



Africa RISING

Africa Research in Sustainable Intensification for the Next Generation

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

USAID-FEED THE FUTURE SUSTAINABLE INTENSIFICATION IN AFRICA

MONITORING AND EVALUATION REPORT

(October 2015 – September 2016)

February 16, 2017



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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/>



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Executive Summary

Africa Research in Sustainable Intensification for the Next Generation (Africa RISING--AR) 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 (WA) (Ghana and Mali), East and Southern Africa (ESA) (Malawi, Tanzania and Zambia) and Ethiopian Highlands-EH). The WA and ESA projects are led by the International Institute of Tropical Agriculture (IITA) while the EH project is led by the International Livestock Research Institute (ILRI). The primary hypothesis of AR is that sustainable intensification of mixed crop-tree-livestock systems leads to increased whole farm productivity, which in turn leads to better development outcomes, including improved food and nutrition security. The monitoring and evaluation (M&E) of the three regional projects is led by the International Food Policy Research Institute (IFPRI), with Wageningen University leading farming systems modeling efforts. A communications project is also part of the program, led by ILRI.

During Phase I of the program (2012 - 2016), the focus has mostly been on a demand-driven approach to identify scalable entry points for sustainable intensification (SI) of key farming systems across program countries. While most of the analyses during Phase I has been at the household-level, researches have also examined the role of enabling environment for SI including markets, institutions and policies.

During Phase II of the program (2017 – 2021), the goal is to reach an estimated 25,000 households for testing alternative SI technologies and management practices. In addition, there will be a significant effort to scale up successful SI options identified in Phase I to over 1 million households, working with development partners and taking advantage of the partnerships and stock of knowledge created in Phase I.

During Phase I, the M&E team has invested significant time and effort to set up a program-wide M&E system, with the following main elements:

- Development of a web-based project mapping and monitoring tool (PMMT) with data entry application (<http://apps.harvestchoice.org/africarising-data-reports/>) and mapping application (<http://apps.harvestchoice.org/africarising/>)
- Several rounds of in-country trainings on the PMMT to AR researchers

- Validation and aggregation of FtF indicators data submitted through the PMMT for subsequent reporting through USAID's FtF Monitoring System (FtFMS)
- Preparation of program-wide data management plan
- Cataloguing of program-wide socioeconomic and agronomic data using ILRI's data repository (CKAN) <http://data.ilri.org/portal/group/africarising>)
- Five Africa RISING Baseline Evaluation Surveys (ARBES):
 - Ethiopia: <http://dx.doi.org/10.7910/DVN/H6RWO0>
 - Tanzania: <http://dx.doi.org/10.7910/DVN/PPUL2W>
 - Ghana: <http://dx.doi.org/10.7910/DVN/QUB9UT>
 - Mali: <http://dx.doi.org/10.7910/DVN/UDKSBJ>
 - Malawi: <http://dx.doi.org/10.7910/DVN/28557>)
- Construction of farm typologies using comparable micro data from ARBES (<http://africa-rising.wikispaces.com/typologies>)
- Preparation of projections of expected number of direct and indirect program beneficiaries in Phase II
- Development of draft indicators of sustainable intensification at the household and community level capturing the five core areas: productivity, economic, environmental, social and human aspects
- Drafting of program beneficiary and technology tracking tool (BTTT) with unique household identifiers
- Drafting of monitoring data requirement guide and supporting documentation, detailing data needs on program beneficiaries (direct and indirect), technologies, and responsibilities
- Conducting several research studies addressing a number of questions of policy relevance. The research topics include targeting and bias in participatory agricultural research; the nexus between production diversity and dietary diversity; assessment of the economic, risk, and labor effects of different farming practices; correlates of farmers' willingness to pay for improved agricultural technologies; and bio-economic modelling of household farm production and its linkages to the environment

During Phase II, the M&E will build upon its activities in Phase I with monitoring efforts decentralized to regional teams and more focus given to evaluation activities, in collaboration with researchers on the ground. The team expects to undertake program-wide analysis on various aspects of program interventions, with results to be disseminated to different audiences and in various formats, including technical reports, journal articles, briefs, and blogs. Specific research topics of focus during Phase II include the analysis of farming systems, household typologies, and poverty characterization; determinants of the adoption of promising SI technologies identified during Phase I and an *ex-ante* and *ex-post* evaluations of their socio-economic and environmental effects; the nexus between production diversity and dietary quality; and a comparative analysis of the return and risk associated with program technologies. The M&E team, in collaboration with AR researches and development partners leading scaling up efforts, will conduct strategic research studies to guide scaling up efforts. These studies will combine baseline data collected in Phase I with mid-line data to be collected during Phase II to generate credible and robust evidence on technology adoption decisions and the agro-economic and environmental effects of program interventions in the short- and long-term.

