

Synthesis of the

**Ethiopian Agricultural Research System - Kansas State University Stakeholder
Consultation Workshop on the**

USAID Feed the Future Food Security Innovation Lab:

Collaborative Research on Sorghum and Millet

Ethiopian Institute of Agricultural Research Headquarter
Addis Ababa, Ethiopia
February 21, 2013

Dr. Timothy J. Dalton
Associate Professor, Department of Agricultural Economics
Kansas State University
Manhattan, KS USA

and

Dr. Adugna Wakjira
Deputy Director General
Ethiopian Institute of Agricultural Research
Addis Ababa, ETHIOPIA

Contents

Background and Introduction to the SMIL Program.....	1
The Opportunity.....	1
Establishing Thematic Areas of Research	2
Prioritizing Research Themes.....	5
Identifying Weaknesses in the National Sorghum Research System.....	5
Strengths of the NARS and Opportunities for Impact	6
Items for Action	7
Works Cited.....	8
Appendix 1. Synthesis of SWOT analysis of Ethiopian National Sorghum Research System.....	9
Appendix 2. List of Participants	12
Appendix 3. Workshop Agenda.....	13

List of Tables

Table 1. Constraints facing the production and marketing of sorghum in Ethiopia from several sources ..	3
Table 2. Thematic research areas, interdisciplinary research opportunities and suggested importance of scientific field	4
Table 3. Weaknesses in human capacity and physical infrastructure of the sorghum research program...	6

Background and Introduction to the SMIL Program

USAID has released a request for applications (RFA) to host the Management Entity (ME) of the Sorghum and Millet Innovation Lab (formerly INTSORMIL)¹. The RFA indicates that the new Sorghum and Millet Innovation Lab (SMIL) should focus on only one country in East Africa. One of the important requirements of the RFA is to solicit input from focus countries on the strategic direction of the program. The purpose of this meeting was to solicit that input from key stakeholders in Ethiopia including EIAR, universities, and regional research centers.

Participants were briefed on the goals and objectives of USAID's Feed the Future (FtF) initiative. The overall goal of the USAID Feed the Future Initiative is to "Sustainably reduce global poverty and hunger" by meeting the objectives of "Inclusive agriculture sector growth" and "improved nutritional status" especially of women and children. Underneath the first objective are several intermediate objectives that include improving agricultural productivity, expanding agricultural markets, increasing investments into agricultural activities, increasing employment opportunities in targeted value chains and increasing the resilience of vulnerable communities and households.

The objectives of FtF were found to be consistent with the sorghum development objectives described in the "Ethiopian Sorghum and Research Development Strategy." The vision of success of the Ethiopian sorghum research strategy is:

... to attain highest productivity level (6+t/ha) that can be translated into the wealth of producer farmers with significant contribution for the home consumption. Beyond satisfying the national demand, the surplus production will meet export market in raw as well as in processed forms to significantly contribute to the GDP.

The overall consistency between Ethiopian strategic objectives in sorghum research and development and the FtF objective provided a starting point for discuss how to operationalize a research investment plan to meet jointly shared objectives.

The Opportunity

The future SMIL provides a new opportunity for the Ethiopian national agricultural research system to work collaboratively with U.S. universities in pursuit of national objectives in the sorghum value chain.

As emphasized by Getachew Alemu, of the National Research System Coordination Council, the National Agricultural Research System (NARS) consists of several institutions that are active in sorghum research including the Ethiopian Institute of Agricultural Research (EIAR), three universities (Haramaya, Mekele, Dessie) and three regional research institutions (Amhara, Oromia, Tigray). The role of the Coordination

¹ The formal name for the new program is "Feed the Future Food Security Innovation Lab: Collaborative Research on Sorghum and Millet."

Council is to ensure that all scientists and centers of excellence in sorghum are exposed to the opportunity for collaborating with U.S. researchers in the SMIL program.

