Africa RISING West Africa Project

External Mid-Term Review Report

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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 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 an associated project on monitoring, evaluation and impact assessment.

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Over 30 years as an agronomist and agricultural economist working with National and International Research and Development Institutions, NGOs, commercial organizations and local farmers primarily in sub Saharan Africa, but also parts of Asia and Latin America. Expertise in participatory research and extension methods, seed systems, management of natural resources and agricultural development projects.

Christine Okali, *Sociologist*

Started out as a rural sociologist teaching in the Faculty of Agriculture at the University of Ibadan, Nigeria in the 1960s and has since worked as a sociologist in the crop, forestry, livestock, and fisheries sectors especially in sub-Saharan Africa. Most recently coordinated the Gender and Social Difference research theme of the Future Agricultures Consortium of the Institute of Development Studies based in the UK. Presently a member of the Science Advisory Group for Africa RISING and member and Chair of the Independent Advisory Committee of Humidtropics.

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Over 30 years of experience in Animal Agriculture with special skills in the inter-phase of crop-livestock-agroforestry and their interactions and with extensive knowledge of natural resource management, and of climate change adaptation and mitigation issues. Worked for the FAO Southern Africa sub-regional office in Harare, Zimbabwe and served as Director General of the International Trypanotolerance Centre based in The Gambia. Worked extensively as a scientist and team leader in both research and development with the CGIAR.

Acknowledgements: We would like to acknowledge the support, openness and enthusiasm of Africa RISING management, staff and partners including farmers during the review process, not only in answering our many questions but also identifying the challenges with which they have been faced and suggestions on a way forward. Many of these have been incorporated into our review.

Cover photos: A collage of different scenes taken during the review

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Acronyms

AEA	Agricultural Extension Agent
AGRA	Alliance for a Green Revolution in Africa
AMASSA	Afrique Verte, Mali
AMEDD	Association Malienne d'Eveil et de Développements Durable, Mali
ARI	Animal Research Institute, Ghana
ATT	Agricultural Technology Transfer
AVRDC	The World Vegetable Center
CBOs	Community-based Organizations
CIAT	International Center for Tropical Agriculture
CG or CGIAR	Consultative Group on International Agricultural Research
CRI	Crops Research Institute, Ghana
CRP	Challenge Research Programs
CMDT	Campagne Malienne de Development des Textiles, Mali
E&SA	East and Southern Africa
FRI	Food Research Institute, Ghana
GLDB	Grains and Legumes Development Board, Ghana
HI	Heifer International, an NGO
ICRAF	International Center for Agroforestry Research
ICRISAT	International Crops Research Institute for the Semi-arid Tropics
IER	Institut Economie Rurale, Mali
IFDC	International Fertiliser Development Corporation
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IFPRI	International Food Policy Research Institute
IWMI	International Water Management Institute, Ghana
KNUST	Kwame Nkrumah University of Science and Technology, Ghana
M&E	Monitoring and Evaluation
MOBIOM	Mouvement Biologique du Mali,
MOFA	Ministry of Food and Agriculture, Ghana
MOH	Ministry of Health, Ghana
MSF	Medecine Sans Frontieres, an international NGO
NARS	National Agricultural Research System
NARES	National Agricultural Research and Extension Systems
NGO	Non Government Organisation
NORGFA	Northern Region Guinea Fowl Farmers Association, Ghana
NRM	Natural Resource Management
PCT	Program Coordination Team
RISING	Africa Research in Sustainable Intensification for the Next Generation
PMMT	Project Mapping And Monitoring Tool
R&D	Research and Development
R4D	Research for Development
SAG	Science Advisory Group
SARI	Savanna Agricultural Research Institute, Ghana
SeeDPAG	Seed Producers Association of Ghana
SI	Sustainable Intensification
SNV	Stichting Nederlandse Vrijwilligers, a Netherlands based NGO

SRI	Soil Research Institute, Ghana
S&W	Soil and water
UDS	University for Development Studies, Ghana
UG	University of Ghana
USAID	The United States Agency for International Development
WA	West Africa
WIAD	Women in Agriculture Development, Ghana
WP	Work Packages

Executive summary

The review: This mid-term review has assessed Africa RISING West Africa's work to date evaluating progress towards the expected outputs and outcomes and made recommendations to meet the challenges being faced. The review process included literature review, discussions with partners, and visits to a number of villages where Africa RISING is working for discussions with farmers, technicians and others involved in the research activities. The review included one week in Ghana, another in Mali and four days in IITA, Ibadan, Nigeria interviewing IITA management and briefing them on Africa RISING.

Project design and implementation strategy: Africa RISING has almost completed three year's work. Two remain. In the first year USAID requested tangible results and research partners were asked to implement "quick wins". This included a number of brief studies, community, value chain and stakeholder analyses, seed production, technology identification and testing with farmers in a number of villages in target communities and communes. Initially Africa RISING-WA had been regarded as independent from two other Africa RISING projects in Ethiopia and East and Southern Africa. However, shortly after initiation USAID requested the three Africa RISING projects to operate as a single Program using a similar research approach, learning from each other and working towards similar outputs and outcomes. The Program design was modified to achieve a common purpose of "increased adoption by smallholder farmers of productivity increasing SI innovations" and goal of "providing pathways out of hunger and poverty through sustainably intensified farming systems. As a result of these changes WA Africa RISING now operates in a considerably smaller number of often different villages than in its first year of operation, as a result of a site selection process undertaken by IFPRI .

The lack of a detailed project design at project inception together with a changing implementation strategy caused and continues to cause difficulties for some scientists.

<u>Recommendation:</u> The recent draft log frame should be finalized including measurable indicators for each output, and guided by a "theory (or hypothesis) of change".

Africa RISING WA's implementation strategy includes the establishment of research for development (R4D) platforms to identify research activities and facilitate community engagement in planning, experimentation and technology evaluation, while also ensuring buy-in and ownership by partners. Partners were expected to include both government agencies with the potential to ensure the sustainability of Program activities, and non-government agencies with shared interests.

Although R4D platforms are being established, their intended role is only now becoming apparent, more so in Ghana than Mali. Consequently research activities to date have tended to be supply led rather than demand driven. Due to political instability in Mali, government partners have not integrated into the Program.

In Ghana "Technology Parks" established in each village provide sites for farmer technology testing using "mother-baby-trials", and dissemination through farmer-to-farmer extension activities whereas in Mali, individual CG-led research trials are scattered around target villages providing less opportunity for learning than in Ghana.

Recommendations

i) R4D platforms urgently need to be operationalised in order to return to the planned bottom-up, demand-led approach envisaged for this Program. Links between platforms to be formed at different levels need to be clarified, and budgetary provision should be made for platform-identified and prioritised research activities.
ii) Africa RISING-Mali should modify its implementation strategy to include at least two hubs linked to villages in adjoining communes to provide a wider learning opportunity and to integrate government research and development organisations as soon as possible. Activities in both Ghana and Mali should be linked to those of the R4D platforms in an annual learning cycle of community engagement, joint planning, implementation, learning and review.

Research outputs. There are four interrelated research outputs comprising ten work packages (WPs).

Situation Analysis and Program-wide Synthesis: This output comprising WP1 is expected to provide socio-economic "support" to other work packages. This includes working with the R4D platforms and assisting in the participatory assessment of SI innovations under test, by undertaking cost benefit analyses and monitoring uptake.

Recommendations

i) Cost-benefit analysis of SI innovations should be established as routine procedures to be undertaken both before and after farmer testing using research protocols as a guide. This analysis should take into account the use of draft animals, labour availability and use, especially the labour of women and children.

ii) R4D Platform purposes and functions need to be clarified and agreed by participants with facilitation provided for their establishment and operation. Platform members must be informed on progress and agree future priorities.

Integrated Systems Improvement: This output comprises nine WPs, four concerned with cereal-legume-vegetable cropping systems, three with livestock and crop-livestock systems, two with natural resource management and one for improving household nutrition and value addition.

***Cereal-legume-vegetable cropping systems*:** More than 400 farmer trials have been conducted to develop and disseminate SI combinations of improved varieties and management practices. Although the majority of these trials have been successful, they have been hampered by complex, and time-consuming institutional and logistical arrangements. The scattering of trials, especially in Mali, has resulted in CG centres undertaking separate and uncoordinated activities.

Recommendations

i) Since most trials other than those including rice are located on top lands opportunities for SI in low lying wetland valley bottom areas guided by WPs on NRM should be explored.
ii) Seek opportunities for improved dry season vegetable production when prices are highest. This will require accessing water from wells and rainwater harvesting, and

exploring wetland use. These activities should provide opportunities to link Africa RISING WA with bi-lateral projects concerned with small-scale irrigation.

iii) Channel farmer requests for more assistance (seed, fertilizer, tractors/bullocks, livestock etc.) through R4D platforms.
iv) In Mali, link ICRAF's indigenous tree and food bank activities with AVRDC work on vegetable production and include IER expertise.

Livestock and livestock-cropping systems. Demonstrating the results of SI livestock technologies to many farmers is difficult as the facilities established do not lend themselves to the "Technology Park" approach. Although delivery of livestock health services is largely a government responsibility, resource availability precludes effective delivery. Farmers particularly women are asking for more support for small ruminant and poultry production.

Recommendations

i) Ensure that livestock management SI practices, which do not lend themselves to the "Technology Park" approach, can be effectively evaluated by farmers and used for training.
ii) Address the requests of farmers, especially women, for additional research and development on small ruminants and poultry, giving attention to high mortality and non responsive feeding trials.
iii) Accelerate and integrate research on animal feed opportunities including use of crop residues and improved feed preservation measures, improved use of fallows with dual purpose crops and fodder trees, and high density crop population thinning and leaf stripping.
iv) Consider the best use of animal manure and urine, maximising collection and investigating alternative application methods.
v) Identify and address livestock health delivery systems, facilitating links between vets and Community-based Livestock Workers, animal owners and livestock marketing agents.

Natural resource management systems. Although some progress is being made there remains a need to balance the need for long term research such as understanding hydrology, water management and modeling processes with immediate requirements to address improved soil and water management for SI, through links with CRPs allowing cross-shared Program lessons, an example from Mali being the Kani watershed, a component of CRP 5 (Water, Land and Ecosystem).

Recommendations

i) Demonstrate S&W technology options in the "Technology Parks" (Ghana) and proposed "hubs" (Mali).
ii) Ensure the necessary economic calculations are made for both trade-off analyses of land restoration and for farming systems modeling.
iii) Provide the necessary support for identifying (opportunistic) options for dry season irrigation of vegetables and other high value crops.
iv) Develop links with other system-related CRPs especially the Dryland, Humidtropics and Water Land and Ecosystems Programs.

In Mali

vi) Ensure that work on local conventions governing NRM and conflict resolution are raised at appropriate fora. At the same time individual villages and/or communities could be encouraged to use the conventions for community land use planning. Local conventions governing water use should be included as part of the ongoing ILRI work.
vii) Ensure that SI combination technologies (contour bunding, fodder grass and tree planting) are appropriately located as demonstrations within "hubs". At the same time care should be taken that these do not exacerbate soil erosion problems by sourcing appropriate expertise.
viii) Ensure appropriate reporting and learning arrangements for joint projects such as the McKnight Foundation-funded and ICRISAT led project in Mali working in areas adjacent to Africa RISING target areas.

Food Nutrition WP. Ways forward related to the challenges include the need to establish baselines for monitoring and assessing change under different circumstances. These should provide the basis for a comparative research program across Ghana and Mali focused on children under two years' old, pregnant women and different household categories. This will require AVRDC, UDS and if possible IER in Mali, to work together, and for the research team to establish links with other nutrition research being undertaken internationally.

There remains a need to develop a research plan and assess change under different circumstances. No assessments of the benefits of identified dietary change appear to be available.

Recommendations

i) Review data held globally on nutritional status of populations. Link with international research institutions covering maternal and child health, and production and nutrition linkages. Draw up detailed plans, including sampling/ research designs as soon as possible and establish links with relevant national health and nutrition Programs to ensure scaled outcomes.
ii) AVRDC, UDS and IER should prepare a comparative research program cutting across Ghana and Mali focused on children 24 months and under, pregnant women and different household categories...
iii) In Mali, the nutrition schools appear to have produced a few success stories in 2012. If a sample of participants can be identified, a systematic study designed for learning should assess the hypothesis that Nutritional Schools stimulate changes in cropping patterns.

Scaling and Delivery of Integrated Innovation: While there remains a need to continue knowledge exchange and capacity building as integral parts of other WPs, there is also a need to address the two outputs shown in the Program framework (ILRI, IITA and IFPRI, 2012), "Wider adoption of innovations being identified and tested within the Africa RISING action research sites" and "National governments and the development community initiate programs based on the knowledge, tools and innovations developed and promoted by Africa RISING".

Recommendations

i) Commence Investigation of wider adoption/adaptation of tested innovations in order to learn more about the performance of SI technologies, to plan future related research, and to contribute to research on appropriate scaling approaches. This should include "Networking Mapping" of who is using which technologies or elements of technologies,

where, why and how these are being modified by different farmer or household categories.

ii) Establish and formalise links with USAID bilateral projects including ADVANCE (Phase 2) and ATT in Ghana, and routinely inform USAID bilateral missions of Africa RISING activities.

Monitoring and evaluation. IFPRI are responsible for impact measurement for this program. At the same time Africa RISING must also undertake M&E activities to ensure that continuous learning is taking place.

Recommendations

i) Routinely assemble socially disaggregated data on project participants. This may require links with institutions and social researchers experienced in evaluation for learning, for backstopping and within- Program training.
ii) Undertake studies on how technology is being incorporated into existing farming activities and livelihoods and undertake comparative case studies of household resource allocations, especially food following uptake of SI systems. These studies require engaging in discussion with household members by a social scientist and agronomist with strong backgrounds in mixed methods research.
iii) Question hypotheses underpinning the program including the value of combined improved crop varieties and agronomic practices for income and food security compared with single technologies using input from i) and ii).
iv) Question issues of gender interpreted as women's issues and prepare a program of gender research around technology that does not limit women or men to specific technologies and/or approaches. Activities carried out under ii) should provide insight but should also include a review of literature on households and gendered livelihoods in Ghana.

Data collection and use

Communication and knowledge management: Much of the communication strategy to date has been targeted at higher level stakeholders rather than project participants on the ground.

Recommendation: Consideration should be given to targeting R4D platforms and farmer groups.

PMMT*:* This has recently become functional and despite training many staff remain unaware of how it operates.

Recommendations

i) Ensure appropriate use of PMMT by scientists, addressing concerns of access for publications.

ii) Follow up on data sharing between different institutions and incorporating data from different sources including NARS into PMMT.

Partnerships

An impressive number of partnerships have been established and are being consolidated. These include CG centers, NARES, NGOs, CBOs and farmers. Most are working effectively and contributing to Africa RISING outputs. A number of challenges were however identified,

including perceptions that CG centres were undertaking research that the NARS could be doing, a sentiment strong in Ghana.

Recommendations

Research partners

i) Improve working arrangements by limiting unnecessarily lengthy and complex compliance arrangements and making timely arrangements for funding.
ii) Encourage more integrated activities and avoid "silo" approaches by both research and development partners, especially in Mali.
iii) Improve communication by initiating: a calendar of upcoming events and visits; regular meetings to discuss administrative issues and staff concerns; a series of seminars / short workshops to share the expertise that exists across the Program allowing lessons to be shared with other R&D partners. This might include CRP, but especially "Water Land and Ecosystems" with regards to NRM.
iv) Ensure CG centres work closely with NARS scientists. This goes beyond joint planning and implementation, graduate training, and short-term courses but should include mentoring and encouraging ownership of research results. This task should be made easier by expected USAID financial support for SARI in Ghana.

Development partners

v) Agree on a clear vision of Africa RISING pathways that begin with farmers and other agric-sector actors in the design and roll out of the research agenda, and promotion and dissemination of research outputs.
vi) Ensure USAID-Ghana and USAID-Mali and their bilateral projects are informed about Africa RISING activities and formalise close working relationships with them. This includes IFDC-ATT and ACDIVOCA-ADVANCE in Ghana, and FARMSEM, vegetable/nutrition, NRM and value chain projects in Mali. Development partners should be encouraged to establish demonstration plots in communities adjoining Africa RISING target communities.
vii) Involve MOFA in Ghana and NGOs in Mali in facilitation of R4D platforms, encouraging other development partners to be an integral part of the platforms.
viii) Ensure two-way feedback of research results through MOFA in Ghana and NGOs in Mali to R4D platforms and farmers on results of research and priorities for the next two years.
ix) In Ghana, ensure AEAs working with Africa RISING are informed well in advance of protocols and associated activities. Logistical arrangements including travel, fuel costs and irregular payments need to be addressed.
x) In Ghana, address farmer concerns about land preparation difficulties, access to and high costs of inputs especially fertilizer and pesticides. Provide more research support for small ruminants and poultry production and crop processing needs.
xi) In Mali, address farmer requests for inter-farm visits and field days.

Management

Achievements include: the establishment of a project steering committee for considering WPs; a recently appointed "Science Advisory Group" at program level to advise the project; a "Program Coordination Team" comprising the three main implementing institutions IITA, ILRI and IFPRI, and USAID, who coordinate topics across the three regions; contractual arrangements between

partners are in place and reporting systems have been established; IITA has established a regional office in Tamale in which Africa RISING is housed. A draft logical framework is now in place providing the vision and allowing implementers to plan their research from a longer term perspective. The Africa RISING team has recently been strengthened by the recent recruitment of an agricultural economist and communication specialist for both WA and E&SA, with research supervisors/ coordinators in each of the three Ghana regions.

Recommendations

i) Address the difficult institutional arrangements related to mode of operations, fund transfers and reporting schedules by ensuring an accountable, responsive funding and reporting system that maximises timeliness in line with seasonal requirements. This includes streamlining procedures for approving and modifying WPs. At the same time partner organisations with limited administration capacity should be provided with on-the-job mentoring in addition to formal training to ensure reports are submitted on time.
ii) Ensure that absence of in-country CG partners does not result in clumsy sub-sub-contracts. Where national institutions have limited capacity greater use of local regional consultants should be considered. At the same time budgets need to be closely matched with expected work.
iii) Re-engage with IER in Mali, using their expertise where capacity allows and build capacity for sustainability. Improve communication with SARI in Ghana, especially as SARI is an IITA partner in a number of projects. IITA should consider establishing a liaison office at SARI...
iv) Complete the draft log frame with output and outcome indicators and incorporate a "theory of change" in line with the vision.

Availability of human resources for successful implementation: It is recognised that capacity limits are present at all levels, some of which are being addressed, while others will require priorities to be established. Lacks of continuity of staff and recent recruitments have led to work disruption and delays. All WPs involve a number of scientists, sometimes with limited time allocated to Africa RISING. Long distances between workstations and research sites plus inadequate transport are costly in terms of researcher time, both CG and national partners.

- Recommendations
  i) Minimise the number of short-term/ part time senior researchers through hiring sufficient senior technical staff.
  ii) Support new staff by linking them with mentors and provide resources for short cross-team meetings of disciplinary and interdisciplinary teams.
  iii) Ensure existing human resources notably national staff are supported with adequate transport and research assistance.

Contribution to the Humidtropics and Dryland CRPs: The review team recognises that IITA is required to map WA Africa RISING onto the Humidtropics CRP and ICRISAT is required to obtain approval for Africa RISING work activities from management of Dryland Systems and Water,

Land and Ecosystem CRPs. Equally, Africa RISING research has a contribution to make to both Humidtropics and Dryland Systems CRPs, and the USAID "Feed the Future" Program.

Recommendation: The team is of the view that the future of this Program lies in maintaining each of these linkages, in order to retain its separate identity.

Research development for a next phase: The review team recognises that a number of the recommendations made for new or existing activities are unlikely to be implemented before 2016, especially as new problems and opportunities will emerge from ongoing work. It will be essential that the review recommendations are prioritised by the R4D platforms in line with farmer requests with work that can concluded in the next two years given priority. This means that recommendations for completely new work are best addressed in a next phase. Key activities will be monitoring technology use, developing and implementing a plan for learning, clearer targeting, strengthening work on crop-livestock integration, addressing livestock health issues and addressing wetland use and irrigation potential.

Introduction

As part of its "Feed the Future" initiative, the United States Agency for International Development (USAID) is supporting an innovative multi-stakeholder agricultural research program, "Africa Research in Sustainable Intensification for the Next Generation" (Africa RISING). The program's main objective is to identify and validate scalable options for the sustainable intensification of key African cereal-based farming systems to increase food production and improve the livelihoods of smallholder farmers and at the same time conserve or improve the natural resource base.

Africa RISING is a 5-year research program launched in 2011 as three regional projects, bringing together a wide range of research and development partners from the CGIAR and national agricultural research and extension systems, farmers, NGOs, input and output dealers and policymakers to develop technology options and management practices to better integrate crops (cereals, legumes and vegetables), livestock (including pigs and poultry) and trees and shrubs in mixed-farming systems with the aim of improving farm productivity, nutrition and incomes of small-farm families without degrading the environment.

Africa RISING's purpose is to provide pathways out of hunger and poverty for smallholder families, particularly for women and children, through sustainably intensified and diversified farming systems that sufficiently improve food, nutrition, and income security and conserve or enhance the environment. It also aims to develop innovations that effectively link farmers to markets and input suppliers. The three projects are located in: West Africa, led by IITA, the Ethiopian highlands, led by ILRI and East and Southern Africa led by IITA.

The program has been organised around three research outputs namely:

1. **Situation Analysis and Program-wide Synthesis**, which includes activities necessary to ensure that technological interventions address farmer identified constraints and opportunities, and to develop a program-wide synthesis related to the lessons learnt across the three projects. This includes activities to ensure that project is able to characterize and stratify target communities effectively so that promising interventions are identified and inappropriate interventions rejected. This will also allow for the identification of existing sound practices within communities that might be more widely propagated, the adaptation of these and other, exogenous innovations, and the more effective combination of innovations from multiple sources.
2. **Integrated Systems Improvement**, which is being delivered through participatory research to increase productivity, incomes, and natural resource management of farming systems. The first two outputs are expected to generate integrated technology combinations targeted at opportunities that meet farmer's development needs and interests.
3. **Scaling and Delivery of Integrated Innovation**, which comprises the development of approaches to scale-up systems innovations to similar development domains. This third output recognizes that, even where technology combinations can be identified, the approaches used for scaling may not always be effective and seeks to redress this.

