

Sustainable Intensification of Cereal-Based Farming Systems in the Sudano-Sahelian Zone

DRAFT CONCEPT NOTE

IITA

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1. Background

As part of the U.S. government's Feed the Future initiative to address global hunger and food security issues in sub-Saharan Africa, the U.S. Agency for International Development (USAID) is supporting multi-stakeholder agricultural research projects to sustainably intensify key African farming systems and as a way of bringing a regional focus to the CGIAR's Integrated Systems CRPs 1.1 and 1.2. The International Institute of Tropical Agriculture (IITA) is the lead institute for developing and implementing the Sudano-Sahelian zone project. This research project focuses primarily on maize- and rice-production systems in Northern Ghana and sorghum-production systems in Southern Mali but is intended to result in spill-over effects in other similar agro-ecological zones. These regions were chosen based on analysis of cropping systems, poverty, population, country development priorities, and the potential for successfully improving agricultural productivity. The development of these regions will be based around research in best management practices for sustainable intensification of production. This will require well-coordinated efforts involving multiple donors, regional organizations, partner universities, the private sector, national and international agricultural research institutes, and Non-Governmental Organisations (NGOs).

2. Overall Purpose and Objectives

The northern Regions of Ghana are characterized by small land holdings of low input-output farming systems, which adversely impact food security in terms of availability, access and quality and result in a seasonal cycle of food insecurity of 3-5, 4-5 and 6-7 months for cereals (maize, sorghum, millet) and 5-7, 4-5 and 6-7 months (groundnut, cowpea, and soybean) in the Northern, Upper West and Upper East Regions, respectively (Quaye, 2008). These crops in the savannas are often produced in a continuous monoculture in which soil natural resources are steadily depleted and yields per unit area are falling to very low levels. Such practices lead to decreasing soil organic matter contents, increasing populations of chronic parasitic weeds (eg. *Striga* spp.), reduced soil biological diversity, enhanced risk of erosion, and annual nutrient losses exceeding 26 kg of N, 3 kg of P, and 19 kg K per hectare (Vanlauwe et al., 2002). Average on-farm maize yields (1-2t/ha) are well below on-station yields (6-8t/ha). The poverty profile of Ghana also depicts the three northern regions as the most poverty stricken and hunger spots in Ghana (GLSS, 2000). Gender inequalities are also apparent in these regions where women have less access

to resources and capacity to generate income. Infrastructure development in marketing and transport, access to social services, such as education and health are poor in the three northern regions. Water management plays a critical role in improving the productivity of these vulnerable mixed smallholder agro-ecosystems. The linkage of water management to sound agronomic practices can serve as a lever of change in these water-limited environments and should encompass the full spectrum of crop production from land preparation through supplemental irrigation from small reservoirs or rain water harvesting interventions.

Food insecurity is therefore driven by erratic rainfall distribution and recurrent drought, floods and crop failures leading to poor yields, high post-harvest losses, lack of improved storage structures and market for farm produce, diminishing resource base resulting from environmental degradation related to population growth rates and poor environmental management and farm practices. Additionally, prevalence of poor soils, low levels of mineral and organic fertilizers usage due to high cost, pervasive poverty and inadequate purchasing power, limited access to productive resources such as land, irrigable land, labour, information, credit, especially for women who constitute a majority of the population and the poor, destruction of farm produce and natural vegetation by transhumant livestock, poor access to improved livestock breeds and crop varieties, inadequate water for dry season irrigated agriculture and livestock watering and inadequate human resource development in terms of capacity building exacerbate the situation.

The Sikasso region of southern Mali is ecologically similar to northern Ghana, but stretches northwards into drier zones, where maize cultivation is associated with high economic risks (Soumare et al 2006). Sorghum is traditionally the lead cereal and staple crop, but both maize and pearl millet are widely cultivated, to exploit specific ecological niches, and marketing opportunities. The entire region is part of the cotton basin, and has thus experienced serious upheavals in terms of credit and fertilizer availability in recent years, as cotton production area decreased by 65% within the past 4-5 years. Farmers are thus actively experimenting with alternate options for increasing production and income from agriculture in this area of relatively reliable rainfall, compared to the more northerly regions of Mali. More options for diversification of agricultural output are essential for farmers in these regions. The high prices for dryland cereals, sorghum millet and maize since 2008 are encouraging farmers to invest more in cereal cultivation, and recent efforts with sorghum and millet marketing have shown encouraging results (Cook, Diourte et al., personal communication).

