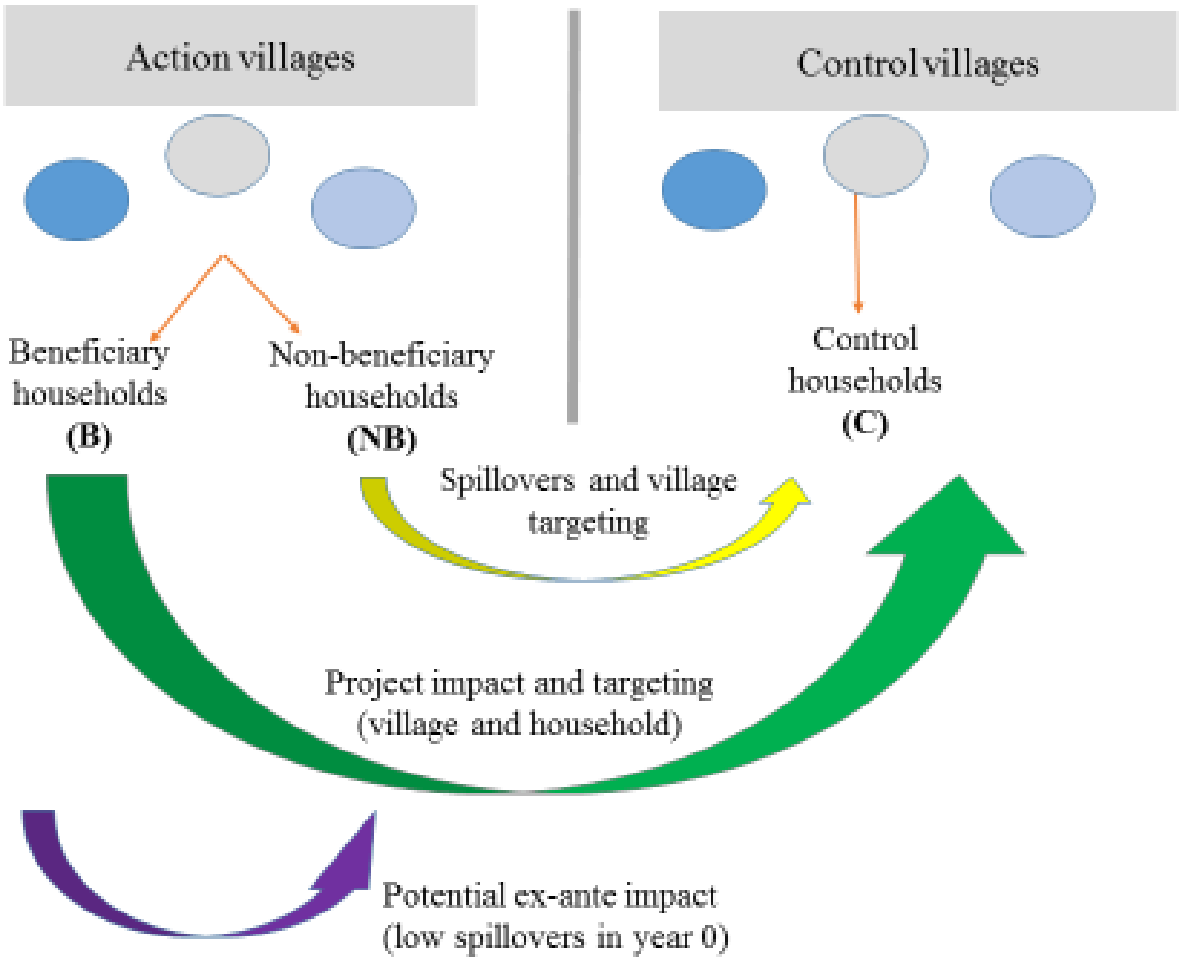
[6] Selection criteria need to be documented and shared with the M&E team to help inform selection of 'comparable' control communities and households.

[7] The 'development domain' refers to the original IFPRI designation from the site selection process, which takes into account locally relevant market, biophysical, and demographic indicators, and is therefore defined in a country-specific context.

[8] External validity refers to the generalizability of results about impact of the intervention(s) on farm productive and development outcomes to other settings.

to be offered to 'enough' number of farmers to precisely estimates its effect.[9] In the absence of a credible and well-thought evaluation approach as well as target households and communities that are not representative of the population they are drawn from, estimates of the effect of interventions on whole farm productivity and development outcomes will be inaccurate and imprecise and, therefore, cannot be extrapolated. Given these evaluation challenges, the M&E team employed a quasi-RCT designed summarized by Figure 2.1.

Figure 2.1 Evaluation design for Africa RISING program



While some elements of the evaluation design may vary across program countries, the general evaluation design involves the following main steps:

[9] If multiple interventions are being offered in a focus country and in a given period of time but no single intervention is offered to 'enough' number of farmers, evaluation efforts will have to focus on assessing the 'overall effect of Africa RISING' in the focus country, rather than the effect of the single intervention.

1. Stratification of geographic areas and creation of development domains based on agro-ecological potential.
2. Selection of action sites from the development domains, in collaboration Africa RISING researchers.
3. Identification of control sites that are in the same development domain as selected action communities but are reasonably far apart to mitigate potential contamination.
4. Listing exercise to compile the list of all agricultural households in the selected (action and control) communities.
5. Random sampling of households in control sites (control households) to serve as a valid counterfactual to program beneficiary households.
6. Purging of beneficiary households from the household list for action communities to develop a sampling frame that *excludes* program beneficiary households.
7. Random sampling of non-beneficiary households from action communities using the sampling frame constructed in (6). Data from non-beneficiary households will then be used to examine potential spillover effects, as shown in Figure 2.1.[10]
8. Gather socioeconomic baseline (already collected) and follow-up (to be collected) data from program beneficiary, control, and non-beneficiary households as well as communities.
9. Using baseline and follow-up data, compare various agro-economic and environmental outcomes of interest among beneficiaries, non-beneficiaries, and control households. This will be done through regression analysis (e.g., matching).

While measuring potential indirect effects of the Program and understanding of transmission mechanisms certainly provide insights on how the Program operates, careful thought should be given to data requirements for correctly measuring spillovers within the context of the Program.[11] If the purpose of data collection from current non-beneficiary households in action sites is to measure spillover effect from research activities, then one also needs to think through how current non-intervention fare during scaling-out of research activities. Specifically, whether the distinction between intervention and non-intervention households within current target communities will prevail over the time-horizon of the Program depends on the nature and timing of planned research activities.

[10] In this report, spillovers refer to a situation where farmers not eligible to receive AR intervention, or who are eligible to receive the intervention but have not received it, benefit from the intervention indirectly through a variety of ways – such as externalities (e.g., when channeled by successful AR farmers), general equilibrium effects (e.g., depressed maize price through increased maize production due to AR interventions), social and economic interactions (e.g., neighbors and relatives interacting with and learning from a successful AR farmer), and behavioral changes.

[11] Manuela Angelucci and Vincenzo Di Maro. 2010. Program Evaluation and Spillover Effects. IDB Impact-Evaluation Guidelines Technical Notes, no. IDB-TN-136 (available here).

3. M&E Activities in Fiscal Year 2014

3.1 Adaptation of household and community survey tools

The team adapted and customized household and community survey tools implemented in Malawi during 2013 for implementation in Tanzania, Ghana, Mali, and Ethiopia during 2014. These surveys (known as Africa RISING Baseline Evaluation Surveys - ARBES) were conducted to aid with household characterization (Research output 1), better target research activities, and generate data for ex ante and ex post evaluation (Research output 4). The adaptation of the survey tools was based on: (1) feedback received from AR researchers during survey design meetings held with researchers in each country, (2) feedback received from enumerators and supervisors during survey personnel trainings, and (3) feedback obtained during piloting and pre-testing of the survey tools in the respective countries. These tools were developed to gather baseline data and capture the characteristics of both beneficiary and control households and communities. To assess sustainable intensification trajectories for different household typologies as they occur, and to inform the development of scaling up and out strategies, the tools included several modules to gather data on household composition, crops grown at the plot level, livestock systems, farm and crop management practices, input use, and key livelihood strategies employed, among other topics. These are crucial pieces of information to evaluate sustainable intensification trajectories and examine changes in farm practices as well as better characterize farm households and systems targeted by the program. The exhibits below summarize the broad areas covered by ARBES survey tools (with some adaptations made for each focus country).

Table 3.1 Summary of contents of ARBES tool (household)

Module	Objective: To gather data on…
Household members	educational attainment, marital status, and primary/secondary occupation of household member
Labor	employment, earnings, unemployment, and seasonality in employment
Health	visited health facilities, on how much was spent on any illnesses/injuries
Agricultural land	land ownership, land and soil characteristics, and water sources (at parcel-level)
Crop inputs (conservation)	farming and soil conservation practices. Data will be collected at a parcel-plot level.
Crop inputs (cost)	seeds, pesticides, fertilizer, and non-labor expenses the household used. Data will be collected at a parcel-plot level
Crop inputs (labor)	labor input on crops grown on each plot during the rainy and dry seasons. Data will be collected on how many person-days were used for different activities for each crop grown on a plot. Person days are calculated as the number of workers times the number of days they worked
Crop inputs (seed)	seed use
Crop production	different crops grown on each plot and the different varieties of the crops.
Crop sale	sales of harvest
Crop storage	storage methods used by households and how effective the methods are/have been. Questions will be asked about all the crops the household grew in the previous cropping season.
Livestock ownership	livestock types (disaggregated by local and improved) owned by the household at the time of data collection and during the preceding 12 months.
Livestock feed and drinking water	sources of food and drinking water for different livestock categories
Challenges	agriculture-related problems faced by the household and coping strategies
Extension and AR	household's interaction with agricultural extension agents and participation in Africa RISING
Other income	non-agricultural income activities that the household has used to acquire/increase the household income in the past 12 months
Credit	household access to and use of credit
Housing	facilities the household has inside the home
Welfare & Food security	household food security and seasonality in terms of access food (at household level and selected demographic groups)
Food consumption	household food expenditure on food, including cereals, starches from roots, sugar, pulse, nuts and seeds, vegetables, fruits, meat, meat products, and fish, milk and milk products, oil and fats, spices and other foods, beverages, and wild fruits, vegetables and meat products
Non-food expenditure	non-food expenditures. Data on food and non-food expenditure will be used to construct a measure of poverty
Shocks	various types of shocks the household mighty have experienced over the past five years and coping strategies
Women anthropometry	nutritional outcomes of women 15-49 years
Child anthropometry	nutritional outcomes of children 0-59 months old

Table 3.2 Summary of contents of ARBES tool (community)

Module	Objective: To gather community-level data on…
Basic services	access to basic services
Extension	agricultural labor, extension services, and agricultural problems
Land	land use
Demographics	organizations, labor movement, major crops provides, and amount and fluctuation of rain water
Water, shocks, and food	access to water, shocks, and food consumption
Local units	metric conversions of local measurement units
Prices	per unit price of crops and foot items

Formatted versions of ARBES questionnaires for each of the countries can be found on Africa RISING wiki page here.