A fourth output is the responsibility of IFPRI and relates to monitoring and evaluation of farmer adoption and adaptation of innovations, and assessing economic and environmental impact of the project activities across the three Program projects. In West Africa, northern Ghana and southern Mali, Africa RISING focuses primarily on cereal-legume-vegetable-livestock production systems.

Review Purpose and Process

Review purpose

The purpose of this review at this early stage, where field activities in the second full season are still ongoing, has been to focus on assessing the conformity of the implemented work with the Program research framework, evaluating how the project is fostering learning by the stakeholders, including farmers, set against the achievements of the expected outputs and outcomes. The review has identified program challenges, the implications for the research program of the management structure at project and program level, the contributions of existing partnerships for implementation of activities, and assessed the availability of human resources for project implementation.

The review team has also considered the extent to which learning experiences from past programs in the intervention areas are being considered. Current identification of data gaps and issues of data handling and sharing among partners have also been part of the review. Since IFPRI has prime responsibility for M&E, the contributions of these activities to the project's research agenda have also been considered. The specific terms of reference for the review are shown in Error! Reference source not found..

The review has been based largely on the 2014-16 work plan which incorporated activities undertaken in 2013, and addressing evaluation questions provided in the TOR. The results are intended to allow Africa RISING management and its partners make necessary adjustments before entering year 4 and for looking towards Phase II.

Review process

The review process included a review of literature and telephone/skype discussions with key stakeholders not met during the Review Team's 3-week visit in WA. The visit included one week in Ghana, another in Mali and four days at IITA, Ibadan before briefing Africa RISING management. The process included:

Document Reviews: This included project documents held at the coordination office and material assembled by partners since the start of the project. These included work plans and reports, baseline data, research protocols and data analysis documents.

- *Key Informant Interviews*: These included researchers of Africa RISING in WA, Africa RISING management and governance staff (some members of the Steering Committee and PCT members), IITA DDG-Research and DDG-Partnerships, IITA directors for NRM and Humidtropics, USAID Washington, USAID missions in Ghana and Mali.
- *Discussions:* with farmer groups at the project sites visited.
- *Stakeholder analysis*: This was used to determine the effectiveness of partnerships and institutional collaborations forged between IITA and its partners.
- *Visits*: to project sites in Mali and Ghana where discussions were held with Africa RISING partners and research trials were visited in a number of villages in each Region and District where the project is working.

The review Program and the people interviewed are shown **Error! Reference source not found.** and **Error! Reference source not found.**.

Challenges experienced during the review included the lack of a completed proposal and log frame from the outset, the need to draw together a coherent analysis of two contrasting programs in terms of their history, the players involved and program roll-out, plus a hectic itinerary with often little time for adequate consideration of issues raised by partners.

Project Design and Implementation Strategy

Project Design

Africa RISING activities in Ghana and Mali were initiated in 2012 and are planned to last until September 2016. Three year's work have almost been completed and two years remain. Although the project commenced with no available implementation plan and no identified research sites, the program is based on four research and development-oriented objectives, these being:

- Identification and evaluation of demand-driven options for sustainable intensification, that contribute to rural poverty alleviation, improved nutrition and equity and ecosystem stability
- Evaluation, documentation and experience sharing with approaches for delivering and integrating innovation for sustainable intensification in a way that will promote uptake beyond the Africa RISING action research sites
- Creation of opportunities for smallholder farm households within Africa RISING action research sites to move out of poverty and improve their nutritional status – especially of young children and mothers – while maintaining or improving ecosystem stability.
- Facilitation of partner-led dissemination of integrated innovations for sustainable intensification beyond the Africa RISING action research sites.

Initially Africa RISING-WA had been regarded as independent from the other two Africa RISING projects in Ethiopia and East/Southern Africa. However, shortly after initiation USAID requested the three projects to operate as a single Program using a similar research approach, learning from each other and delivering similar outputs and outcomes. These feed into USAID's "Feed the Future" and its goal of "sustainably reducing global poverty and hunger through improved agriculture sector growth and improved nutritional status particularly of women and children"

During 2012, IITA issued contracts to both CGIAR and national partners to build on their existing activities to achieve "quick wins" and to generate information that would inform the design process for use in the longer-term project. Initial activities included a number of studies including, community, value chain and stakeholder analyses, seed production, technology identification and implementation in a number of target communities. During this process partnerships were forged on which to build in future. Stakeholder consultations and workplan development meetings resulted in a workplan centred on five outcomes: I) Improved crop-livestock production; ii) Improved nutrient recycling; iii) improved water management; iv) Improved nutrition of women and children and; v) improved partnerships and capacity building. Implementation of activities involved a wide range of actors. A research implementation plan (IITA et al, 2012) for the three Africa RISING projects identified approaches and included five key principles:

- The research conducted will be designed to test a set of hypotheses linked to outputs and developmental outcomes.
- Research activities will be problem-focused and driven by changes in market demand, evolving policy environments and meeting the needs of farmers.

- A set of guiding principles to ensure that research outputs are targeted on development needs and are feasible for target farm households to implement.
- Core research outputs should be common across the program; using methods and tools that can be applied flexibly.
- Scaling-up will be embedded in the Program at a pilot level and beyond through the development of investment plans with development agencies.

In 2013, the second year work activities for Output 1-Situation analysis included: community mobilisation, establishment of research-for-development (R4D) platforms, compilation of an inventory of innovations and identification of entry pathways for different household typologies. Activities for Output 2-Integrated systems improvement comprised:

- **In Ghana**: improving cropping and crop-livestock cropping systems; land management strategies to intensify crop-livestock production; agricultural water management for intensive crop and livestock production; improving cattle, sheep and goat production; intensifying rural pig and poultry production; and the testing and disseminating technologies to improve household nutrition.
- **In Mali:** improving farm household nutrition, sustainably managing natural resources and producing fodder, and increasing farm and field productivity through integration of technologies.

Activity for Output 3-Scaling and delivery included a number of delivery approaches and, capacity of scientists for data management and analysis.

In 2014, the third year of the project, work plans for three years 2014-2016 (Larbi et al, 2014) were developed. These comprised 10 work-packages (WPs) covering Research Outputs 1 and 2, but not Output 3 - Research on Scaling-up and Delivery Systems. However different delivery approaches were planned to exchange knowledge and disseminate technologies as an integral component of other WPs. Key amongst them were building the capacity of young scientists for data management and analysis, and developing integrated crop-livestock production packages. The WPs related to each research Output were:

Research Output 1 - Situation Analysis (WP-1)

- WP-1: Socio-economic studies on sustainable intensification in northern Ghana and southern Mali.

Research Output 2 - Integrated Systems Improvement (WPs 2-10)

- WP-2: Raising and sustaining productivity in cereal-legume cropping systems in northern Ghana.
- WP-3: Biological control of aflatoxins in maize with Aflasafe Ghanaian product GH01.
- WP-4: Integrating vegetables into cereal-legume cropping systems in northern Ghana.
- WP-5: Improving farm and field productivity and profitability in Mali.
- WP-6: Intensifying livestock and poultry production in northern Ghana and southern Mali.
- WP-7: Raising and sustaining productivity in crop-livestock systems in northern Ghana.
- WP-8: Land, soil and water management to intensify cereal-legume farming systems in Ghana.
- WP-9: Managing natural resources to increase watershed productivity in southern Mali.
- WP-10: Improving household nutrition and value addition in northern Ghana and southern Mali.

Also during 2014, a comprehensive project document (Larbi et al, 2014) outlined the goal, purpose, outputs, activities and implementation strategies of Africa RISING in West Africa. This document brings together earlier thinking and provides a draft logical framework that will guide the project during the final two years (**Error! Reference source not found.**). Although outputs (or deliverables) are clearly defined, there remains a need to establish indicators and realistic targets for each output using baselines from already completed WP surveys as well as IFPRI's baseline report.

These recently completed logical frameworks together with the 2014-2016 WPs were used to guide the review.

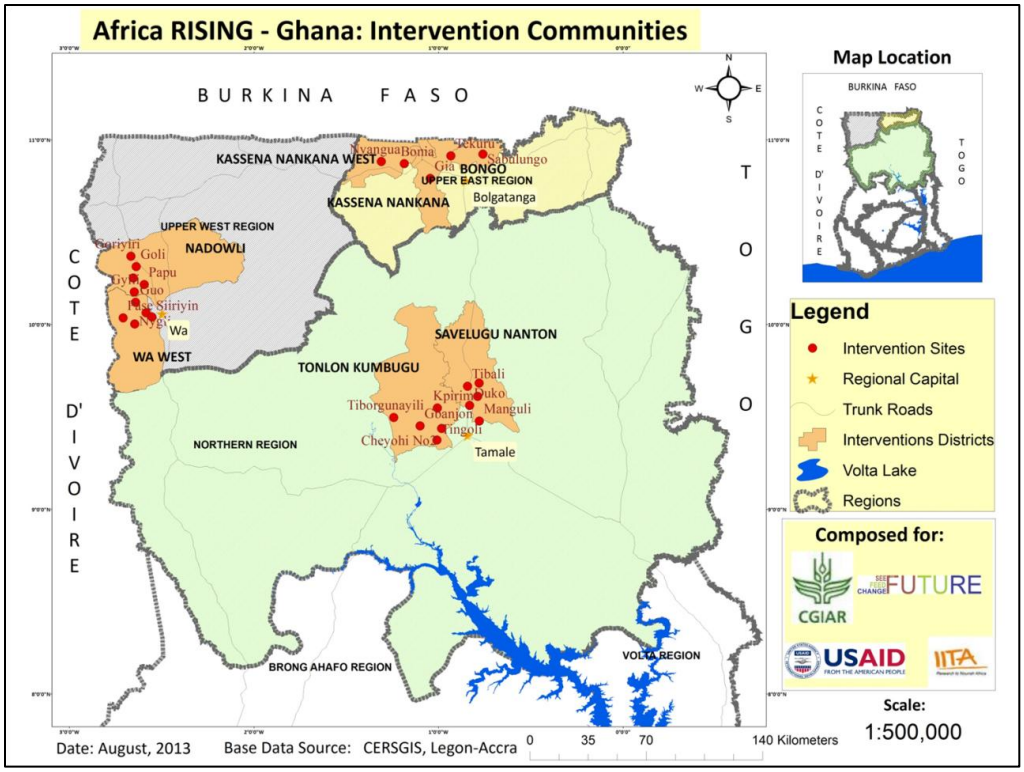
Challenges: The lack of a project proposal at the inception of the project caused and still causes difficulties for some scientists. Confusion about Africa RISING's vision and how the three projects interrelate and intended outputs contribute to a common purpose is still apparent among some partners.

Way forward: The recent draft log frame now requires finalising and measurable indicators guided by a "theory (or hypothesis) of change" need to be defined.

Implementation Strategy

Africa RISING WA's implementation strategy included participatory identification of research activities to address challenges and opportunities through development-orientated R4D platforms at both community and district levels involving partners from public, NGO and private sectors as well as community based organizations. The approach was intended to facilitate community engagement, joint planning, joint experimentation and evaluation, ensuring buy-in and ownership by partners, using appropriate participatory communication tools. These approaches were also designed to ensure sustainability and effective scaling-up through the building of strategic partnerships including R4D platforms involving local governments, farmer associations and CBOs, NGOs, the private sector, national and international organisations through interrelated work on food security, poverty, household nutrition and environmental challenges.

Presently Africa RISING WA operates in 25 intervention villages across six Districts and three regions in Ghana and 10 intervention villages in two Districts in Mali (Map 1, below and Map 2, overleaf).

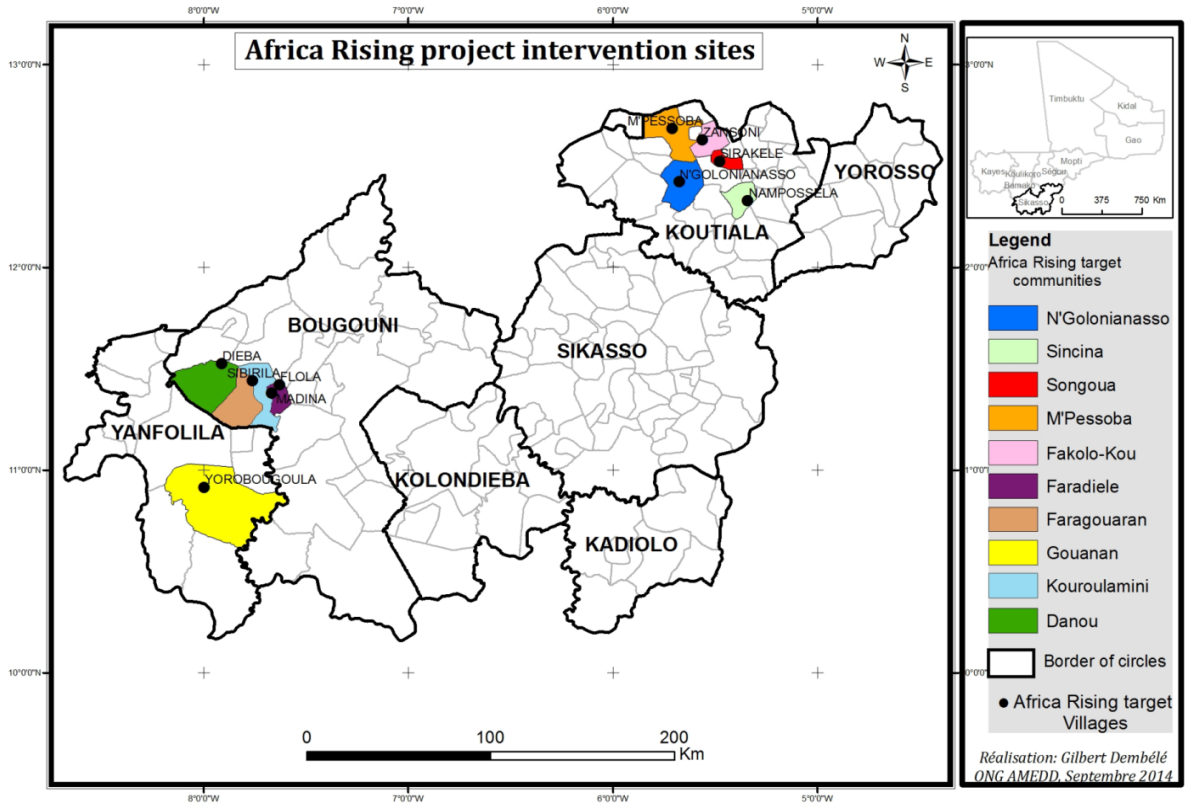


Map 1: Africa RISING, Ghana intervention communities

On-farm research activities comprise a "mother-baby" and dissemination approach managed by researchers, researchers and farmers, and farmers only. These compare intensified practices with farmers' practices and demonstrate new technologies and combinations of technologies through farmers' field days, farmers' field schools and exchange visits. They are also used to train farmers, extension and research assistants. In Ghana on-station research activities are largely used by graduate students as part of their dissertation research in developing new technologies.

Strengthening human capacity at all levels from farmers and their associations' officers, development workers, field and laboratory technicians, scientists and policy makers is an important component of the project. Academic training at MSc and PhD level focuses on research to address important knowledge gaps, and to develop 'second generation' technologies that may be suited specifically to particular recommendation domains. Gender awareness and gender equity, youth and under-privileged groups within society are considered in all project activities. Barriers-to-participation of women are reduced by offering interventions that lie within their interests, (gender sensitive interventions) and women interest groups are promoted to enhance the potential of their collective action in their commercialisation of small-scale agriculture.

The scale of implementation varies from plot to farm/field scale and from household to community level with results and outputs designed to be extrapolated to larger scales and recommendation domains for other areas and countries with similar agro-ecology and socio-economic environments using modeling, Geographical Information Systems (GIS) and Remote Sensing techniques.



Map 2: Africa RISING, Mali intervention communities

Knowledge transfer strategies have included

- Facilitating the formation of R4D platforms at strategic (District) and operational (Village) levels comprised of local leaders, R&D stakeholders, representatives of CBOs and the private sector, so that local priorities could be identified and research results used to support development opportunities.
- Establishing research-for-development plots to test and demonstrate technologies
- Using participatory and joint learning approaches for technology testing such as the 'mother-baby' and Farmer Field School dissemination approaches.
- Providing training courses for the different stakeholders including on-the job training of local staff and farmers.
- Organising exchange visits for farmers, research and extension staff.
- Developing media materials such as posters, leaflets, films for farmers and extension staff.
- Publishing interim and annual reports, proceedings and journal papers.

Challenges: Although R4D platforms are being established, their intended role is only now becoming apparent, more so in Ghana than Mali. Consequently research activities to date have tended to be supply led rather than demand driven.

Way forward: The process of R4D platform involvement at community and district level requires to be accelerated so that they can play their intended roles in 2015 and 2016. This includes identifying or confirming how they should operate.

In addition budgetary provision should be made for platform-identified and prioritized activities in line with Africa RISING WA objectives.

In Ghana a "Technology Park" approach has been used in each village providing opportunity not only for research but importantly for demonstration and training thereby linking research and development activities. This follows a mother-baby-dissemination approach with areas for further farmer testing, demonstration and adaptation through a farmer-to-farmer extension process.

Challenges: In Mali single research trials are scattered around Africa RISING-villages providing less opportunity for learning.

Way forward: Africa RISING-Mali should be encouraged to modify its implementation strategy to include at least two hubs linked to other villages in communes and Districts to provide the wider learning opportunity observed in Ghana. This will help in bringing Mali and Ghana closer, learning from each other. Both countries should link their activities to those of the platforms in an annual learning cycle (community engagement, joint planning, implementation, learning and review) to feed into the next learning cycle. This requires clarification of their role and membership with facilitation by platform development partners.

Progress towards outputs and realistic 2016 achievements

This section's is based on Africa RISING's expected Program Research Outputs and Outcomes as determined by West Africa, Africa RISING Project Outputs and their associated Work Packages. Progress, challenges and ways forward have been identified for each WP or group of WPs, addressing what can be realistically achieved by 2016.

It is noted that the project funding will cease in September 2016, before the end of the 2016 growing season. It would be sensible to alert USAID to this and to make an early request for a 6-month extension until March 2017 to ensure that data are collated and reports consolidated and shared with stakeholders, prior to initiation of a possible second Phase.

Program output 1: Situation Analysis and program- wide synthesis

This output comprises a single WP and is expected to provide socio-economic 'support' to other research activities.

WA Africa Rising Output 1: Farming systems at the Africa RISING intervention communities characterized and technological, institutional and policy options for SI documented

WP1: SOCIO-ECONOMIC STUDIES ON SUSTAINABLE INTENSIFICATION IN GHANA AND MALI

• Outputs/Deliverables	Outcomes (2014)	Impact
- Mobilise communities and establish 6-8 R4D Platforms in Ghana and Mali (Dec 14) - Survey of feed markets and analysis of livestock value chains identified by R4D platforms - Ghana (MSc -Dec 14) - Conduct cost benefit analysis of two interventions (Oct 14) - Link 100 farmers to markets – Ghana (Dec14) - Data base on monthly market prices for inputs and outputs (Jun and Dec) - Reports on value chains - Mali) (Mar 14)	– Increased interaction among stakeholders through the R4D Platforms – Research institutions use R4D Platforms and less of the linear approach to research – Other outputs contribute to other WP outcomes	- None on its own but supports other work packages

Progress towards delivering Outputs

2012. This included a project design workshop, stakeholders' planning workshop, consultations with AfricaRice and SARI in Ghana. ICRISAT organized similar multi-stakeholder planning meetings in Mali. Community engagement and analysis occurred with 47 communities in Ghana. A list of crop and livestock-based technologies was prepared, which formed the basis for on-farm mother-baby and demonstration trials in 2013 and 2014. An R4D platform was established - at Yorobougoula in Mali.

2013. 35 farmers groups were established at the intervention communities in Ghana (20) and Mali (10). Three R4D platforms were established at Nampossela in Mali, and Nadowli and Wa West in Ghana during September. Reports on guinea fowl, small ruminant and pig value chains were produced by ILRI and the University of Ghana and two MSc dissertations completed.

2014. A report on farming systems and farmer typologies was developed for intervention communities by Wageningen University.

Surveys: A number of different surveys have been undertaken beyond the IFPRI baseline survey in both Ghana and Mali. These include three situation analyses identifying constraints and opportunities for sustainable intensification; community analysis; two baseline surveys; two farming systems surveys. Steps towards the achievement of Output 1 have therefore been undertaken but not completed. The various surveys need to be drawn together to provide a more holistic synthesis.

R4D platforms: Although District-level R4Ds were and are currently being established to facilitate project implementation, they appear non-functional in Mali and have only recently been formed in Ghana. Their role both in ensuring that research is demand led and appropriate development activities are initiated cannot be overstated. R4D platforms will require facilitation to ensure appropriate representation, objectives and participant roles are agreed and regular meetings take place. Platforms need to be established at two levels District and Community or Village level, the former concerned with strategy and the latter operational issues. In Mali consideration should also be given to commune level platforms. Monitoring and learning from progress with R4D platforms will be important so that corrective action can be taken if required.

The strategy for scaling, or achieving 'increased adoption of technologies' under test is based on the formation and operationalisation of R4D Platforms. Since the platforms are also viewed as potential sources of institutional learning, their involvement in the planning and implementation of these activities is essential. Achievements and challenges from ongoing research needs to be presented or communicated to the platforms in an easily understandable form and a way forward agreed based on priorities agreed with the platforms. At the same time development partners can be encouraged to support scaling up of successful research in adjoining areas.

Specific commodity value chain stakeholders can also be linked through the R4D platforms and encouraged to identify opportunities for addressing input and output marketing and processing constraints.

Consideration should be given to providing a budget for inclusion in existing WPs for areas considered important by RD4 platforms not already being undertaken.