The northern part of the Sikasso region, specifically the Koutiala district, is the most intensely farmed area in Mali. Increasing total production by expanding the area cultivated is no longer an option in this area. Maintaining soil fertility and soil health, and reducing soil erosion, while increasing overall productivity are key issues for agricultural development in this area. The area is well linked to national and regional cereal markets for sorghum and millet. 'Le mil de Koutiala' is well recognized by processors and other users in Mali for its quality. The region also exports sorghum, and to some extent pearl millet to neighboring countries, Burkina Faso and Niger. Increasing agricultural productivity in this zone hinges on improved crop livestock integration, as animal traction is essential for improving crop yields, by improving timeliness of farming operations. Maintaining the strength of traction animals during the dry season is a key issue. Improving fodder

availability during the dry season could also have wider benefits for income generation, especially as milk collection centers are developing in more and more areas. In contrast the Bougouni district, in the southern part of the Sikasso region is characterized by low population density, large tracts of reserve forests, and very locally diverse cropping situations, ranging from infertile lateritic rock outcrops on hilltops to large inland valley tracts that allow for double cropping, irrigated farming and vegetable production. The potential for fruit tree cultivation is high.

Integrating livestock management with crop production is a key issue for this region, as it is a zone heavily used by transhumant herders for dry-season grazing. This is resulting in serious conflicts with the local resident farming communities. A key research issues for this region is how to support growing livestock herds temporarily, while increasing crop productivity and maintaining forest cover and diversity.

Most countries in West Africa, including Ghana and Mali, fall within the top 20 worst affected countries globally, with respect to the proportion of chronically undernourished children (UNICEF, 2009)¹. Lack of dietary diversity is a key causal factor since populations consume mainly cereals as their major staples. These crops are high in carbohydrates but low in nutrients and vitamins. Nutrient-dense traditional African vegetables can be used to complement cereal staples. They are also cultivated as traditional vegetables, with amaranth and African eggplant dominating.

We hypothesize that farmer sensitization and sound management of the natural resource base of production, particularly soil, water and vegetation, will lead to sustained high agricultural production, and halt land degradation to maintain ecosystem integrity. This will include sustainable intensification arising out of an integrated use of organic inputs, strategic use of fertilizer and improved resilient germplasm such as dual-purpose grain legumes, drought tolerant and N efficient cereal to provide the necessary organic matter, better soil water management, improved management of surface and groundwater resources for domestic and agricultural productivity, access less available N and P sources, and at the same time provide a good grain yield to the farmer. This new initiative will use legumes for improving cropping systems and household well-being, increasing inputs from biological nitrogen fixation (BNF) that will link family protein supply and farm nitrogen inputs directly to the atmosphere through the expansion in cultivation of grain and forage legumes, using rhizobium inoculums and associated BNF-enhancing technologies in legume-based farming systems. In addition a collection of other soil fertility management and conservation technologies including, contour planting, *in-situ* biomass production, boundary planting, stone lining, zai pits, use of vetiver strips to break slope will be evaluated and improved with farmers. Integrating livestock management with crop production is a key issue for the savannas of Ghana and Mali.

The objective of this project therefore is to improve livelihoods through sustainable increased productivity of maize-legume and crop/tree/livestock systems in the northern Guinea and Sudan savanna zones of Ghana and Mali.

¹ UNICEF 2009. Tracking Progress on Child and Maternal Nutrition. Published by UNICEF, ISBN: 978-92-806-4482-1. (<http://www.unicef.org/spanish/publications/index>).

3. Geographic Focus

The project will focus on the northern regions of Ghana, specifically in the administrative districts of Karaga, Chereponi, and Tolon-Kumbungu (Northern Region); Kassena-Nankana and Bawku West (Upper East Region); and Wa East and Nadowli (Upper West Region) to address production constraints in rice and cereal-legume production systems. The average annual rainfall in this area is approximately 1100 mm yr⁻¹ with an annual mean temperature of 29°C. The rainfall pattern is uni-modal with distinct dry and wet season. The dry season lasts for about 6 to 7 months, while the wet season lasts for about 5 to 6 months. Thus providing employment during the off-season through multiple cropping systems involving the cultivation of traditional crops during the rainy season and producing high value crops during the dry season will have credible poverty and food security impact. Certain crops such as maize can also be cultivated during the transition period from dry to wet season contributing to the intensification process.

