

Host Country Program Enhancement



Central America (El Salvador, Honduras, Nicaragua)

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Activities and Anticipated Products

Initiated publication of extension bulletins and production guides on sorghum management recommendations, including agronomy, economics, breeding methods, plant protection and grain utilization.

Output: Improved technology transfer by extension services and NGOs.

Evaluated potential for use of microdose fertilizer application for photoperiod sensitive varieties grown on poor soil fertility situations on hillsides in Central America.

Output: Determined if this new technology from West Africa has potential to improve grain sorghum production in Central America.

Continued research to identify high nitrogen use efficient sorghum varieties that respond well to low applications rates of nitrogen fertilizer.

Output: Select varieties that produce high yields with relatively low fertilizer input rates.

Promoted use of nitrogen fertilizer and the use of intercropped mungbean for nitrogen supply through field demonstration, publication of extension bulletins, and by developing closer working relationships with fertilizer dealers and NGOs.

Output: Improved extension of nitrogen fertilizer management recommendations to producers while building relationships with input suppliers and technology transfer agents, facilitated a process that makes fertilizer available at a more economical cost, thus promoting fertilizer use and increased yields.

Helped with transfer of the improved green chop variety CENTA SS-44 through field demonstrations.

Output: Research suggests that adoption of the variety with good management can increase milk production by 25%.

Continued breeding program to improve yield, grain quality and pest resistance of photoperiod sensitive and insensitive varieties for grain and forage uses.

Output: Development of superior varieties and hybrids for release and diffusion in Central America that increase yield, biotic and abiotic stress tolerance, and grain (and/or forage) quality.

Held meetings with producers to improve fertilizer and pest management, and bakers to increase utilization of sorghum flour.

Output: Producers will increase yields and bakers will increase profitability by increasing use of sorghum flour.

Transferred the improved variety's RCV, Sureño, 85SCP805 and ES-790 by producing one metric ton of seed of each in both El Salvador and Honduras, teaching small farmers to produce their own seed, and distribution of seed to small farmers.

Output: Increased adoption of improved varieties and farmer yields, and establishment of sustainable production by promoting artisanal seed production by small-scale farmers.

Continued graduate degree training of three students (entomology, pathology and food science) and provide short-term training to one economist in impact assessment.

Output: Increased scientific capability of national programs in Central America.

Major achievements of the past year are transfer of the improved high N use efficient sorghum variety 85SCP805 (with and without fertilizer application) to 141 small farmers, and transfer of the improved variety's ES-790, CENTA S-3, 86EO226 and CENTA RCV to approximately 500 small farmers. The improved photoperiod sensitive variety 85-SCP-805 with high yield potential and nitrogen use efficiency was validated on 40 farms. The new variety with 47 kg ha⁻¹ N fertilizer application increased grain yield by 800 kg ha⁻¹ (about 25%) over the local variety without N fertilizer. In addition, rapid progress is being made in validation and seed increase of the forage hybrid ICSA275 X TX2784, with formal release planned for November 2005. The variety/hybrid pipeline at CENTA and CNIA/INTA indicates the potential

for release of several improved grain sorghum varieties/hybrids in 2006. Progress was made in developing improved integrated crop and pest management programs. Improved ties with the food processing industries in El Salvador and Nicaragua were achieved through workshops and personal contacts, and one company, GUMARSAL has participated in grain quality research and plans to mill sorghum flour. Graduate and undergraduate educational, and short-term training efforts have improved the human capital available for sorghum research and technology transfer in Central America. In addition research and technology transfer efforts for poultry nutrition in Central America have focused on seminars given in Nicaragua and at the RAPCO short courses in Costa Rica. Dr. Hancock/KSU used the RAPCO short courses to promote sorghum as a component in animal feeds (especially for poultry). Attendees for the short courses (limited to 35 each year) were representatives from the major livestock/feed producers in most of Latin America (i.e., Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Peru, and the Dominican Republic). The unquestionable success of these short courses results from the organizational skills of Carlos Campabadahl (Universidad de Costa Rica). Collaboration with in-country specialists is a key to the success of INTSORMIL in collaborating countries.