Introduction

The primary hypothesis of Africa RISING 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.

Phase I of the program has focused primarily on diagnostic studies, partnership building, action research, and development of multi-stakeholder platforms. In addition, researchers have tested the aforementioned hypotheses by implementing baskets of interventions in selected communities¹, with interventions ‘offered’ to volunteers and delivery methods varying across time, space, and local context. Farming systems analysis, (crop) modelling, and socioeconomic analyses have been conducted to identify and target appropriate technologies and management practices across different farm types. Phase II of the program will focus more on scaling up (and out) of successful SI innovations in collaboration with relevant development partners. This report discusses the main activities undertaken by IFPRI’s M&E team during Fiscal Year (FY) 2016 and outlines activities planned for FY 2017.

The rest of the report is organized as follows. Section 2 summarizes activities undertaken in FY 2016. Section 3 summarizes activities planned for FY 2016. Section 4 concludes the report.

¹ Definition of community varies among countries, depending on the local administrative and geographical arrangements.

2. M&E activities in Fiscal Year 2016

The M&E team conducted a broad range of activities in FY 2016, in collaboration with researchers on the ground. These activities include the management and cataloguing of data in ILRI's public repository CKAN, updates to the project mapping and monitoring tool (PMMT), PMMT trainings, draft monitoring data requirement guide and supporting tools, draft beneficiary and technology tracking tool, preparation of the Ethiopia ARBES survey report, aggregation of the 2016 Feed the Future (FtF) indicators data, analysis of Africa RISING Baseline Evaluation Survey (ARBES) datasets and dissemination of results. Each of these activities is elaborated below.

2.1. Cataloguing of program-wide agronomic and socioeconomic data

To comply with the program's approved data management plan², the M&E team, in collaboration with ILRI, has continued its efforts to properly catalogue various program-wide socioeconomic data using ILRI's portal CKAN. AR researchers are expected to store their data in the CKAN repository, with clearly written metadata, within 12 months after completion of data collection (embargo period for data cleaning and documentation). Both AR researchers and the general public can access the meta-data (i.e., information about the data) about all the datasets published in CKAN (65 datasets as of September 2016). Data stored in CKAN is not publicly available. Instead, these data are confidential, that is potential data users need to send a request to the data owner through the system before accessing data.

A screenshot of the metadata template is shown in Figure 1.

² Details on the data management plan can be found here: http://africa-rising.wikispaces.com/program_moneval.

Figure 1. Portion of the meta-data template

| Element | Description |
|---------------------------------------|--|
| Identifier | Unique and persistent identifier assigned to the dataset in its current form |
| Title | Name of the dataset |
| Creator | Person, team, or institution that produced the dataset |
| Format | Physical or digital medium in which the data are stored |
| Subject | General description of the contents of the dataset |
| Publication Year | Year that the dataset is made public |
| Version | Necessary if multiple versions of the data are released |
| Language/s | Language or languages in which the data are available |
| Funder/s | The person, team, or institution that provided the funds to collect and/or transform the data |
| Usage and Sharing Rights/Restrictions | List of usage and sharing rights, along with acknowledgment requirements |
| Keywords | Search terms that could lead a user to the dataset |
| Filename | For electronic data, a label associated with each file, which contains a brief description of its contents |

2.2. Updates to the Project Mapping and Monitoring Tool

The project mapping and monitoring tool (PMMT) is developed to aid project monitoring efforts within and outside the program and is intended to help users (project managers, donors, researchers, data analysts, and stakeholders in general) better understand where and how program activities are taking place. The tool has the following two applications:

- **Data entry application** which 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
- **Mapping application** which 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

Based on feedback received from program partners, the M&E team undertook another round of updates to the PMMT in 2016, including modification of the data entry application to accommodate Phase II, requiring researchers to provide a narrative when there is a discrepancy between target and actual (which originally was optional), and addition of new program sites for Zambia.