In Mali the project will focus on the Sikasso region, specifically the circles of Koutiala and Bougouni. Koutiala, located in the Sudan Savannah, has an average annual rainfall of approx. 800 mm whereas Bougouni lies in the northern Guinea savannah, with about 1100 mm annual rainfall. The rainfall pattern is uni-modal with distinct dry and wet season. The dry season lasts for about 6 to 7 months, while the wet season lasts for about 4 to 6 months. Thus providing employment during the off-season through multiple cropping systems involving the cultivation of traditional crops during the rainy season and producing high value crops and animals during the dry season will have credible poverty and food security impact. In the northern Guinea savannah, certain crops such as maize, or tomato, water melon can also be cultivated during the transition period from dry to wet season, or during the transition from wet to dry season, contributing to the intensification process.

4. Sustainable Intensification: Challenges, opportunities, and the way forward

Sorghum-based farming systems (Mali and related agro-ecological zones)

i. On-going activities

In Mali, the project will build on key projects/activities/experiences managed by the group of partners. Existing innovation platforms, created for specific value chains and commodities, will be enlarged to include partners representing the full spectrum of relevant value chains and expertise for each site. At each site, strong collaborations with the farming and/or livestock herder communities, as well as with local authorities managing land use, and other natural resource management issues exist. This project, and the choice of sites is partially driven by requests from the local partners, for more diversity in terms of agricultural production and utilization options. There are currently several

ongoing projects that will benefit from the planned Feed the Future activities in Mali. The projects address diverse issues, ranging from development of sorghum hybrids to soil fertility and *Striga* management in sorghum-based systems in the selected target zones.

ii. Topics to be addressed as integrated parts of whole systems

- a. Appropriate agroforestry management options to contribute to the economic and ecological sustainability of farming systems and household wellbeing
- b. Improved technologies (crop management and varieties) that will increase grain and fodder productivity for food and nutrition security and create opportunities for income generation
- c. Integration of improved vegetable technologies to contribute to diversification of farming system, diet enhancement and income generation
- d. System intensification that is driven by market opportunities, awareness and availability of processing options
- e. System intensification and diversification that can contribute to the preservation of biodiversity reserves, via reclaiming degraded lands, and reducing encroachment on protected areas
- f. The IAR4D framework with innovation platforms to serve as sound mechanisms to enhance linkages among value chains actors and improve their capacity to exchange information and knowledge, to have better access to inputs and services and to learn lessons in support to sustainable system intensification.

iii. Proposed research and partners

- a. Assessment of indicators for household well being, including nutritional status, natural resource status and dynamics as well as agricultural productivity for the target areas, in a participatory manner
- b. Tree management guidelines and options developed including a database on the performance of different technologies in different study sites
- c. Spatial, economic and ecological impact of various agroforestry technologies and approaches evaluated
- d. Options to produce more feed, to make better use of existing and external feed resources and to move feed around temporarily and spatially are co-developed and pilot tested

- e. Locally adapted legume and cereal varieties and hybrids identified for increased productivity and stability of production and made available to the majority of farmers in the target zone
- f. Tools for integrated soil fertility and *Striga* management adapted to the specific local situations, and options for their dissemination tested
- g. Market driven improved tree-vegetables (e.g. baobab and moringa, etc.) garden management options for diet enhancement and income generation developed for specific ecologies
- h. Enhanced cereal-vegetable mixed or sequential cropping options for sustainable and profitable system diversification identified and promoted among smallholder farmers
- i. Nutritional status of populations improved through increased nutritional awareness interventions and promotion of dietary diversity
- j. Soil fertility, including *Striga* seed bank dynamics, monitoring system for farmers' fields in the target areas of the project developed and implemented with farmer participation
- k. Performance of each key fertilizer tree/shrub species under various farming systems assessed, including the evaluation of their respective potential for nitrogen fixation
- l. Biomass use trade-offs are assessed in a participatory manner in innovation platforms
- m. Options for improving efficiency of soil fertility and water management assessed for specific crop-tree-livestock combinations in the target ecologies
- n. Approaches developed for encouraging investment in small-scale businesses for processing and marketing of tree, vegetable, field crop and livestock products (e.g. fruits, fodder and fuelwood, etc.)
- o. Profitable livestock management options linked to cattle, sheep and goats value chains that maximize efficient nutrient cycling are designed and pilot tested
- p. Grain (cereal and legume) marketing options assessed in target ecologies and institutional options for their enhancement tested in a participatory manner (inventory, credit, contract farming, lead farmer approach, group marketing)
- q. Options developed for tree species diversity, abundance and conservation management in farming systems
- r. Options of land management practices which would prevent land degradation, enhance carbon sequestration, fodder, fruit and fuelwood production evaluated
- s. Land use and system productivity and biodiversity monitored, integrating participatory tools with remote sensing