3.2 Screening and recruitment of survey firms

Given the complexity of the survey tool used in ARBES surveys, the M&E team screened several survey firms, including through a series of in-country meetings with potential survey firms. Among other things, the team assessed potential survey firms on the bases of previous experience in conducting computer assisted personal interviewing (CAPI), capability to deliver quality product, as well as budget considerations. Four survey firms were selected to conduct ARBES surveys in Tanzania, Ghana, Mali, and Ethiopia. The M&E team was actively and heavily involved during the planning and implementation of these surveys as detailed in the sections below.

3.3 Survey tool programming

All ARBES surveys were conducted using CAPI. CAPI was implemented using *Surveybe* software (in Tanzania), *SurveyCTO* software (in Ghana) and *CSPro* software (in Mali and Ethiopia). The M&E team opted for CAPI, as opposed to paper and pencil interview (PAPI) for two main reasons. First, given the length and complexity of ARBES tools, intricate routing would have inevitably produced errors from interviewers conducting interviews using PAPI. By enforcing routing consistently and correctly throughout the questionnaire, CAPI would benefit data quality and reduce data cleaning and editing post fieldwork. Second, CAPI would allow a faster data turnaround and data quality checking while survey staff were still in the field. The M&E team made a lot of investment on the programing and testing of the survey tools to mitigate programming-related errors that could compromise data quality.

3.4 Household listing

To randomly sample non-beneficiary households (in AR target villages) and control households (in non-AR target villages), the M&E conducted listing of all households in AR target and control villages. In addition, the team invested a lot of time and effort to purge AR beneficiary households from the household list for AR target villages before randomly sampling non-beneficiary households in AR target villages (see the discussion in Section 2).

3.5 Conducting and supervising trainings

The M&E team conducted and supervised in-country trainings of survey staff recruited by survey firms to conduct ARBES surveys. Table 3.3 summarizes training duration and participants, by country and gender.

Table 3.3 Survey personnel trainings for ARBES (by country and gender)

Event Name	Location	Training dates	Number of Trainees	
			Male	Female
Training of supervisors and enumerators for Mali Africa RISING Baseline Evaluation Surveys (Mali-ARBES)	Bamako, Mali	April 24 - May 15, 2014	28	5
Training of supervisors and enumerators for Ethiopia Africa RISING Baseline Evaluation Surveys (Ethiopia-ARBES)	Addis Ababa, Ethiopia	May 8 - June 8, 2014	23	7
Training of supervisors and enumerators for Ghana Africa RISING Baseline Evaluation Surveys (Ghana-ARBES)	Tamale, Ghana	April 15 - May 8, 2014	34	2
Training of supervisors and enumerators for Tanzania Africa RISING Baseline Evaluation Surveys (Tanzania-ARBES)	Bukoba, Tanzania	Feb 03 - Feb 21, 2014	20	21
Total			105	35
Total			140	

In each ARBES country, the first half of the training was dedicated to detailed classroom discussions of the paper questionnaires to enhance staff's understanding of the tools and the complex logic therein. After trainees (enumerator, supervisors, data managers, and quality controls) get comfortable with the contents of the tools, the second half of the training was devoted to the art of CAPI using tablets and notebooks. Survey staff then piloted the tools using CAPI and the programs were updated based on feedback from the field. The following photo pictures provide a highlight of ARBES trainings.

Figures below show the M&E team at work during **Ghana ARBES** (conducting classroom training and field supervision)



The M&E team at work during **Ethiopia ARBES** (conducting and supervising classroom trainings)


The M&E team at work during **Mali ARBES** (conducting and supervising classroom trainings and field supervision)

3.6 Implementation of ARBES

Overall, the four ARBES surveys conducted in 2014 covered about 4700 households from 76 Program and 81 control communities. The table below summarizes ARBES focus regions and number of communities surveyed (by country). As noted before, it is worth remembering that the definition of a community varies between countries, depending on the local administrative and geographical arrangements.

Table 3.4 Summary of ARBES communities (by country and type)

Country	Region [District]	No. of communities
Ethiopia	Amhara, Oromia, Tigray, SNNP	8 action
Ghana	Upper West [Wa Municipal, Wa West, Nadowli, Wa East] Upper East [Kassena-Nankana, Bongo, Bawku, Talensi-Nabdam] Northern [Savelugu, Tolon, Mion, West Mamprus]	25 action† 25 control
Mali	Bougouni, Yanfolila, Koutiala	10 action; 10 control
Tanzania	Dodoma and Manyara [Babati, Kongwa, and Kiteto]	7 + 4 action†; 14 control

Note: †Ethiopia ARBES included only the eight AR action sites (*kebeles*) and no control villages. Secondary data from other comparable surveys conducted around the same time and using comparable survey tools will be explored to construct the control sample. †† While a total of 11 Africa RISING target villages have been identified, Africa RISING research activities were ongoing only in seven villages at the time of ARBES survey.

The next table summarizes ARBES sample size by country and beneficiary status.

Table 3.5 Summary of ARBES sample (by country and beneficiary status)

Country	AR beneficiaries	Non-beneficiaries	Control	Total
	(1)	(2)	(3)	(4)
Ethiopia	72	451	-	523[c]
Ghana	472 + 150[a]	200 (=25X8)	500 (=25X20)	1322
Mali	350	-	350 (=10X35)	700
Malawi	452	200 (=26X8)	560 (=28X20)	1212
Tanzania	108 + 434[b]	105 (=7X15)	270 (=18X15)	917
Total	**1966**	**505**	**1680**	**4674**

Notes: In column 2, (AXB) means A = Number of AR **action** communities, B = number of non-beneficiary households per village. In column 3, (AXB) means A = Number of **control** communities, B = number of control households per village. Column 4 summarizes the ex-ante sample by country with an interview completion rate of 95% (about 4434 households have been interviewed).
a: A total of 472 AR beneficiaries in 2013 and 150 would-be beneficiaries (in 2014) were included in the Ghana ARBES.
b: A total of 108 AR beneficiaries and 434 additional households who have been recruited into an impact evaluation research study in Babati district have been included in the Tanzania ARBES.
c: A total of 72 households participating in on-farm research and 451 households who participated in a SLATE survey conducted by Ethiopian Highlands researchers were included in the Ethiopia ARBES. The "SLATE farmers" were included in Ethiopia ARBES given the expectations on the part of Ethiopian Highland researchers to recruit SLATE farmers into the on-farm research.

3.6.1 Ethiopia ARBES sample

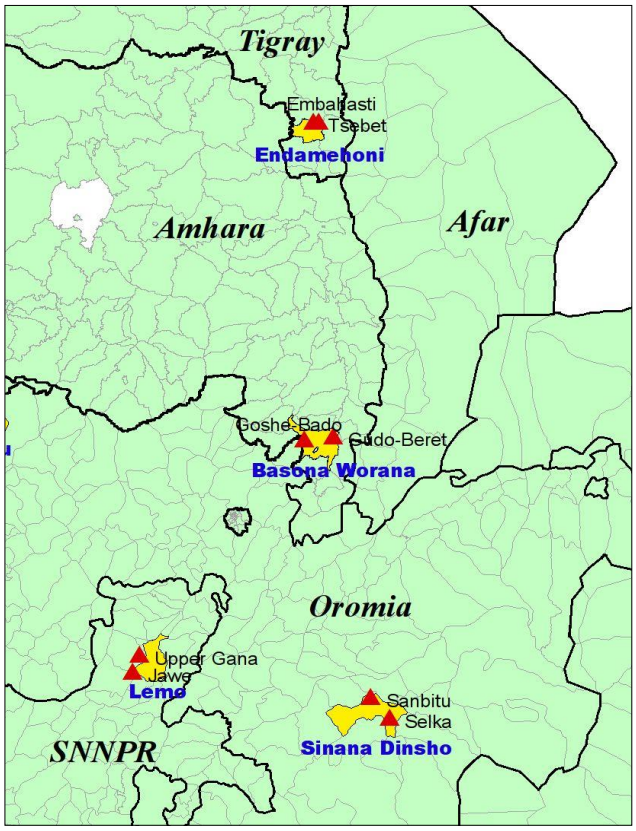
Table 3.6 summarizes the Ethiopia ARBES sample by geographic area and research group while Figure 3.1 shows the map of Africa RISING sites in Ethiopia.

Table 3.6 Interviewed ARBES households in Ethiopia (by community and beneficiary status)

			Group		Total
Region	**Woreda**	**Kebele**	**On-farm trial farmer**	**SLATE farmer**	**Sample**
Amhara	Basona-Worana	Gudo-Beret	6	57	63
Amhara	Basona-Worana	Goshe-Bado	6	28	34
Tigray	Endamehoni	Tsebet	7	55	62
Tigray	Endamehoni	Embahasti	7	56	63
SNNP	Lemmo	Jawe	8	57	65
SNNP	Lemmo	Upper Gana	7	58	65
Oromia	Senana	Selka	10	57	67
Oromia	Senana	Sanbitu	10	59	69
		Total	**61**	**427**	**488**

Note: On-farm trial farmers refers to farmers who have been engaged in on-farm trial of various Africa RISING technologies (such as improved potato and wheat varieties).