Increased interaction amongst stakeholders due to platform activity. Existing networks and relations amongst platform members in Ghana have yet to be analyzed. Since platforms have a central role to play in organizing and enabling learning institutional and policy support will be needed for effective operation. Reducing the linearity of the research may already be happening

even though the R4D platforms are not yet fully operational. Some platform players, such as AMASSA and AMEDD in Mali, might act as brokers between stakeholders including small farmers organized into groups/ small cooperatives and individual (larger) farmers and different categories of buyers such as World Food Program and large processing companies. Other players may be in a position to influence policy e.g. on taxes/ input prices etc.

Socio-economic support. WP1 is expected to provide socio economic 'support' to other WPs by drawing together packages identified and already under test.

Scaling options: The next step involves identifying scaling options with scaling being linked (conceptually) with increasing levels of adoption of tested technologies, or parts of tested technologies, with the necessary institutional and policy options in place. The use of the term 'adoption' in this and other WPs implies that the equivalent of the tested packages might be visible in farmers' individual/household fields.

- *Participatory budgets and cost benefit analysis:* Little economic analysis has taken place, although market data is being collected. Participatory budgeting comparing farmer and new practices as set out in research protocols needs to be undertaken both as protocols are agreed and after trials have been completed, providing a before (*ex-ante*) and after (*ex-post*) analysis. Although value chain analyses are being undertaken as separate studies, research protocols need to give consideration to where inputs are to be acquired and how outputs will be utilized or marketed. The involvement of farmer groups in this process will be important.

- *Value chain analysis:* Results from a number of studies associated with value chains are due to be completed by the end of 2014. These include: livestock value chains (poultry and pigs) in Ghana, feed markets, database on agricultural input and market prices, value chain analysis in Koutiala and Bougouni, linking farmers to markets where required. Activities in progress include market price monitoring for crops, livestock feed and livestock, and commodity value chain stakeholder-network analyses. How these data are to be used needs to be clarified. What is the purpose of the market price monitoring: to undertake economic analyses of the various packages; to provide feedback to farmers/ producers/ platforms; to feed into a larger data set for household-level decision-making. The data need to be integrated into some kind of communication/ marketing activity.

Assessing adoption. Because it is still early, it is difficult to say much about adoption so soon after new technologies have been tested by individuals and groups. However, discussions at the level of household/ individual fields should begin as soon as possible. Learning about adoption is learning about farmer innovation and researchers need to detail unforeseen ways in which the packages or elements of the packages tested are being used. Research questions should be framed in the context of whole farm/ livelihood systems, with consideration being given to the impact of change on households, especially child nutrition and gender equity. This activity needs to be undertaken by researchers, breeders and others since its findings will influence future research, along with information that should be provided from the platforms.

Monitoring for learning: Each WP should include a detailed plan to monitor what has changed or is likely to change in crop/ livestock practices, and to answer questions about institutional and policy options: Were any of the new management techniques/ planting arrangements/ crops and crop varieties incorporated into the household livelihood system? If yes, what was incorporated, where (on which plots, fields, or livestock), and how (who did the work, what

other varieties/ crops were affected or moved to another site?). This monitoring should include how any changes made to usual practice influenced the way work had been done before, such as changes in labour allocations, how and by whom income was earned, and production controlled etc.

In relation to monitoring for learning, there appears to have been little expectation of learning from the 'quick wins'. This would include preferred technologies, cost-benefit analysis, what adoption has taken place and by whom. This could be the subject for masters' dissertations, if the farmers who were involved can be identified.

Farm system models. Participatory budget economic data could feed into the system components and different farm types that are planned to be available by December 2014. This can further lead into trade-off analysis within the models.

Challenges :

- Platforms are viewed as 'innovation spaces' but the main challenge is how to build the evidence that innovation/ change is happening, and to be in a position to say what it looks like. The Humid Tropics CRP is monitoring the 'capacity to innovate'. Monitoring of change following trials and the ability of platforms to respond to these changes fits into this notion of the 'capacity to innovate'.
- Widespread platform establishment could be reduced to a bureaucratic procedure and lead to the multiplication of power of existing power holders. This issue of entrenching existing power holders is especially problematic for platforms established at lower levels where the number of possible platform members who are in a position to 'make change happen' at scale, is likely to be small. Efforts to widen the scope of platform membership at this level should be made.
- Lack of cost benefit analysis (gross-margin), participatory budgeting that includes labour costs, and limited attention being given to the possibilities of women and children being used to fill labour gaps resulting from shifts to increased commercialization and intensification of production systems.
- Limited attention being given to possible gender inequity arising from changes in production systems, and gender-specific programming that entrenches women in the domestic sphere with little scope for their advancement.
-

Ways Forward:

- Platform functions and links between platforms formed at different levels need to be clarified while at the same time avoiding possible bureaucratization of a process that is expected to be innovative.
- Cost-benefit analyses of technical 'solutions' identified for participatory testing need to be established as routine procedures to be undertaken both before and after farmer testing.
- A plan for monitoring the incorporation of technical change in farms needs to be put in place as soon as possible.
- All partners need to engage in developing a gender strategy that should involve the collection of sex disaggregated information, on participants and others, and move beyond seeing women as the sole focus of a gender strategy. As part of this strategy, the program needs to question assumptions about women's and men's roles, needs and interests, and to seek to identify areas of ongoing change that may or may not be beneficial for everyone involved. This would compliment any alignment with Humidtropics CRP gender strategy.

Program output 2: Integrated systems improvement

- WA Africa RISING Output 2: Smallholder mixed farm household productivity is increased through adoption of SI innovations.

WPS 2, 4, 5 AND 7: IMPROVING PRODUCTIVITY IN CEREAL-LEGUME-VEGETABLE CROP-LIVESTOCK SYSTEMS IN GHANA AND MALI

WP 2: Raising and sustaining productivity in cereal-legume cropping systems in northern Ghana

WP 4: Integrating vegetables into cereal-legume cropping systems in Ghana

WP 5 Improving farm and field productivity and profitability in Mali[1].

WP 7: Raising and sustaining productivity in integrated crop-livestock systems in northern Ghana

Deliverables/outputs	Expected Outcomes
1. *Quality seeds* of improved cereals, legumes and vegetables distributed to at least 2000 farmers in Ghana and Mali each year. 2. At least 10 high-yielding cereal and legume genotypes with potential for food and feed production identified Ghana, 6; Mali, 4. By Mar 20 15 3. At least 5 on-farm trials to *compare single versus*	- Households in the intervention communities adopt cereal-legume strip-cropping and rotation - Households integrate cash crops into cereal cropping systems to diversify income - Households adopt improved

[1] This includes on-farm testing of various SI technologies funded by MacKnight Foundation

combined technologies on SI completed, Ghana, 3; Mali, 2. – Dec 15: **4.** At least 5 farmer-preferred cereal-legume rotation and intercropping options for SI identified and in use by farmers in Ghana and Mali – June 2016. **5.** Recommended fertilizer rates for cereals and legumes identified —Dec 2015. 6. Agronomic packages for SI of *vegetable production in pure and mixed stands with cereals identified and disseminated* to at least 500 farm households in both countries — Oct 15. 7. A report on fruit trees, fodder/fertilizer trees and leafy vegetables from baobab and *Moringa* made annually (ICRAF). 8. Strategies for integrating livestock into fruit tree plantation tested on-farm – Dec 2015. 9. Fodder shrub-based options for fallow management are tested on-farm – December 2015. 10. Farmer-preferred options to reduce on-farm cowpea and maize grain losses by 15%—Mar 2014. 11. *Options to add value to crop and livestock products* disseminated to at least 500 households in Ghana and Mali – Dec 2015.	storage practices to reduce post-harvest losses of grains - More households are integrating legumes into their cropping system ● Impact - Reduction in food insecurity - Household income increase by 15% through sales - Dietary diversity, especially legumes increased by 20% - Meat, milk and egg production increase by 15% - On-farm soil N and infiltration rate increase by 10%

Progresses in delivering outputs include:

Baseline studies have been undertaken and crop, livestock, and/ tree 'packages' designed and detailed (Larbi et al., 2014). Farmers are engaged in testing and capacity building activities at all levels, as individuals, households, community representatives, CBO and Farmer Field School members, with some crop packages at some sites moving from mother to baby trials and dissemination fields.

Male and female farmers are involved in all activities, notably in vegetable production and the use of tree products that is usually indicated as women's domain, and in activities connected with human, and especially child nutrition. Use of a "mother-baby" and dissemination approach in Ghana is well established and accepted. Community and farmer involvement has been impressive and interest in some technologies is apparent, especially improved varieties and inter cropping. More than 400 farmer trials have been conducted in each country since 2012 to develop, test and/or adapt and disseminate combinations of improved varieties of cereals (maize, rice, sorghum, millet), legumes (groundnut, cowpea, soybean, pigeon pea) and vegetables (okra, roselle, tomato, chilli and bell pepper) with management practices (planting date, sowing densities, cereal-legume rotation and intercropping, integrated soil, weed, pest and disease management). Studies include: sorghum hybrids, responses of extra-, early- and medium-maize types to nitrogen fertilization; responses of early and late maturing soybean to fertilizer and rhizobium; cowpea cultivar responses to spraying regime and planting date; integrated soil fertility management on soybean-maize and cowpea-maize rotations; reducing

post-harvest losses in cowpea and maize grain; cereal-legume-vegetable rotations and intercropping.

In Ghana

Seed production. Africa RISING partnered with plant breeders at the Crops Research Institute and Savanna Agricultural Research Institute to produce breeder seeds, the Grains and Legumes Development Board to produce foundation seeds, and the Northern Region Seed Producers Association of Ghana and community-based organizations to produce certified seeds. In 2012 three tons of breeder seed and 16 tons of certified seeds of maize, cowpea and soybean were produced. Similarly, in 2013, 2.7 tons of breeder seed and 43 tons of certified seed of maize, rice, soybean, cowpea and breeder seeds were produced. Community-based seed production systems have been established and linked to seed companies. Over 1000 farmers were given improved seed for on-farm demonstration and scaling up trials during the 2014 growing seasons.

On-farm trials. 189 on-farm research trials being a combination of mothers, babies and dissemination plots were established during the 2014 cropping season to compare single and combined technologies as detailed in **Error! Reference source not found.**. These included:

- On-going cereal-legume rotations, inter-and strip cropping trials.
- Fertilizer nitrogen trials to determine optimal rates. These have been identified for extra-early, early and medium maturity maize varieties for increased maize production (SARI).
- Identification of *Striga gesneroides* resistance in *Songotra* cowpea cultivars (IT99K-573-1-1 and IT99K-573-3-2-1) by SARI.
- Evaluation of 19 okra, 15 Roselle and 6 tomato genotypes by SARI in the Upper East region
- Trials to identify improved varieties of okra, tomatoes and rossel (IITA and AVRDC) and their introduction to farmers by SARI.
- On-going trials of three grain storage methods and grain protectants to reduce post-harvest losses in cowpea and maize led by SARI to be completed in October 2014.
- Ongoing training in adding value to soybean processing and cowpea ….???? (Activity under nutrition).

In Mali, On-farm trials included

- 105 vegetable-cereal trials established by AVRDC in Bougouni and Koutiala districts. 88 trials established to compare two varieties each of okra, sorrel, tomato and pepper with local checks
- Monitoring fruit trees for intensive fruit and leafy vegetable production and improving soil fertility using fodder and fertilizer trees by ICRAF. This includes indigenous trees such as baobabs and Ziziphus on fenced demonstration plots with wells. These could be included within the vegetables areas being established by AVRDC.
- Establishment of a nursery with 3000 seedlings of two local shrubby legumes, although transplanting was delayed due to mid-season drought.
- On-farm testing of various SI technologies including cereal-legume intercropping, contour bunds, improved cereal and legume varieties, cattle stable feeding with 100 farmers in 9 villages of the Koutiala region.
- Assessing the performance of innovative farming systems, (combining different crops and livestock management technologies) using, i) dynamic simulation of long-term

productivity for contrasting plausible future socio-economic conditions and, ii) feedback session involving different stakeholders (farmers, NGOs and policy makers).

Challenges have included

- Complex and time-consuming institutional and logistical arrangements related to mode of operations, fund transfers and reporting schedules.
- Inadequate cooperation between CG centres, especially in Mali, has resulted in separate activities being undertaken. This is undermining the need for an integrated program of work designed to address issues of sustainable intensification and long-term change. Development partners and farmers need to see integration.
- Little cost/ benefit analysis has been undertaken of the SI technologies being tested and assessed by farmers.
- Most trials are located on toplands. Wetland valleys and adjoining areas are highly productive areas not only for rice, but also for early planting of maize-legumes, and for dry season irrigation, where water is available.
- Mobility of students in Ghana taking part in studies in more distant sites.

Way forward

- Identify opportunities for SI in low lying wetland valley bottom areas in addition to toplands
- Seek opportunities for improving dry season vegetable production when prices are highest. This will require irrigation, such as wells and rainwater harvesting and might include the use of wetlands guided by NRM activities and/or linking with projects associated with development of small-scale irrigation.
- Increase the focus on the use of manure and urine. Animal husbandry management techniques that aim at maximizing the amounts of manure and urine (and mixture of them) collected and applied to crop fields should be investigated. For example, overnight corralling in enclosed sections of farm plots, displaced to other sections after a specified duration could be introduced to livestock farmers.
- Assess the possibility of improving fallows with dual purpose legumes.

- In Mali
  - There is a need to learn from Ghana's "Technology Park" approach. Learning could be enhanced through establishing, say two, focus villages in each District where trials and demonstrations can be easily visible and used for training, learning and reviewing. Their activities should be linked to other villages and farmer groups and to those of the RD4 platforms in an annual learning cycle (community engagement, joint planning, implementation, learning and review to feed into the next learning cycle. This work will needs to be facilitated by NGO partners.
  - Link ICRAF's indigenous tree and food bank activities (fenced demonstration plots and wells) closely with AVRDC trials/ demonstrations on vegetable production for sale and home consumption and the nutrition WP.

WP3: BIOLOGICAL CONTROL OF AFLATOXINS IN MAIZE AND GROUNDNUT – GHANA

Deliverables/Outputs	Outcomes	Impact
1. Efficacy of *biocontrol products for the reduction of aflatoxin* in maize and groundnuts demonstrated – May 2015 2. Increased *public awareness and sensitization of aflatoxin* as a health menace in food and feed crops – August 2015. 3. Efficacy and product data available for pre-registration of atoxigenic strains as bio-pesticides – July 2016. 4. An aflatoxin biocontrol product, GH01 available for registration and use in Ghana – August 2016.	- Farmers and value chain actors have adopted bio-control and management practices in maize and groundnuts - Extension officers have included aflatoxin management in their extension messages to farmers	- Reduced risk of aflotoxin - Sustainable production of better quality maize and groundnuts - Increased income through sale of aflotoxin safe crop at a premium price - Improved nutrition through reduced exposure to aflotoxins

Progress in delivering outputs

SARI conducted a prevalence study on aflatoxins contamination in maize and groundnut value chains in six districts in the Upper East and Upper West regions of Ghana, in December 2013. This provided important input for the development of biocontrol products. On-farm trials have now been started in all three regions using biocontrol products for maize and groundnuts supported by laboratory trials in Tamale. Output target dates remain for 2015 and 2016.

Although the deliverables for this WP are not due until 2016, it remains important that farmer and consumer awareness of aflotoxins as a health menace in food and feed crops are continued throughout the life of the project. This will help in ensuring that i) the efficacy of bio-control products in reducing aflatoxin in maize and groundnuts are tested and demonstrated by May 2015 and, ii) efficacy and product data are available for pre-registration of atoxigenic strains as bio-pesticides by July 2016, resulting in the availability of an aflatoxin bio-control product for registration in Ghana by August 2016 that can then be successfully marketed.

Challenges: During discussions with MOFA and farmers, no mention was made of the dangers of aflotoxin contamination.

Way forward: It is perhaps early days yet, but farmer and consumer awareness will be important if biocontrol products are to be utilised. This needs to be raised at R4D platform meetings.

WP 6: INTENSIFYING LIVESTOCK AND POULTRY PRODUCTION - GHANA AND MALI

Deliverables/Outputs	Outcomes	Impact
1. *Rural pig and poultry production systems* in the intervention communities in Ghana characterised and reported – December 2013. 2. Feed and health interventions for improvement of sheep and goats tested and disseminated to at least 400 households at the project sites in Ghana and Mali – December 2015. 3. Feed, housing, health and breeding management options to improve rural poultry and pig production tested with at least 200 households in Ghana – December 2015. *4.* Improved options for *nutrient cycling by small ruminant* tested and disseminated to at least 100 households in Ghana – January 2015.	- Households keep their livestock under improved husbandry conditions (feeding, housing, health care) - Households have improved manure management - Farmers are adopting lamb fattening to capture niche markets	- Crop yields will increase from more and better quality manure from better fed livestock - Reduction in mortality rates; meat, milk and egg output increased from better housing, feeding, breeding and health care; more off take to meet household needs - Reduced degradation of soil, water and plant resources through better management of fallow and grazing lands - Income will increase through sale of more livestock products - Increased nutrition through intake of more and diversified livestock products

Progress in delivering outputs

Rural pig and poultry production systems. Reports by KNUST and UDS on pig and poultry production and improved housing on growth performance of chickens paved the way for feed, housing, health and breeding management options to improve rural poultry and pig production to be tested in Ghana by December 2015. The approach taken to intensify pigs and poultry production rely on changes in management of inputs related to animal health, feeds and feeding, housing and combinations of such inputs. Five graduate students attached are either doing Master's degrees or have completed their programs at Universities in Ghana.

Farmers, especially women have voiced their interest in these activities.

Feed and health interventions for improvement of sheep and goats. ILRI in conjunction with ARI have been testing improved feeding and health packages resulting in higher growth rates, more birth and reduced mortality in small ruminants. In Ghana the interventions applied to farmers' own sheep and goats (supplementary feeding, vaccination and deworming) in six communities in the three northern regions (North, Upper East and Upper West). These showed significantly greater daily weight gains than those not receiving the treatments. Similarly, animals that

received the treatments had fewer deaths, while birth rates among females receiving treatment also exceeded those in untreated females. In Mali the traditional practice of fattening sheep towards the Muslim festival (Tabaski) was tested with improved inputs (planted fodder, veterinary interventions- treatments, vaccination) during the first and second quarter of 2014. However no economic analysis has yet been undertaken. This is clearly a priority before recommendations can be made on suitable feed and health interventions. Although this was targeted for both Mali and Ghana by December 2015, this should be December 2014.

Feed, housing, health and breeding management options to improve rural poultry and pig production. Farmer participatory trials on feeding and health management on sheep and goats, pigs and poultry have been conducted. A UDS-led on-farm study to assess the effects of improved housing on performance of chickens showed that birds that are housed and fed were 44% heavier than their free-range counterparts at 15 weeks of age.

Improved options for nutrient cycling by small ruminants. The strategy for raising and sustaining productivity in integrated crop-livestock systems is designed to improve exchanges of nutrients among different categories of crops (legumes benefiting cereals), between livestock and crops (manure and urine) to benefit crops and trees, and between livestock and crop and tree parts (residues and foliage) as feed to benefit livestock. Trials involving legume crops and cereals, as well as demonstration plots, were established. Large trials involving small ruminants and cattle corralled on farming lands for varying periods were set up with sorghum, millet and maize as test crops. These field activities were accompanied with capacity building in participating partner institutions. Among courses offered to partners was an experimental design and data analysis course held for 15 scientists in 2014. Improved options for nutrient cycling by small ruminant are expected to be tested and disseminated in Ghana by January 2015.

Fourteen students, including five women are being trained for various degrees (BSc, MSc/MPhil, and PhD) in three Universities in Ghana.

Challenges include

- Upscaling SI livestock technologies include the difficulty in demonstrating these results to other farmers. The facilities established are difficult for many others to learn from as livestock management practices do not lend themselves to the “technology park” approach.
- Although delivery of livestock health services is largely a Government responsibility, resource availability precludes effective delivery.
- Lack of cost-benefit analyses of completed trials makes it difficult to identify cost-effective options for livestock producers.
- Farmers particularly women are asking for more support for small ruminant and poultry production.

Way forward

- Accelerate and integrate research on animal feed opportunities such as improving use of crop residues with better preservation measures, use of fallows and dual purpose crops and fodder trees, high density crop population thinning and leaf stripping and better preservation of crop residues.
- Consider the best use of animal manure and urine.
- Ensure that livestock management SI practices, which do not lend themselves to the

"technology park" approach, can be effectively evaluated by farmers and used for training.

- Identify and address livestock health delivery systems. Facilitate links between vets and Community-based Livestock Health workers, animal producers and traders to analyse their own problems.
- Ensure data collected allows participatory cost-benefit analysis of trial options. This includes issues related to draft animals, labour availability and use, especially that of women and children.
- Address the demand of farmers, especially women for additional research work on small ruminants and poultry related to high mortality and non performing feed.

WP8: LAND, SOIL, AND WATER MANAGEMENT STRATEGIES TO INTENSIFY CEREAL-LEGUME FARMING SYSTEMS – GHANA

- Africa RISING Output 3: On-farm and off-farm management and use of land, soil, water and plant resources improved through adoption of SI innovations.

• Deliverables/ Outputs expected	• Outcomes	• Impact
1. Soil physical and chemical characteristics of at least 25 intervention communities in Ghana characterised —March 2013; and at least 6 villages in Mali —December 2015. 2. *Soil and land health indicators and land use change dynamics* at intervention communities in Ghana documented (CIAT) December 2015. 3. *Land and water management options for SI tested and disseminated* to at least 400 farmers in Ghana by IMWI and Mali by ICRISAT —December 2015. 4. A report on trade-off analyses for *land restoration* in Ghana produced (CIAT) —March 2016	- Households adopt technologies to improve soil, water and land management - More households are harvesting water for off-season vegetable production •	- Increased system productivity - increased crop yields through wise combinations of technologies thus intensifying crop-livestock systems - Improved natural resource base - Soil and water conservation measures impart greater resilience in landscapes helping to restore ecosystem services and biodiversity - Mitigation strategies that impart climate change adaptation mechanisms to households •

Progress towards deliverring outputs

Soil physical and chemical characteristics: SRI's 2013 report on soil physical and chemical characteristics in the 25 intervention communities has paved the way for CIAT's documentation of soil and land health indicators and land use change dynamics being undertaken.