2.3. PMMT training to 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 two rounds of in-country trainings in the past for AR researchers in all five AR countries. In 2016 M&E team identified several focal persons from researchers on the ground to coordinate AR FtF data entry for Zambia, Tanzania and Malawi. Multiple refresher PMMT trainings were conducted with these focal persons.

The refresher trainings covered mostly on how to input project level FtF and custom indicators into PMMT including some time for hands-on experience. The trainings highlighted consistency checks in data entry process for both online and excel template.



*Figure 2 PMMT refresher training in Arusha, Tanzania
Picture: courtesy of Apurba Shee*

2.4. Draft monitoring data requirement guide and supporting tools

Monitoring and evaluation are integral to manage and assess the efficiency and effectiveness of investments in agricultural programs in general and within AR in particular. Inadequate planning and capacity for timely collection, analysis, and dissemination of data are among the challenges faced during the M&E of programs, outputs, and outcomes. To address this challenge, and with input from researchers, the team drafted a guide for monitoring data requirements, along with supporting tools. This guide discusses data needs on program beneficiaries (direct and indirect) and technologies, data requirements

for sustainable intensification indicators and measuring longer-term development outcomes, and data collection responsibilities by the different partners involved.

2.5. Beneficiary and technology tracking tool

Over the course of Fiscal Year 2016, the M&E team has developed an excel-based beneficiary and technology tracking tool (BTTT). This tool will allow partners to track program beneficiaries using unique household identifiers and is expected to assist with the linking of various agro-economic data with technologies and management practices that are being tested as part of the program.

2.6. ARBES survey report for Ethiopia

Similar to what was done for Malawi, Tanzania, Ghana, and Mali during 2015, the M&E team finalized the cleaning of the Ethiopia Africa RISING Baseline Evaluation Survey (ARBES) data and produced a report, which has been shared with Ethiopian Highland researchers. The ex-ante EARBES sample included 523 households drawn from the eight program kebeles. The sample included all households that were participating in on-farm trials as of April 2014 as well as households that participated in a Sustainable Livelihood Assets Evaluation (SLATE) survey conducted by program researchers. The latter group did not receive any treatment at the time of the survey and was included in the survey, with the expectation that the group would be recruited into in on-farm trail research. The final sample includes 488 households, with a response rate of 93 percent. Data were collected using structured questionnaires in multiple local languages through Computer Assisted Personal Interviewing, using the Census and Survey Processing System (CSPPro). A summary of the ARBES Ethiopia sample is shown in Table 1.

Table 1 Ethiopia ARBES Sample Summary

| Region | Zone | Woreda | Kebele | On-farm trial households | SLATE households | Total households |
|-------------|--------------|---------------|------------|--------------------------|------------------|------------------|
| Tigray | South Tigray | Endamehoni | Tsebet | 7 | 55 | 62 |
| | | | Embahasti | 7 | 56 | 63 |
| Amhara | North Shewa | Basona-Worana | Gudo-Beret | 6 | 57 | 63 |
| | | | Goshe-Bado | 6 | 28 | 34 |
| Oromia | Bale | Senana | Selka | 10 | 57 | 67 |
| | | | Sanbitu | 10 | 59 | 69 |
| SNNPR | Hadiya | Lemmo | Jawe | 8 | 57 | 65 |
| | | | Upper Gana | 7 | 58 | 65 |
| Full Sample | | | | 61 | 427 | 488 |

Source : ARBES (2014).

Note: On-farm trial farmers = farmers testing Africa RISING technologies on their farms; SLATE = Sustainable Livelihood Assets Evaluation participants, who were used as a control group for the on-farm trial group.

Table 2 summarizes land ownership and management practices among ARBES participants, as an example. Nearly all households own the land they operate and can access it within 15 minutes from their homestead. They cultivate about 5 parcels over around 2.5 hectares of land. Less than half of them have experienced soil erosion on their land and can access seed suppliers in less than an hour, on average. About 5 percent of the households irrigate during the *Meher* or big rainy season while 10 percent report irrigating during the *Belg* or small rainy season. Forty percent of all households practice intercropping and more than 90 percent apply fertilizer and practice crop rotation. However, few households (16 percent) practice following.