Figure 3.1 Agro-ecologies represented by AR action sites in Ethiopia



3.6.2 Tanzania ARBES sample

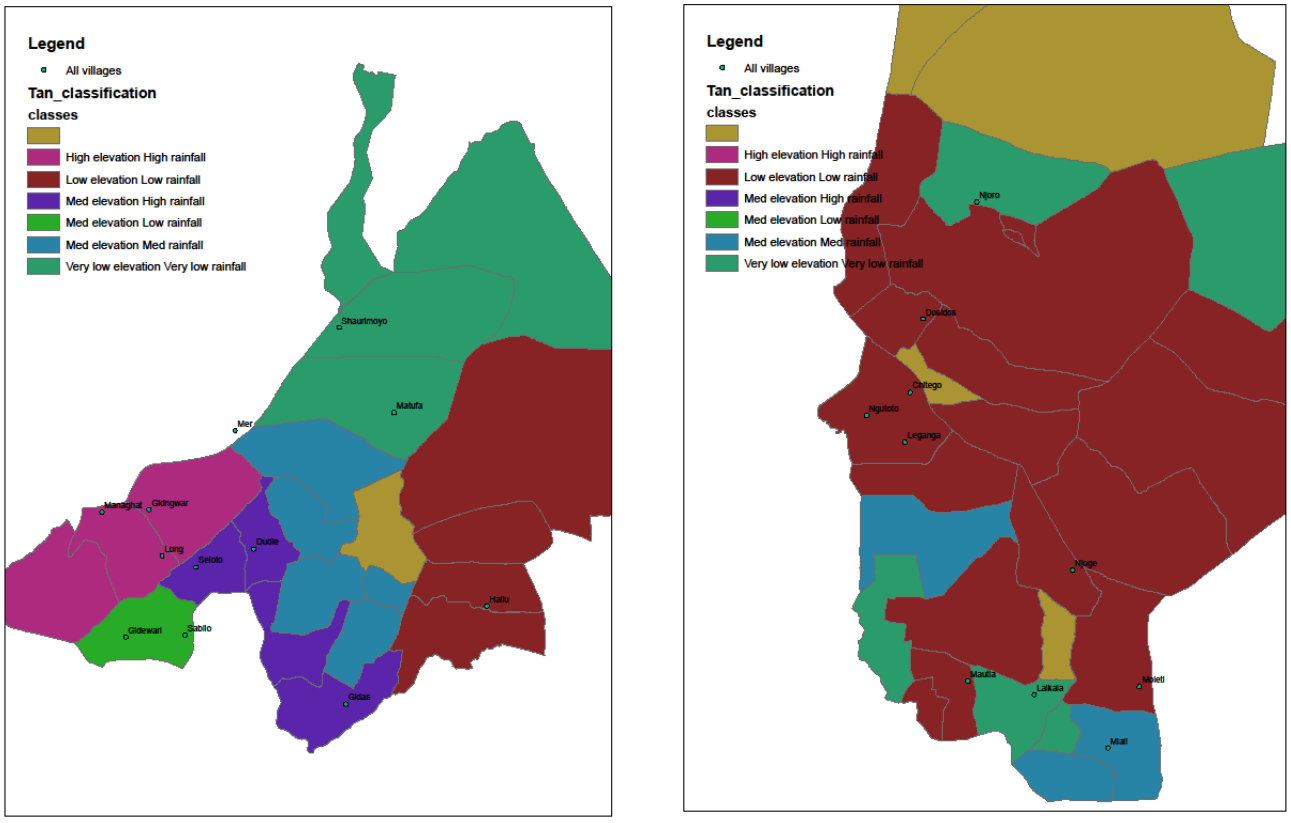
Table 3.7 summarizes the Tanzania ARBES sample by geographic area and research group while Figures 3.2 shows agro ecologies represented by AR target and control sites in Tanzania.

Table 3.7 Interviewed ARBES households in Tanzania (by community and beneficiary status)

		Group						
District	**Village**	**AR Beneficiary(Only)**	**Non-Beneficiary**	**Control**	**Babati IE-No Coupon**	**Babati IE-With Coupon**	**AR-Beneficiary And Babati-IE**	**Total Sample**
District	**Village**							
Babati	Long	22	15	0	29	37	7	110
Babati	Sabilo	23	15	0	53	63	1	155
Babati	Seloto	45	15	0	54	73	11	198
Babati	Dudie	0	0	15	0	0	0	15
Babati	Gidas	0	0	15	0	0	0	15
Babati	Gidewari	0	0	15	0	0	0	15
Babati	Gidngwar	0	0	15	0	0	0	15
Babati	Hallu	0	0	15	0	0	0	15
Babati	Haysum	0	0	15	0	0	0	15
Babati	Matufa	0	0	15	0	0	0	15
Babati	Mer	0	0	15	0	0	0	15

Babati	Shaurimoyo	0	0	15	0	0	0	15
Kongwa	Chitego	1	15	0	0	0	0	16
Kongwa	Mlali-Iyegu	6	15	0	0	0	0	21
Kongwa	Moleti	7	15	0	0	0	0	22
Kongwa	Laikala	0	0	15	0	0	0	15
Kongwa	Leganga	0	0	15	0	0	0	15
Kongwa	Makawa	0	0	15	0	0	0	15
Kongwa	autiya/Mautia	0	0	15	0	0	0	15
Kongwa	Ngutoto	0	0	15	0	0	0	15
Kongwa	Njoge	0	0	15	0	0	0	15
Kongwa	Vihingo	0	0	15	0	0	0	15
Kiteto	Dosidos	0	0	15	0	0	0	15
Kiteto	Njoro	3	15	0	0	0	0	18
Kiteto	Makame	0	0	15	0	0	0	15
	Total	**107**	**105**	**270**	**136**	**173**	**19**	**810**

Figure 3.2 Agro ecologies represented by AR action and control sites in Babati, Kongwa, and Kiteto districts (Tanzania)



3.6.2. Ghana ARBES sample

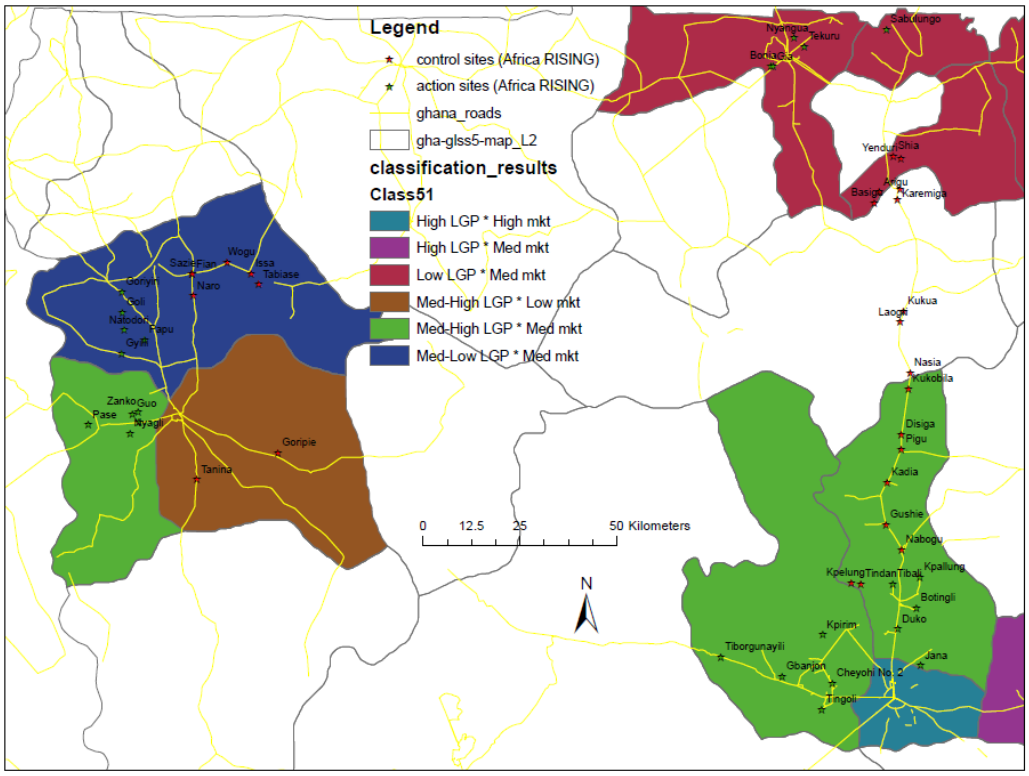
Table 3.8 summarizes the Ghana ARBES sample by geographic area and research group while Figure 3.3 show agro ecologies represented by AR target and control sites in Ghana.

Table 3.8 Interviewed ARBES households in Ghana (by community and beneficiary status)

Region	Community	AR beneficiary in 2013	AR would be beneficiary in 2014	Non beneficiary	Control	All sample
		(1)	(2)	(3)	(4)	(5)
Northern	Arigu	0	0	0	20	20
Northern	Basigu	0	0	0	20	20
Northern	Botingli	17	7	4	0	28
Northern	Cheyohi No. 2	22	6	8	0	36
Northern	Disiga	0	0	0	20	20
Northern	Duko	24	8	6	0	38
Northern	Gbanjon	25	6	8	0	39
Northern	Gushie	0	0	0	20	20
Northern	Jana	14	4	8	0	26
Northern	Kadia	0	0	0	20	20
Northern	Karemiga	0	0	0	20	20
Northern	Kpallung	24	6	8	0	38
Northern	Kpelung	0	0	0	20	20
Northern	Kpirim	11	4	1	0	16
Northern	Kukobila	0	0	0	20	20
Northern	Kukua	0	0	0	20	20
Northern	Laogri	0	0	0	20	20
Northern	Nabogu	0	0	0	20	20
Northern	Namiyila	0	0	0	20	20
Northern	Nasia	0	0	0	20	20
Northern	Pigu	0	0	0	20	20
Northern	Tibali	21	6	8	0	35
Northern	Tiborgunayili	18	7	8	0	33
Northern	Tindan	0	0	0	20	20
Northern	Tingoli	11	7	8	0	26
Upper East	Bonia	24	6	8	0	38
Upper East	Gia	14	7	8	0	29
Upper East	Nyangua	16	6	10	0	32
Upper East	Sabulungo	34	7	8	0	49
Upper East	Shia	0	0	0	20	20
Upper East	Tekuru	19	7	8	0	34
Upper East	Yenduri	0	0	0	20	20
Upper West	Fian	0	0	0	20	20
Upper West	Goli	16	7	7	0	30
Upper West	Goripie	0	0	0	20	20
Upper West	Goriyiri	17	3	1	0	21
Upper West	Guo	11	6	8	0	25
Upper West	Gyilli	29	6	8	0	43
Upper West	Issa	0	0	0	20	20

Upper West	Naro	0	0	0	20	20
Upper West	Natodor	24	6	8	0	38
Upper West	Nyagli	13	6	8	0	27
Upper West	Papu	16	7	8	0	31
Upper West	Pase	13	1	9	0	23
Upper West	Sa Gie	0	0	0	20	20
Upper West	Siiriyin	8	6	8	0	22
Upper West	Tabiase	0	0	0	20	20
Upper West	Tanina	0	0	0	20	20
Upper West	Wogu	0	0	0	20	20
Upper West	Zanko	13	6	8	0	27
	Total	**454**	**148**	**182**	**500**	**1,284**

Figure 3.3 Agro ecologies represented by AR action and control sites in Ghana



3.6.3. Mali ARBES sample

Table 3.9 summarizes the Mali ARBES sample by geographic area and research group while Figure 3.4 and Figure 3.5 show agro ecologies represented by AR target and control sites in Mali.