Soil and land health indicators, land use change dynamics and trade-off analysis for land restoration: This work led by CIAT is work in progress. It focuses on identifying land degradation hotspots and soil health constraints so that restoration approaches to help reverse degradation and improve land health can be identified. This involves:

- Land use land cover change assessments made using GIS spanning a 15-year period (2000-2014). This has been complemented by verification visits to the areas. It is intended that land use transitions will help to predict how the land cover is likely to evolve to provide viable SI options that can be used to prioritize action. The target date for completion is the end of 2015.
- Land health assessments detailing soil erosion and other degradation processes (climatic and anthropogenic) are being monitored in order to determine the effectiveness of rehabilitation measures.
- Collection of data on farming systems to link the work on land use and land cover to agricultural system productivity. This considers the landscape incorporating land use and agronomic practices (such as manure and fertilizer use, tillage practices) as well as livestock and water resources to account for ecosystem health. This activity will need to be linked with cost-benefit analysis of technologies for targeting the full range of stakeholders from policy makers to farmers through R4D platforms.
- **A** land degradation surveillance framework has been successfully completed; agronomic yield surveys linking land health to productivity have been conducted; a preliminary land use and cover map has been produced; high quality imagery on IWMI's work on dug outs and reservoirs has been secured and the integration of these data with the GIS is designed to provide a set of recommendations of landscape measures and technologies with established potential for increasing agricultural productivity and ecosystem health around and beyond the target sites. Training and capacity building using GPS for extension agents on how to conduct land health assessments, deploy weather stations, download data and undertake periodic maintenance is taking place.

Land and water management options for SI tested and disseminated. Although this deliverable is not targeted until Dec 2015, IWMI has a number of milestones during 2014 many of which may not be achieved. These include: *Demonstration manuals* – Aug 14, *Training of trainers report* – Sep 14, *Training workshop report* – Oct 14, and *an after-workshop evaluation* report – Dec 14, Keyline *systems surveyed, marked out* – Sep 14 *and implemented* – Mar 15; *Runoff available for supplementary irrigation* – Apr 15; *Method developed for leveling rough cultivation using existing tillage implement* – Jul 14; *Prototype tractor- ridger tested to reduce water logging* – Jul 14; *three fields prepared with ridges to reduce water logging* – Aug 14; *at least 10 simple earthmoving equipment for draft animals constructed* – Oct 14; *10 pairs of animals and handlers trained in earthmoving using DAP* – Oct 14; *one dugout constructed for supplementary irrigation* – Apr 14; *Rain gauges deployed* – Jul 14; *3 agents trained to collect and clean data* – Aug 14; *Runoff installations deployed* – Jul 14.

Challenges:

- During the rainy season there is alternatively too much, then n too little rain with crops suffering from alternate waterlogging and drought conditions over relatively short periods of time. This needs to be addressed but much of the work is long term and will only deliver outputs towards the end of the project. A strategy for ensuring close links between this work and national institutions/ Programs is therefore likely to be critical

for its success. There is a need to link better with other system-related CRPs especially the Dry-lands and Water Land and Ecosystems Programs that have sites close to those of Africa RISING. This will allow cross-shared lessons with the Humidtropics CRP.

- Apart from the water component with IWMI, linkage with other WPs has been minimal. CIAT has arranged to hire a research assistant to help facilitate field activities, partnership engagements and integrate closely with other work packages.
- Need to identify options for irrigation (opportunistic)
- Frequent changes of IWMI staff have meant that it will be difficult to deliver the land and water management options for SI unless IWMI is able to provide the staff required.

Way forward:

- Ensuring participation in monthly regional meetings to enhance communication on IWMI activities including research protocols and field work plans.
- Integration with other WP's is required especially economic linkages, as CIAT has undertaken to provide trade-off analyses for land restoration but requires input from WP 1 deliverables including crop-livestock cost benefit analyses and the farming systems model being developed by WUR .
- It is recognized that S&W technologies do not lend themselves to the biometric analysis used for agronomic activities. IWMI's work on SI land and water management options requires demonstrations of suitable technologies in Technology Parks or their equivalent. Begin by establishing short lists of possible appropriate S&W technology options for demonstration. A selection from options already tested in similar environments in SSA should then be made. This should be initiated for demonstrations to be in place for the 2015 season.
- Provide support for identifying (opportunistic) options for dry season irrigation of vegetables and other high value crops for household or small group investigation.

WP9: MANAGING NATURAL RESOURCES TO INCREASE WATERSHED PRODUCTIVITY – MALI

Outputs expected ICRISAT, ILRI, ICRAF, AVRDC, WUR, AMASSA, AMEDD, CAAD and MOBIOM	Outcomes	• Impact

1. A report on seasonal variation in grazing land biomass production and forage quality and grazing itineraries and pasture use in Mali produced —December 2015. (ILRI) 2. A report on *local conventions and conflict management practices* at the project sites in Mali documented —December 2015. (ILRI) 3. A watershed for integrated crop-livestock research identified and characterised in Mali —June 2015. (ICRISAT) 4. Model exploration and development workshops completed and model code available (ICRISAT, WUR)—June 2016 5. At least *4 water and soil management options tested* on-farm in both countries —December 2015. (ICRISAT, ILRI, WUR) 6. Fallow management options for integrated crop-livestock production tested with households in at least 4 communities by 2015 (ILRI)	- Farmers are using the technologies developed to improve their existing [farming practices - Communities manage the natural resources in a way that improves their livelihoods and minimises conflicts over natural resource use • •	Contributing to those of other WPs

Progress towards delivering outputs

NRM soil and water outputs in Mali are due to be completed by the end of 2015 with input from other WPs expected to feed into the farming systems model being developed by WUR.

Seasonal variation in grazing land biomass production and forage quality, grazing itineraries and pasture use: The key constraints to livestock production in the study sites were identified as: feed shortages, disease, increasingly restricted livestock mobility hindering access to natural pasture, and housing.

During 2013-14, a village-level biomass and pasture assessment was carried out in selected study sites in Mali. Grazing itineraries in selected villages/communities were mapped. Grazing natural pasture accounted for 40 – 55% of the diet of ruminants with crop residues accounting for 20-35% and naturally occurring and collected fodder accounting for 10-15% of ruminants' diets. Purchased feeds accounted for 3-10% of the animal diet on annual basis. Feed resources are in abundance and of good quality in the wet season (July to October) followed by period of reasonable amounts of crop residues with limited quality in November to January. The late dry season (March to May) is characterized by acute feed shortage and it is the most critical period for animal nutrition.

Local conventions and conflict management practices: Local conventions governing natural resources exist in all the intervention communities, mainly in oral form with a need for formalisation in order to be recognised by the local and regional administrative authorities to facilitate implementation. Research results on local conventions have been validated with community members through a community feedback workshop. Existing local conventions on livestock and associated practices, including grazing and routes were documented using information provided by community leaders. In the process of validating the documented conventions participatory conflict management approaches were reviewed with the communities .ILRI reported that development processes and implementation of local

conventions is generally low in all the study communities, confirming a widely held view of elite domination with women being largely marginalized in the implementation of local conventions. This will need to be confirmed and the implications considered in follow-up activities.

- A watershed for integrated crop-livestock research identified and characterised and water and soil management options tested: A 57 km^2 watershed area is being monitored and water availability in 256 wells assessed. This includes ICRISAT linking with the Water Land and Eco system CRP. The work is also looking at the effectiveness of soil contour bunds reinforced with a fodder grass Andropogon. Bunds have been established in sorghum and cotton fields. Cattle feeding trials are also being undertaken aimed at improving livestock productivity including farmer access to working oxen/bullocks.

ICRAF are also contributing to this output through a combination of SI technologies including soil contour bunds also reinforced with *Andropogon* grass on the bund and fodder trees (*Gliricidia* and *Moringa*) below the bund. Demonstration trials have been located in sorghum fields.

Fallow management options for integrated crop-livestock production tested (this is planned for implementation only on Ghana): No work has yet been started on this deliverable in Mali. It will be important that this links with WP 7 in Ghana.

Model exploration and development. This is work in progress.

Challenges

- The uptake pathway for the documented village-level conventions needs to be addressed.
- The watershed monitoring is unlikely to show results over the relatively short period of the project. However, data on water availability from wells will be important, when available, in identifying irrigation opportunity especially for dry season vegetable production.
- The effectiveness of soil contour bunds requires that they are pegged correctly and of sufficient size to avoid breakages. Poor establishment is likely to result in worse erosion than no contour bunds. Carting stones or using wooden stakes for repair is labour intensive and may not be effective. Establishment of *Andropogon* grass on the bunds and fodder trees below the bunds is likely to prove problematic during establishment and in the dry season due to free grazing animals. Grass strips rather than bunds may be a better option. Emphasis on what can be achieved in the next two years should be a priority.

Way forward

- Ensuring that work on local conventions governing NRM and strategies and conflict resolution are addressed at appropriate fora. This may include commune level village chiefs where convention harmonization can take place and a stronger voice can be developed and projected for the attention of the appropriate officials at both commune and district levels. Such support will be needed for policy advocacy.
- At the same time individual villages and/or communities could use the conventions for implementation of community land use plans. Examples might include demarcation of livestock corridors, grazing and arable areas as well as improving management of watershed areas. Particular attention must be given to the needs of different community-level stakeholders, including women.

- There is a need to balance the need for long term research such as understanding hydrology and modeling processes with immediate requirements to address problems such as alternatively too much then too little rain over relatively short periods resulting in crop waterlogging followed by drought conditions.
- Opportunities for irrigation are likely to be limited to low lying wet areas and depend on local knowledge on the siting of wells or boreholes. There are also likely to be local conventions on water use which should be included as part of the ongoing ILRI work.
- Establish short lists of possible appropriate S&W technology options and provide demonstrations in the "Technology Parks". It is recognised that S&W technologies do not lend themselves to the biometric analysis used for agronomic activities, but demonstration remains important.
- Provide support for identifying (opportunistic) options for dry season irrigation of vegetables and other high value crops for household or small group investigation.
- Ensure that SI combination technologies (contour bunding, fodder grass and trees planted) are appropriately located and do not cause soil erosion problems. These could be demonstrated in "Technology Parks".
- Ensuring appropriate reporting arrangements for joint projects such as the McKnight Foundation-and Dryland System funded project in Mali working in areas adjacent to Africa RISING target areas. This is contributing valuable information but the activities lie outside the Africa RISING intervention areas.

WP10: IMPROVING HOUSEHOLD NUTRITION THROUGH AGRICULTURAL AND BEHAVIORAL CHANGE COMMUNICATION AND VALUE ADDITION IN GHANA AND MALI

- WA Africa RISING Output 4: Dietary diversity of smallholder farm households especially women and children is improved through change in nutrition habits and increased availability and consumption of a variety of nutritious foods.

Deliverables	Outputs	Outcomes	Impact
1. At least two workshops organised in Ghana to define relevant household nutrition activities — June 2012 and October 2014. 2. A report on household nutrition survey at the Africa RISING intervention communities in Ghana produced —December 2013. 3. A booklet and at least two journal papers are	1. Results of nutrition baseline survey published 2. Integrated agriculture-nutrition-health activities identified 3. Capacity of women strengthened for implementation of integrated agriculture-nutrition-health 4. Nutritional status of farm-families improved through	- Household adopt behaviour that will improve dietary diversity - Women apply their nutritional skills in food preparation - Households apply post-harvest technologies	- Crop and livestock production by women and women's groups intensified and outputs increased - Increased incomes and diversification through sale of excess crop and livestock outputs

drafted from the household nutrition survey —Dec 2014. 4. At least 1000 pregnant and nursing women in Ghana and Mali trained *on improved infant nutrition* — December 2014. 5. At least *3 nutrition modules developed, revised, and in use* by project partners in Mali —Dec 2014. 6. A report on a study comparing the effect of *BCC and AGB* alone and their combination on household nutrition produced — June 2016.	linking agriculture, nutrition, and health 5. Effective methods of nutritional training and communication 6. Women understand nutritional benefits of locally available food resources and use them in diversified diets 7. *Dietary diversity of smallholder farm households,* especially women and children, in the Africa RISING intervention communities in Ghana increased by at least 15% —June 2016.	that increase shelf-life of their milk products	- increased dietary diversity and reduced mal-nutrition in children below 23 months

Progress with delivering outputs

2012 in Ghana. A planning workshop on nutrition activities was held in Ghana. Another is planned for later in 2014.

2012 in Mali: Various nutrition-related activities were undertaken to achieve behavioural change druing the quick-win phase of the project. A total of 36 villages were selected and grouped by 'commune' into six clusters: Medinacoura, Konseguela, Miena, Molobala, MPessoba, and N'Togonasso. These were selected on the basis of Medicins Sans Frontieres on-going activities concerning nutrition rehabilitation of severely malnourished children and emphasising the need for malnutrition prevention-related activities. This involved ICRISAT, AVRDC, MSF and AMEDD. These nutrition schools produced a few success stories in quick wins.

2013 in Ghana: Two reports on household nutrition surveys were submitted by the Food Research Institute and University for Development Studies. In addition UDS produced a report entitled a 'Review on nutritional status, quantity and quality of food consumed, macro and micro nutrient intakes, and nutrient retention during processing, infectious diseases'. Drafts of a booklet and two journal papers based on the household nutrition survey have been prepared and submitted to IITA for review.

2013 in Mali. Six nutrition modules, currently being revised, were prepared and used by AMEDD for training nursing mothers and pregnant women. Cluster based nutrition field schools were initiated in Sirakele and Mpessoba training 500 mostly pregnant women and nursing mothers on nutrition of children between 6-24 months, prevention of Vitamin A, iron and iodine deficiency, and preparation of enriched porridge and enriched peanut sauce.

2014 in Ghana. A household survey has been conducted to collect baseline data. A study comparing the effect of behavioural change communication and agri-based nutritional interventions alone and in combination on household nutrition is at the planning stage.

In Mali, 600 farmers were trained on the importance and daily use of vegetables through nutrition awareness activities in Koutiala, by AVRDC. About 500 women participated in cluster-based nutrition field schools organized by ICRISAT.

Challenges

- There is a need to establish baselines, develop a research plan and assess change under different circumstances.
- No assessments of the benefits of identified dietary change appear to be available.

Way forward

- Review data held globally on nutritional status of populations in Ghana and Mali. Link with LANSET research on maternal and child health and production and nutrition linkages.
- Improvements in nutrition are central to Africa RISING and the related Humidtropics CRP. Detailed plans, including sampling/ research designs are essential if this Work Package is to achieve expected outcomes. Link with relevant national ministries/ Programs concerned with health and nutrition to ensure scaled outcomes.
- Prepare a comparative research program cutting across Ghana and Mali focused on children 24 months and under, pregnant women and households categories. This will require close links between AVRDC and UDS and if possible IER in Mali
- In Mali, the Nutrition schools appear to have produced a few success stories in 2012. If a sample of participants can still be identified, a systematic study designed for learning should be planned to assess the hypothesis that Nutritional Schools change cropping patterns

Program output 3: Scaling and delivery of integrated innovation

Originally intended outcomes

- Wider adoption of innovations are identified and tested by the program's outputs within the Africa RISING action research sites
- The development community initiates programs, based on the knowledge, tools and innovations developed and promoted by Africa RISING, that are directed at developmental goals that are consistent with the Africa RISING program purpose/aim

No work packages have been specifically developed for this output, although WA Output 5 addresses dissemination and scaling within the intervention sites and with partners through the establishment of R4D platforms, demonstrations, training, field days, media communication and workshops as part of the implementation strategy. A need to develop work plans for monitoring shifts in farm/ crop management within household-level fields is made for WP1 and WP10. These relate to households/individuals and groups of producers who have been involved in activities detailed in WP5. Wider dissemination will depend on national partners, such as MOFA

in Ghana, including 'successful' technologies in their own national Programs, and agro-dealers providing inputs where these are needed. At the same time WA Output 5 addresses the need for capacity building at all levels of the project. As such both Outputs 5 and 6 provide cross-cutting support for the other WPs.

WA OUTPUT 5: ENHANCING KNOWLEDGE EXCHANGE AND INFORMATION FLOW AMONG BENEFICIARIES

Outputs
1. At least 30 farmers' groups (Ghana, 20; Mali, 10) established at the project communities — March 2013. 2. At least 5 (Ghana, 2; Mali, 2) district level R4D platforms established to facilitate knowledge exchange —December 2014. 3. At least 50 demonstration plots established annually per country to show-case new technologies. 4. At least 15 field days organised annually at the community level in Ghana and 10 in Mali. 5. One interim and one technical report published each year. 6. At least 2 workshop proceedings and 8 journal papers published —June 2016. 7. At least 2 on radio discussions and one TV discussion aired annually on the project activities in Ghana. 8. At least 6 posters, 2 policy briefs, 4 leaflets, and 3 films prepared —December 2015. 9. At least 2 in-country exchange visits for scientists and farmers in Ghana organised — November 2014 and 2015 10. At least one international exchange visit for scientists organised —October 2013, 2014, and 2015. 11. At least one regional review and planning workshop organised each year. 12. At least mid-term (2015) and end of project (2016) workshops organised to disseminate project results.

Progress delivering outputs

Farmer groups and R4D platforms: Farmers' interest groups have been formed in each of the 25 communities in Ghana, and in the 10 villages in Mali. R4D platforms were established - at Yorobougoula (2012) and Nampossela (2013) in Mali; and Nadowli and Wa West districts in Ghana in September 2014 but require further support.

Trials and demonstrations

- 234 on-farm demonstrations were established in Ghana in 2012, 591 on-farm demonstrations were established in Ghana during the 2013 cropping season whilst 351 agronomic trials (demonstrations) were established in Mali during the 2013 cropping season.
- 3 field district level field days were organised in the Wa West and Nadowli districts involving 386 participants in 2013.
- Ghanaian scientists visited research and demonstration trials in Mali in September 2013.

Reports, papers publications and other communication

- Proceeding on a regional workshop on 'Crop-livestock systems for increased farm productivity and food/nutrition security' in Ghana, 27-28 August 2012, Tamale, Ghana published by Animal Research Institute, IITA and Africa RISING.
- Two papers on rural poultry production have been submitted for publication in peer reviewed journals by Herbert Dei of UDS.
- Two technical (1st October 2012-31 March 2013 and 1 October 2013-31 March 2014) and three interim (January 1-March 31, 2012; 1 April 2012-30 September 2012; 1 April 2012-30 September 2012) reports have been produced.
- 5000 DVD's on 'Fighting Striga' were produced in 6 Ghanaian languages and are being distributed in Ghana. In addition, the videos have been and are being shown on a new agricultural TV channel.
- A leaflet on the use of GroPlus fertiliser translated into French and Bambara in Mali.
- Annual project review and planning meetings were held in Accra, Ghana in 2013 and Bamako, in 2014.

WA OUTPUT 6: INDIVIDUAL AND INSTITUTIONAL CAPACITIES STRENGTHENED TO TEST AND DISSEMINATE SI INNOVATIONS

Deliverables/Outputs
1. Capacities of at least 5000 male and 2000 female farmers, 40 male and 20 female extension staff, and 10 male and 5 female policymakers on SI enhanced through *direct and indirect participation in farmer participatory on-farm trials, field days, traveling workshops, and exchange visits* —June 2016. 2. At least 100 male and 50 female early career research scientists in both countries trained on SI —December 2015. 3. At least 7 MSc students (4 male and 2 female) and 3 PhD (male) with research on SI graduated —March 2016. 4. Institutional capacity of at least 8 NARES and 4 NGOs strengthened —June 2015.

- Progress against these deliverables
- Capacities of farmers, extension staff, and policymakers enhanced

2012	2013	2014
– 173 herdsmen, women and cattle owners were trained in milk hygiene practices in three districts in Ghana by Animal Research Institute and KNUST staff – 2012. – 325 processors were trained in 'wagashi' (soft cheese) processing	– 158 (107 men, 51 women) producers trained on tree propagation and planting techniques by ICRAF – 256 farmers participated in Farmer Field school	– 129 participants (41 men and 88 women) participated in a field day to exchange knowledge

2012	2013	2014
in 3 districts in Ghana by Animal Research Institute and KNUST staff – 40 milk processors were introduced to rudiments of yoghurt processing by Animal Research Institute and KNUST staff – 94 farmers trained in aflatoxin awareness by IITA (August 1-6, 2014). – 103 farmers (50 men and 47 women) were trained on nursery techniques at Yanfolila , Mali by AVRDC – 47 farmers (26 men and 21 women) were trained in vegetable pest management techniques by AVRDC. – 135 farmers (57 men and 78 women) participated in training of facilitators by AVRDC, – 89 farmers (63 men and 36 women) were trained in 'Participatory trial implementation and monitoring' at Yorobougoula, Mali	and Participatory Variety Selection organised by SARI in the Upper East Region – 6 field agents trained on conduct of participatory trials and use of video for farmer training – 6 (4 farmers and 3 field agents) use of adapted disc for mechanized micro-dosing, – 141 farmers (grafting and planting of improved fruit trees) (34). – 30 farmers (25 male and 5 female) were trained in Good Agricultural Practices on rice production	vegetable by AVRDC – September 2014 (18).

Early career research scientists countries trained, student attachments and institutional capacities strengthened

2012	2013	2014
– 28 research and extension staff trained in a short-course on 'Crop-livestock farming systems', by ILRI and Animal Research Institute. – 25 directors and agricultural	– 20 technicians trained on Feed Assessment Tool (FEAST) by ILRI in Tamale, – 33 health staff and Women in Agricultural Development (WAID) officers were trained in Community Infant and	– 38 research technicians were trained in on-farm survey data collection for rapid (and detailed (on farm characterization by IITA and a Consultant from Wageningen University – – 14 Agricultural Extension Agents (AEAs) were trained in participatory establishment of on-farm trials by IITA. – 14 early career research staff were trained in a short-course on integrated crop-livestock

extension agents trained on aflatoxin awareness by IITA in Ghana). – 4 research technicians were trained on yield gap analysis and diagnostic surveys in Cotonou by Africa Rice,). – Training workshop was organised for 21 agricultural extension agents at Wa, Upper West Region. – Training workshop was organised for 22 agricultural extension agents at Bolgatanga, Upper East Region	Young Child Feeding by the Nutrition Division of the Ghana Health Service – 40 enumerators and supervisors were trained to collect baseline household nutrition data by the Community Nutrition Department of	production in Ghana by IITA (25). – 9 MSc and 6 PhD students are currently attached to the project. – Capacities of research institutes in Ghana (Soil Research, Animal Research, Crop Research, Savanna Agricultural Research, University of Ghana, University of Renewable Resources, University of Ghana, Plant Genetic Resources and Oil Palm and Coconut Research) and NGOs in Mali (AMEED, AMASSA) have been strengthen through group and individual training of staff.