Research areas (called “Areas of Inquiry” by USAID) under the SMIL program have been broadly defined by USAID as 1) Genetic enhancement, 2) Production systems management and 3) Market development and added-value products research. Cross-cutting issues of gender, nutrition and the environment are also areas of focus. Research conducted in each of the areas must be interdisciplinary which is already common in the Ethiopian NARS and embedded into the research programs of EIAR and its partners. The combination of activities under these areas of research should be integrated into a program of “demand driven research to enhance food security.” In addition to these research areas, Human and Institutional Capacity Development (HICD) are seen as key elements of the future SMIL and these are essential components of any collaborative research project with EIAR according to Dr. Adugna Wakjira and Dr. Adefris Chere. Dr. Adefris Chere also emphasized that planning for research activities must be done on equal footing between Ethiopian and U.S. researchers to avoid a “big brother-little brother” conflict.

Finally, it was emphasized that research investments will be rigorously monitored. The primary reason for this high degree of monitoring and evaluation is to conform to the evaluation requirements established by USAID. Dr. Adugna indicated that the impact assessment and evaluation unit of EIAR was already active and that there were numerous examples of successful collaborations with INTSORMIL, CGIAR centers including ICRISAT, ICARDA, CIAT and CIMMYT (especially through the Drought Tolerant Maize for Africa project) and evidenced through three gold medal awards of collaborative research. The high level of accountability expected by USAID is consistent with the transparent and tight management policies established at EIAR. Dr. Dalton explained that the role of the ME is to collaborate with the national program on the collection of the relevant indicators and to summarize and present them to USAID and other interested agencies.

Establishing Thematic Areas of Research

Several meetings over the past year have focused on defining the key constraints limiting the development of the sorghum value chain in Ethiopia. From September 2-6, 2012 ASARECA and INTSORMIL conducted a workshop to discuss national and regional sorghum research and development areas and important research topics were identified (ASARECA-INTSORMIL 2012). The Bill and Melinda Gates Foundation conducted a “Sorghum and Millets Value Chain Convening” from July 26-27, 2012 (Bill and Melinda Gates Foundation 2012). In addition to these meeting, EIAR has recently revised its strategic plan for sorghum and millet (EIAR 2013).

Table 1. Constraints facing the production and marketing of sorghum in Ethiopia from several sources

<i>Source</i>	ASARECA-INTSORMIL Regional Sorghum Research and Development Workshop, 2012	BMGF Convening, 2012	Waddinton et al., 2010: Highland Temperate	Waddinton et al., 2010: Maize Mixed	Additional issues defined on February 21, 2013 and in "Ethiopian Sorghum Research and Development Strategy"
<i>Abiotic</i>	Drought tolerance, early maturing cultivars	Drought	Nitrogen deficiency, drought, soil physical degradation, fertility depletion	Soil physical degradation, drought (establishment and grain filling), nitrogen deficiency	Frost/cold tolerance in highlands, regional differences of abiotic constraints
<i>Biotic</i>	<i>Striga</i> , pests	<i>Striga</i> , insect pests, birds	Leaf, stem, panicle pests, weed competition, <i>Striga</i>	Weed competition, bird damage	Regional differences of biotic constraints, bird damage, diseases (<i>Quelea quelea</i>)
<i>Management</i>	Mechanization, Integrated pest, soil and water management,		Crop establishment		Best bet land-use practices, Inadequate package of improved crop management practices
<i>Post harvest</i>	Grain quality, handling, public private partnerships for products	Lack of platform for value chain; malting, feed industry	Inadequate utilization knowledge	Inadequate utilization (post harvest) knowledge	Varieties with desirable post-harvest and organoleptic traits, other desirable end-use traits, improved storage methods and structures
<i>Socio-economic</i>	New products, regional integration, value chain integration, adoption constraints, seed availability, farmer information	Lack of effective seed system, informal seed	Inadequate farmer production knowledge	Insufficient access to agricultural information	Economic evaluation of components, technology transfer, psychology of adoption, transportation and transaction costs limiting trade, discriminatory government policy, no agroprocessing industries, commercial farming

The purpose of this meeting is not to conduct another similar exercise but to look within the Ethiopian research system and define the key institutional limitations that SMIL could address. To do this, a review of the constraints to improved agricultural productivity was conducted. These areas are presented in Table 1 by source category and study. While there is considerable overlap in the constraints identified in each study, additional constraints were specified during the meeting and presented in the final column.