Table 3.9 Interviewed ARBES households in Mali (by community and beneficiary status)

Region	AR action village	No. of households	Region	AR action village	No. of households
Bougouni	Dieba	25	**Yanfolila**	Goualala 1	35
Bougouni	Flola	28	**Bougouni**	Siratogo	35
Koutiala	N'golonianasso	56	**Bougouni**	Sakoro	35
Koutiala	M'pessoba	47	**Bougouni**	Dossola	35
Bougouni	Madina	19	**Bougouni**	Dialakoro	35
Koutiala	Nampossela	35	**Koutiala**	Tiere	35
Bougouni	Sibirila	15	**Koutiala**	Konina	35
Koutiala	Sirakele	56	**Koutiala**	Konseguela	35
Yanfolila	Yorobougoula	44	**Koutiala**	N'Togonasso	35
Koutiala	Zansoni	25	**Koutiala**	Bobola-zangasso	35
	Total	350		Total	350

Figure 3.4 Agro ecologies represented by AR action and control sites in Mali (Koutiala)

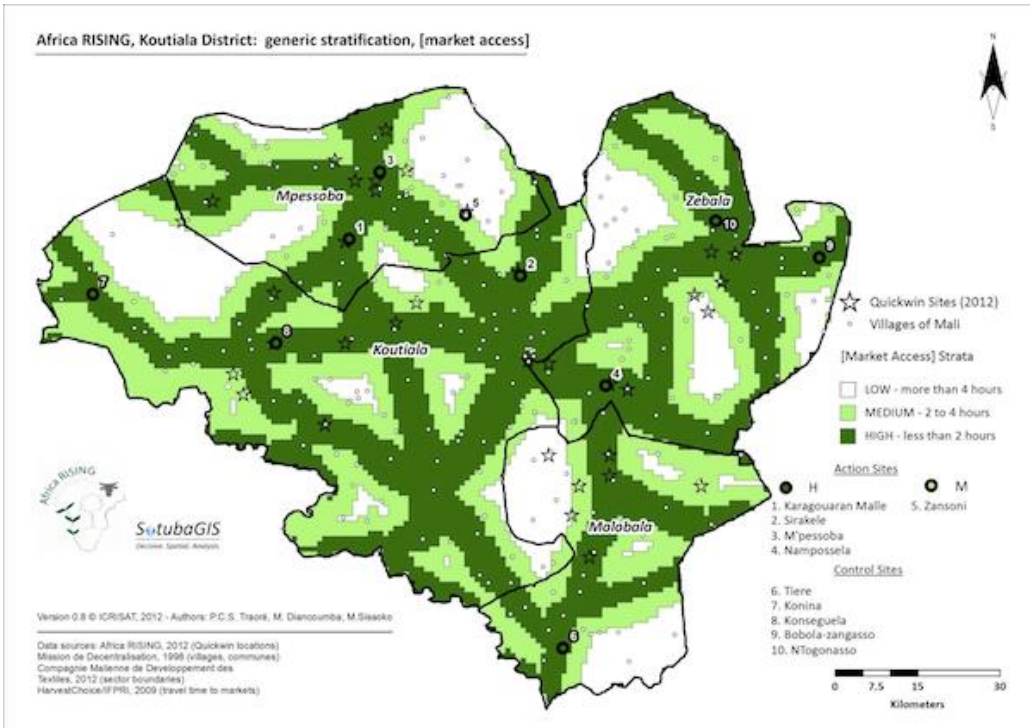
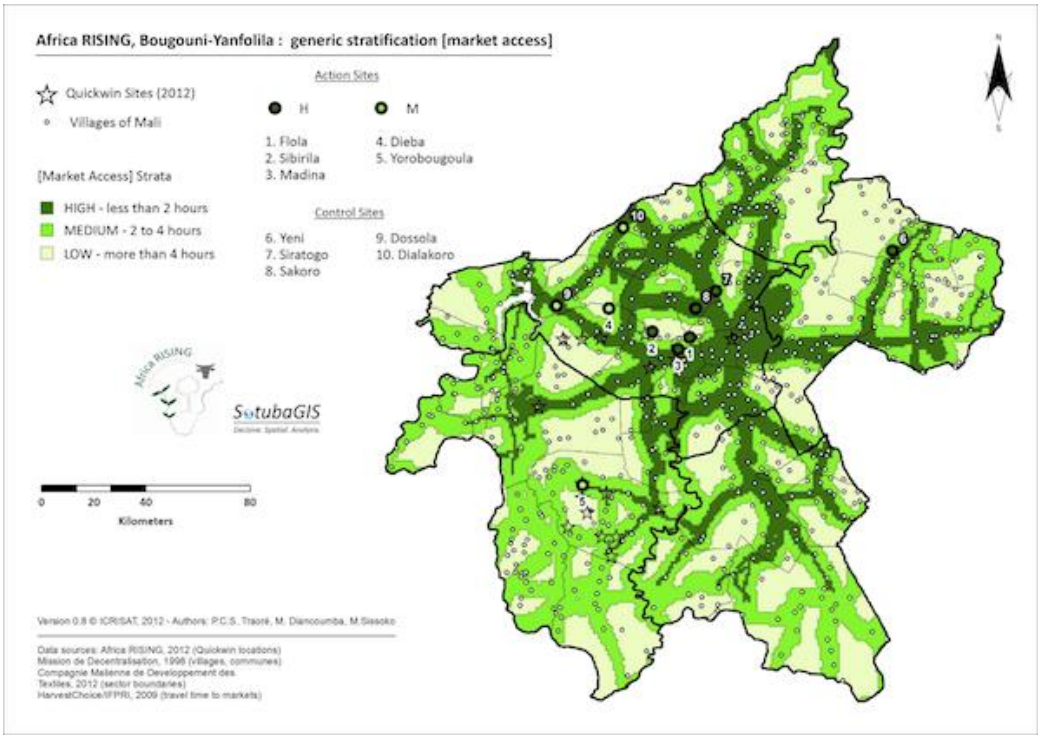


Figure 3.5 Agro ecologies represented by AR action and control sites in Mali (Bougouni-Yanfolila)



3.7 ARBES data cleaning and documentation

While simultaneously planning and implementing ARBES surveys, the M&E team spent considerable effort in 2014 validating and cleaning ARBES data (including from Malawi that was collected in Fiscal Year 2013) and putting together accompanying documentations. Given that ARBES surveys were conducted electronically, the team reviewed and updated paper versions of the questionnaires to make them consistent with programed and fielded electronic versions. The main tasks involved in the data cleaning process include: (1) organization of raw data from the different modules of the household and community questions into separate Stata files (in "long format"), based the level at which data were collected, (2) ensuring that each data file has unique identifying variables (e.g., for households, individual household members, parcels, plots) to enable merging of data files from different sections, (3) construction of metric conversion factors for production and consumption based on conversion data collected through ARBES community survey and secondary sources when necessary, (4) re-organization of data files to fit requests by a number of data users both within and outside Africa RISING.

3.8 ARBES data processing and sharing

Cleaned and partially cleaned ARBES data have been shared with numerous researchers within and outside Africa RISING. AR teams with whom the M&E team shared data include Michigan State University, Wageningen University and IITA. Malawi ARBES data have also been aggregated to different

levels (household, farm, plot, and crop) for use in "DAHBSIM" -Dynamic Agricultural Household BioEconomic Simulation Model-, a collaboration effort between EPTD/IFPRI and IAMM under the Biosight project. For Malawi, unit conversions for crop production as well as other agricultural-related variables have also been constructed based on ARBES community survey and data from secondary sources. These constructed variables have also been shared with MSU, IAMM and other independent researchers. A MoU between IFPRI and FAO has been signed to allow FAO access the Malawi ARBES data. Raw data from Ghana ARBES have been provided to Wageningen University for the calibration of farming systems models, as well as IITA researchers. Raw data from Tanzania ARBES have been shared with and used by researchers at ILRI and IITA. Data from Ethiopia ARBES have been shared with students at Wageningen University and Colorado State University, and shared with ILRI. The same dataset have been shared with ICRISAT upon request. IITA also requested household typologies to be constructed based on all the ARBES surveys for the five countries, a request that the M&E is currently working on.

3.9 Analysis of ARBES data and preparation of survey reports

During 2014, the M&E team was able to partially analyze ARBES household and community data, especially from Malawi, given that Malawi ARBES was collected in 2013. Working with its collaborators, the M&E team has produced draft ARBES survey reports for Ghana, Mali and Tanzania. Given the comparability of survey instruments used across program countries, the M&E team has been summarizing ARBES data using comparable templates. These reports are expected to give a crucial overview of the farming systems and household targeted by AR across countries. In this section, we provide a summary of selected preliminary findings, including typology of households based on the following six variables: non-agricultural wealth, household size, size of total land operated, cereals production, use of hired labor, livestock ownership (measured in tropical livestock units).