Achievements

- Knowledge exchange and capacity building activities have been a key component of the project implementation strategy. The use of trials and demonstrations for FFS training on technologies and combinations of technologies has generated considerable enthusiasm and is likely to be resulting in some adoption in the intervention villages and possibly other villages through MOFA, NGO and farmer-to-farmer extension activities.
- Training of research and extension staff is providing a solid foundation for the last two years of the project.
- MSc and PhD students are making valuable contributions to project activities and outputs.
- Institutional professional capacity strengthening will be of long term benefit.

Challenges

- While there remains a need to continue knowledge exchange and capacity building there is also a need to address the two outputs shown in the Program framework, namely:
  - 'Wider adoption of innovations being identified and tested' within the Africa RISING action research sites'.
  - National governments and the development community initiating programs based on the knowledge, tools and innovations developed and promoted by Africa RISING.

Way forward

- Wider adoption needs to be investigated in order to learn more about the performance of these complex technologies, to plan future related research and to contribute to research on appropriate scaling approaches.
- Research on appropriate scaling approaches should include "Networking Mapping" adoption studies of who is using which technologies, why and how these are being modified by different typologies of farmers/households.
- Linking with USAID supported research and development partners. In Ghana this includes ADVANCE (Phase 2) and ATT to agree a way forward. In Mali this includes a variety of well-funded development projects with ICRISAT, ICRAF and AVRDC. At the same time USAID bilateral missions and national governments need to be kept informed of WA Africa RISING activities.
- Farmer requests for more assistance (seed, fertilizer, tractors/bullocks, livestock etc.) must be channeled through R4D platforms
- As a matter of urgency, attention must be given to the functioning of R4D platforms.

Program output 4: Monitoring and evaluation

Although IFPRI are responsible for this Output, their role to date has been primarily to undertake a baseline survey of intervention and counterfactual villages in order to be able to measure impact against the wider "Feed the Future" indicators (**Error! Reference source not found.**).

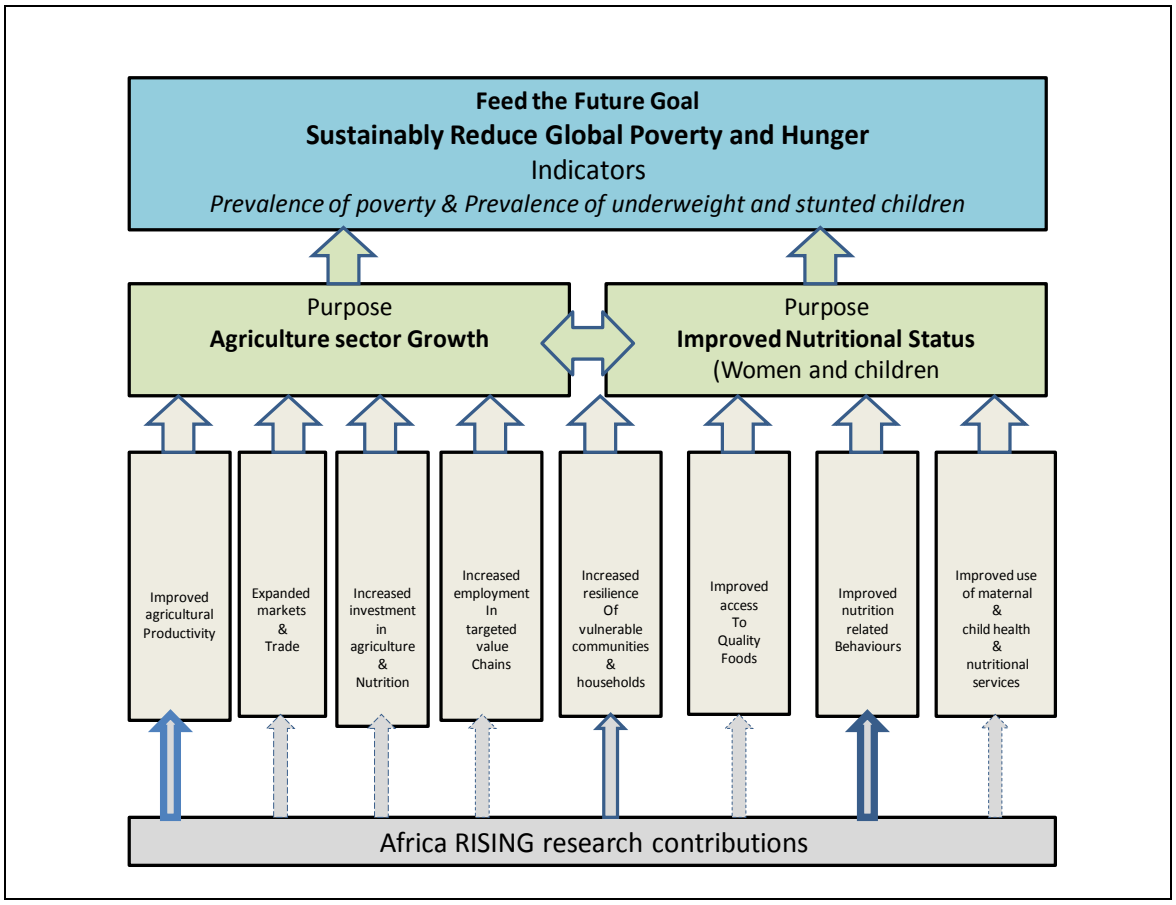


Figure 1: Feed the Future Goal, Purposes, and Objectives showing Africa RISING research contributions (Source: Feed the Future, 2013)

Progress against deliverables

IFPRI had not produced a base-line report by the time the review was undertaken, although the Review Team understands that this would shortly be available. It is expected that the report will provide indicators for enhanced capacity, enhanced technology development, dissemination, management and information, increased investment in agriculture and nutrition and increased resilience of vulnerable households in line with the FtF indicators.

Africa RISING WA has produced a number of baseline studies and is reporting to USAID against the eight FtF indicators. The PCT is now providing coordination across the three projects having organised a number of Program/ project sharing and learning events.

Challenges

- The lack of base-line information from IFPRI's base-line report, which should be corrected shortly.
- Few indicators are available of to assess output or outcomes, although discussions have been initiated about identifying measurable SI indicators at Program level. Additional custom indicators need to be developed in line with project log frame.
- Little monitoring or learning from adoption is yet taking place as it is early in the project, but now requires consideration.

Way forward: Plans need to be prepared for monitoring for learning. This should include:

- Assembling socially disaggregated data on program participants
- Questioning the hypotheses underpinning sustainable intensification.
- Following up on unexpected outcomes – specific studies of issues around how technology is incorporated into existing farm family livelihoods – in depth comparative case studies of household food allocations – labour allocations (including the use of hired labour) following the uptake of sustainable intensification systems, including questioning issues of gender.
- Outlining a program of gender research around technology development.

In addition, future priorities need to be establishing with R4D platforms, identifying measurable simple indicators to assess progress. This will require researcher facilitation. At the same time individuals within the platforms should be identified to be responsible for their measurement and a system for participatory M&E instigated.

Data Collection and Use

There are two primary data types, that required for communication and knowledge management and that required for storage and retrieval for research.

Communication and knowledge management linking with ILRI Program level communications

- https://cgspace.cgiar.org/*:* This website provides a repository for agricultural research outputs and results produced by different parts of CGIAR and partners including that of Africa RISING. It indexes reports, articles, press releases, presentations, videos, policy briefs and more. CGSpace is a collaboration of several centres and research programs. It is hosted by the International Livestock Research Institute.

- http://africa-rising.net/: This website reports on the activities of Africa RISING supporting the delivery of Program activities and outcomes, through various communication, knowledge and information activities including information on the Program, where it operates and reports of activities, outcomes and outputs. These contribute to:
    - Communicating to widen influence and impact
    - Internal communication
    - Knowledge sharing, learning and dissemination
    - Photojournalism trips and annual Program learning events
    - Translating research outputs into outcomes and getting knowledge into use

Achievements: The Africa RISING website is providing a repository for research outputs, photos, videos and films, posters and presentations, Program collaboration and sharing wiki, with considerable input from the WA project.

Challenges: Much of the communication strategy to date has been targeted at higher level stakeholders with less attention to R4D platforms, and farmer groups

Way forward: Consideration needs to be given how to target other stakeholders such as the R4D platforms and strengthening links to reinforce the objectives of the Program.

Project mapping and monitoring tool

http://dev.harvestchoice.org/africarising/ [2]

The Project Mapping and Monitoring Tool is intended to help users 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 provide the following benefits:

- *Inform strategic and project management decisions.* The PMMT can help inform decisions by allowing users to take geographic information about Africa RISING sites into account, whether it is the location of markets, related projects and partners, travel time, annual precipitation, or maize crop yields.
- *Communicate programmatic projects to key stakeholders*. A primary benefit to users of the PMMT is to see the spatial layout of Africa RISING activities relative to geographic context. Users have the ability to add their projects to the PMMT database and then to visualise those projects in a variety of ways.
- *Understand how programmatic efforts relate to other projects as well as to useful agricultural information*. Users have the ability to browse and map other people's projects alone and alongside their own projects. This functionality provides the framework for multiple organisations to communicate vital strategic information together in a coordinated fashion.

The PMMT is composed of two functional modules which perform specific and complementary functions, i) *Mapping Application, which* allows users to contextualise where Africa RISING activities are taking place and view data related to them, and ii) D*ata Entry Application, which allows u*sers with the appropriate credentials to add additional data to the PMMT. This site provides a repository for:

Publications: In addition to monitoring data reports available from this website, Africa RISING research outputs are currently available from the CGIAR CGSpace. This space provides public access to project briefs, reports, presentations, and other communications and M&E resources.

*Datasets and Tools***:** All experimental and survey data are posted to ILRI CKAN on-line catalogue within one year of data collection. Results from agricultural field trials are also available from a dedicated CGIAR AgTrials repository. Information can be stored, updated and used in a number of forms. Data base structure includes agronomic data from mother, baby and upscaling trials, livestock trials, and socio-economic data including surveys and other studies and socio-economic analysis on trials across the three regions

[2] All data created using USAID funds are the property of USAID, and proper citation and attribution is required.

Challenges

- A data management document regulating the use of the data and protecting owners for a specific period of time has been shared with partners but no comments yet received. It is intended that this will be made binding in all new agreements, in line with CGIAR policy.
- Despite a course being run on how to use the data storage/retrieval system, many staff and partners are still unaware of how it operates. As a result no data from 2012 and little data from 2013 is yet stored, including limited economic data on which to base cost-benefit or gross margins analysis.
- Consideration needs to be given to data generated by non CGIAR partners including NARS and Universities that can be incorporated into PMMT.

Way forward

- Follow up training and mentoring on the use of PMMT is required for both CGIAR and national scientists

Partnerships

In both countries multi-stakeholder partnerships have been established and consolidated. These include an impressive range of R&D partners, communities, private sector and other USAID-funded bilateral projects involved in implementing activities through sub-contracts, sub-sub contracts or working arrangements (Table).

Table 1: Africa RISING partners in West Africa

Partners	Sub-contracts with IITA		Sub-sub contracts with IITA or ICRISAT		Working arrangements	
	Ghana	Mali	Ghana	Mali	Ghana	Mali
Research partners						
CG centres and international research institutions	AVRDC, CIAT, ILRI, IITA, IWMI	ICRISAT, AVRDC	-	ICRAF	IFPRI	IFPRI
National Research Institutions	FRI, SARI, SRI, CRI	-	ARI	IER	-	-
Universities	KNUST, UDS	-	WUR	WUR	-	-
Development partners						
National Agriculture Extension	-	-	-	-	MOFA-Regions & Districts	-
NGOs	-	-	-	AMASSA AMEDD CAAD MOBIOM	SNV Heifer International	-
Farmers- farmer groups, CBOs and associations	-	-	-	-	25 villages	10 villages
Private sector					Heritage seeds	

Other projects	USAID-ADVANCE	USAID-AVRDC
	USAID-ATT	USAID-ICRISAT

The Review Team met with most partners obtaining their views on achievements to date, the challenges being faced and their suggestions for a way forward. Since achievements were detailed in earlier sections, only challenges and a way forward are detailed.

Ghana

IITA subcontracts with research institutions include: ILRI, CIAT and IWMI for Ghana, ICRISAT for Mali, and AVRDC for both Ghana and Mali, the latter being a single contract for both countries for ease of payments. AVRDC does however report to ICRISAT in Mali. Sub-contracts with NARS include: ARI, SARI and SRI, all institutes within CSRI, and KNUST and UDS Universities. IITA also has a sub-contract with WUR for farming systems research. The contracts detail the terms and conditions for delivering WP outputs. Although MOFA was sub-contracted in 2013, costs are now reimbursed for activities undertaken, this arrangement working effectively.

Responsibilities for coordinating the WPs are: IITA (WP1-socio-economics, WP2-cereal-legumes and WP3-aflotoxins, WP7-crops-livestock); IITA and AVRDC (WP4-vegetables); ILRI (part of WP6-small ruminants), KNUST (part of WP6-poultry) and UDS (part of WP6-pigs); IWMI and CIAT (WP9-NRM in cereals-legumes) and UDS (WP10-nutrition). IITA sub-contracts components of WP2-cereal-legumes to SARI and ILRI sub-sub contracts ARI for components of WP6-livestock (small ruminants). Lead scientists from each institution are responsible for the WP but draw input from scientists in other institutions where necessary.

SARI - WP2**:** SARI's views are that Africa RISING is making an impact on the farmers and institutions involved and that the "Technology Park" approach is particularly useful. However, they state that more participation of farmers and researchers with the R4D Platforms and field operations will add value to the Project. SARI was concerned that Africa RISING's priorities changed from the "quick wins" involving many intervention sites and the sudden reduction was a disappointment for local people and affected the credibility of both the institutions and scientists involved. The research appeared "top-down" as the activities implemented preceded the formation of the R4D Platforms. SARI has also been concerned that the new WPs increased pressure on SARI to accommodate new activities. New sites were not always considered the best in terms of logistics, some being far from where workers were located and funds allocated were inadequate. For instance the allocation for rice was felt to be particularly small as the "rice group" had previously received a larger budget from AfricaRice, before their withdrawal from the project.

Reporting to IITA has been a challenge for SARI, requiring consolidation of reports from different scientists and administrative officers resulting in delay. SARI also felt that their inability to provide Africa RISING with enough office space was unfortunate, having a dampening effect on the working relationships of SARI researchers involved. As the project progresses, the establishment of an IITA liaison office within SARI would be welcomes, especially as SARI works with IITA on a number of projects.

Some challenges and way forward include: ensuring budgets are closely matched with expected work; Africa RISING needs to be seen to build the capacity of national scientists, through ……rather than being a competitor; and ensuring data held by scientists, is lodged with PMMT. Further training has been requested on it use.

ILRI and ARI - WP6: Activities have revolved around improving the importance of small ruminants and increasing manure use for crop production through feed and health interventions. Challenges experienced have included: the dropping of ARI proposals by ILRI for community-based animal health workers; animal deaths after treatment for PPR; poor housing with leaking pens in wet weather; poor record keeping by farmers; a limited budget and delays in accessing funds from ILRI. Other concerns include inadequate staff, ARI having only four scientists with only 25% of the time of one scientist being available for Africa RISING. A way forward was seen as having a "Livestock Technology Park" with livestock housing demonstrations, more social and economic content and more co-supervision of students.

KNUST - WP6**:** Activities involved five MSc students working on maize-vegetable intercropping and one on food nutrition, looking at existing foods and diets and seeing how these can be improved. Students and their supervisors receive stipends and operating costs are covered by Africa RISING. The main challenges were seen as a need for irrigation especially in the dry season to target vegetable production when prices are highest and transport problems to sometimes remote locations.

UDS - WP10**.** A number of problems inhibiting functioning of Community-based Health Workers were identified including: inadequate systems for providing follow-up support with education; inadequate growth charts and registers; irregular meeting among mother-to mother support groups. This would require support for mothers groups to meet monthly. UDS plan to leverage public events to recognise and reward positive nutrition behaviours through cooking competitions, farmer's festivities and awards for community members. Community leaders will be encouraged to publicly promote nutrition messages. Educational tours to well-performing communities and institution of awards for excellent performance at the community and district levels can inspire people in a healthy competition. Often too much is expected of community volunteers and some incentive is required to enhance volunteer performance; a major constraint to feeding children with diversified diets was linked to poverty in most households. To sustain community interest, it is planned to have community based nutrition education that focuses on recipe development using local foods and food preservation, food diversification with demonstrations at community sites and forums. Community–level competitions are anticipated as well. However these are not necessarily research activities and the main challenge will be to identify appropriate funding.

CIAT and IWMI - WP8**:** This partnership provides input for land, soil and water management. Although the two work closely together, staff changes and no permanent CIAT presence in Ghana has hampered communication and affected field activities.

IWMI's role with local partner's activities has included: establishing weather stations for measuring rainfall, temperature and soil moisture; testing contour ploughing, tied ridges, manure application in maize-soya rotations, comparing these with farmers' own methods and using S&W conservation videos as extension training tools. Achievements have largely revolved around: re-thinking the problem, acknowledging complexity and system interactions and developing a conceptual framework for systems research. Awareness raising and training has occurred involving farmers in concepts of water balance measuring rainfall and runoff and building their own small dugouts.

CIAT activities include: soil surveys undertaken in the Northern Region with results expected shortly; landscape scale water and nutrient movements and restoration issues, linking this to field level issues; remote sensing techniques identifying degradation hotspots; soil properties being assessed in Africa RISING sites to help validate models; and a support tool intended to match NRM technologies with local resources.

MOFA: Discussions held with MOFA regional and district staff from Upper East, North and Upper West, included specialists (planning and coordination, crops, livestock, extension and Women in Agricultural Development), who provide support for front-line AEAs working directly with communities. AEA work involves implementation of research protocols and close work with those CBOs working with Africa RISING. Interactions with communities have been constructive with mother-baby-dissemination trials, supported by exchange visits and field days helping in spreading technologies. It was emphasized that MOFA provides links for a number of IITA projects and other organisations including N2Africa, DTM, Africa RISING and AGRA with the intention that existing networks and groups will increasingly be sensitised to their activities.

Other points of note included: Regions are becoming less important as decentralisation occurs and the focus needs to be at District level; there is an increasing need for synergy and coordination with NGOs being encouraged to obtain approval for their work from both MOFA and District Assemblies. Presently USAID and CIDA require that projects funded by them have to provide a letter of support from the District Assembly.

Some challenges and way forward suggested by MOFA include:

- Ensuring all R4D platforms are inaugurated with individual and institutional roles clarified and their effectiveness promoted through ensuring members see short-term benefits from participation. MOFA are keen to support the platforms.
- Since a large number of AEA posts are vacant, AEAs need to be informed well in advance of activities with early provision of research protocols. Logistical arrangements including travel, fuel costs and irregular payments need to be addressed.
- Greater livestock support giving attention to livestock health and nutrition. Possibilities discussed included support for “Community Livestock Workers”, these being literate farmers who had received basic training, starter kits and a revolving fund.
- Improved feedback on farm data sent by AEAs via their Districts to IITA.

Seed Producer Association of Ghana: The Northern Region branch of SeedPAG has 65 members with 16 working with Africa RISING. Three have their own seed companies, of which one, Heritage Seeds is working with Africa RISING with some 200 outgrowers, usually planting about 2 acres each. These are closely linked with SARI, AGRA and ADVANCE. Each outgrower receives training in seed production and business management. IITA has provided foundation seed and certified seed of released varieties, inspected by seed inspectors and produced with most being purchased by Africa RISING. Africa RISING has provided loan-funding based on production costs, which is repaid when seed crop is produced.

Seed produced includes five varieties of soya bean, five varieties of cowpeas, four varieties of groundnuts and a number of drought tolerant maize varieties. Sales outlets include own agents, some being outgrowers, and agri-input dealers who sell seed, fertiliser and chemicals, NGOs and Africa RISING. Seed is sold in one, two and nine kg packs. Main challenges include obtaining sufficient breeder seed, sales of adulterated seed and hybrid seed recycling by farmers.

A way forward in promoting use of improved seed was identified by setting up demonstration plots in communities adjoining the Africa RISING target communities.

SNV – (Stichting Nederlandse Vrijwilligers): SNV, a Netherlands based NGO works with Africa RISING on the promotion of sesame as a cash crop. Africa RISING is undertaking research on sesame varieties and cultivation practices with SNV addressing other value chain components including input supplies, credit and marketing arrangements.

Farmers: The views expressed by farmers indicate appreciation for what has been achieved but concerns were raised about resources for land preparation, high costs and access to inputs especially fertilizer. Requests were for more support in scaling up cropping activities, for small stock, especially poultry and pigs and training in crop processing (**Error! Reference source not found.**).