t. Innovation platforms that develop social capital and promote market linked crop and livestock value chains development through institutional innovations established, operational, and documented.

Partners: ICRISAT; ICRAF; ILRI; AVRDC; IITA; IWMI; IER; PROGEBE National Coordination Unit with project office in Bougouni; Department of Forestry; IER cattle breeding; LCV – veterinary MOBIOM network in Bougouni and Koutuala; NGO AMEDD in Koutiala; local authorities responsible for land use management; farmer organizations involved with group marketing, fertilizer supplies, and information sharing; women groups; local health centers; and local processors

iv. Options for scaling out

- a. Assessing options for enhanced information flows among farmers, men and women, and among communities, using a range of new Info technologies
- b. Assessing options for sustainable seed and planting material supply for locally appropriate varieties and species for sustainable intensification
- c. Establishing and assessing Rural Resources Centers (RRCs) in project areas as vehicles for scaling up various agroforestry options
- d. Use innovation platforms for information exchange and knowledge management.

Maize-based farming systems (Northern Ghana and related agro-ecological zones)

i. On-going activities

Several technologies have been developed to improve the productivity of maize-legume based production systems through the collaborative efforts of IITA and national and international partners in the West African sub-region. These technologies are being evaluated in several countries for large-scale dissemination in the sub-region which may have relevance for northern Ghana. For example the drought-tolerant maize project, the Striga management project and Tropical Legume project all funded by the Bill and Melinda Gates Foundation (BMGF) have elements that are similar to those in the proposed project. The N2Africa project, also funded by the BMGF and operational in northern Ghana, also seeks to improve nitrogen fertilization of cereals through increased nitrogen fixation. Few research activities involving vegetables have been undertaken on maize-based farming systems in northern Ghana. The most common systems encountered in the region are the maize fields in association with vegetable such as okra, spider plant and mainly *Hibiscus sabdarifa*. This association is widespread in the maize fields maintained around the houses in the villages and rarely in the pure fields of maize cultivated in the bush far from homes. Thus, studies should be undertaken and to find better associations that optimize the combined value of the

associations, which also applies to sorghum and rice-based systems. Various efforts are also led by IWMI which focus on integrated water resources management in northern Ghana. The project will draw from the experience of these efforts in the region in order to develop sustainable cereal-legume-livestock production systems for small holder farmers.

The project will establish multi-institutional partnerships and multidisciplinary teams based on comparative advantage using innovation platforms to improve knowledge and information sharing to improve the productivity of maize-legume based systems through promotion and adoption of integrated mixed crop-livestock management technologies. Key partners will include IITA, IWMI, AVRDC, ILRI, SARI, NGOS, national agricultural extension services and other relevant government departments, research institutes, NGOs, input and output dealers, farmers, farmer organizations and microfinance firms. Improving the capacity of partners to undertake their tasks effectively will be a focal area from the start, which will include not only technical training but use of participatory research and extension (PREA) approach and value chain approaches, strengthening community-based organizations and gender mainstreaming. At the same time, establishing consensus, reporting, transparency and accountability will be essential in ensuring viable institutional and partnership arrangements based on good governance, trust and capacity to deliver.

ii. Topics to be addressed as integrated parts of whole systems

- a. Integrated research for development through building innovation platform (IPs) and building capacity of partners
- b. Land, water, and natural resource management issues
- c. Sustainable improved crop-livestock systems for improved food security
- d. Improved rural incomes through improved input-output market linkages
- e. Improved nutrition awareness interventions and promotion of dietary diversity.

iii. Proposed research and partners

- a. To promote and strengthen partnerships for implementing sustainable initiatives in the maize-legume systems of northern Ghana
- b. To improve land, water, and natural resource management for increased systems productivity
- c. To develop and improve the adoption of productive and resilient agronomic practices and local innovation systems for system intensification
- d. To identify market and investment opportunities for the maize-grain legume/vegetable sub-sector
- e. To improve nutritional status of populations through increased nutritional awareness interventions and promotion of dietary diversity.