Horn of Africa (Ethiopia, Eritrea, Kenya, Tanzania, Uganda)

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Critical Activities

Production and availability of improved seed continues to be a bottleneck in many of the countries in the Horn of Africa region. In each of the countries where INTSORMIL Striga resistant sorghum varieties have been officially released for wide cultivation and the integrated Striga management pilot project has aroused interest in the technology, a community based seed multiplication effort has been started. This program requires continual interaction between seed producers and collaborating research scientists. We will encourage this interaction and assist in the production and dissemination of improved seed.

Completion of a project in Uganda exploring the potential of a newly released Striga resistant sorghum cultivar for agronomic adaptation and use of the grain in local breweries has great impact potential.

Agronomic research in the areas of nutrient management, phosphorous fixation, and the collection and cataloguing of a sorghum database will be finalized during this year.

In collaboration with ECARSAM, the regional sorghum and millet program under ASARECA, INTSORMIL plans to hold a regional conference to establish a coordinated program in sorghum and millets for the region.

Southern Africa (Botswana, Mozambique, Namibia, South Africa, Zambia)

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The overall thrust of this project during this period has been to shift sorghum and pearl millet from subsistence crops to value added cash crops and complete the graduate training of students supported through the project. The Southern Africa Regional program is a multi-disciplinary program with the goal to understand the factors that reduce grain yield and quality of sorghum and pearl millet, to develop technology to mitigate the stress effect, and to develop end-use processing technology that will increase production on, of, and processing yield of high quality sorghum and pearl millet grain. INTSORMIL funding provides resources to support graduate training and technology transfer activities conducted in collaboration with the National Agricultural Research Programs in the areas of:

Food Quality

Role of sorghum grain quality in sorghum grain and malt lager beer brewing. Research is focused on determining the benefits of using US developed white tan-plant and high digestibility sorghum lines and it involves the M.Sc. training of two Zambian graduate students: Mr. L. Mugode and Mr. C. Ng'andwe. 2) Sorghum and pearl millet milling technology: a) Optimizing sorghum roller milling to produce meal at maximum grain extraction but of optimum quality over a wide range of sorghum grain qualities. b) Assess the effects of traditional and roller milling technologies on pearl millet meal quality, particularly with respect to nutritional value. The completion of graduate training of Mr. M. Kebakile (Botswana, Ph.D.) and Mr. S. Barrion (Namibia, M.S.) will happen this year.

Expected impacts from the student research this year include: 1) Selection of white tan plant and high digestibility sorghum lines with optimal properties for lager brewing. 2) Optimization of the sorghum roller milling process to efficiently produce meal of optimal quality. 3) Knowledge as to how milling affects the nutritional value of pearl millet and why meal produced by the traditional milling process seems to be preferred.

Pathology

Complete the screening of germplasm for sources of resistance to major diseases emphasizing tan plant white grain food type sorghums for the small Southern Africa farmer. 2) Screen for toxin production by grain mold pathogens in sorghum grain products emphasizing resistance and its role in reducing toxin level. 3) Complete the study the heritability of resistance to grain molds.

Entomology

Complete the evaluation of cultivars for adaptation, and grain quality in comparison with local commonly grown varieties. We expect to identify varieties with multiple stress resistance suitable for use by indigenous small farmers. Completion of research on stored grain insects in Mozambique will result in control recommendations for farmers.

Mycotoxins

Complete the research on Fusarium toxins on Nigerian maize, sorghum and pearl millet that parallels research already completed with aflatoxin. This study is of critical importance as sorghum production may become more important if problems associated with toxins in maize result in maize produced in marginal areas being

unsafe for human consumption. This issue directly effects food security and human well-being and should encourage planting of sorghum and pearl millet in areas where both thrive but where maize is marginal.