Table 2. Land ownership and management practices in Ethiopia

| | On-farm trial households (n=61) | SLATE households (n=427) | All households |
|---|--|--------------------------------|-------------------|
| <i>Land characteristics</i> | | | |
| Households that own land (%) | 80 | 83 | 82 |
| Size of operated land (ha) | 2.69 | 2.45 | 2.48 |
| Total number of parcels | 5.49 | 5.35 | 5.37 |
| Households with closest parcel accessible within 15 minutes (%) | 89 | 85 | 86 |
| Travel time to seed supplier (minutes) | 33.12* | 40.72* | 39.77 |
| Households experiencing soil erosion (%) | 41 | 47 | 46 |
| <i>Management practices</i> | | | |
| Households using irrigation in the Meher season (%) | 3 | 5 | 5 |
| Households using irrigation in the Belg season (%) | 20*** | 9*** | 10 |
| Households practicing intercropping (%) | 43 | 40 | 40 |
| Households practicing rotation (%) | 95 | 91 | 92 |
| Households practicing fallowing (%) | 13 | 16 | 16 |
| Households using manure on (any) plot in either season (%) | 67* | 78* | 77 |
| Household using fertilizer (%) | 100** | 91** | 92 |
| Households using hired labor (%) | 49 | 43 | 44 |
| Households using communal labor (%) | 64 | 66 | 66 |

Source : ARBES (2014).

Note: On-farm trial households = households testing Africa RISING technologies on their farms; SLATE = Sustainable Livelihood Assets Evaluation participants.

Analysis of data from the household and community portions of the survey suggest that many on-farm trial and SLATE households face land pressures, especially with respect to livestock. Most land is acquired from the government and while most households own the land they cultivate and can reach it within 15 minutes, they hold relatively small amounts of land, less than 2.5 ha on average. This small amount of land must be used for both crops and livestock—less than 10 percent of land can be allocated to livestock in either the *Meher* or *Belg* season. Land pressures among households drive farmers to migrate for grazing land and seek out forages and crop residues to supplement grazing. Even smaller percentages of community land are available for grazing. In some, no community land is available at all for grazing. This is an especially important concern given that a great majority of households hold cattle.

2.7. Aggregation of the 2016 FtF indicators data

The M&E team has aggregated Feed the Future (FtF) Indicators data submitted by program researchers using the PMMT. Data submitted by individual research teams were have been validated and aggregated by mega-site level, along with a discrepancy narrative, whenever the gap between target and actual achievement is more than 10 percent. The team will subsequently upload aggregated data onto USAID's FTF Monitoring System (FtFMS) portal.

2.8. Policy-relevant research studies

The M&E team conducted a number of research studies during Fiscal Year 2016 addressing various topics of policy relevance. These include targeting, bias, and expected impact of AR innovations in Malawi (has just been accepted at a peer reviewed journal); the nexus between production diversity and dietary diversity in Malawi and Ghana (under submission to peer reviewed journals); economic, risk, and labor effects of different legume and fertilizer practices in Malawi (under review in a peer reviewed journal); heterogeneous impacts of credit constraints in the presence of risk rationing and wiliness to pay for improved agricultural technologies (Tanzania), and a bio-economic model for the assessment of research into the sustainable intensification of agricultural production systems (draft technical documentation completed).³ Preliminary research findings have been shared with both AR researchers and the general public (e.g., the 2016 AAEEA meeting in Boston and the 2016 CSAE Conference in Oxford). Appendix A summarizes some of the findings from these studies.

³ Draft report can be found here: <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/130683>.

3. M&E Activities Planned for Fiscal Year 2017

During FY 2017, the team will maintain its role in cataloguing AR-wide data through CKAN; update various monitoring tools, including the project mapping and monitoring tool and the beneficiary and technology tracking tool; update the monitoring data requirement guide and supporting tools; compile and report FtF indicators data. In addition, the team will conduct focused mid-lines survey in Malawi and initiate/finalize the preparation for mid-line surveys in Tanzania and other program countries. In addition to finalizing research studies initiated in Phase I and disseminating findings, the team will work with researchers on the ground to identify new areas of research to advance our understanding of program-wide SI efforts and their overall impact. The sub-sections below elaborate on the planned activities.

3.1. Continued cataloguing of program-wide socioeconomic data

In the interest of collecting all data generated through the program in one place and to comply with the approved program's data management plan, the team, collaboration with ILRI, will continue facilitating the uploading of data onto CKAN.