Table 1: Benefits, challenges and other concerns expressed by farmers in Ghana

Upper East Region	Northern region		Upper West Region
Kassena Nankana District	Salvelugu		Wa West District
Bonia (30 men and 70 women **Nyangua (**20 men and 48 women)	Doku -7 groups **(** 30 men and 35 women)	Tibali **(**30men and 43 women)	Goriyiri and Goli **(**20 men and 20 women**)**
Major benefits – Seed, new technology – row planting – free fertiliser and free chemical – cowpeas new varieties	– Better farming practices – row planting – Has brought the community together – Women now active in farming, makes lives easier	– New practices and varieties esp. early maturing ones – Intercropping – Better yields and able to feed family – Good collaboration with MOFA – Women now taking part in farming – Planting in rows, rather than broadcasting makes it easier to weed and harvest	– Row planting – easier to weed and harvest – Improved seed of a number of crop varieties, – Fertilizer now available learnt how to apply. – Brought hope to the community – Seeds, varieties, planting, high plant populations – one man sceptical in Y1, then saw improvements

Upper East Region	Northern region		Upper West Region
Kassena Nankana District	Salvelugu		Wa West District
Bonia (30 men and 70 women **Nyangua (**20 men and 48 women)	Doku -7 groups **(** 30 men and 35 women)	Tibali **(**30men and 43 women)	Goriyiri and Goli **(**20 men and 20 women**)**
Major challenges			
– rainfall pattern – land preparation (scarcity of bullocks) – want Africa RISING to remain for 4-5 years – Irrigation scheme not functioning due to lack of water in the dam	– Land area for farming decreasing as land is being sold for urbanisation – Striga	– Small plot size of demos trials – Vocational skills required for women without land – Need to look at animal husbandry, – High cost of fertilizer	– Land preparation (tractor) costs are very high – High fertilizer cost. – Seed insufficient, low rainfall, low soil fertility – Need for animals (pigs, poultry, goats
Other concerns			
– Shea butter transport to town – Assistance with food processing – Finance for joint enterprises by women	– How to acquire inputs – High price of fertilizer (hence a need for crop rotations) – Mini-plots are too small, plea for larger	– Need to extend to other communities – Knowledge must be implemented – Empowerment required, links to service providers – Access to inputs – Support for poultry (women), – Marketing links required, prices at farm gate very low	– Need to increase babies to one acre (will contribute labour) – Want project never to end – Soya bean processing, (AGRA have operated in the area in the past promoting soya) – Animal rearing request

Upper East Region	Northern region		Upper West Region
Kassena Nankana District	Salvelugu		Wa West District
Bonia (30 men and 70 women **Nyangua (**20 men and 48 women)	Doku -7 groups **(** 30 men and 35 women)	Tibali **(**30men and 43 women)	Goriyiri and Goli **(**20 men and 20 women**)**
	ones		

USAID- Ghana: The Economic Growth Division of the USAID Mission funds and oversees 25 projects, many of which focus on food security and the environment. In addition the mission provides "distant" oversight on projects designed and awarded by USAID-Washington. Although this includes Africa RISING, the Mission indicated that it was not well informed about Africa RISING and could learn more through receipt of Africa RISING reports. The Mission is of the view that most development partners in Ghana would like to see consultation and coordination between projects. Hence efforts by Africa RISING are likely to attract support, but the mechanisms for establishing and operating the linkages should be formalized. Africa RISING is seen as playing a significant role in packaging its research results and technologies and making these available to ATT for dissemination. Africa RISING should not focus on dissemination. Important projects being supported by USAID include:

- **SARI**. The Mission sees SARI's role in leading R&D activities in Northern Ghana, although currently SARI appears overloaded. SARI needs to be strengthened to focus on its research mandate including a strong M&E unit. A US$ 5 million grant from USAID for institutional support is in the "pipeline".
- **The Agricultural Technology Transfer (ATT) Project**: ATT, designed and awarded by the Mission, is a 5-year project implemented by IFDC focusing on technology transfer has been running for 18 months. ATT does not work directly with farmers but engages with the private sector and public research institutes upscaling proven technologies as its core activity. This includes seed production, integrated soil fertility management-based technologies and some adaptive research.
    - The Ghana Seed Inspection Unit has been supported through provision of equipment and laboratory testing of germplasm.
    - Seed producers have been supported in producing certified seed.
    - Other activities have included support for conservation agriculture (CA), use of urea deep placement and labor saving technologies such as small machinery for planting.

This adaptive research involves support to and collaboration with national institutions, including SARI with a Communication Specialist being embedded in SARI responsible for communicating data that can be disseminated for users. Although preliminary discussions between ATT and Africa RISING have taken place, no collaborative arrangements have yet been developed. This is considered essential as ATT is working in several districts in the three northern regions.

- **ADVANCE**: This project, implemented by an NGO, ACDI-VOCA, works primarily with private sector partners and farmers with a commercial focus across maize, soya

commercial and rice value chains. ADVANCE acts as a facilitator to encourage private sector involvement in seed production, input supply, and post harvest technologies. Partners include seed dealers introducing new varieties, N2-Africa on soybean inoculants, fertiliser companies such as YARA, and banks for credit provision. About 180 "commercial" demonstrations of about 0.5 ha[3] have been established in northern districts, with inputs provided by partners. These include: soya beans, TSP fertilizer, inoculant, manual jab planters; maize and rice, primarily hybrids, from local and International seed companies

Way forward: USAID-Ghana and its bilateral projects need to be informed about Africa RISING activities and close working relationships established between Africa RISING, ATT and ADVANCE.

Mali

ICRISAT is responsible for coordination of all activities in Mali and therefore responsible for delivery of Mali WP outputs through a sub-contract with IITA. ICRISAT in turn has sub-sub-contracts with ICRAF and ILRI. ICRISAT lead WP5-farm and field productivity, WP9-NRM and watershed productivity and WP10-nutrition. ICRAF is responsible for components of WP1-socio-economics, ICRAF and IER for components of WP5 and WP9 and WP10, and ILRI for components of WP5. AVRDC leads the vegetable component of WP5. ICRISAT also works with WUR to deliver components of WP1, WP5 and WP9, partly funded by the MacKnight Foundation and partly through Cristal's sub-contract with IITA.

Challenges: These have been faced at management, activity and institutional levels by all research partners.

Management level

- Three changes of coordinator with the present incumbent taking charge in March 2014.
- Delays of up to six months in amending sub-sub contracts between ICRISAT and partners, resulting in late arrival of funds and consequential late start to activities.
- Difficulties for ICRISAT in pre-financing agreed activities, even when assured of obtaining funds from IITA.
- Monitoring and evaluation at activity level has not occurred with no targets or indicators having been set.
- Inability of AVRDC to provided technical report s by February, when approved WPs continue until May.

Activity level

- Communication between partners has been poor with inadequate co-ordination particularly with the nutrition component of the program
- Poor understanding of trial protocols due to language problems and hence risks of losing correct procedures for trial establishment.
- Difficulties in mobilizing farmers for crop trials and natural resources management activities

[3] These include one at an Africa RISING community site. This was purely coincidental and not designed.

- Little understanding and uptake by farmers of improved land and water management practices due to lack of capacity at local level.
- Late start of activities and hence difficulties in finding land for crop trials, compounded by early sowing of crops by farmers and hence difficulties in making trial comparisons with farmers practice. Women participants had additional problems acquiring land as decisions often rested with male household heads.
- Poor trials in some areas as a result of poor establishment due to poor germination, seed exposure after heavy rains and erratic rainfall mainly affecting groundnut and vegetable trails. Many farmers are expecting to implement vegetable research activities not only during the rainy season but also in the cold dry season.
- Lack of appropriate human resources made livestock feeding trials unsustainable for ICRISAT to continue.

Institutional level

- The lack of integration of technologies by project partners
- A need for better information sharing, how, by whom and when
- Inadequate IT skills for using Africa RISING communication.

Way forward: A number of measures have been proposed, including

- Regular meetings of the Mali team to harmonise intervention strategies and learn from each other. This includes development of technology hubs with concentration of research activities with irrigation potential.
- Timely submission of work plans and budgets by Mali partners to ICRISAT to ensure timeous release of funds, these being available for a full 12 month period to ensure dry season activities, especially vegetables can be undertaken.

In addition to partnership arrangements with research institutions, there are sub-sub contracts with four development partners AMASSA, AMEDD, CAAD and MOBIOM for undertaking research activities in the communities where Africa RISING is operating.

- **AMEDD,** who have been working with Africa RISING since inception on the understanding that field work would be undertaken after establishment of an R4D platform in Koutiala. Although the platform was formed there has been little follow up due to late arrival of funds from ICRISAT, slow implementation and inadequate synchronization with farmers' activities.

- A**MASSA,** now in their first year of working supporting a group of women involved in producing cowpea and investigating links between improved nutrition and crop production as part of WP10.

- **MOBIOM**, an apex cooperative working primarily in the Bougini area in much the same way and with similar problems to AMEDD in Koutiala.

- **CAAD** working with ICRISAT for three years have undertaken groundnut PVS according to agreed WP protocols involving demos, FFS training, field days and seed production. In 2012 and 2013 CAAD pre-financed their activities and have been reimbursed according to its agreement with ICRISAT.

- **IER** had an early involvement in 2012, but the unsettled political situation during that year resulted in USAID suspending payments to State institutions, although an economist has continued to collecting data on market prices.

Way forward: These include

- An urgent need for R4D platforms to be re-established at village and District levels utilising existing commune authorities. District R4Ds should be facilitated by AMEDD and AMASSA as originally intended. The platforms need to be involved in prioritising activities
- Ensuring NGOs receive funding so that field operations start on time.
- Re-engaging with IER. Although IER capacity is limited, they do have agronomists, soil scientists and socio-economists at the Picasso research station, it would be appropriate for their involvement to support future sustainability. Economic work could be extended to support participatory budgeting and value chain analysis.

Farmers: The views expressed by farmers indicate appreciation for what has been achieved with their main concerns being a lack of inter-farm visits and field days, access to irrigation and suitable land by women for trials. In addition requests were made for improving child nutrition and challenges in connection with livestock corridors (**Error! Reference source not found.**).

Table 3: Benefits, challenges and other concerns expressed by farmers in Medina and Sirakile

Bougoni District, Medina village (20 men and 20 women)	Koutiala District, Sirakile village (12 men and 13 women)
Major benefits	
– About 40 farmers & senior community members have been working with Africa RISING for two years. – Many ICRISAT partners are working in the village, sorghum seed promoted by Sasakawa – cowpea liked due to its rapid growth, high yield and good taste – food banks (*Moringa* which can be used medicinally and baobab leaves)	– New practices and varieties esp. early maturing ones – Intercropping – Better yields and able to feed family – Good collaboration with the project – Women now taking part in farming – Planting in rows, rather than broadcasting makes it easier to weed and harvest
Major challenges	
– Lack of visits between farms (local and between villages – no field days, – would like animal fattening – want Africa RISING to continue	– Water problems – wells to be dug – How to develop and improve local trees – access to land controlled by men – Tomato varieties provided by AVRDC do not do well-pests – Need to improve child nutrition- weigh children at intervals

Bougoni District, Medina village (20 men and 20 women)	Koutiala District, Sirakile village (12 men and 13 women)
Other issues	
– In the past projects have come for 1-2 years to test varieties, arrange demos and then leave, Africa RISING is different and is here for longer	– Have been working with AMASSA and AMMED for 10 years, ICRISAT – 3 years, – CMDT work with cotton only, although originally this was with all crops, – Most households have livestock, less with cattle, everyone slaughters – Who enforces conventions-Chief through discussion with effected parties – Big challenge that livestock corridors are too small and do not meet needs

Feedback from farmers in other areas is shown in Box 1.

Box 1: Feedback from farmers on food banks, PVS and livestock conventions in Mali

Food bank demo (ICRAF)**.** This is owned by a self-reliance group, *Oido Oyen*, involving 230 women, growing seven species of trees on fenced land with a well provided by ICRAF (being monitored for growth, biomass, physiology, yield, etc). The women have learnt how to graft and there has been some uptake to other households. The main scaling challenges are access to land, fencing and irrigation.

PVS (AMEDD and AMASSA). This included five varieties each of groundnuts and cowpeas comparing local and improved varieties and use as a FFS. Three cowpea varieties were liked for grain, one for leaves. The land provided for the trial had serious couch grass and sedges with low soil fertility, reasons being the difficulties in obtaining land.

Groundnuts and cowpeas PVS (MOBIOM). This is being undertaken by the Koulibale women's group with "*Nasforo*" groundnut being the preferred variety as it gives a good income, and "*Willibillie*" is the preferred cowpea variety, as it gives both good grain and leaves. FFS training on techniques was liked. Challenges include: animal damage, difficulties in acquiring land, and pest attack on cowpeas with neem and soap mix not being effective.

Livestock conventions (ILRI). Discussions took place at Zanzoni Village with 10 farmers confirming that conflict rules are centred on the village chief, with written rules required in case of contest. Conflicts are resolved by the chief and his councilors. A need was identified to reinforce this committee to be responsible for NRM Requests were made for knowledge on cereals, livestock techniques, processing training, equipment, and literacy for children, gardens.

USAID-Mali is funding a number of bilateral development projects under the broad umbrella of Africa RISING for scaling-up proven technologies. This involves ICRISAT, ICRAF and AVRDC on different projects with 50% of funding goes for local partners. Projects include:

- **FARMSEM.** An ICRISAT-managed project ($8m over 3 years) initiated in Nov 2013, to disseminate millet and sorghum seed working with CRS, Aga-Khan Foundation and IER. It involves seed multiplication and distribution for intercropping of cereals with cowpeas

and groundnuts and is targeted at high potential areas including Sikasso and Mopti. To date 230 sorghum plots have been established with FFS being an integral component.

- **NRM project.** A recently commissioned ICRAF-managed project ($8m over 5 years) involves the same local partners as FARMSEM for scaling up NRM technologies (live *Jatropha* fences, food -B*aobab and Ziziphus,* and fodder banks of G*liricidia)*.
- **Improving vegetable production and consumption**: AN AVRDC-managed ($2m over 3 years) initiated in 2011, aims to increase vegetable consumption and production in Sikasso Region through breeding, testing , multiplying and disseminating and encouraging farmers adoption of indigenous and exotic vegetables. This has established "Best Practice Hubs" each linking 5-10 villages.
- **Value chains with ACDI-VOCA:** ICRISAT is working with a local agent of SYNGENTA with millet, rice and sorghum value chains providing seed and seed treatment, this being a $2-seed treatment sachet for one ha, that ensures a six-week disease free environment.

As in Ghana, USAID-Mali would like to see Africa RISING bilateral projects working closely with USAID-Washington funded initiatives. At present USAID-Mali does not receive reports and would appreciate short 1-2 page summaries. As the coordinating partner in Mali, ICRISAT needs to ensure close collaboration and provision of reports.

Management achievements and challenges

IITA is managing a complex project with both directly employed staff and contracted partners (Figure). It involves many sub-contracts primarily with CG and national research institutes, who in turn have a number of sub-sub contracts with other research institutions and development organizations for undertaking field activities. In Ghana IITA management has been made easier by the recent recruiting of Associate Research Officers responsible for coordination of research in each of the three regions and through who contracted research institutions can work. These Research Officers are accommodated at MOFA Regional Offices providing effective linkages with MOFA AEAs and the 25 target communities with which Africa RISING is working. They are expected to ensure that "Technology Parks" meet community needs for demonstration and training, ensuring research protocols are correctly implemented and supporting students to undertake their research. They should also be able to play a key facilitation role in establishing and ensuring the R4D platforms at both District and Community level meet regularly to ensure research activities are demand-led and linked to development initiatives.

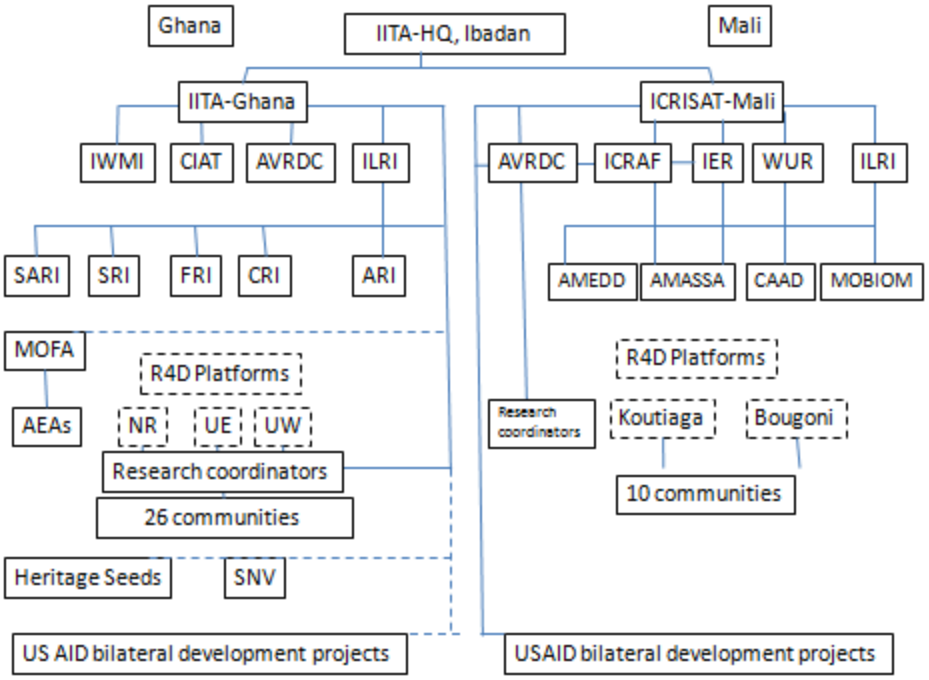


Figure 2: Africa RISING West Africa management structure

The situation in Mali differs considerably from that in Ghana. In Mali four development-orientated NGOs/cooperatives have been contracted to implement on-farm research activities. Each works independently with the CG research institutions, with little coordination of activities at community level. Although RD4 Platforms were established in 2012, there has been little if any follow-up and they appear to be effectively non-operational.

IITA is responsible for management of two Africa RISING projects, one in West Africa and the other in East & Southern Africa. Responsibility for partnerships lies with the DDG-partnerships through its partnerships Coordination office, and the Regional Director-West Africa through the Country Representative, 85% of whose time is available for Africa RISING (Figure). A recent decision to map Africa RISING- to the Humidtropics Program may change these arrangements.

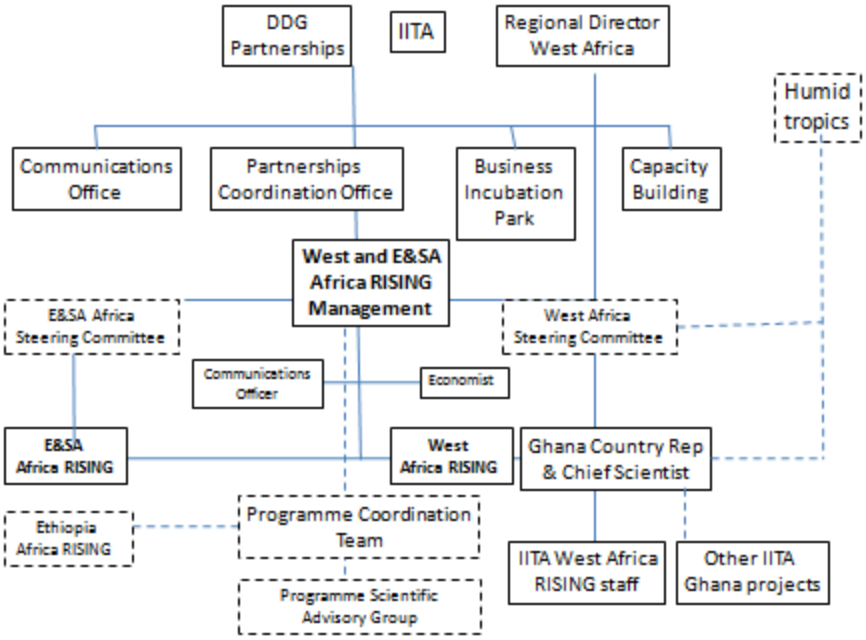


Figure 3: IITA management structure related to Africa RISING West Africa

Africa RISING management has recently been increased through the appointment of a communications officer in Ibadan and an economist in Tamale, both with technical responsibilities across West and E&SA Africa RISING.

Issues associated with the process of WP approval and contractual agreements are shown in **Error! Reference source not found.**, against the background of the agricultural season, funding commitments from USAID and WA Africa RISING planning.

Africa RISING-West Africa's Steering Committee chaired by the Regional Director (West Africa) has the responsibility of approving Africa RISING's WPs. A Scientific Advisory Group for the three Africa RISING projects was formed in 2014 to advise IITA and ILRI on Africa RISING's science. Inter-institutional contractual agreements and their associated WPs can only be signed after approval by the Steering Committee and after referral by in-country representatives to their HQs in India, Kenya and Taiwan. This is often the responsibility of DGs, who can only sign after consideration of the WP against other institutional Programs, projects or activities. Delays may occur as this process is followed. For instance in the case of ICRISAT, the Dryland Research Program Manager's prior approval is required, before consideration by the DG. After approval it is passed to the Communications Unit for action. In some cases contracting institutions are able to pre-finance expenditure provided IITA have provided a written commitment that payments will be made. Clearly no such commitment can be made without USAID providing such assurances. Some institutions are unable to pre-finance expenditure causing delays in implementation.

Although Africa RISING is a 5-year Program, contracts are renewed on an annual basis, based on USAID's financial year (October-September) in contrast to most CG centre's financial year (January-December) with WPs being agreed each year. Clearly the 3-year WP Program (2014-2016) should reduce delays.

	O N D J F M A M J J A S	Issues raised
SEASON	Rainy season / Dry season / Rainy season	Although most field activities occur during the rains, dry season activities' are important for vegetables and other irrigation.
USAID funding commitment	X	This is often given well into the financial year
Africa RISING WA Planning	X	This occurs over 3 week period with input from Chief Scientist
Plan approval	X	Steering committee considers and approves plans
IITA	X	IITA contract negotiation with partners
ICRISAT	X	Approval from ICRISAT HQ India
ICRAF	X	Approval required from HQ Nairobi
ILRI	X	Approval required from HQ Nairobi
AVRDC	X	Approval required from HQ, Taiwan
IITA issues contracts	X	IITA issued contracts, after consideration by contracted institutions
ICRISAT expenditure frozen	X	ICRISAT stops all expenditure at the end of Feb with unexpended funds not being rolled over
Report deadlines	X X	6-monthly reports to USAID by IITA

The budgets agreed for 2013 and 2014 as a percentage of the total budget for partners are shown in Figure.