Based upon these constraints, logical regroupings of the constraints were suggested to form thematic research areas. Participants in the meeting suggested that there were three main themes that could regroup the identified constraints into thematic research areas that respond to the areas of inquiry defined in the SMIL RFA. These research themes are 1) Low sorghum productivity in Ethiopia’s agroecologies, 2) Utilization and marketing of sorghum, and 3) Technology transfer and seed systems. It was suggested that Theme 1 could be broken down into three or four sub-areas based upon agroecologies in order to better reflect the differential prevalence of stresses and opportunities specific to each ecology. Each of these themes were established to be inclusive of at least two of the USAID-defined areas of inquiry and the cross-cutting issues.

Theme 1 concentrates on integrated research on genetic enhancement (Area of Inquiry 1) and production systems management (Area of Inquiry 2) with strong elements of gender and environment (cross-cutting issues). Theme 2 concentrates on integrated research on genetic enhancement in areas of end-use traits (Area of Inquiry 1) and market development and added value products (Area of Inquiry 3) with strong elements of gender and nutrition (cross-cutting issues). Theme 3 integrates all three areas with strong elements of gender, environment and nutrition. Table 2 suggests a qualitative composition of disciplinary fields that are likely to collaborate and the importance of each of these fields in the research themes. The low sorghum productivity theme could be broken down into specific abiotic and biotic constraints and management strategies that limit sorghum productivity.

Table 2. Thematic research areas, interdisciplinary research opportunities and suggested importance of scientific field

Theme	Disciplines				
	Breeding	Plant Protection	Agronomy	Food Science	Social Sciences
1. Low sorghum productivity					
1.a Highland	5	2	5	5	3
1.b Mid-Altitude	5	2	5	4	3
1.c Dry lowlands	5	5	5	4	3
1.d Moist lowlands	5	5	5	4	3
2. Utilization and Marketing	5	3	1	5	5
3. Technology Transfer and Seed Systems	4	3	3	3	5
Notes: Scale: 5=Essential, 4=Very important, 3=Strongly important, 2=Moderately important, 1=limited role, 0=nonessential					
Breeding includes additional fields such as physiology, genetics and biotechnology etc.					
Plant protection includes fields such as plant pathology, entomology, weed science and nematology etc.					
Agronomy includes fields such as agronomy, soil science, cropping systems, climate, hydrology, natural resource management etc.					
Food science includes food scientists, nutritionists, grain scientists, post-harvest specialists etc.					
Social sciences include agricultural economists, sociologists, anthropologists, agribusiness etc.					

Prioritizing Research Themes

Once all the participants agreed upon the thematic research areas, a hierarchical analysis of the importance of each was conducted by comparing one theme to another (Hartwich, Janssen 2000). The purpose of conducting the hierarchy ranking analysis was to establish priorities to meet the overall program objective of inclusive agricultural growth in the sorghum sector. Other strategies have been proposed to establish priorities but this method was chosen due to the limited time available to participants (Kelley, Ryan et al. 1995, Mills 1998, Mills 1997). Neither the BMGF convening nor the ASARECA/INTSORMIL attempted to create a prioritization of research constraints. This approach could also be used to prioritize disciplinary importance in the research themes instead of using the qualitative ranking in Table 2. This was not conducted because there was not enough time to complete the exercise.

Overall, participants indicated that research in Theme 1 “Low sorghum productivity in Ethiopia’s agroecologies” will be the most important area to conduct research. They indicated that 60% of all effort should be allocated to this area (with a standard deviation of 11%). The second most important theme is Theme 3 “Technology transfer and seed systems” and the least important is Theme 2 “Utilization and marketing of sorghum.” Twelve percent of the effort should be allocated to the second theme (with a standard deviation of 5%) while 28% (standard deviation of 13%) should be allocated to Theme 3 “Technology transfer and seed systems.” This exercise indicates that it is possible to prioritize areas of research and themes irrespective of how complicated the tradeoffs are. These results reflect the views of those who participated in the meeting including extension specialists, sorghum breeders, economists, research directors, public relations specialists, and outreach coordinators.