3.2. Updates to the project mapping and monitoring tool

The PMMT will go through additional updates in FY 2017 to accommodate new communities (to be) targeted by the program as well as other needs of program partners that may arise during the year.

3.3. Updates to the beneficiary and technology tracking tool

The M&E team has received feedback on the draft beneficiary and technology tracking tool (BTTT) during the ESA inception meeting, including the need to develop another version of the BTTT using Open Data Kit (ODK) – a free and open-source data collection tool. The draft BTTT will be shared with researchers in the other two projects in the coming months. Based on feedback received from the different partners, the team will update the tool and prepare how-to guide for use during in-country BTTT and PMMT trainings, also to be organized in FY 2017.

3.4. Updates to the monitoring data requirement guide and supporting tools

Similar to the BTTT, the M&E team is has/is receiving comments on the draft data requirement guide it has shared with researchers. The guide and supporting tools will be updated in the coming months to ensure a more coordinated and targeted data collection effort in Phase II.

3.5. Reporting of the 2017 FtF indicators data

The team will continue to aggregate individual Feed the Future indicators data for subsequent reporting to the donor.

3.6. In-country trainings

In-country trainings will be organized to orient and update researchers on the different monitoring tools and data requirement guide that are being developed/refined.

3.7. Mid-line surveys

Given that the first baseline survey was conducted in Malawi in the summer of 2013, the team expects to implement the first Africa RISING Mid-line Evaluation Survey (ARMES) in Malawi in the summer of 2017. For the sake of comparability of baseline and mid-line data, all ARMES surveys will be conducted at the same time (of the year) as the baseline surveys. In order to ensure timely implementation of the survey, most of the survey preparation work will be done in the second quarter of FY 2017, including finalization of the list of program beneficiaries and communities (working with AR Malawi researchers), survey design, and identification and contracting of a competent local partner to oversee and implement the data collection. The team will also conduct the necessary background work for ARMES in the other program countries, with Tanzania's expected to be implemented in early 2018.

3.8. Attend program- and project-level meetings

The M&E team will continue to actively contribute to and participate in various program- and project-level meetings. The team's continued presence and participation in these meetings will facilitate communication between the research teams and the M&E team about ongoing research activities on the ground and will help the team to better tailor its activities to the needs of the researchers.

3.9. Partnerships and collaborations

Collaborative work with researchers in and outside of the program will continue in FY 2017. Specifically, strong collaborative work is expected with the team of researchers from Columbia University and Michigan State University (MSU) who have been developing the *Sustainable Intensification Indicator Framework (SIIF)*. The SIIF provides guidelines for the selection of sustainable intensification SI indicators across the following domains: Productivity, Economic, Environment, Social and Human. It also provides guidelines for how data may be collected to estimate those indicators at field/farm-, household-, and landscape or administrative-scale, as applicable. As noted in SIIF, the timing of data collection will

depend on the appropriate indicators to be selected by each research team and as such the M&E team will provide necessary guideline on appropriate data collection post-selection of indicators by researchers.

3.10. Research and communication

As noted in Section 2, a greater share of the team's time in FY 2017 will be devoted to finalizing on-going characterization and impact (*ex-ante* and *ex-post*) studies as well as initiate new collaborative research to better understand SI technology adoption decisions, constraints to adoption, and the agro-economic, environmental, and social effects of SI technologies. With the scaling up and out of promising SI technologies identified in Phase I, the team will conduct strategic research to inform scaling efforts. A summary of selected research studies is provided in Appendix A. Findings from these studies will be shared with AR researchers and the general public using different outlets (e.g., program review and planning meetings, non-technical reports, blogs, policy briefs, conferences, and peer reviewed journal articles).

4. Conclusion

IFPRI's monitoring and evaluation (M&E) team will continue to play a crucial role in coordinating and overseeing various activities across the three projects to generate solid evidence for program managers, the donor, and the general public. Based on the experience of Phase I, the team has refreshed its mandate and overall scope of work with more focus on evaluation activities and decentralized project monitoring.