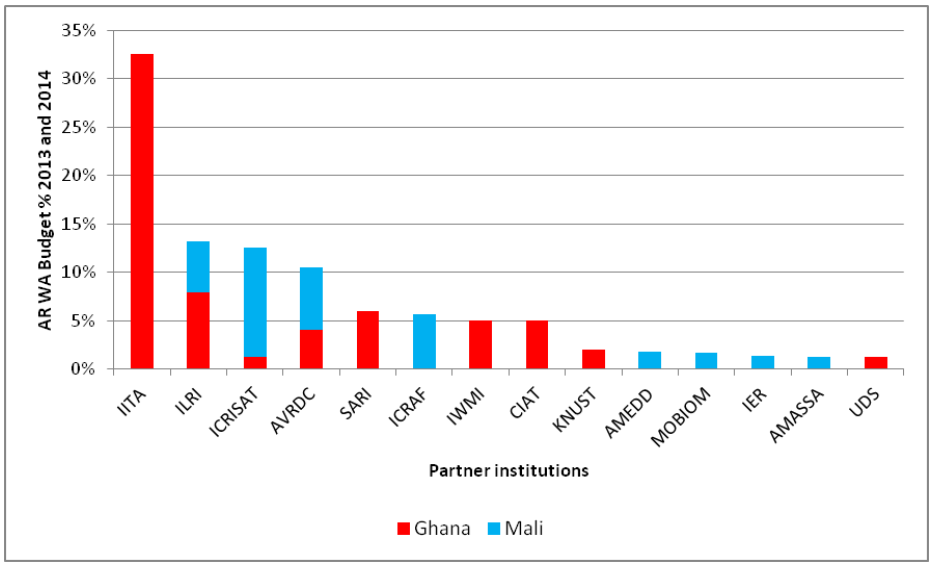


Figure 4: Project budgets, 2013 and 2014 (% of total budget) (Source: 2013 and 2014 work plans)

Once contracts have been signed, IITA will pay 80% of the agreed budget before the start of activities, retaining 20% for payment after technical and financial reports have been submitted. Figure shows actual payments by IITA to contractors over the period 2012-October 2014.

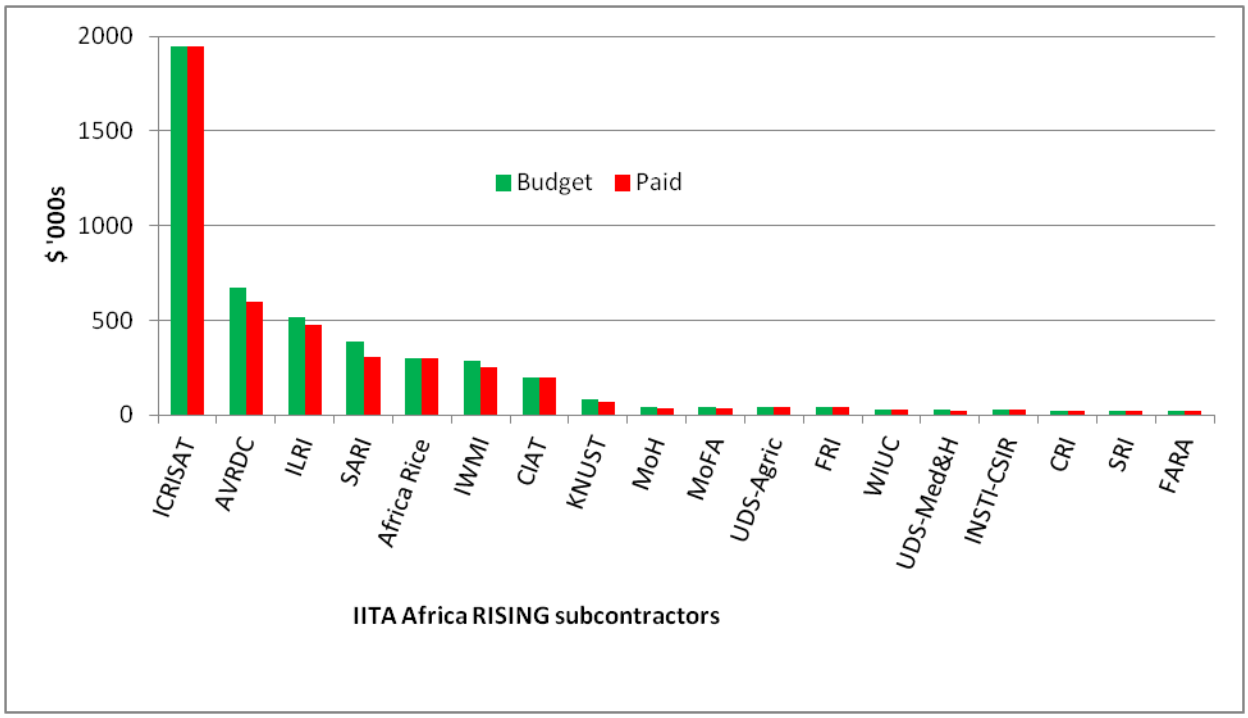


Figure 5: Partner budget and payments to contractors,2012-October 2014 (Source: IITA contracts office)

This confirms under expenditure by a number of contracting institutions notably AVRDC, ILRI and SARI. In the case of AVRDC this was related to misunderstandings in connection with activities planned for the dry season in Mali. ILRI under expenditure relates to livestock activities being funded by ICRISAT and the associated activities of WUR and MacKnight Foundation. SARI under expenditure relates to late reporting, some activities not being undertaken and non compliance with IITA's requirements for financial reporting.

In summary achievements include: a project steering committee is in place and a science advisory group at the program level has recently been established to advise the project; at Program level, a Program Coordination Team consisting of the three main implementing institutions IITA, ILRI and IFPRI and USAID coordinates topics across the three regions in Africa; contractual arrangements between partners are in place and reporting systems have been established; IITA has established a regional office in Tamale in which Africa RISING has been housed; Research plans (WPs) 2014-16 based on draft logical framework now in place providing the vision that allows implementers to plan their research from a longer term perspective. The Africa RISING team has been strengthened with recently recruited staff Research supervisors/coordinators in each of the three Ghana regions as well -an agricultural economist and communication specialist for both WA and ESA, and a social scientist.

Challenges include: some CG partners do not have a country office, notably in Ghana, where only IWMI has staff with national institutions being sub-contracted to carry out activities, but often their capacity is limited; contrasting management arrangements exist in Ghana and Mali, with the Chief Scientist able to take direct control in Ghana but only providing an advisory role in Mali as inter-institutional contracts hamper this process. In Mali, the coup in 2012 led to interruption of work, with activities being largely carried out by local NGOs as funding disbursement to IER was banned by USAID until October 2013 and re-engagement has not occurred to any significant level. Contracts can take time to be signed with reports to IITA sometimes being late, having to be chased with consequently transfer of funds being delayed. The role of NARS is important for broad and long term impact sustainability, especially SARI in Ghana and IER in Mali. Although both have capacity problems, their involvement is seen as crucial.

Issues which need to be addressed include:

- Establishing accountable and responsive funding and reporting system that maximizes timeliness in line with seasonal requirements, addressing difficult institutional arrangements related to mode of operations, fund transfers and reporting schedules. This includes addressing procedures for approving or modifying WPs. Partner organisations with limited administration capacity may need to be provided with on-the-job mentoring in addition to formal training to ensure reports are provided on time.
- Ensuring that absence of in-country CG partners, especially in Ghana, where only IWMI is present does not result in clumsy sub-sub-contracts. Where national institutions have limited capacity greater use of local regional consultants should be considered.
- Improving communication between different CG centres in Mali to ensure more integrated activities. A "silo" approach needs to be avoided both with research and development partners. This requires close working relations between the different CG Centers involved.
- Re-engaging with IER in Mali, using their expertise where capacity allows and building capacity for sustainability, and improving communication with SARI in Ghana. This might include establishing a liaison office at their HQ.

- Agreeing a clear vision (an Africa RISING pathway) that begins with farmers and other agric-sector related actors to establish and roll out the research agenda, and include other sets of actors who will be responsible for promoting / disseminating research outputs. These 'other' actors must include USAID-funded programs, ensuring that monitoring uptake for learning remains with Africa RISING.
- Completing the draft log frame and incorporating a "theory of change" in line with vision.

Availability of human resources for implementation

- It is recognised that capacity limits are present at all levels, some of which are being addressed through Output 6. Others require prioritisation for the way forward to be established.

Some of the challenges being faced include

- Lack of continuity of staff of some partners leading to work disruption. In Mali, Africa RISING is currently working with its third ICRISAT coordinator. In Ghana, the second IWMI PI for water and soil management leaves in a few weeks. The PI for NRM is based in Nairobi with no staff available in Ghana
- An economist and communications officer have only recently been recruited for Africa RISING WA and S/EA, one based in Tamale and the other in Ibadan. This has contributed to a number of socio-economic led activities being delayed and sometimes inadequate communication. The new appointment of a social scientist should make this an interesting and valuable team. Support needs to be given to encourage this small group, possibly with researchers from national institutions in both countries, to work together forming a 'community of practice'.
- Each WP has input from between five and 15 scientists, and possibly some students with the research led by a Lead Scientist or Principle Investigator. Where scientists are located in more than one institution, coordination and logistical arrangements can be problematic.
- Many CGIAR scientists have limited time allocated to Africa RISING as they are involved in other projects and may give these priority.
- NARS, for example SARI in Ghana , have many commitments as many donor-funded projects are contracting with them, including a $1 million AGRA-funded project involving AfricaRice.
- Farmer drop outs affect the set-up and/or completion of field trials.
- In some cases long distances of scientists from workstations to the field and often inadequate transport.
- Siting of research trials and destruction of experiments by livestock.

Way forward

- Consideration needs to be given to ensuring an appropriately qualified person (research associate) is available in each region/district for coordinating research activities and partner arrangements, rather than depending on NGO partners who may not have the capacity for research, or post-graduate students who must complete a substantive thesis within a specific timeframe. Issues surrounding the mobility of students taking part in studies in distant sites need to be addressed.
- There is also a need to address the issue of implementing work Programs with part time individuals. This could be achieved by consolidating work plans to increase contract size?

Contribution to the humidtropics and dryland CRPs

The Africa RISING research approach with its research outputs follows largely the research approach of the Humidtropics CRP. Africa RISING is mapped under Humidtropics. However the East and Southern Africa and the West Africa projects are currently not within the geographical focus of Humidtropics' first phase which is focusing on the humid tropical zones in Africa and not the moist savannahs. The Africa RISING intervention sites in Mali fall within the geographical scope of the Dryland Systems CRP and the research is therefore also reported by the Africa RISING partner ICRISAT to the Dryland Systems CRP.

It is recognised that IITA is required to map WA Africa RISING into their Humidtropics (H) CRP. It is also recognised that Africa RISING has a contribution to make to this CRP. At the same time Africa RISING's contribution to USAID's "Feed the Future" is also recognised and maintaining Africa RISING with a separate identity from Humidtropics is likely to be important, especially with budget reductions for CRPs.

Research development for a next phase

In rural settings with low human population, where land is relatively scarce, livestock and crop production often occur separately. As population increases and land becomes scarcer, integration of crop and livestock production occurs with animal feed generated from within the system. In peri-urban environments characterised by increasing land scarcity and increasing human population, crop-livestock interaction and integration become important. These two kinds of mixed farming can be intensified through exchange of resources between animal and plant-based enterprises, mainly through manure use for crop production and feeding of crop residues to livestock, but also animal draft power for crop production and transport.

At higher human population pressure and greater land scarcity, as in urban areas, crop-livestock interactions may be separated to become specialized crop or livestock enterprises with greater value-added, for example horticulture. Intensification of livestock production can take place with purchased inputs, feeds and mineral licks, imported from outside the system. Although crop-livestock interaction and integration are important, opportunities to intensify livestock production, unrelated to on-farm resources, should be considered.

Since Africa RISING operates in both rural and increasingly urban and peri-urban areas, this provided opportunity for the three forms of intensification. Opportunities for linking with other system-related CRPs (Dryland systems, Humidtropics and Water, Land and Ecosystems) should allow shared lessons and opportunities for Africa RISING in the future.

The review team recognises that a number of the recommendations made for new or existing activities are unlikely to be implemented before 2016, especially as new problems and opportunities emerge from ongoing work. It will be essential that the review recommendations are prioritised by the R4D platforms in line with opportunities and farmer requests. This should also give priority to work that can be concluded in the next two years. This means that some of the recommendations for completely new work are best addressed in a next phase. This will include:

- Monitoring technology use, developing and implementing plans for learning.
- Clearer targeting with more careful linking of research activities to derive synergies between on-farm and off-farm resources.
- Strengthening work on crop-livestock interaction and integration, including animal feed opportunities (crop residues with better preservation, improved use of fallows and innovative methods of maximising fodder production from food crops).
- Addressing livestock health delivery systems.
- Addressing wetland use and increasing opportunities for irrigation.

Annexes

Annex 1: Terms of Reference, External Mid-Term Review of Africa RISING, West Africa

Terms of reference

i) Assess conformity of Africa RISING WA project with the Program Research Framework
ii) Evaluate how the project is fostering learning by stakeholders
iii) Identify weaknesses and gaps in research
iv) Identify data gaps and issues of data handling and sharing
v) Assess the contribution of M&E activities by IFPRI to the research agenda
vi) Review appropriateness of current partnerships, available human resource, current management structure
vii) Provide recommendations to address identified issues

Key evaluation questions

- What progress has been made towards the Africa RISING program objectives and expected outcomes? What can realistically be achieved within the given time frame?
- How relevant and feasible is the current field research approach to achieve the three research outputs and the outcomes?
- To which extend has the project built on experiences of past projects in the intervention areas in terms of farmer-level learning? How can this be improved?
- Which data gaps exists to provide the scientific evidence for achievement of the three research outputs and the outcomes? How can they be addressed?
- What issues exist around data management and how can they be addressed?
- Which research areas are missing or need to be strengthened (economics, gender, scaling approaches, communication…)? How can the gaps be filled?
- How adequate are the available human resources to the successful implementation of the project? Which expertise needs to be strengthened or added?
- Are the current research and development partnerships adequate for a successful project?
- How effective is the collaboration, coordination, and working relationship among key partners?
- How relevant is the program and project management structure in terms of enhancing the implementation of the WA project?
- Which lessons have been learned by each key partner so far?
- To which extent is the project contributing to the Humidtropics and Dryland CRPs?
- How should the research be further developed in a next phase?

Deliverables

- A short written report for debriefing IITA management, focusing on issues posed by the TOR before leaving Nigeria
- A draft report on detailed findings and recommendations for comments by the Africa RISING team
- A final report

Annex 2: Review Program

Date	Program
September 28	Overview of Africa RISING West Africa Project, Tamale, Ghana
September 29	Meeting with MoFA representatives, Field trip Bonia and Nyangua community
September 30	Field trip Duko and Tibali
October 1	Field trip Wa-Goriyiri and Goli-Wa
October 2	Meeting with MoFA representatives, Field trip Wa-Zanko and Zanko-Guo
October 3	Meeting with MoFA representatives (Regional and District Directors), Northern Region Office, ADVANCE and ATT, Seed Producers and Input-dealers, SARI with director and staff, UDS and KNUST
October 4	Meeting with graduate students, IWMI, ILRI and ARI, IITA
October 6	Meeting with ICRISAT ILRI, ,ICRAF, AVRDC
October 7	Presentation by MOBIOM visit to Madina Village
October 8	Presentation by AMEDD, Field visit to ILRI research sites (Sirakele & Zanzoni) and interaction with AMEDD and farmers. Field visit and interaction AMASSA and farmers. At Sirakele and M'Pesoba villages
October 9	Field visit to ICRISAT research sites (Kani & Try) and interaction with AMEDD and farmers. Field visit to ICRISAT research sites (groundnut trial establishment in Try1 and interaction with CAAD and farmers.
October 10	Field visit to AVRDC research sites
October 11	Field visit to ICRAF research sites Reviewers discussion with CAAD, AMEDD & AMASSA
October 13	Discussions with ICRISAT, AVRDC and de-briefing and discussion with partners
October 15	Meetings with IITA, DDG Partnerships and Capacity Development, DDG Research, Communications manager

October 16	Meeting with IITA and Humidtropics staff: Contracts Office, Regional Director and Chair Africa RISING Steering Committee, Head Partnership Unit, Humidtropics Deputy Director, Visit to Business Incubation Park
October 17	De-briefing with AR Management

Annex 3: Persons consulted

GHANA

IITA, Tamale

- Irmgard Hoeschle-Zeledon, Africa Rising Project Coordinator
- Asamoah Larbi, Chief Scientist
- Bekele Hundie Kotu, Socio-economist

UDS/ KNUST Students with Africa Rising

- Eliasu Salifu, Mphil Soil And Water Engineering, KNUST
- Sheibu Melton, Mphil Agricultural Economics, UDS
- Haruna Abdulai Mphil Agronomy (Crop Physiology), KNUST
- Sarfo Kantanka, Phd, Animal Nutrition, Animal Science Poultry, KNUST
- Mohammed Bashiru Mphil, Post-Harvest Technology, KNUST
- Theodore Eyram, Mphil Post-Harvest Technology, KNUST
- Abdul Rahman Nurudeen Phd Soil Science, KNUST
- Bright Kwame Amponsah, Mphil, Animal Nutrition, KNUST
- Kwame Mponsa, KNUST

CIAT

- Fred Kizito (written contribution)

MoFA – Kassena-Nankana Municipality

- Alhaji Ahmed Musbahu District & Regional Director
- Bernard My Issah, RAO Extension
- Doris Mabare, WIAD Officer,
- Adamu Seidu; AEA
- Elijah Bobby, Priscilla Kugusiye and Linda Afibilla (Youth Harvest Foundation Ghana) – Field Officers
- Issah Sugri, Researcher, SARI

ILRI

- Augustine Ayantunde ,ILRI (Burkina Faso), Animal Scientist

MoFA - Upper West, Wa

- David Waawela, District / Regional Director
- Huudu Abu, RADU-crops
- Dr Rashid Jimah, Regional Veterinary Officer.

IWMI

- Tim Ellis, Senior Research Officer

MoFA Tolon District Northern Region

- Baba Musah Jolon, District / Regional

- Chief Issahaku Jesiwuni, Executive Director BADECC
- Hussein Mohammed Mansur, Programs Officer in charge of operations
- Amponsah Twumasi, Transport Officer Daniel

ARI - Nyankpala

- Minongkordam Karbo, Director
- Franklin Avornoyo, Senior Researcher

SARI, Nyankpala

- S.K. Nutsugah, Director
- Nicholas Denwar, Legume Breeder
- Julius Yiragla, Agronomist
- Wilson Dagbe, Rice Agronomist
- Mumuni Abudulai, Entomologist–
- Sata Buah, AR link scientist (written contribution)

KNUST, Dept. of Horticulture

- Francis Appiah, (Food Scientist/ Post Harvest Technology) Head, Senior Lecturer, also representing AVRDC

UDS, Bolgatanga

- Mahama Saaka, Head of Dept for 'Community Nutrition'

USAID-Ghana

- John Brighenti (Agricultural Officer)
- Samson Konlan (Food Security Specialist)

Director

- Yusuf Ahmed, RADU, Regional Crops Officer
- Francis Abdulai Neindow
- Savelugu Nanton, Municipal Director

IFDC – ATTP

- Brian Kiger, - Deputy Chief of Party, IFDC
- Musa Salifu Taylor, Development Advisor, IFDC

ACDI-VOCA – ADVANCE

- Allan Pineda, Technical Director
- Collins Kyel Boafo, Outreach ICT Specialist
- Peter Asibey-Bonsu, Agricultural production Specialist

Heritage Seed Company (Ghana)

- Zakari Iddrisu, Managing Director

Farmers

- Farmer groups in Tibali, Duko, Bona, Nyangua, Goli, Goriyia

MALI

- Ramadjita Tabo, Regional Director ICRISAT
- Haile Desmae, ICRISAT Groundnut

Farmers

- Farmer groups in Koutiala and

breeder
- Mary Ollenburger, ICRISAT/WUR PhD student
- Marc Traore, ICRISAT Admin Assistant
- Birhanu Zemadim ICRISAT Scientist and AR Coordinator
- Sidi Toure ICRISAT Tech Research Land/ Water Management
- Augustine Ayantunde ,ILRI (Burkina Faso), Animal Scientist
- Clarisse Umutoni, ILRI PhD student
- Abdou Tenkuzno, AVRDC Regional Director
- Albert Rouamba, AVRDC Vegetable Breeder/Community Mobilisation
- Yvette Dossa, AVRDC, Nutritionist
- Jean-Baptiste de la Salle, AVRDC Africa RISING contact person
- Carolina Makamto Sobgui , AVRDC Breeder
- Joachim Nyemeck Binam, ICRAF Policy and Impact specialist
- Catherine Dombele, ICRAF Tree Scientist
- Yah Diakiteyah, AMASSA-Head of Mission
- Bougouna Sogoba, AMEDD Director
- Pierre Coulibaly, AMEDD Supervisor
- Glauosame Jiwawara (CAAD coordinator)
- Usmanne Sanogo (IER-economist)
-

Bougoni

USAID-Mali

- David Yunggen

NIGERIA

IITA, Ibadan

- Ylva Hillbur , DDG Research
- Kenton Dashiell, DDG Partnerships and Capacity Development
- Alfred Dixon, Head, partnerships Coordination Office
- Tahirou Abdoulaye, Agricultural economist

- Eric Koper, Chief Officer Management, Humidtropics
- Hilda Koper, Contracts Officer
- Katherine Lopez, Communications and Publications Manager
- Jonathan Odhong', Communications Officer
- Joseph Atenhnkeng, Aflasafe Project

Prior to the field visits skype or telephones discussions were held with Jerry Glover (USAID-Washington), Fred Kizito (CIAT, Nairobi), Bernard van Lauwe (IITA Nairobi), and Katrien Descheemaeker (WUR, Netherlands).

Annex 4: Reports and publications provided

1) Asamoah Eric, Anim Boafo, Francis M. Tetteh, Nketia, Kwabena Abrefa, KwasiAppiah, 2013. Baseline Survey Report. Soil Resources of Africa RISING Intervention Community in Ghana . Council for Scientific and Industrial Research, Soil Research Institute.