3.10 The 2014 annual M&E expert meeting

The M&E team organized the 3rd annual M&E meeting during November 11-13, 2014 in Arusha, Tanzania. The meeting allowed the M&E team to share and discuss initial results from ARBES survey for all program countries (except Zambia), present updated version of the PMMT (discussed in Section 3.12) and receive feedback from AR researchers. Results of the external evaluation for West Africa were also discussed. More information about this meeting, as well as the previous two annual expert M&E meetings, can be found here.

3.11 Africa RISING data management plan

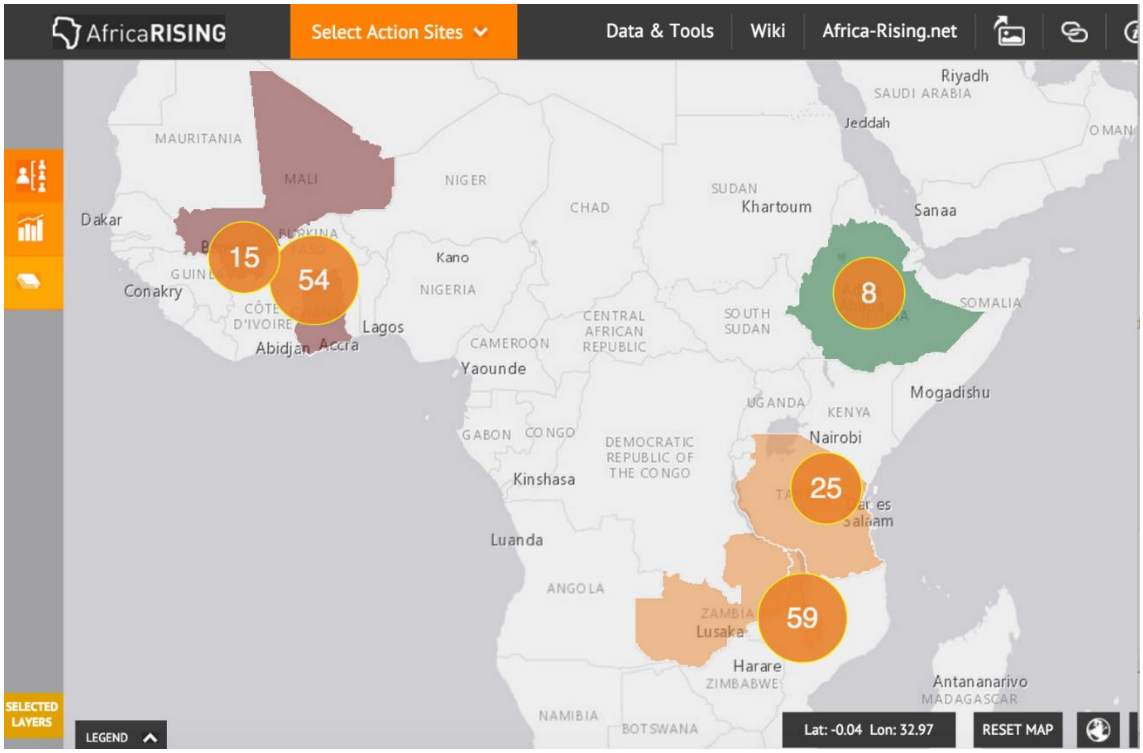
The M&E team developed a data management plan to provide guidance on data management practices and standards for research institutions and teams working in AR program. Among other topics, the plan discusses open data access, standards for data and metadata format and management, data standardization, internal and external diffusion of AR data, data storage and transmission, as well as data confidentiality. Draft version of the plan has been circulated among project coordinators and was discussed during the 3rd annual M&E meeting in Tanzania. The M&E team revised the plan based on feedback received from AR researchers and the plan is now binding for all research teams participating in AR and USAID believes that this plan can be adopted to other agency-funded projects. A copy of the M&E plan can be found here.

3.12 Updates to Africa RISING Project Mapping and Monitoring Tool (PMMT)

In partnership with an IT consultant (Spatial Development International), the M&E team made several updated to its project mapping and monitoring tool (PMMT) in 2014. This tool is developed to aid project monitoring efforts within and outside AR and is intended to help users (project managers, donors, researchers, data analysts, and stakeholders in general) to understand where and how AR activities are taking place (see the screenshot below), as well as improve project strategies and partnerships for greater impact of their work. Its features and functions have been designed to inform strategic and project management decisions, communicate programmatic projects to key stakeholders, and understand how programmatic efforts relate to other projects as well as to relevant agricultural and socio-economic information.

The updated PMMT has three main functionalities:

- A **data management component** that allow users to upload their research outputs (e.g., data, tools, documents) to a secure on-line catalog in any format;
- A **data entry application** component that allows users with the appropriate credentials to add project-related data (e.g., FtF indicators as well as customs indicators) to the PMMT through an intuitive, step-by-step web interface;
- A **mapping application** that allows users to contextualize where Africa RISING research activities are taking place and provide them the opportunity to view and overlay various socio-economic, biophysical, and agriculture-related data.



The table below summarizes the main functionalities of the updated PMMT.

Table 3.10 Updated PMMT functionalities

Planned Enhancement	**Intended to…**
PMMT monitoring and reporting module	- Simplify indicator data-entry to only record 2 actual and 2 target values per year - Allow users to record indicators at multiple reporting units (work package, partner, district, country) - Allow users to enter a narrative when there is a 10% (or more) gap between target and actual - Allow AR partners to define and record additional project-specific indicators - Allow users submit questions and feedback as well as project-related information using the PMMT
User roles and permissions	- Create a user management module - Create 3 user roles: Administrator (can administer user accounts and data), Data Manager (can add/edit indicator definitions and values), Editor (can add/edit indicator values) - Create a mechanism for linking PMMT and CKAN user accounts and credentials
Export and print	- Provide an option to export indicator summaries in MS Excel (or CSV) format - Create a pre-set layout for printing and exporting PMMT maps and activity summaries (similar to MAPPR export feature)

In addition, the M&E team and its collaborator developed a video and user guide to aid users of the PMMT. The updates also allowed AR users to provide their feedback about the PMMT to the M&E team. USAID-HQ is investigating the possibility of using the PMMT for other Feed the Future projects, starting from the Sustainable Intensification Innovation Lab. The M&E team has been invited to USAID-HQ to give seminars to staff on this web-based M&E system. Please refer to M&E report for Fiscal Year 2013 for additional details about the PMMT.

3.13 PMMT trainings to AR researchers

In order to demonstrate and highlight the different features of the PMMT and how the tool can aid project monitoring efforts of both the research teams and the M&E team, the M&E team organized 4 one day in-country trainings for AR researchers. A total of 54 AR researchers attended these trainings: 12 in Malawi, 12 in Tanzania, 10 in Zambia, and 12 in Ghana (for AR researchers from Ghana and Mali), and Ethiopia (14 researchers). Some of the feedback received from the trainees are summarized in the Appendix B.

3.14 Reporting and processing of 2014 FtF indicators through the PMMT

The M&E team also enabled AR researchers to compile and report their 2014 FtF indicators data using the updated data entry application of the PMMT. While there were some challenges faced by AR researchers (due to limited internet connectivity) and M&E team (AR researchers not upload indicators data on a timely manner), the option of reporting data through the PMMT was found to be more efficient. IITA and IFPRI's coordinated the data entry process through the PMMT and the M&E team was responsible for aggregating FtF data submitted by individual researchers by mega-site and then uploading aggregated data onto USAID's FTF Monitoring System portal.

3.15 Cataloging of AR data

In the interest of collecting all data generated from AR in one place, and to comply with the recently approved program's Data Management Plan, the M&E team has initiated a process to adapt all AR data gathering needs to ILRI's Datasets Portal CKAN. We intend to use CKAN as a data repository accessible by all Africa RISING researchers. Here, AR researchers and the general public will be able to access the datasets generated by the program once they have been uploaded. Users will be able to access the meta-data (i.e., information about the data) before the datasets get published. An example of the metadata for the Malawi ARBES dataset can be found here.

3.16 Ongoing research papers, proposals, and concept notes

3.16.1 Characterization and targeting analysis

Developing-country initiatives on sustainable intensification (SI) and climate-smart agriculture (CSA) revolve primarily around the promotion of complex systems-based technologies and management practices that simultaneously improve yields and conserve natural resources. Many agronomic evaluations of these technologies have been conducted under near-perfect experimental conditions to provide precise measures of physical inputs and outputs. However, few evaluations have been run under analogous social experimental conditions in which farmers make constrained optimization decisions. As a result, researchers, policymakers, and donors are involved in sustainable intensification programs that rely on studies administered among purposively selected group of farmers, typically those who are more likely to successfully adopt the proposed technologies for a sustained period of time. This approach opens the door to potentially serious biases and provides a poor basis with which to assess the prospects for large-scale replications across a wider population of farmers. Yet the complex nature of these technologies often conflicts with the use of randomized controlled trials that address sample selection bias. To overcome this limitation, the M&E team employed a quasi-experimental approach integrated with geographic information systems to evaluate various SI innovations within Africa RISING.

Using socioeconomic survey data from Malawi (and Tanzania), the team analyzed the characteristics of adopters of SI innovations and estimated predicted effects on yields and value of crops cultivated. Findings show higher expected maize yield and value of harvest across all quantiles of the distributions for AR beneficiaries, compared to control households, and systematic potential targeting of villages and households. Overall, these findings point to the need to rethink how SI/CSA initiatives identify and select project beneficiaries, something that could bear potentially severe implications upon scaling up. Preliminary descriptive statistics results based on Malawi and Tanzania have been shared with researchers and policy makers at the Integrated Systems Research for Sustainable Intensification in Smallholder Agriculture. More results (including from regression results) from Malawi will be shared at upcoming conference in Oxford (the 2015 Center for the Study of African Economics conference) and Milan (the 29th International Conference of Agricultural Economists).