Some of the main activities to be conducted in FY 2017 include Africa RISING Mid-line Evaluation Survey (ARMES) in Malawi, preparation for ARMES in the other program countries; modelling for forward-looking impact projections, impact assessment, and intensification-pathway analysis; provision of ongoing data management and analysis; maintenance of an open-access data management platform; provision of monitoring reports and projections; coordination of multi-scale M&E activities (program, project, country, and sub-system levels) and reporting to donor, including compliance with FTF M&E requirements; analysis and research on the effects of the program at various scales; provide overall support to the Project Coordination Team (PCT), project coordinators, research teams, and the donor; and keep the PCT, Communications Team, and project steering committees informed of the various M&E activities.

To aid with the decentralization of the monitoring and data management-related activities, three regional M&E officers (in Ethiopian Highlands, West Africa, and East and Southern Africa) will be hired by ILRI/ICRISAT/IITA (respectively), with joint supervision by IFPRI and the recruiting center. The local M&E coordinators/data managers are expected to significantly improve the communication between the DC-based M&E team and the research teams on the ground.

References

Africa RISING. 2011. *Program framework 2012-2016*, available [here](#).

IFPRI. 2016. Africa RISING Monitoring and Evaluation Report October 2014 – September 2015.

IFPRI. 2015. Africa RISING Monitoring and Evaluation Report October 2013 – September 2014.

IFPRI. 2014. Africa RISING Monitoring and Evaluation Report October 2012 – September 2013.

Africa Research in Sustainable Intensification for the Next Generation: Proposal for a second phase, 2016–2021.

Sustainable Intensification Indicators Framework (SIIF), *Africa Rising Meeting*, Bamako 1/22/16 version, mimeo.

Appendix A. Summary of findings from research studies in FY 2016

I. Characterization and Targeting Analysis

This research study examines the socioeconomic characteristics of farmers testing technologies. The findings, recently accepted to a top peer reviewed journal, show systematic targeting of better-endowed farmers, with the implication that attention should be given to program design and household characterization to better define and improve targeting criteria, technology selection, and external validity.

II. Bio-economic Modelling of Household Farm Production and Its Linkages to the Environment

The Dynamic Agricultural Household Bio-Economic Simulator (DAHBSIM) was developed out of a joint project effort between researchers at the Mediterranean Agronomic Institute of Montpellier (IAMM), the University of Madrid, the French National Institute for Agricultural Research (INRA), and the International Food Policy Research Institute (IFPRI). The origins of DAHBSIM come from the earlier FSSIM (Farm Systems SIMulator) model (Louhichi et al, 2010). DAHBSIM was designed to be applied to a rural, developing country-setting, for the purpose of addressing questions around the biophysical constraints to on-farm agricultural productivity, and the whole-farm implications of alternative strategies to sustainable agricultural intensification. The model links socio-economic and biophysical aspects, in order to better illustrate the environmental and human welfare implications of different agricultural production practices, as they are influenced by policies. Africa RISING Baseline Evaluation Survey (ARBES) data from Malawi is used to calibrate this model. Details about this piece of work can be found here: <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/130683>.

III. Assessing Farm-level Trade-offs between Organic and Inorganic Nitrogen Fertilizers

Land degradation, population growth, and poverty in Africa south of the Sahara threaten the sustainability of livelihoods for smallholder farmers. These farmers often manage soils depleted of nutrients, use limited fertilizer, and make choices about their cropping systems that entail multiple trade-offs. This study combined the modelling of crop production with an economic analysis to explore the economic, risk, and labour-use effects of different legume and fertilizer practices for maize-focused cropping systems in central Malawi. A maize-groundnut rotation provided a 79% higher average profit and increased the

stability of profits compared with maize monoculture that also used more inorganic fertilizer than the rotation. Maize monoculture with inorganic fertilization provided a 54% higher average caloric yield and used less labour, compared with the maize-groundnut rotation. Using a maize-groundnut rotation increased the likelihood of labor shortages in the spring and summer seasons, compared with maize monoculture. Despite the ability of legumes to fix nitrogen from the atmosphere, increase profits, and reduce risk, these benefits might not be enough to encourage greater adoption when maize monoculture with inorganic fertilization provides higher caloric yields and is not as labor intensive.

IV. Land Cover Changes and Poverty Dynamics

This research study, recently shared with researchers at The Seventh (2016) International Conference on Agricultural Statistics (ICAS VII), examines the link between land cover changes in the three AR regions of Ghana and rural livelihoods. Findings show that areas currently cultivated but covered by vegetation in 1994 show higher agricultural production and productivity than those previously bare. Thus expansion of cropland into degraded areas with poor soil fertility may not yield positive gains, threatening the sustainability of agricultural production upon which millions of poor smallholders rely.