Partners: IITA; IWMI; ICRAF; CIAT; AVRDC; ICRISAT; SARI; NGOs in Ghana; seed companies; soybean processors; the AGRA funded project on Marketing managed by IFDC; YARA fertilizer company; TechnoServe; Tamale Implement Factory Ltd; "Linking Farmers to Markets" (funded by AGRA and implemented by IFDC); 3K&A oil mill; ADVANCE (USAID project); Ghana Nuts oil mill and their out growers project GOAL; the AGRA funded Soil Health Project implemented by SARI Savanna Farmers Marketing Company Ltd

iv. Options for scaling out

- a. The technology dissemination approach of this project is based upon a series of proven developmental models including group training in technology extension, Participatory Research and Development, community-based outreach through farmer collective action, and the support for agricultural value chains. Dissemination begins in the first year through a series of training activities. Experts will organize and conduct a workshop providing Training-of-Trainers in maize grain legume production technology and extension attended by at least two cooperators from each organization participating in the project. These specialists will return to their organizations and hold workshops to train at least 500 lead farmers in the first year. Detailed plans will be made on important components of the value chains such as seed production and distribution, access to appropriate fertilizers and inoculum, access to herbicides, insecticides and fungicides and developing strong markets
- b. Innovation Platforms to sue broad partnership involving researchers, extension system, marketers, policy makers
- c. Use of GIS tools, modelling to scale-out workable technologies to broader areas
- e. Support to community seed production to enhance adoption

Rice-based farming systems (Northern Ghana and related agro-ecological zones)

i. On-going activities

The northern part of Ghana accounts for about 60% of rice cultivated in the country. Various production systems are in use but the inland valley systems accounts for most of the production area. There are a few small- to medium-sized irrigation schemes in addition to small reservoirs for on-farm water storage or natural depressions that allow for supplementary irrigation of the rice crops or the cultivation of a non-rice crop. Some diversification exists but tremendous improvements are needed to make such efforts more sustainable and economically viable. Due to favorable water availability, inland valleys are more suited for intensive and diversified cropping systems. Cropping diversity can be accomplished in time (rotation), space (intercropping), or in both space and time (relay-intercropping). This project will build on the achievements of the European funded project "Realizing the agricultural potential of inland valley lowlands in sub-Saharan Africa while maintaining their environmental services" (RAP). This two-year project was funded by the EU as part of the Annual

Action Plan (AAP) 2008 through IFAD (Project number: SUPP-ECG 34 SWP-WARDA 2009-2010). It is coordinated by AfricaRice, and covers two West-African countries: Mali and Benin and will move in 2012 into its second phase. The project will also be linked to 5 year project funded by CIDA on “Enhancing food security in Africa through the improvement of rice post-harvest handling, marketing and the development of new rice-based products” in Ghana and 7 other African countries. The project locations in Ghana are Navrongo (Upper East Region in the Sudan Savannah), Afife (Volta region in the Southern guinea Savannah) and Attebubu (Brong Ahafo Region in the transition between Forest and Guinea Savannah). The ultimate outcome of the project is to increase food security and sustainable livelihoods among rice value-chain actors in Africa.

ii. Topics to be addressed as integrated parts of whole systems

- a. Project management, monitoring and evaluation
- b. Participatory development of competitive, gender-sensitive and environmentally sound value chains in rice-based inland valley systems through multi-stakeholder platforms (MSPs)
- c. Analysis of opportunities and risks related to agricultural production and environmental goods and services
- e. Development of innovative technologies that allow for sustainable intensification and diversification of productive resources linked to farm diversity
- f. Support to development projects and the private sector promoting sustainable development of inland valley systems in Africa

iii. Proposed research and partners

- a. Develop and promote through multi-stakeholders platforms, competitive value chains for rice, rice by-products and vegetable crops, enhanced market access for smallholder land and water users
- b. Develop and apply spatial model in a GIS/remote sensing environment that is applicable on a national scale to determine agricultural potential and ecosystems services for agricultural development of inland valleys
- c. Develop innovations that enhance productivity through intensification and diversification while maintaining environmental goods and services.