3.16.2 Willingness to pay and impact study

Using a prospective multi-arm randomized evaluation design in Tanzania (Babati district), and data collected for this purpose, this ongoing research aims to elicit farmers' willingness to pay for improved

agricultural technologies as well as the effects of improved innovations on productivity and household welfare. Evidence from this research is expected to contribute to the broader literature on adoption, diffusion, and impact of improved innovations. Existing empirical evidence suggests the existence of several socioeconomic constraints. For example, Matuschke, Mishra and Quaim (2007) find that access to information, individual networks, and income/access to credit matter for the adoption of hybrid wheat in India. Bandiera and Rasul (2006) show that for the introduction of a new crop (sunflower) in Mozambique, social learning effects are U-shaped, that is, when there are many adopters, individuals may have incentives to strategically delay their own adoption decision, until the results of their neighbors' adoption decision have materialized. In Kenya, Duflo, Kremer and Robinson (2011) find that it is not a credit constraint that is preventing farmers from buying fertilizer (which previous work by the same authors had shown to be a profitable investment in the context, see Duflo, Kremer and Robinson (2008)), but rather present-bias and procrastination: The authors find that a small nudge (a time-limited offer of free delivery of fertilizer) can induce farmers to buy fertilizer. Calibrations of their model suggest that such a nudge may produce better welfare outcomes than not intervening in the market or intervening more heavily (subsidized purchase price).

3.16.3 Bio-economic modelling of household farm production and its linkages to the environment

During 2014, IFPRI (through the BioSight project) has been engaged with key partners at the Institute for Advanced Studies of Agronomy in the Mediterranean (CIHEAM-IAMM) in Montpellier, France, to develop a new dynamic, household-farm bioeconomic simulation model which we call "DAHBSIM". This effort represents an evolution from previous models build by the researchers at CIHEAAM-IAMM, and incorporates closer feedbacks between crop productivity, soil conditions and farm-level profitability, and also incorporates livestock in a much better way. Malawi was chosen as a case-study country, in order to provide a "proof-of-concept" for how to advance bio-economic modelling of household farm production and its linkages to the environment. The "DAHBSIM" model has been constructed around household-level data from the USAID-funded Africa RISING project for Malawi, and contains distinct typologies of farm-households that capture the heterogeneity observed in the sample of farm households. Using DHABSIM, we will assess the responses of farm households to different scenarios of changes in agricultural and environmental policies and technological innovations as well as their subsequent economic, ecological and consumption impacts. Those scenarios will be a combination of individual or combined effects of two main types of driving forces: i) socio-economic, policy and market changes (e.g., prices of inputs and outputs, availability of land and labour, agricultural and water policies), and ii) with

or without alternative technology options (e.g., new technologies and innovations believed to be suitable for the production systems such as new maize variety, improved maize fertilization, conservation agriculture, rotation with forage and food legumes, agroforestry.

With DHABSIM those scenarios will be evaluated and compared by calculating a multi-perspective set of economic (e.g., farm income, total cost, labour cost), social (e.g., total labour by task, female labour, hired labour), environmental (e.g., soil fertility, soil water content, water stress) and nutritional (e.g., total consumption, total protein, consumption by product) indicators of the sustainability and multi-functionality of agricultural systems, policies and innovations to enable trade-off analysis. This bio-economic modelling effort will provide another way of carrying out ex ante evaluation on various technologies, and has created a strong partnership between the BioSight and Africa RISING research groups, and powerful synergies between the evaluation work being carried out by both teams. Pending availability of resources, the teams expect to expand DAHBSIM analysis to other Africa RISING countries to capture different economic and agro-ecological contexts.

3.16.4 Assessing farm-level trade-offs between organic and inorganic nitrogen fertilizers

Using Africa RISING data from Malawi as a case study, the M&E team is collaborating with crop modelers and other researchers in IFPRI (HarvestChoice and Biosight) initiated a research project that combines crop modelling (DSSAT) with economic analysis to provide empirical evidence on the following topics: the least cost method to produce a fixed quantity of maize or obtain a specific profit, how changes in the costs of fertilizers and organic materials change the input mix, the degree of complementarity between organic and mineral nitrogen, the sensitivity of input mix to changes in rainfall and soil type, the environmental benefits of organic systems, and whether more organic systems can reduce yield variability or down side risk, among research questions. Using DSSAT results from Malawi, the M&E expects to expand similar work to other Africa RISING countries.

3.16.5 Sustainable intensification and nutrition

Food and nutrition security are important outcomes that may be supported by the sustainable intensification of agriculture. Using both cultivation and consumption data from the Africa RISING Baseline Evaluation Survey, the M&E team will examine the relationship between intensification and household nutrition. In particular, it will focus on the link between crop diversity and dietary quality, measured in both the quantity and nutrient content of food consumed. As dietary quality is associated with dietary diversity, the team will investigate whether crop diversity translates into dietary diversity.

Nutrition is of distinct importance regarding women of childbearing age and children under five years. Because women often play an important role in household consumption decisions, they are an important vector for affecting nutrition outcomes. Furthermore, women's nutrition status before, during, and after pregnancy has implications for their children's well-being long after childbirth. Malnourished women may give birth to malnourished children who struggle to thrive even into adulthood.

3.16.6 Climate Smart Agriculture

The IFPRI team is collaborating with the Economics of Sustainable Agricultural Systems Team (ESAS) of the Food and Agriculture Organization of the United Nations (FAO) on CSA themes of mutual interest. Potential collaborative activities include analysis of data to provide empirical evidence on topics such as determinants of adoption of CSA practices and effects of such strategies on agricultural output such as yield and ecosystem services.

3.16.7 Land cover changes and poverty dynamics

The objective of this study initiated in 2014 is to examine the interdependence between land cover changes and welfare combining data from household surveys, remote sensing, and GPS measurement of specific parcels. The fact that the incidence of poverty tends to be concentrated in areas and systems that are vulnerable to land degradation already suggests a correlation between the two, but careful examination of potentially differential trajectories of land cover changes and assessment of their interdependence with welfare is crucial to dive deeper on the causality mechanism. Using data from North Ghana, this study will examine trajectories of land cover changes over the last two decades, assess the independent effects of different land cover change trajectories on welfare (controlling for other confounding factors), and examine how different biophysical and socioeconomic factors mediate the interdependence between land cover changes and welfare.

3.17 Partnerships and collaborations

Multiple organizations operating in the AR regions of interest have been contacted, and with most of them there is an active collaboration, both on methods and data collection. Partner institutions include FAO, MSU, World Bank, Wageningen University, Conservation International, and the Earth Institute at Columbia University (Vital Signs project). With the Food and Agriculture Organization of the United Nations (FAO), for example, the M&E team is collaborating with the Economics of Sustainable Agricultural Systems Team (ESAS) on CSA themes of mutual interest. Potential collaborative activities

include analysis of data to provide empirical evidence on topics such as determinants of adoption of CSA practices and effects of such strategies on agricultural output such as yield and ecosystem services.

3.18 Some M&E challenges during Fiscal Year 2014

In spite of the several achievements, there were several challenges faced by the M&E team during Fiscal Year 2014. While some of these challenges have arisen in 2014, the rest have been lingering for longer. The discussion below highlights some of the main challenges.

- Given that the systems-based innovations tested by AR are highly context specific, require considerable adaptations, place greater demands on farmers to learn new skills, revisit longstanding beliefs about agricultural practices, and adopt an experimental and empirically minded approach to farm management, accurately quantifying and attributing their effects is an inherent challenge. Previous studies on the subject are relatively rare, indicating that empirical evidence remains in short supply. The M&E team has been trying to fill this gap in the literature using a mix of empirical methods.

- The M&E team faced a continuous and difficult trade-off between monitoring and evaluation tasks. Given the size, composition, and resources of the team on the one hand and the scale and geographic coverage of the Program on the other hand, the time the team spends on some tasks (for some AR focus countries) will inevitably delay or prevent some other tasks (for other AR countries). This has caused tensions between IFPRI and AR local researchers.
- The reluctance of AR partners to embrace RCT-type evaluation design in evaluating a participatory, demand-driven agricultural research for development program such as AR. This led to different expectations about M&E activities between IFPRI and the other CG centers involved in AR. While there has been an informal understanding between IFPRI and AR research teams on splitting responsibility of AR project monitoring, there was lack of clarity in terms of specific monitoring tasks and responsibilities.
- Difficulty of finding a competent local survey firm capable of conducting ARBES as planned and within budget. As a result, the selection of survey firms; organization, planning, and supervision of data collection; as well as cleaning of survey data took longer than initially expected.
- IFPRI's inability to recruit (and retain) local M&E coordinators to actively work with each and every research team across the Program was also a challenge. In addition to financial constraints, finding competent and interested local M&E coordinators, capable of delivering quality products has proven problematic, exacerbated by the lack of clarity about IFPRI's M&E role. Coordinators faced competing priorities in working to support AR evaluation and conducting monitoring in the field to satisfy AR

partners' needs. In addition to the Arusha-based M&E coordinator consultant, and to assist with the implementation of ARBES surveys, the M&E team recruited two in-country survey residents for Mali and Ghana and a survey coordinator for Ethiopia in 2014. Subsequently, the team hired in January 2015 a post-doctoral fellow (staff position) based in Arusha (Tanzania), and a Senior Research Assistant based in Washington, DC in April 2015) to assist the M&E team with cleaning, analysis and management of ARBES and other data collected through the PMMT. The SRA will also assist with the management of the PMMT and provide overall guidance related to the management of data collected by the M&E and the research teams.

- Incomplete information and data on which specific SI innovations have been tested and adopted (in which villages, by which households). This was a major problem during the planning and implementation of baseline surveys. Proper documentation and details of SI innovations being tested is crucial to understanding the diffusion mechanism of the Program and to adequately capture potential spillovers. This is a serious challenge for which collaboration among IFPRI's team, AR researchers and stakeholders is key.
- With a dearth of information about program beneficiaries, reporting on FtF indicators and other project-specific data has also been a challenge. For example, a huge investment was made by IFPRI to develop a web-based user-friendly project mapping and monitoring tool (discussed before) through which AR researchers can report FtF indicators data and additional details about their project. While part of this challenge has been explained by poor local internet connection, it was evident that even AR researchers who were able to log into the system reported incomplete and sometime inaccurate information which in turn caused a significant challenge while uploading FtF indicators data onto the USAID's FtF monitoring system using pre-populated template (that has a in-built consistency checks).
- Miscommunication and inefficiency in interaction between DC-based staff and field-based consultants. A solution sought was to advertise a staff position for which the team has already sarted the process in 2014 to recite a post-doctoral fellow to be based in Arusha-Tanzania with responsibilities in all the three mega-sites.
- Lack of funds to cover the local WA M&E coordinator and data manager. Several attempts were made rework the budget, and dialogue is still ongoing with USAID to find a shared and effective solution to cope with the shortfall without compromising previous commitments.