V. Heterogeneous Impacts of Credit Constraints in the Presence of Risk Rationing: Evidence from Tanzania

This research, presented in the International Conference on Economics and Management of Risks in Florida, uses direct elicitation of credit constraints through a specialized survey in Tanzania coupled with Africa RISING baseline evaluation survey data. It identifies and estimates the average cost of credit constraint on agricultural productivity for constrained, unconstrained, and the entire sample population. We directly elicit household's credit constraint status for borrowers and non-borrowers using survey-based technique akin to contingent valuation. We have found a modest 13% of households are quantity rationed whereas more than half of the sample (57%) are risk rationed. We employ a generalized version of Heckman's selection model to account for farmers' self-selection based on unobserved heterogeneity and find that the average cost of credit constraint for the entire population of farmers in our study area is about 19% loss in agricultural productivity. If the constraint is removed from a constrained farmer, on average his/her productivity is expected to increase by 11%, and if credit constraint is imposed on an

unconstrained farmer, he/she is expected to suffer a very high 38% loss in productivity. We have found that average cost of constraint for the unconstrained set is much higher than that of the constrained set which indicates that the principle of comparative advantage is at work.

VI. Willingness to Pay for Improved Agricultural Technologies: Results from Field Experiment in Tanzania

This study has investigated whether small holder farmers would be willing to pay for these technologies, and what factors determine their informed demand for technologies. Using a contingent valuation experiment combined with baseline evaluation survey of 400 households in Northern Tanzania, we measured farmers' willingness to pay (WTP) for hybrid maize seed and local inorganic fertilizer. Farmers' WTP is estimated using a dichotomous contingent valuation with follow-up model, and the average WTP is found to be 61.6% higher for hybrid maize seed and 14.7% lower for inorganic fertilizer compared to their average market prices locally available in 2013. Education of household head, maize productivity and extension services are found to influence farmers' likelihood of buying hybrid maize seed positively, whereas farmers risk aversion preferences and distance to nearest supply market have a significant negative influence on WTP for both hybrid seed and inorganic fertilizer. The study concluded that WTP analysis can not only shed lights on cost-benefit analysis but also on the sustainability of agricultural innovation.

VII. The Nexus between Production Diversity and Dietary Quality

The M&E team, in collaboration IITA, has been examining the link between production diversity and dietary diversity using IFPRI's baseline data from Malawi and Ghana. Preliminary results from Malawi, shared at the 2016 AAEA meeting in Boston, show a significant increase in production diversity that has not translated into increase household dietary diversity. The evidence from Ghana shows both on-farm diversity and productivity to improve household dietary diversity, with the positive impact of on-farm diversity on dietary quality increasing as access to markets becomes more difficult. These findings underscore the importance of complementary inputs, such as infrastructure and awareness about nutritional values of crops, to improve the food and nutrition security of poor farm households.

Appendix B. Research studies for FY 2017

I. Farm Household Characterization

In collaboration with researchers from Wageningen University (WUR) and building upon its work in 2015 and 2016, the team will refine its farm household typologies generated based on Africa RISING baseline survey data. Given the diversity of the farming systems targeted by AR, the drivers (e.g., biophysical, institutional, and economic) of technology adoption and effects thereof are expected to vary significantly and the farm typology work is expected to guide program targeting and scaling up efforts and support the identification of technology-specific suitable farming systems. The construction (and operationalization) of farm typologies is also expected to help explain trends and farmer behaviour (functional characteristics, including sustainable intensification indicators) as well as the verification of the agro-economic effects of program interventions for different farm types.

II. Ex-ante Evaluation

In order to guide priority setting, inform ex post impact assessment and promote learning about the generalizability of the evidence generated during Phase I (through field experimentations), the team will conduct an ex ante evaluation of selected SI technologies. The ex-ante evaluation will make use of and complement plot-level findings by generating evidence on the expected gains if promising SI technologies identified in Phase I were to be scaled up. The ex-ante evaluations (using Decision Support System for Agrotechnology Transfer - DSSAT) will measure expected agro-economic and environmental effects for different farm typologies and agro-ecological zones and will be complemented with policy simulations about the effects of exogenous shocks (e.g., climate change) with and without AR SI technologies?