Economics

Baseline indicators will be developed that can measure progress through time toward achieving USAID focus areas priorities. An in-depth study of the value added supply chain for the brewing of a sorghum based beer will be completed. A potentially large market exists for a high quality sorghum beer that can compete in a market niche between the higher priced lager beers and the lower priced opaque beers but a major constraint to developing this market is a shortage of the supply of sorghum. An in-depth study of this entire value added supply chain in Tanzania and Zambia will be completed in order to identify the many linkages in the supply chain that must function in a coordinated, efficient manner to achieve success in this value added market. This study has potential for significantly increasing the demand for sorghum.

Breeding

Documentation of the genotypes with the necessary traits will be completed and the genotypes will be proposed for release as varieties in the respective countries. Interact with the energy sector in Zambia which is interested in sweet sorghums for biofuels. Develop a procedure to quickly move the genotypes into the market place. Work with NGOs (such as WVI, CARE, Harvest Help, etc) to refine and extend training programs on production and processing of sorghum and pearl millet.

West Africa (Burkina Faso, Ghana, Mali, Niger, Nigeria)

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Only the most critical activities have been conducted in the region during this period. These involve the transfer of selected high impact INTSORMIL-generated technologies within the region and the compilation of reports and documentation of progress and impact. Plans are being made for PIs within each country to meet in a workshop format to document and write final reports.

Niger

On farm testing for elite sorghum hybrid F1-223, midge resistant SSD-35, Striga -resistant lines (EM der, Wassa). These are well developed new and important sorghum lines. Field tours and farm days are being organized for maximal exchange with other farmers and promote the acceptance of the cultivars by farmers.

On-station conservation and on-station/on-farm seed production for elite sorghum and millet cultivars to collect and preserve needed germplasm. INRAN/Niger is a leader in seed technology and establishment of a national seed unit. This came as a result of the INTSORMIL sorghum hybrid seed project.

On-farm evaluation of soil fertility management options for millet yield increase including the use of poultry manure and modified microdose.

Countrywide evaluation and demonstration of the marketing potential for value-added sorghum and millet products using grain of existing improved sorghum and millet cultivars. This will strengthen the link between production and utilization activities.

On-farm demonstration of performance enhancing finely-ground sorghum-based rations in poultry feeding.

Mali

On-farm trials demonstrating the yield potential of the white-seeded, tan-plant Guinea type sorghum cultivars through the IER On-farm Group and NGO's (World Vision and Winrock International); evaluate value-added products and commercial utilization of these cultivars.

Increased seed of selected elite sorghum varieties for collection and preservation.

Completed on-farm facility survey and botanical insecticide (from local plant) use on millet and sorghum.

Completed short-term training in biotechnology methods in marker-assisted selection at TAMU under C. Magill's direction.

Completed the ongoing sustainability analysis (started on sorghum crop yield across years) using soil parameters.

Senegal

Seed multiplication of one promising millet variety and on-farm testing of new millet varieties for demonstration purposes. Seed multiplication of two newly released sorghum varieties and advanced yield trials of selected lines have been completed.

Complete study on the slow digestion property of sorghum-based foods for use in diabetic foods.

Ghana

Transfer of technology to farmers by conducting on-farm trials of most promising sorghum lines; on-farm testing of sorghum-groundnut rotation or cowpea rotation with 40 kg N/ha applied to sorghum.

Nigeria

Multi-locational hybrid millet yield trials for farmer demonstration.

Complete the packaging and marketing studies for tsari flour, couscous, fura, dakuwa, and weaning foods from millet and sorghum.

Burkina Faso

Demonstration trials with field days, audiovisual, and scaling up for microdose fertilization, mechanized zai (water conservation system), and integrated Striga management.

Complete grain sample characterization experiments to screen for dolo (commercial local sorghum beer). Disseminating of the new dolo container developed last year that extends dolo shelf-life from 1 to 5 days; train 100 dolo makers; and produce and disseminate 300 dolo containers.