Identifying Weaknesses in the National Sorghum Research System

The final exercise of the meeting was an SWOT analysis of the Ethiopian sorghum research system. The synthetic result of this exercise is reported in Appendix 1. All elements of the SWOT analysis are important in the development of the investment strategy of the SMIL program but it is critical to view the weaknesses of the current system to meet the objective of building inclusive agricultural growth through the integrated research program undertaken in the three thematic areas.

Participants indicated that the system has significant human resource limitations that could be addressed through the SMIL project. These human resource needs and their importance are described in Table 3. This list is synthesized from the response of all participants in the workshop and some of the wording is a verbatim reproduction from those responses, and similar responses are grouped together. If more than one person indicated the same or similar response, it is indicated by a number in brackets following the response.

This table helps to illustrate that there are numerous impediments to achieving the desired results of each of the three thematic areas and these impediments are found both in the human capacity to undertake research and the supporting institutional infrastructure. For example, Theme 1 requires human resources in the area of breeding, plant protection and agronomy yet human resource needs are the highest in the breeding area. This clearly identifies a need for investment in this discipline. The

weakness assessment also indicates that there is a lack of important infrastructure to conduct research in this area including greenhouses, irrigation and disposable supplies. We also found limitations in human resources for plant protection and agronomic research. Both of these are highly important in thematic Area 1. Similarly, theme 2 will be hampered by the lack of food scientists and limited resources available for breeding for specific end-use traits. Lack of social scientists, important in each of the themes, may limit progress in all themes. Economists are required to evaluate the value of strategies to increase economic productivity of new crop and resource management technologies, sociologists or economist to evaluate the gender impacts of technologies and marketing strategies. Other weaknesses were noted (described in Appendix 1) but only some are possible to be addressed through the SMIL research program.

Table 3. Weaknesses in human capacity and physical infrastructure of the sorghum research program

Human Capacity Weaknesses	Physical Infrastructure Weaknesses
Breeding (6)	Crop improvement and molecular tools/crossing facilities (5)
Physiology (3)	Greenhouse (4)
Genetics (2)	Supplies, chemicals (lab and field) (3)
Pathology (3)	Field vehicles (2)
Plant protection	Cold room (2)
Entomology	Irrigation (2)
Agronomy (2)	Journals, electronic documents (2)
Natural resource management	Laboratory equipment
Food science (3)	Computing facilities
Social sciences (3)	
Business development	
Extension (2)	
Biometrics	
Workshop facilitation	
Research & admin support staff (2)	

Strengths of the NARS and Opportunities for Impact

Despite the limitations described above, all participants agreed that there are substantial strengths in the Ethiopian NARS for sorghum. These strengths can be described as a strong national program with excellent research coordination, a long-term history of successful research management, a well-established network of research organization and good government support for operations. Researchers are dedicated. Participants note that there is strong demand for research products because of the national and regional demand for sorghum. Diverse sorghum genetic resources provide a foundation to develop new varieties and the diverse agroecologies are a potential laboratory to generate scientific advances that may spillover to other nations with similar conditions.

Combining SMIL investment to address national weaknesses, while capitalizing on the strengths in the system, can generate advances to meet the Ethiopian vision of success in sorghum research and the

USAID FtF goals. More importantly, the investment and collaborative research activities with U.S. scientists may lead the NARS to achieve a desired opportunity to build national research capacity to reduce key constraints along the sorghum value chain, become the regional leaders in sorghum research and expand the market opportunities and demand for sorghum products.

All present agree that there will be need to develop an in-country coordinator and also support staff to manage the financial transactions of the program.

Items for Action

1. Develop contact list of researchers (or key research contacts at each of the NARS institutions) who might be interested in collaborating with U.S. researchers on a project (Getachew Alemu).
2. Make available RFA for those interested in greater details on the SMIL program. (It can be downloaded at <http://www.grants.gov/search/search.do?mode=VIEW&oppld=214173>). Key elements of the RFA are attached.
3. Keep all interested individuals informed of proposal submission (Dalton).

Works Cited

ASARECA-INTSORMIL 2012, *Regional Sorghum Research and Development Workshop: September 2-6, 2012 Executive Hotel, Adama, Ethiopia.*

Bill and Melinda Gates Foundation 2012, *Sorghum & Millets Value Chain Convening:Tribe Hotel, Nairobi Kenya, July 26-27, 2012.*

EIAR 2013, *Ethiopian Sorghum Research and Development Strategy*, EIAR Melkassa Agricultural Research Center.