Some of the SI technologies to be evaluated in 2017 are listed below:

Zambia: Climate smart agriculture

- Control – Conventional moldboard ploughing planted with sole maize. Residues may be grazed, removed, burned or incorporated into the ridges.
- Conservation Agriculture – sole **maize**, seeded in lines/furrows made by a ripper. No tillage, no burning. Previous year's ridges retained (*but not reformed*). Residue retained (mulch).

- Conservation Agriculture – maize rotated with **cowpea** or **soybean**, seeded in lines/furrows made by a ripper/direct seeder. No tillage, no burning. Previous year’s ridges retained (*but not reformed*). Residue retained (mulch).
- Conservation Agriculture –maize rotation with cowpea/soybean, seeded in lines/furrows made by a ripper/direct seeder. No tillage, no burning. Previous year’s ridges retained (*but not reformed*). Residue retained (mulch).

Tanzania: Intercropping with different fertilizer application rates

- Application of different sources of phosphorus (*Minjingu* granular, *Minjingu mazao*, DAP and TSP)
- Intercropping of maize/pigeonpea varieties that are differentiated by maturity periods.
Maize varieties include: *PAN 691*, a long maturing maize variety, *Mkombozi*, an early to medium maturity high yielding maize variety, and *SC 627*, an early maturing variety.

Mali: Pigeonpea variety (from ICRISAT), a long maturing and high yielding variety that is considered new in the study sites.

Ghana: Testing of improved varieties and agronomic practices:

- Cowpea (living mulch and no mulch), with alternative maize planting densities
- Maize – groundnut intercropping with residue management and strip cropping
- Different fertilizer application rates (for maize)
- Integrated soil fertility mgt ((Farmer practice, Triple superphosphate (TSP) at 60 kg/ha, *Fertizol* (F) at 4 t/ha, *Fertizol* (F) at 4 t/ha, TSP + F, TSP + F + *Boostxtra*

III. Ex-post Evaluations and Targeted Impact Evaluation Studies

The M&E team will continue analyzing baseline data to generate evidence on the early effects of the program on agronomic and economic outcomes. Follow-up survey will be conducted in Malawi so that longer-term effects of the program can be analyzed using more robust panel-based identification techniques. The team is collaborating with AR researchers in Ethiopia on the design and implementation of a randomized controlled trial (RCT) to evaluate the impact of an integrated decision support system (IDSS) on the adoption of climate smart agricultural practices and on subsequent outcomes. Similar opportunities will be explored in other countries as well during the first year of the scaling up phase.

IV. The Nexus between Gender, Agriculture, and Food Security

The team will continue exploring the linkages between gender, agriculture, and food security using baseline data collected from Malawi, Ghana, and Ethiopia. Some of the questions to be answered include: are there gender differences with regard to access to and ownership of agricultural inputs and management practices? If so, how do these differences affect agricultural production and productivity as well as food security (e.g., availability and quality)? Are there heterogeneous effects of AR technologies by, for example, the gender of main decision maker within the household? The evidence based on AR households and data will be complemented with the analysis of nationally-representative nutrition and agricultural data that has been compiled by IFPRI researchers under the Advancing Research on Nutrition and Agriculture (AReNA) project.

V. Land Ownership and Technology Adoption

This research will focus on the relationship between land ownership on the one hand and investments and technology adoption on the other hand, using data from Africa RISING baseline surveys and other secondary data sources in Southern Mali. Specifically, we will analyze plot-level data on the type of ownerships (private, communal, rented, and sharecropped) and community-level self-reported data on land insecurity, to examine how the adoption of improved agricultural technologies, including those promoted by AR, are affected by land ownerships, controlling for plot-, household, and landscape-level factors that could affect adoption decisions.

VI. Multivariate Approach to Adoption of Complementary Technologies under Constraints: Hybrid Maize and Fertilizer in Tanzania

This work in progress will revolve around the adoption decision of improved maize seed and fertilizer in Tanzania in the presence of multiple adoption constraints. Since technologies, such as seed and fertilizer application, are often complementary, farmers' adoption decisions need to be determined simultaneously. Specific questions of policy relevance we will analyze include: given farmers might be more likely to adopt hybrid maize seed if they adopt fertilizer first or vice versa, do households make adoption decision on fertilizer and hybrid seed simultaneously or sequentially?