Partners: The main target group is comprised of resource-poor smallholder farmers and their organizations in two target countries (Mali and Benin) and local entrepreneurs (product processors, traders, etc.). Change agents from NARES and NGOs will act as the main service providers and will thereby greatly benefit, as they will be exposed to new methods dealing with remote-sensing, integrated natural resource

management, co-innovation, competitive product value chain development and multi-stakeholder platforms within the dynamic and diverse nature of inland valley systems.

The NARS of Ghana, CSIR-Savanna Agricultural Research Institute (CSIR-SARI), CSIR-Animal Research Institute and CSIR-Food Research Institute will be responsible for planning and implementation of project activities. The NARS teams will be multi-disciplinary in the domains of agro-ecology, agro-economy, business development and socio-anthropology. Other actors include government agencies, NGOs, and private sector and development projects. AfricaRice as the convening center of the Inland Valley Community of practice will provide backstopping with respect to action-research, lowland NERICA varieties, lowland rice integrated crop management, remote sensing and GIS mapping procedure, water productivity and project management. The Wageningen University and Research Centre (WUR), the Netherlands, will provide backstopping with respect to farm level agronomy and ecosystem services. AVRDC will contribute to development of sustainable rice-vegetable systems.

iv. Options for scaling out

The typology of inland valley systems that will be developed in the first years of the project ensures that results can be scaled-out to appropriate recommendation domains (a function of e.g. degree of water control, distance to markets, degree of organization of producers etc.). The use of participative approaches and Multi-Stakeholder Platforms will ensure ownership of research results and rapid diffusion of knowledge beyond the key sites in each target country. Active linkages will be sought with development projects and the private sector. Videos will be used as a primary vehicle to out-scale results obtained. AfricaRice will also ensure that project results and methodologies are reported during annual meetings of the National Experts' Committee (attended by representatives of AfricaRice's 24 member countries) and the Inland Valley Community of practice (IVC).

In each working package, training sessions are planned in different key domains like water management, conception of sustainable cropping systems, value chain analysis, gender and equity, impact assessment and overall competitiveness of the cropping systems in the lowlands, for different type of trainees (researchers, technical agents, farmers, students). A minimum of 30% of participants in these training sessions will be women.

5. Monitoring and Evaluation

The monitoring and evaluation (M&E) activities are designed to achieve a number of goals:

- **FtF Compliance:** To conform to the overarching M&E standards, best practices, and core indicators established for the entire FtF initiative (e.g. USAID 2011b)

- Open-access platform: To deliver and maintain an open-access M&E data management and analysis platform to serve the needs of SI stakeholders
- Backward & forward assessment: To provide monitoring reports for *and* ex ante projections of agreed M&E indicators on an annual basis to meet stakeholder reporting and planning needs.
- Multi-scale reporting: To meet various stakeholder needs, and to support multi-scale analysis, the M&E platform will report at several scales; (SSA wide, site wide, country, sub-system reports).
- Scaling-up and out assessments: To inform planning and long-term projections of potential impact

Proposed Implementation Approach

The M&E activities will be coordinated by the HarvestChoice team at IFPRI whose spatial evaluation framework encompasses nationally representative household survey data as well as biophysical, production, market, demography and infrastructure data holdings. These elements form the core of a consistent M&E platform to be applied across not only the target farming systems within the Sudano-Sahelian megasite, but also across all three FtF Sustainable Intensification (SI) megasites in SSA. By design the current platform has a high degree of spatial and system granularity to support disaggregated examination of farming sub-systems, household types and key ecosystem services, but the need to disaggregate further or interface with higher resolution capacities of implementation partners within specific sites still needs to be established. This core capacity will, thus, be augmented to assimilate richer location and intervention-specific data from field-based activities of the SI partners, including the conduct of specialized, supplementary M&E surveys.