Hartwich, F. & Janssen, W. 2000, "Setting research priorities: an example from agriculture using the analytic hierarchy process", *Research Evaluation*, vol. 9, no. 3, pp. 201-210.

Kelley, T., Ryan, J. & Patel, B. 1995, "Applied participatory priority setting in international agricultural research: Making trade-offs transparent and explicit", *Agricultural Systems*, vol. 49, no. 2, pp. 177-216.

Mills, B. 1998, *Agricultural research priority setting: information investments for improved use of resources*, International Service for National Agricultural Research.

Mills, B.F. 1997, "Ex-ante agricultural research evaluation with site specific technology generation: the case of sorghum in Kenya", *Agricultural Economics*, vol. 16, no. 2, pp. 125-138.

Appendix 1. Synthesis of SWOT analysis of Ethiopian National Sorghum Research System

The following list presents a summary of the strengths, opportunities, weaknesses and barriers to success of the Ethiopian sorghum research system. This list is synthesized from the response of all participants in the workshop and some of the wording is a verbatim reproduction from those responses and similar responses are grouped together. If more than one person indicated the same or similar response, it is indicated by a number in brackets following the response.

Strengths

1. Strong National Agricultural Research System (9)
 - a. Strong research coordination
 - b. Long term history of research and research management
 - c. Well established network of research organizations
 - d. Adequate base salary for researchers
 - e. Government provides basic support for research
 - f. Modest field research facilities
 - g. Good researchers
 - h. Good coordination between universities, research and extension
2. Diverse sorghum genetic resources (4)
3. Diverse agroecologies that provides opportunities for regional spill-outs (2)
4. Strong national extension system
5. Easy to mobilize community for technology roll out (2)
6. Strong demand for research products to improve productivity (5)
 - a. Strong domestic consumption base
 - b. Regional market for sorghum is expanding, especially in Sudan
 - c. Market infrastructure is expanding
7. Existence of complementary investments in the agriculture sector

Opportunities

1. Ethiopia can be a leader in regional sorghum research (7)
 - a. Premier genetic resource center or sorghum in Africa
 - b. May be affected by introduction of GMOs (some argue that this may be a threat)
 - c. Since researchers in Ethiopia are recruited by the government the system is sustainable
 - d. Best available sorghum scientists in Africa with a high rate of retention
 - e. Favorable research, extension and policy environment created by government (5)
 - f. Strong interest by sorghum research community
2. Building national research capacity to reduce key constraints along the sorghum value chain (5)
 - a. Strengthening seed systems
 - b. Strengthening extension systems
 - c. Strong opportunity to link with the large numbers of farmer training centers and development agents
 - d. Develop more linkages with Ethiopian universities (2)
 - e. Expansion of irrigation in sorghum production areas

3. Build collaborative research programs with
 - a. U.S. universities
 - b. Regional networks like COMESA and ASARECA
 - c. University of Queensland
4. Strong/Increased market opportunities and demand for sorghum
 - a. Good trends in agricultural growth
 - b. Growing demand in Sudan and Arabian countries
 - c. Competition with maize
5. Additional investment in agro-industries
6. Improved access to infrastructure (road, telecommunications) to major sorghum production areas
7. Good natural resources available
 - a. Human
 - b. Land
 - c. Water
8. Previous impact was achieved with limited investment so greater base for expansion of activities has been established.
9. Strong and influential position in AU, NEPAD, Eastern Africa

Weaknesses

1. Human capacity weaknesses
 - a. Breeding (6)
 - b. Physiology (3)
 - c. Genetics (2)
 - d. Pathology (3)
 - e. Plant protection
 - f. Entomology
 - g. Agronomy (2)
 - h. Natural resource management
 - i. Food science (3)
 - j. Social sciences (3)
 - k. Business development
 - l. Extension (2)
 - m. Biometrics
 - n. Workshop facilitation
 - o. Research & admin support staff (2)
 - i. Accountants
 - ii. Research directors
 - iii. Technicians
2. Physical infrastructure
 - a. Crop improvement and molecular tools/crossing facilities (5)
 - b. Greenhouse (4)
 - c. Supplies, chemicals (lab and field) (3)
 - d. Field vehicles (2)
 - e. Cold room (2)
 - f. Irrigation (2)
 - g. Journals, electronic documents (2)