4. M&E Activities Planned for Fiscal Year 2015

For 2015, the M&E team envisions to accomplish the following tasks. IFPRI is currently in discussions with USAID regarding IFPRI's future M&E scope of work and some of the below tasks may be modified depending on the outcome of the ongoing discussion.

4.1 Clean, analyze, and share results from ARBES survey data

The M&E team will continue cleaning and analyzing ARBES data, producing summary reports, and sharing results and cleaned data files with AR researches and the general public. The team also expects to finalize survey reports for Mali, Ghana, and Tanzania and produce similar reports for Ethiopia and Malawi. This tasks are expected to take a significant amount of time and effort, given the scale of ARBES data collected by the team in 2013 and 2014.

4.2 Conduct additional updates to the PMMT

The M&E team expects to continue making updated to the PMMT, within the available resources, also based on feedback received during the first wave of PMMT trainings.

4.3 Conduct additional PMMT trainings

As summarized in Appendix B, AR researchers who received the first wave of trainings on the PMMT highlighted the need for additional trainings. The M&E expects to organize additional PMMT trainings for AR researchers. The number and duration of these trainings will depend on the demand for the trainings, availability of AR researchers, and budget considerations.

4.4 Cataloging of AR data through ILRI's CKAN

In collaboration with ILRI, the M&E team will continue facilitating the uploading of all AR data collected since 2012 onto ILRI's CKAN. The team has already developed and distributed a metadata template to all AR researchers (See Appendix C). Up on receiving populated templates from researchers, the team will work with ILRI to ensure uploading of the metadata onto CKAN. Afterwards, a link will be created for each metadata file submitted by AR researchers and shared with them to enable them upload the associated data files. The deadline for uploading data is set for April 30, 2015.

4.5 Research and communication

The M&E expects to spend significant time in 2015 to pursue and expand various research studies initiated in 2014 (See Section 3.16). Results from these research studies will be communicated with researchers (both within and outside of Africa RISING) and the general public using various outlets. Building upon

evidence generated over time and using spatially-explicit biophysical and socioeconomic data, the M&E team plans to study the spatial diffusion of AR innovations, taking the statistical representativeness of AR communities into account. The analysis will take advantage of nationally-representative household surveys to construct synthetic cohorts of households similar to AR beneficiary farmers. The different SI innovations will be assessed along several agronomic and environmental dimensions (e.g. productivity, income, poverty, nutrition, and the environment)

4.6 Organize the 2015 annual M&E expert meeting

The upcoming (forth) annual M&E expert meeting will create an opportunity to keep AR stakeholders informed about M&E activities, plans, and challenges, as well as share additional results of ARBES surveys across the program countries.

4.7 Attend program- and project-level meeting and field trips

The M&E team will continue to actively participate in various Program- and Project-level meeting and field visits to project sites to better understand the research activities and tailor the M&E activities to the needs of the research teams.

4.8 Reporting of 2015 FtF indicators data

The M&E team expects to work with the research teams to compile 2015 FtF indicators data through the PMMT for reporting to donor.

4.9 Assist with the development of sustainability indicators

The M&E team will continue to work with the research teams and the donor to develop indicators of sustainability and custom indicators to assess the effect of the Program on sustainability and to gauge progress within individual projects, respectively.

4.10 Partnerships and collaborations

The M&E team will continue perusing and exploring collaborations with organizations working in areas of common interest (See Section 3.17), and it expects to collaborate with AR researchers on various research topics of common interest (See Section 3.16).

5. Summary and conclusion

Monitoring and evaluation of Africa RISING is aimed at supporting effective project management, providing data for timely reporting to project management, helping stakeholders learn about the program's successes and failures to help inform the design and implementation of new interventions, as well as catalyzing adjustments to ongoing activities that might enhance efficiency and effectiveness. The M&E team believes that FY 2014 was a productive year with a considerable effort and investment made to collect baseline data from four program countries (Tanzania, Ghana, Ethiopia, and Mali). Household and community data collected through these surveys have been (partially) cleaned and shared with several research teams within and outside the Africa RISING Program (IAMM, Michigan State University, Wageningen University, ILRI, IITA, ICRISAT, BioSight-IFPRI, Texas A&M University) for household characterization as well as analysis of various agronomic outcomes of Program beneficiary households.

Documentation of project locations and activities through Africa RISING Project Mapping and Monitoring Tool (PMMT) is enabling users to understand where and how Africa RISING activities are taking place, and improve project strategies and partnerships for greater impact in their work. Its features and functions have been designed to inform strategic and project management decisions. The PMMT can help inform decisions by allowing users to take geographic information about AR sites into account, e.g. location of markets, related projects and partners, travel time, annual precipitation, or maize crop yields. The PMMT is also useful to communicate programmatic projects to key stakeholders. Understanding how programmatic efforts relate to other projects as well as to useful agricultural information will be crucial. A primary benefit to PMMT users is to intersect the spatial layout of AR activities relative with a suite if biophysical and socio-economic contextual characteristics. Users have the ability to add their projects to the PMMT database and then visualize them in a variety of ways, as well as to browse and map other people's projects alone and alongside their own. This functionality provides the framework for multiple organizations to communicate vital strategic information in a coordinated fashion.

The M&E team is aware that there is still the need to integrate M&E actions into the Programme' activities on the ground. A still controversial issue is whether and how the program should/can be evaluated using traditional Impact Evaluation methods.

Systems-based innovations, like those promoted by AR, involve complex sets of tangible and intangible elements combined with scientific guidance to bring about desired outcomes. While some elements of these innovations may be discrete and easy to identify (for example, a specific crop variety or inorganic fertilizer), what characterizes such systems-based approach is the way individual elements interact in a system to create synergistic effects, augmenting productivity and sustainability outcomes more than the sum of their single increases. These innovations are highly context specific, require considerable adaptations, place greater demands on farmers to learn new skills, revisit longstanding beliefs about

agricultural practices, and adopt an experimental and empirically minded approach to farm management. While there are sound practical and theoretical reasons to believe that these systems-based innovations can be beneficial, there is yet insufficient evidence on their social and economic impacts. Because of the unique features of these innovations, accurately quantifying and attributing their effects is very challenging. Each mix of innovations must be readily identifiable and consistently applied by farmers for its impact to be measured and compared across individuals, farms and households.

While the investment made by the IFPRI's M&E may not be quite apparent at this stage, the team is confident that its continuous efforts will have high payoff and be highly informative of the targeting criteria and the expected impact across program countries, the characteristics of adopters of sustainable intensification innovations (relative to the underlying population of smallholders), the agronomic and economic effects of these innovations, as well as the implications of targeting for scaling up. M&E past and current actions could establish a good proof of concept according to which similar methods and approaches can be applied not only within AR but also in other similar systems-based sustainable intensification programs.

Bibliography

Africa RISING. 2011. *Program framework 2012-2016*, available here.

Annan, Jeannie, C. Dixon, R. Glennerster, F. Kimmins, and T. Suri. 2011-2013. *Promoting adoption of new rice varieties: Addressing the costs of early adoption in Sierra Leone*. Cambridge, MA: Abdul Latif Jameel Poverty Action Lab (Ongoing study)

Benin, S., E. Nkonya, G. Okecho, J. Randriamamonjy, E. Kato, G. Lubade, M. Kyotalimye, and F. Byekwaso. 2008. *Impact evaluation and returns to investment of the national agricultural advisory services (NAADS) program of Uganda*. Discussion Paper 724. Washington, DC: International Food Policy Research Institute.

Bennett, M. and Franzel. 2013. Can Organic and Resource-Conserving Agriculture Improve Livelihoods? A Synthesis. *International Journal of Agricultural Sustainability*. 11(3), 193–215. 193-215, DOI: 10.1080/14735903.2012.724925.

Bolwig, S., P. Gibbon, and S. Jones. 2009. The economics of smallholder organic contract farming in tropical Africa. *World Development* 37(6): 1094–1104.

Carletto, C., S. Savastano, and A. Zezza. 2013. Fact or artifact: The impact of measurement errors on the farm size–productivity relationship," *Journal of Development Economics*, 103: 254–261.

Carter, M. and D. Yang. 2009-2013. *Savings, subsidies and sustainable food security in Mozambique*. New Haven, CT: Innovations for Poverty Action (Ongoing study) (http://www.poverty-action.org/project/0384).

Dercon, S., D.O. Gilligan, J. Hoddinott, and T. Woldehanna. 2008. *The impact of agricultural extension and roads on poverty and consumption growth in fifteen Ethiopian villages*. Discussion Paper 840, Washington, DC: International Food Policy Research Institute (IFPRI).

Diao X. and D. Sarpong. 2007. Cost Implications of Agricultural Land Degradation in Ghana: An Economywide, Multimarket Model Assessment, IFPRI Discussion Paper 00698.

Duflo, Esther, M. Kremer, and J. Robinson. 2011. Nudging farmers to use fertilizer: Theory and experimental evidence from Kenya. *American Economic Review* 101: 2350–2390.

Duflo, Esther, M. Kremer, and J. Robinson. 2008. How high are rates of return to fertilizer? Evidence from field experiments in Kenya. *American Economic Review* 98(2): 482–88.

Erenstein, O. 2010. Zero Tillage in the Rice–Wheat Systems of the Indo-Gangetic Plains: A Review of Impacts and Sustainability Implications, in Spielman, D. and Pandya-Lorch, R. eds., *Proven Successes in Agricultural Development: A Technical Compendium to Millions Fed.* Washington, DC: IFPRI.

Essama-Nsaah, B. 2013. Coping with the attribution problem in program evaluation. Special Series on the Nuts and Bolts of M&E Systems, number 26. Washington, DC: World Bank.