Several important organizational and management principles will be adopted:

- M&E Alliance: A core advisory team of M&E and key stakeholder specialists to guide and provide internal review of the M&E work plans and deliverables.
- M&E Open-Access Web-Site: To host and make accessible SI project documents and work plans, as well as M&E technical notes and annual reports, and underpinning background publications, datasets and, wherever possible, analytical tools.
- Annual M&E Technical Meeting: Prior to finalization of each annual suite of M&E reports, a technical consultation will review findings and distill M&E-based recommendations. Where possible this will build on other project meetings to minimize travel time and project costs.

Analytical Approaches and Deliverables

There are at least four data and analytical aspects of the M&E evaluation capacity: (i) Delineation and characterization of target farming systems, (ii) Maintenance of a technology/intervention characterization inventory, (iii) Baseline and change assessment/projection for core M&E indicators, (iv) Change attribution. Coupled with the data management and access, report generation, and broader outreach activities, these analytical elements constitute the principal elements of the M&E logframe.

The specific details of M&E activities, outputs and responsibilities will be determined in the first three months of the project, and will largely be shaped by both technical consultation with partners (e.g. the January 2011 planning meeting in Ghana), as well as with donor-specific M&E, impact and attribution needs.

6. Project Management and Coordination

Overall responsibility for project delivery, budgetary control and reporting to USAID will lie with the lead center, IITA, through the Project Coordinator. The Lead Center will establish a performance contract with USAID.

The development of this concept note has been a collaborative effort between IITA, ICRISAT, ILRI, CIAT, ICRAF, AVRDC, AfricaRice, and IMWI. These organizations are primary project partners.

A Project Steering Committee (PSC) will provide overall policy guidance, approve annual work plans and budget, monitor progress and approve significant changes in activities during implementation period to ensure timely achievement of the objectives. The PSC will consist of representatives of CG centers, the Lead Center (IITA), the Project Coordinator, USAID FtF Ghana and Mali, USAID Washington, and stakeholders in the target areas. The PSC will meet regularly or when need arises in a virtual manner.

At the end of each implementation year, a workshop with partners and relevant collaborators will be conducted to assess project progress, address constraints and plan for the next year of implementation.

The Project Coordinator manages the project on a daily basis. S/he will monitor and oversee implementation of the three systems sub-projects that have received grants for implementing the project. The Project Coordinator will conduct half-yearly visits to all sites to review progress. The Project Coordinator will collate and synthesize M & E reports as needed for monitoring of project progress. The Coordinator will be supported by administrative staff in based in Ghana.

The research team will be organized around the three key farming systems and led by IITA, ICRISAT, and AfricaRice respectively. The Lead Center, IITA, will establish performance contracts and sub-grants with these Centers. Each systems team will identify and mobilize key stakeholders, establish a research team, develop work plans and budgets and implement research. The Centers that lead the sub-projects will sub-contract key stakeholders as needed and report technical and financial progress to the Project Coordinator for transmission to the PSC and USAID.

7. Timeline

Mali (ICRISAT) April 2012-March 2017)

April 2012: Inception workshop(s) in project area(s) with local partners, building existing partnerships of ICRISAT and ILRI in the areas, identification of opportunities for testing synergies between livestock, crop and tree research with farming communities.

Season 2012: Targeted surveys, and observation to complete existing base-line data sets from the target regions, for in-depth production system analysis, and participatory identification of specific research needs and opportunities.

Season 2013: Initial testing and evaluation of a large range of acceptable options

Season 2014: Targeted testing of integrated crop/tree/livestock components by farmer groups, including women groups.

Season 2015: Continued testing, enhanced by market orientation, and increased information campaigns.

Season 2016: Testing specific improvements for priority value chains, as selected jointly with producers

Season 2017: Assessing strengths and weaknesses of priority innovations with users on a larger scale. Systematic information campaigns.

Ghana (IITA) April 2012-March 2017

April 2012: Inception workshop(s) to identify and build strong partnerships

May-June n 2012: Ex-ante impact assessment to identify baseline conditions before research interventions.

Cropping Season 2012. Evaluation of improved technologies for adaptation and further refinement

Season 2013: Testing and evaluation of a large range of acceptable integrated options

Season 2014: Targeted testing of integrated crop/tree/livestock components by farmer groups, including women groups.

Season 2015: Continued testing, enhanced by market orientation, and increased information campaigns.

Season 2016: Testing specific improvements for priority value chains, as selected jointly with producers

Season 2017: Assessing strengths and weaknesses of priority innovations with users on a larger scale. Systematic information campaigns.