- h. Laboratory equipment
 - i. Computing facilities
- 3. Limited opportunities for short-course training
 - a. Grant preparation
 - b. Scientific writing
- 4. Poorly developed seed system (4)
- 5. Poor research and extension network (2)
- 6. Poor financial incentives for research and development workers (2)
- 7. Agronomic recommendations for different agroecologies incomplete
- 8. Poor salary; May have risk of retention
- 9. Inadequate funding for graduate students

Barriers

- 1. Inadequate human resource development (2)
 - a. Staff turnover due to poor incentives
 - b. Inadequate management skills
 - c. Some managers/heads who are not interested in the jobs or in the improvement of sorghum
- 2. Fragmented and disciplinary research
- 3. Aligned and coordinated research within the NARS
- 4. Limited mobility of research and extension agents across major sorghum production zones due to the lack of vehicles
- 5. Transportation facility
- 6. Less friendly (remuneration) research environment (3)
- 7. Inadequate facilities, equipment, supplies and financing for research and universities (2)
- 8. Shortage of seeds and extension services
 - a. Inappropriate technologies for certain agroecologies, users & consumers
 - b. Seed system; Increase seed production capacity
- 9. Restriction of germplasm exchange from the Ethiopian side
- 10. Climate change (2)
- 11. Reduced commitment to sorghum compared to other crops
- 12. Lack of access to affordable credit services to farmers
- 13. Weak linkage between researchers and farmers

Appendix 2. List of Participants

Participant Name	Institution	Discipline/Title
Brhane Gebrekidan	EAS/AWG	AWG Chair
Dawit Alemu	EIAR	Socioeconomist
Agugna Wakgira	EIAR	Deputy Director General
Getachew Alemu	EIAR	NARS Coordinator
Taye Tessema	EIAR	ISM Project Coordinator
Adefris Teklewold	EIAR	Crop Research Director
Beyene Seboka	EIAR/MARC	Extension Research
Getachew Ayana	EIAR/MARC	MARC Center Director
Alemu Tirfessa	EIAR/MARC	Sorghum Breeder
Derese Teshome	EIAR/MARC	Public relations director
Asfaw Adugna	EIAR/MARC	Sorghum Breeder
Ketema Belete	Haramaya University	Sorghum breeder/agronomy
Million Fikreselassie	Haramaya University	Breeder
Tesfaye Tesso	Kansas State University	Sorghum Breeder
Timothy Dalton	Kansas State University	Agricultural economist

Appendix 3. Workshop Agenda

Ethiopian Agricultural Research System - Kansas State University Stakeholder Consultation Workshop on the USAID Sorghum and Millet Innovation Laboratory (SMIL) Program

February 21 2013,

EIAR Headquarter, Addis Ababa, Ethiopia

Program Outline

8:00 – 8:10am	Registration
8:10 – 8:20am	Welcome remark (Dr. Adujna Wakjira, DDG EIAR)
8:20 - 8:30am	Introduction of participants
8:30 – 8:35am	Program Introduction (Dr. Tesfaye Tesso, Kansas State University)
8:35 – 9:00	Overview of SMIL program (Dr. Timothy Dalton, Kansas State University)
9:00 – 10:00am	Analysis of sorghum production/utilization constraints and future research priorities (Moderated by Dr. Tim Dalton)
10.00 - 10:15am	Coffee break
10:15 – 12:00am	Analysis of sorghum production/utilization constraints and future research priorities (continued)
12:00 – 1:00pm	Lunch
1:00 – 3:00 pm	SWOT analysis of resources and institutional capacity for sorghum research and translation of constraints into research themes (Moderated by Dr. Tim Dalton)
3:00 – 3:15	Break
3:15- 5:00	Research theme development and hierarchical analysis of priorities (Moderated by Dr. Tim Dalton)
5:00	Discussion, synthesis and future actions (all)
5:30	Adjourn