FAO. 2000. Land Resources Potential and Constraints at Regional and Country Levels. World Soil Resources Report 90. Rome. Available here.

Feder, G., R. Murgai, and J.B. Quizon. 2004. Sending farmers back to school: The impact of farmer field schools in Indonesia. *Review of Agricultural Economics* 26 (1): 45–62.

Franzel, S. and S. Scherr, eds. 2002. *Trees on the Farm: Assessing the Adoption Potential of Agroforestry Practices in Africa.* Wallingford, U.K.: CABI Publishing.

FSG. 2010. *Smallholder Farmer Development: International Donor Funding Trends. A Trend Analysis of the Corporate Leadership Coalition for Smallholder Farmer Livelihoods*. Boston: Foundation Strategy Group.

Godtland, E., E. Sadoulet, A. De Janvry, R. Murgai, and O. Ortiz. 2004. The impact of farmer field schools on knowledge and productivity: A study of potato farmers in the Peruvian Andes.‖ *Economic Development and Cultural Change* 53 (1): 63–92.

Kato, E., Nkonya, E. and Place, K. 2011. Heterogeneous Treatment Effects of Integrated Soil Fertility Management on Crop Productivity: Evidence from Nigeria, IFPRI Discussion Paper 01089.

Kristin D. , E. Nkonya, E. Kato, D. Mekonnen, M. Odendo, R. Miiro, J. Nkuba. 2010. Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa, IFPRI Discussion Paper, 00992.

Lei Pan and L. Christiaensen. 2012. Who Is Vouching for the Input Voucher? Decentralized Targeting and Elite Capture in Tanzania, *World Development*, 40(8):1619–1633

Owens, T., J. Hoddinott, and B. Kinsey. 2003. The impact of agricultural extension on farm production in resettlement areas of Zimbabwe. *Economic Development and Cultural Change* 51 (2): 337–357.

Pretty, J., C. Toulim and S. Williams. 2011. Sustainable Intensification: Increasing Productivity in African Food and Agricultural Systems. International Journal Agricultural Sustainability Series, *Earthscan*, 2011.

Sumberg, J. and Thompson, J., 2012. *Contested Agronomy: Agricultural Research in a Changing World.* Oxon, UK: Routledge.

Sumberg, J., Thompson, J. and Woodhouse, P., 2012. Why Agronomy in the Developing World Has Become Contentious. *Agriculture and Human Values.* 30, 71-83.

Warner, J., Stehulak, T. and Kasa, L. 2015. Woreda-Level Crop Production Rankings in Ethiopia: A Pooled Data Approach. Available here.

World Bank. 2011. *Impact evaluations in agriculture: An assessment of the evidence*. Washington, DC: The World Bank.

World Bank. 2011. Republic of Ghana Tackling Poverty in Northern Ghana., Report No. 53991-GH. Available here.

World Bank. 2007. Ghana Country Environmental Analysis, Report No: 36985-GH. Available here.

Appendix A. PMMT Training feedback from East and Southern Africa mega-site

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The objectives of the training were clearly defined.	17	13	1	0	0
2. Participation and interaction were encouraged.	17	14	1	0	0
3. The topics covered were relevant to me.	13	14	4	0	0
4. The content was organized and easy to follow.	10	15	2	0	0
5. The materials distributed were helpful.	17	10	3	0	0
6. This training experience will be useful in my work.	14	8	3	0	0
7. The trainer was knowledgeable about the training topics.	16	16	1	0	0
8. The trainer was well prepared.	19	12	0	0	0
9. The training objectives were met.	10	17	3	0	0
10. The time allotted for the training was sufficient.	3	12	6	8	1
11. The PMMT will be **very useful** for your research activities	13	11	6	1	0

Appendix B. PMMT Training feedback from West Africa mega-site

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The objectives of the training were clearly defined.	6	5	1	0	0
2. Participation and interaction were encouraged.	2	6	2	0	0
3. The topics covered were relevant to me.	2	4	0	0	0
4. The content was organized and easy to follow.	3	5	2	0	0
5. The materials distributed were helpful.	2	6	4	0	0
6. This training experience will be useful in my work.	3	8	1	0	0
7. The trainer was knowledgeable about the training topics.	7	3	2	0	0
8. The trainer was well prepared.	4	7	1	0	0
9. The training objectives were met.	1	8	3	0	0
10. The time allotted for the training was sufficient.	3	2	2	4	0
11. The PMMT will be **very useful** for your research activities	6	6	0	0	0

Appendix C. Meta-data submitted (as of April 15, 2015)

No	Template sender's full name	Country	Date template received	Sender's email	File/Tab title	CKAN code
1	Damtew, Elias (ILRI)	Ethiopia	1/14/2015	e.damtew@cgiar.org	Metadata for Inovation platform M_E	innovation_platform_m_e
2	Birachi, Eliud Abucheli (CIAT-Kenya)	Ethiopia	1/16/2015	e.birachi@cgiar.org	MetadataStds4DataPortal-AR VC	value_chain_analysis_eth
3	Thorne, Peter (ILRI)	Ethiopia	1/19/2015	p.thorne@cgiar.org	MetadataStds4DataPortal-AR-ET	participatory_selection
4	Sharma, Kalpana (CIP-Ethiopia)	Ethiopia	1/15/2014	k.sharma@cgiar.org	MetadataStds4DataPortal-AR-promotion of quality se	quality_seed_promotion
5	Sharma, Kalpana (CIP-Ethiopia)	Ethiopia	1/15/2014	k.sharma@cgiar.org	MetadataStds4DataPortal-AR-promotion of diffused l	diffused_light_storage
6	Sharma, Kalpana (CIP-Ethiopia)	Ethiopia	1/15/2014	k.sharma@cgiar.org	MetadataStds4DataPortal-AR-develop community bas	community_action_plan
7	Sharma, Kalpana (CIP-Ethiopia)	Ethiopia	1/15/2014	k.sharma@cgiar.org	MetadataStds4DataPortal-AR-contribute to the integr	ar_integration
8	Sharma, Kalpana (CIP-Ethiopia)	Ethiopia	1/15/2014	k.sharma@cgiar.org	MetadataStds4DataPortal-AR-community based seed	seed_multiplication
9	Adie, Aberra (ILRI)	Ethiopia	1/23/2015	a.adie@cgiar.org	Metadata-AR-SWIFB	faba_analysis
10	Derseh, Melkamu (ILRI)	Ethiopia	1/25/2015	m.derseh@cgiar.org	MetadataStds-AR-ILRI led protocol- Crop Residue Mar	crop_residue_mgm
11	Derseh, Melkamu (ILRI)	Ethiopia	1/25/2015	m.derseh@cgiar.org	MetadataStds-AR-ILRI led protocol- irrigated-rainfed f	irr_rain_fodder
12	Lema, Zelalem (ILRI)	Ethiopia	1/24/2015	z.lema@cgiar.org	Metadata for facilitation, communication and coordi	innovation_platform_design
13	Aster Gebrekirstos (ICRAF)	Ethiopia	1/14/2015	a.gebrekirstos@cgiar.org	doi:10.7910/DVN/25288	
14	Aster Gebrekirstos (ICRAF)	Ethiopia	1/14/2015	a.gebrekirstos@cgiar.org	doi:10.7910/DVN/25286	
15	Aster Gebrekirstos (ICRAF)	Ethiopia	1/14/2015	a.gebrekirstos@cgiar.org	doi:10.7910/DVN/25291	
16	Aster Gebrekirstos (ICRAF)	Ethiopia	1/14/2015	a.gebrekirstos@cgiar.org	doi:10.7910/DVN/25292	
17	Mekonnen, Kindu (ILRI)	Ethiopia	1/18/2015	k.mekonnen@cgiar.org	MetadataStds4DataPortal-AR-ILRI led protocol- tree lucerne	
18	Marc Traore	Ghana/Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR -2	nutrition_survey
19	Marc Traore	Ghana/Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR -5	conventions_survey
20	Kotu, Bekele (IITA)	Ghana/Mali	3/30/2015	b.kotu@cgiar.org	Metadata_Ghana.Meta-data_Activity 4(WP2)	
21	Kotu, Bekele (IITA)	Ghana/Mali	3/30/2015	b.kotu@cgiar.org	Metadata_Ghana.Meta-data_Activity5(WP2)	
22	Kotu, Bekele (IITA)	Ghana/Mali	3/30/2015	b.kotu@cgiar.org	Metadata_Ghana.Meta Data Activity7 (WP2)	
23	Kotu, Bekele (IITA)	Ghana/Mali	3/30/2015	b.kotu@cgiar.org	Metadata_Ghana.Meta dataActivity2(WP4)	
24	Roberts, Cleo (IFPRI)	IFPRI	12/10/2014	c.roberts@cgiar.org	MetadataStds4DataPortal-AR-MWI_ARBES	mwi_arbes
25	Roberts, Cleo (IFPRI)	IFPRI	2/18/2015	c.roberts@cgiar.org	MetadataStds4DataPortal-AR-ETH_ARBES	eth_arbes
26	Roberts, Cleo (IFPRI)	IFPRI	2/18/2015	c.roberts@cgiar.org	MetadataStds4DataPortal-AR-GHA_ARBES	gha_arbes
27	Roberts, Cleo (IFPRI)	IFPRI	2/18/2015	c.roberts@cgiar.org	MetadataStds4DataPortal-AR-MLI_ARBES	mli_arbes
28	Roberts, Cleo (IFPRI)	IFPRI	2/18/2015	c.roberts@cgiar.org	MetadataStds4DataPortal-AR-TZA_ARBES	tza_arbes
29	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR-Mali-trials	mali_trials
30	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR-Mali-sheep feeding	mali_sheep_feeding
31	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR-Mali-farm characteriza	mali_farm
32	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR-Mali-biomass assessm	mali_biomass
33	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR -1	houehold_farmer_survey
34	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR -3	nutrition_modules
35	Marc Traore	Mali	2/2/2015	m.traore@cgiar.org	MetadataStds4DataPortal-AR -4	feed_evaluation
36	Abass, Adebayo (IITA)	Tanzania	1/26/2015	a.abass@cgiar.org	MetadataStds4DataPortal-AR (Postharvest WP-Tanza	post_harvest_food_loss