2) Ayantunde Augustine A. , Rainer Asse, Mohammed Y. Said, Abdou Fall . 2014. Transhumant pastoralism, sustainable management of natural resources and endemic ruminant livestock in
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5) Brain Akakpo Daniel, 2014. Africa RISING - MOFA Monthly Report Northern Region

6) CSIR-Food Research Institute, 2014 Progress Report Reporting Period: October-December, 2013Sustainable Intensification of Key Farming Systems in the Sudano-Sahelian Zone of West Africa Activity 3.2.6.1

7) Diawara Fatou, 2014 Characterization of food consumption patterns of southern Mali. Africa Rising, Districts of Bougouni and Koutiala, Sikasso. AVRDC

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Annex 5: Summary of on-farm trials in Ghana

	Northern									Upper East					Upper West	
	Salveugu					Tolon				Kassena Nankana				Bongo	Nadowii	
Trial type	Tibali[1]	Duko[1]	Botingli	Jana	Kpaliung	Gban jong	Tibogunayili	Tingoli	Kprim	Bona[1]	Nyangua[1]	Gia	Tekuru	Samboligo	Gyiili	Papa
N rates on maize	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
modeling sustainable maize production										1						
Spraying regime on cowpeas	1	1		1	1					1	1			1	1	1
Cowpea varieties								1		1						
N rates on cowpeas																
P rates on cowpeas																
Spraying and starter N on cowpeas										1						
Cowpea variety early														1		
Cowpea variety medium														1		
Phosphorus rates on groundnuts		1				1	1	1		1	1					
groundnut variety trial														1	1	

Trial type	Northern									Upper East					Upper West	
	Salveugu					Tolon				Kassena Nankana				Bongo	Nadowii	
	Tibali[1]	Duko[1]	Botingli	Jana	Kpaliung	Gban jong	Tibogunayili	Tingoli	Kprim	Bona[1]	Nyangua[1]	Gia	Tekuru	Samboligo	Gyiili	Papa
ISFM - Soybean	1	1	1		1	1	1			1	1			1		
Soybean variety trial		1								1						
Soybean medium		1														
Soybean early			1													
Maize-okra intercrop	1				1				1	1	1	1		1		1
Maize-roselle intercrop	1				1				1	1	1			1		
Maize and pepper intercrop						1	1		1	1	1					
Maize-egg plant intercrop	1									1	1			1		
Vegetable into cereal legume intercrop										1	1	1				
Maize and tomato intercrop						1										
Okra variety trial										1						
Roselle variety adaptation										1						

	Northern									Upper East					Upper West	
	Salveugu					Tolon				Kassena Nankana				Bongo	Nadowii	
Trial type	Tibali[1]	Duko[1]	Botingli	Jana	Kpaliung	Gban jong	Tibogunayili	Tingoli	Kprim	Bona[1]	Nyangua[1]	Gia	Tekuru	Samboligo	Gyiili	Papa
Maize sesame intercrop		1								1	1			1		
Sesame variety										1						
Sesame planting date										1	1			1		
Spraying regime on sesame										1	1			1		
Mid August sesame																
Pigeon pea short										1					1	
Pigeon pea medium										1					1	
Cereal-legume strip cropping		1		1			1	1		1		1	1	1		
Maize-legume rotation			1							1		1	1	1		
Ridge type on cereal legume		1				1		1			1	1				
Zia and fertiliser micro-dosing on cereals										1	1	1		1		
Sheep, maize-soil interactions											1	1		1		

Trial type	Northern									Upper East					Upper West	
	Salveugu					Tolon				Kassena Nankana				Bongo	Nadowii	
	Tibali[1]	Duko[1]	Botingli	Jana	Kpaliung	Gban jong	Tibogunayili	Tingoli	Kprim	Bona[1]	Nyangua[1]	Gia	Tekuru	Samboligo	Gyiili	Papa
Maize-Cowpea intercrop (medium)					1											
Cowpea Songotra multiplication					1											
Total	6	9	4	3	7	6	5	5	4	24	15	8	3	16	5	3

Annex 6: Summary of on-farm trials in Mali

Villages included

- In Bougouni District: Dieba, Flola, Sibirila, Madina and Yorobougoula
- In Koutiala District: M'pessoba, Zanzoni, Sirakélé, Napossela, N'Golonianasso

ICRISAT activities have included crop trials of new varieties of legumes, intercropping options for food and feed production, and combined organic and mineral fertilizer use. Based on farmer and local partner priorities five intensification options were prioritised to test

- Cowpea grain and fodder varieties n organic pest control
- Sorghum-cowpea intercrop testing cowpea varieties and intercropping type (substitutive and additive
- Soybean with compost and inoculation
- Groundnut improved varieties (5 varieties in mother-baby trial design)
- Maize with mineral and organic fertilizers

An interesting option tested in 2013 was a grain cowpea variety developed by IITA (IT90K372-1-2) which was given the local name "Wilibali" because of its short stature. This early-maturing variety was appreciated by farmers, who tested it last year and several saved the seed harvested from the trials to plant in 2014. In addition, 14 farmers purchased seed from the project, and demand exceeded the seed available.

For 2015 ICRISAT plans to explore seed production in collaboration with the USAID-funded Farmsem project to meet seed demand locally and improve the sustainability of the project.

AVRDC activities included **i**ntercropping of maize-pepper, maize-okra, maize-tomato, roselle-groundnuts and mono cropping tomato, okra, pepper and African eggplant.

ICRAF activities included demonstrations of food and fodder banks, the former comprising indigenous trees in fenced demonstration areas, the latter as an integral part of soil contour bunding in arable fields

ILRI activities comprised an assessment of availability of local fodder requirements and local conventions governing NRM and conflict resolution

Annex 7: Some success stories

Abdul Rahman Nurudeen

a graduate from Garu in the Upper East Region of Ghana supported by Africa RISING to pursue a PhD in Soil Science

Abdul Rahman Nurudeen, was born into a modest family in Garu, a small-sized town in the Upper East Region of Ghana some 30 years ago. As is usually the case with many Ghanaians born in the rural areas, the young boy Abdul started school in his hometown. At the time of moving from home to go to senior high school at the age of about 14 years, Abdul had taken interest in agricultural science and so chose to go to a school where agricultural science could be studied as an elective subject. From 2001 to 2003 Abdul had his senior secondary school education at the Anglican Senior Secondary School in Kumasi in Ashanti Region. In his pursuance to ground his knowledge in agricultural science and technology, Abdul went back to northern Ghana at the age of 20 to study agricultural technology, with focus on agronomy at the University for Developmental Studies, Tamale, where he graduated in 2008 with BSc. Agricultural Technology degree with honors. After completion of his national service assignment in 2009, Nurudeen enrolled in a 2-year Master of Science program at the Kwame Nkrumah University of Science and Technology in Kumasi. At KNUST Nurudeen studied soil science with specialization in fertility and chemistry. As narrated by Nurudeen, before completing his MSc in 2011, his thesis research supervisor from the Soil Research Institute informed him about the PhD scholarship opportunity advertisement with Africa RISING project. Nurudeen added : "*I applied and I was called for an interview in Tamale. After the interview, I was selected".* Nurudeen, now a proudly married humbly but confidently states: *"I am pursuing a PhD in Soil Science, registered under Kwame Nkrumah University of Science and Technology. I hope to complete my PhD in Soil Science by 2016 and become a soil scientist to help address the major problem of agriculture which is low and declining soil fertility in the Northern part of the nation and Ghana as a whole. Also I aspire to be a renowned soil expect in sub- Saharan Africa to help attain a green revolution and ensure food security in this part of the world*."

Africa RISING has already noticed the academic and intellection depth, and skills of Nurudeen and his potential to contribute to crop agriculture and has provided him with the opportunity to undertake his PhD field research with the Project. His PhD research thesis is on "Raising and sustaining productivity of integrated crop-livestock systems". Mr. Nurudeen is one of 15 graduate students granted scholarships and provided with monthly stipends by the Africa RISING Project in Ghana. All 15 students are attached to Africa RISING and are undertaking either MPhil/MSc or PhD thesis research on aspects of the research program. Africa RISING is truly nurturing the next generation of agricultural research and extension specialists.

Baba Yisa

A royal from Duko in Northern Region of Ghana was so impressed about cowpeas that he is now converting some his maize plots for cowpea production.

Baba Yisa, a 49 year old farmer, born into a royal household in a town in the Duko Community in the Savelugu District in Northern Region of Ghana, has been farming for 13 years after being a mason for many years. According to Yisa when he started farming in maize on a part time basis he soon realized that the monetary gains from maize farming far exceeded his incomes from masonry. He therefore decided to become a full-time farmer, growing maize for home consumption and for cash income, through the sale of maize to traders. In recent years Yisa who is married to three wives and have 16 children has been experiencing difficulties in taking care of the three wives and children, and had been looking for ways to improve the yields from his maize plots. In the 2014 cropping season Yisa came across the farm plots of Africa RISING farmers in the Duko Community. He observed maize crop planted in rows positioned between two rows of cowpea. He was very much impressed about the condition of the maize crop as compared with his maize crop on his plots which were not planted with cowpea. Upon enquiry from neighbors he learnt that maize planted close to cowpea can benefit from cowpea crop planted close to the maize crop. Yisa who has three (3) acres of land under maize cultivation and harvests about four bags from each acre has made the decision to intercrop his maize with cowpea during the next crop season, using the Africa RISING technologies used by his neighbors . According to Yisa from what he saw on his neighbors' plots, he is absolutely convinced that the productivity of his farm will increase by adopting the new technologies. Yisa aspires to become a traditional ruler in his town in future by reason of royalty. He believes being able to cater for his immediate and extended family from improved agricultural productivity and resultant incomes can only be a plus for him when the time comes for the selection of a new traditional ruler.

Souleymane Diawara

A farmer in Menina community, Koutiala District, Mali

An improved cowpea variety, developed with germplasm provided by IITA (IT90K372-1-2) and released by IER, is named locally as "Wilibali" because of its short stature. It was much appreciated by farmers, who tested it in 2013 because of its early maturity and taste when cooked. Several farmers saved seed harvested from trials planting them in 2014. In addition, many more purchased seed from Africa RISING, with demand exceeding the seed available.

Souleymane Diawara grew over half a hectare of Wilbali in 2014 planning to sell much of his harvest as seed.

ICRISAT plans to support seed production with funding from FARMSEM, a USAID-supported project aligned with Africa RISING to meet local demand. Souleymane will receive training in support of his new seed business.

Annex 8: Africa RISING- West Africa Project log frame (draft)

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
Feed the Future Goal			
Sustainably reduce global poverty and hunger	• Prevalence of poverty • Prevalence of underweight and stunted children	–	–
Africa RISING Goal			
Provide pathways out of hunger and poverty for smallholder farm households through sustainably intensified farming systems.	• % of people living on less than $1.25 per day • Increased resilience of vulnerable communities and households • Improved nutritional status • % of rural and vulnerable households benefitting	– IFPRI impact assessment	– Appropriate pro-poor policies and institutions promote rural development, equity, and economic growth in target countries.
Africa Rising West Africa Purpose			
Increase adoption by smallholder farm households of SI innovations that improve productivity (crop, livestock, and water), product quality, nutrition, income, market access, and conserve the natural resources (soil, water and vegetation) in the Guinea/Sudan savanna zone of West Africa.	By the end of the project in 2016 • At least 9000 farmers at the intervention communities adopt SI innovations, resulting in at least a 15% increase in agriculture productivity, expanding markets and trade and increased investment • Average income of participating households increased by at least 15%. • Degradation of the natural resources is reduced - 15% decrease in run-off; 15-20% increase in soil cover and plant diversity; water productivity (kg/unit of rainfall) increased by 20%. • Nutritional status of farm households, especially	– IFPRI impact assessment – Africa RISING website. – Impact assessment reports. – Adoption studies reports. – Project reports and publications.	– National policies and institutions support technology adoption and SI. – Agriculture will remain an important sector for rural development. – Markets for crop and livestock products continue to grow and smallholders will participate in the market. – Institutional and policy

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
	women and children, improved – dietary diversity increased by 25%.		environment does not preclude functional partnerships.
Outcomes	IFPRI indicators		
1. Enhanced capacity 2. Enhanced technology development, dissemination, management and information 3. Increased investment in agriculture and nutrition activities 4. Increased resilience of vulnerable households	• No of farmers , groups, CBOs who have applied new technologies and management practices • No of individuals, groups, CBOs receiving training • No of (profitable) enterprises • No of individuals, groups, CBOs receiving assistance • No of new technologies and management practices researched, tested and made available • Area under improved technologies and management practices • Yield increases, gross margins • No of private-public partnerships formed • Value of loans • No of small and medium size enterprises accessing bank loans • No of small and medium size enterprises receiving development services • No of beneficiaries accessing business and development services • No of rural households benefitting • No of communities benefitting	– IFPRI impact assessment – Africa RISING website. – Impact assessment reports. – Adoption studies reports. – Project reports and publications	– Government policies and institutions support small-holders' access to inputs (seeds, fertilizer, etc.) – Access to study sites is not constrained by factors outside the control of the project. – Project partners including farmers collaborate effectively. – Project is well funded and staffed. – Project activities are not affected by natural disasters such as drought and infectious diseases, e.g., Ebola. – Effective endogenous dissemination channels can be identified and utilized for disseminating SI innovations.

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
			see theory of change diagram and assumptions

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
Outputs		–	–
Program Research output 1 (situation analysis and program-wide synthesis): community mobilization, establishment of R4) platforms, inventorize innovations, and identification of entry pathways for different household typologies.			
1 Farming systems at the Africa RISING intervention communities characterized and technological, institutional and policy options for SI documented.			
WP1 Farming systems at the Africa RISING intervention communities characterized and technological, institutional and policy options for SI documented.	• Increased interaction among stakeholders through the R4D Platforms • Research institutions use R4D Platforms and less of the linear approach to research	–	–
Program Research Output 2: integrated systems improvement: Improved cropping and crop-livestock cropping systems; land management strategies to intensify crop-livestock production; agricultural water management for intensive crop and livestock production; improving cattle, sheep and goat production; intensifying rural pig and poultry production; technologies to improve household nutrition			
2 Smallholder mixed farm household productivity is increased through adoption of SI innovations.			
WP 2: Raising and sustaining productivity in cereal-legume cropping systems in northern Ghana	• households in the intervention communities adopt cereal-legume strip-cropping and rotation • households integrate cash	–	–

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
	crops into cereal cropping systems to diversify income • Households adopt improved storage practices to reduce post-harvest losses of grains • Increase in households are integrating legumes into their cropping systems		
WP3: Biological control of aflatoxins in maize and groundnut with Aflasafe Ghanaian product	• Farmers and value chain actors have adopted bio-control and management practices that minimize aflatoxins in maize and groundnut in the field and during storage • Extension officers have included aflatoxin management in their extension messages to farmers	–	–
WP 4: Integrating vegetables into cereal-legume cropping systems in Ghana	• More farmers integrate vegetables and legumes into their cereal cropping systems. • Farmers adjust their vegetable cropping patterns to increase the number of plants per unit area	–	–
WP5 Improving farm and field productivity and profitability in Mali	• More farmers integrate vegetables and legumes into their cereal cropping systems. • Farmers adjust their vegetable cropping patterns to increase the number of plants per unit area	–	–
WP 6: Intensifying livestock and poultry production in Ghana and Mali	• Households keep their livestock under improved husbandry conditions (feeding, housing, health care) • Households have improved manure management	–	–

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
WP7: Raising and sustaining productivity in integrated crop-livestock systems in northern Ghana	• Farmers are adopting lamb fattening to capture niche markets • Committees are managing the fallow lands • Farmers are following using improved cropping practices to optimize food and feed production • Tree crop farmers integrate livestock into their plantations to diversify income • Students are applying their increased skills in data analysis and integrated crop-livestock research	–	–
3 On-farm and off-farm management and use of land, soil, water and plant resources improved through adoption of SI innovations.			
WP8: Land, soil, and water management strategies to intensify cereal-legume farming systems in northern Ghana **WP9:** Managing natural resources to increase watershed productivity in southern Mali	• Households adopt technologies to improve soil, water and land management • More households are harvesting water for off-season vegetable production • Farmers are using the technologies developed to improve their traditional farming practices • Communities manage the natural resources in a way that improves their livelihoods and minimizes conflicts over natural resource	– –	– –
Output 4: Dietary diversity of smallholder farm households especially women and children is improved through change in nutrition habits and increased availability and consumption of a variety of nutritious foods. Dietary diversity of smallholder farm households especially women and children is improved through change in nutrition habits and increased availability and			

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
consumption of a variety of nutritious foods.			
WP10: Improving household nutrition through agricultural and behavioural change communication and value addition in Ghana and Mali	• Household adopt behaviors that will improve dietary diversity • Women apply their nutritional skills in food preparation • Households apply post-harvest technologies that increase shelf-life of their milk products	–	–
Program Research Output 3: Scaling and delivery (as indicated in 2013 workplan			
Output 5: Knowledge exchange and information flow among beneficiaries is enhanced through the use of appropriate media.			
Output 6: Individual and institutional capacities to test/adapt and disseminate SI innovations are strengthened.			
Assess scalability of integrated innovations (meta-analysis of options)		–	–
Identify and develop (where necessary) scaling approaches for targeted integrated innovations that are identified to have potential for scalability		–	–
Pilot and test scaling approaches from action sites within project area		–	–
Develop costed templates for scaling by development investors		–	–
Evaluate aggregated		–	–

Narrative Summary	Indicators	Means of Verification	Risks and Assumptions
impact of household level interventions at landscape scale and beyond Evaluate/validate scaling approaches for integrated systems		–	–
Program Research Output 4: M&E (as indicated in 2013 work plan)			
Validation of indicators and impact pathways		–	–
Development of an M&E indicator collection, management, and sharing platform		–	–
Assessment of the nutrition and gender-specific outcomes of SI interventions		–	–
Ex-ante assessment of project- and program-scale outcomes, impacts and spill over potentials		–	–
Adoption and impact studies		–	–

Annex 9: Towards a theory of change for Africa RISING

Governance, leadership, policy	R4D Platforms provide support to……		…..farmer groups and value chains	……so that…….	…project outputs and outcomes are achieved. ..	….. delivering sustainable impact, (agricultural growth, reduced poverty and hunger)	
	Facilitation, lesson learning and communication						
	Time						
	Stakeholders and function		R4D Platform Activities	Capacity is enhanced..	……Outputs….	…..Outcomes …..	….Impact
	Research	Research, WPs and protocols "Technology Parks"	– Ensure research meets farmer priorities and/or opportunities – Facilitate information flows from and to extension providers and farmers	• Research is better focused • Technologies are appropriate responding to farmer needs • Advice is more reliable • New problems detected faster	1. Situational analysis Farming systems at the Africa RISING intervention communities characterized and technological, institutional and policy options for SI documented. 2. integrated systems improvement Smallholder mixed farm household	Enhanced capacity/sustainability New and emerging problems are rapidly identified and appropriate responses taken Enhanced human and institutional capacity development for sustainable agriculture sector productivity Large numbers of farmers have increased access to relevant and reliable information	Agricultural growth/expanding markets • Increased yields • Increased profitability • increased/improved input and output marketing • Increased investment in agriculture and value chains
	Farmers and local leaders- Men and women, CBOs	Production, home utilisation, marketi	– Farmer testing, farmer	• Problems with new technologies are		Enhanced technology development, dissemination, management	Reduced poverty and hunger • Improved

		ng	field schools and farmer-to-farmer extension	quickly identified and solutions found	d productivity is increased through adoption of SI innovations On-farm and off-farm management and use of land, soil, water and plant resources improved through adoption of SI innovations Dietary diversity of smallholder farm households, especially women and children is improved through change in nutrition habits and increased availability and consumption of a variety of nutritious foods.	and innovation Large number of farmers have adopted improved practices Increased investment in agriculture and nutrition activities Increased resilience of vulnerable households	livelihoods, food and nutritional security • Increased resilience in communities and households
	Different extension providers - Govt and NGOs	Promotion and farmer support	– Facilitate farmer experimentation and learning – Facilitate links with credit providers, input and output markets	• Quick response to farmers needs/demands • Information delivered to scale • Coherent targeted messages are delivered			
	Cooperatives Seed companies and nurseries Fertiliser companies Agro-chemical suppliers Agro-dealers and vets Agents,Tr	Input and Output Marketing Value chains	– Ensure delivery of appropriate / improved products and technologies at affordable prices	• Improved products are advised and stocked • Affiliation of input suppliers gives credibility • Agro-processing opportunities are			

	aders Processors, Other		when required – Ensure purchase of products at realistic prices	identified • Markets are available	3. Scaling and delivery Knowledge exchange and information flow among beneficiaries is enhanced Individual and institutional capacities to test/adapt and disseminate SI innovations are strengthened.		

Assumptions (or hypothesis) to support change which need to be monitored

Research and regulation	Promotion and farmer support	Seed production	Other input supplies	Natural resource management	Production and Marketing
1. Sustainable intensification productivity enhancing technologies can be produced for local conditions 2. New technologies/varieties are approved by regulatory authorities	3. Facilitation is provided to support on-going farmer innovation and problem solving through R4D platforms 4. Farmers are linked to input markets including sources of credit	5. Potential market is identified and served 6. Seed producers have skills to produce using new varieties 7. Finance is available for production and any credit is repaid 8. Equipment, if necessary is available for production	9. Cooperatives /Agro-dealers have sufficient inputs available when required 10. Minimum stocks are left unsold 11. Finance is available to purchase inputs and credit provided is repaid 12. Cooperatives/ Agro-dealers have profitable businesses	13. Farmers adopt land, soil and water management strategies to intensify crop-livestock production	14. Farmers are convinced that improved technologies will increase productivity and are not too risky 15. Farmers have resources to purchase technologies and skills to use them 16. Yields and profits achieved are actually higher than other systems / technologies 17. Farmers are able to market their increased yields 18. Credit is repaid 19. A support Program is established for poor households (if required)
20. R4D Platforms bring stakeholders together to build capacity, access resources and speed scaling up, requiring commitment of partners, availability of resources and staff for conducting research, investment in innovation by development organisations and the private sector					