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## **Transfer of Sorghum, Millet Production, Processing and Marketing Technologies in Mali**

**Quarterly Report  
April 1, 2011 – June 30, 2011**

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**by**

**Management Entity  
Sorghum, Millet and Other Grains Collaborative Research Support Program  
(INTSORMIL CRSP)**

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**Production-Marketing**



**Decrue sorghum**



**Processing**



**Training**

## 1. Introduction

### **“Processing and Marketing Technologies in Mali” Project**

#### **Objectives:**

- **Facilitate adoption of production and marketing technologies to improve the incomes of sorghum and millet producers**
- **Facilitate the development of markets for the use of millet and sorghum as a food for humans and as a feed for poultry**
- **Develop stronger farmers’ groups and enhance their marketing power**
- **Extend mechanized food processing technologies to entrepreneurs and processor groups**
- **Introduce improved agronomic practices into décrue farming systems in northern Mali.**

## 2. Acronyms and Abbreviations

ACRONYM	DESCRIPTION
AMEDD	Association Malienne d’Eveil au Developpement
BNDA	Banque Nationale de développement Agricole Mali
CONFIGES	NGO/ Gao
CRRA	Centre regional de Recherche Agronomique
DRA	Division de la Recherche Agronomique
FCFA	Franc CFA
Ha	Hectare
IER	Institut d’Economie Rurale
IICEM	Integrated Initiatives for Economic Growth In Mali

<b>LTA</b>	<b>Laboratoire d’Technologie Alimentaire (IER)</b>
<b>MOU</b>	<b>Memorandum of Understanding</b>
<b>MT</b>	<b>Metric tonne</b>
<b>NGO</b>	<b>Non Governmental Organization</b>
<b>RCGOP</b>	<b>NGO/ Tomboctou</b>
<b>SAA</b>	<b>Sasakawa Foundation</b>
<b>WFP</b>	<b>World Food Program</b>
<b>WTAMU</b>	<b>West Texas A&amp;M University</b>

### **3. Executive Summary of Achievements**

#### **Production-Marketing**

In Koutiala, Segou and the Mopti regions heavy rains caused flooding in 2010 and the sorghum was damaged.. Sorghum is planted predominantly in the low land regions (bas fonds). When sorghum has too much rain, the crop does not thrive and seed quality is reduced. Millet did very well with the excess rain and farmers were pleased at harvest time.

In our pilot project activities, 10 ha of the area is reserved for women. Our seven partner entrepreneurs in Mopti/Severé, Gao and Bandiagara are women and they employ workers (both women and men) to run the processing facilities. As the project has developed, it has become apparent that some of the women were in particularly difficult situations and becoming part of the project is viewed as a significant opportunity for them.

Our basic pilot project activities are undertaken in conjunction with IER, the national agricultural research institution and with either the national extension agency, DRA, or with an NGO undertaking the extension activities for our technology-marketing introduction project.

#### **Food Processing**

The processing project had activities in two major components during this period, 1) with partner entrepreneurs in the Mopti/Gao area, we are currently moving from issues related to mechanization of units to fully functioning units for processing quality products and selling them into the marketplace, and 2) in Bamako at IER/LTA in Sotuba, we have completed the main structure and placement of the equipment line for the Incubation Centre with purpose to train,

support and nurture processing entrepreneurs and their enterprises, and we have held our first workshop. Additionally, we are beginning work with IICEM to assist their efforts for larger industrial processing of sorghum and millet-containing foods.

For component 1, in this quarter two trips were made to the Mopti/Gao area to assess, further train, and problem-solve entrepreneur partner processing units. Six of the seven units are functional with processing of millet and sorghum products underway and products in the marketplace. Current status of the functional units varies dependent on a number of factors including equipment breakdown, reliability of workers, and quality grain sourcing. Those who have fully processed grains to high quality products have expressed the need for good grain sourcing and prefer to obtain grains through the farmer's groups organized by the Production-Marketing part of the project (J. Sanders and O. Botorou). Plans for the next quarter are to work with these processing groups to strengthen their ability to process market-competitive millet and sorghum products through bringing agglomeration technology to the two locations, training, and promotion.

For component 2, the Incubation Centre at IER/LTA Sotuba is now fully functional physically. A modest building effort expanded an existing building both in area and height that housed milling equipment at IER Sotuba's research facility. Further processing equipment purchases were made from fabricators in Senegal and Bamako to bring a new agglomeration technology to Mali and reasonably costing cereal processing equipment for mechanization of processing enterprises in Mali. We held our first workshop at the Incubation Centre to demonstrate the capability of the equipment and had participants from the Bamako area including two INTSORMIL processing partners in the area and IICEM processing partners from Bamako and Sikasso. Our goal for the Incubation Centre is to make this an interactive facility where local entrepreneurs are trained in new cereal processing technologies, are able to use the equipment to produce product on a limited scale, test the marketplace, bring feedback to the Centre for process improvement R&D, and to access investment funds for their own mechanized operations. This concept, through INTSORMIL activities in Niamey, Niger has worked to bring high quality milled and agglomerated products into the local marketplace and has resulted in investment opportunities and functioning mechanized private enterprises. Technical support and encouragement from the Incubation Centre for local entrepreneur has been essential for development of competitive processing enterprises there, and a similar though modified concept will be used in the coming months for the IER/LTA Incubation Centre in Sotuba.

## **Décrué Sorghum in Northern Mali**

Scientists and farmers have been increasing plant population (minimizing spacing) increased grain yield across all genotypes, suggesting better resource use (light, nutrients and water). Use of seed or soil treatment with pesticides increased the number plants that survived till maturity. However, there were no clear differences for number of panicles infested with pests. Further research is necessary on use of other chemicals, rates and methods of application. Application of fertilizer did not increase grain yield. This suggests high fertility of the soil in the décrue system (especially in the selected sites).

## **Training**

### **Long Term Training (Academic)**

Yara Koréissi Dembélé from the INTSORMIL CRSP attended the 9<sup>th</sup> African Nutrition Leadership Program in South Africa in March. Abdoul Wahab Toure will do an 8-week agronomy crop and soil science training at Kansas State with Drs. Prasad and Staggenborg.

### **Short term training**

We have five long-term academic students from Mali studying the US. Three students, Fatimata Cisse (Food Science at Purdue), Bandiougou Diawara and Sory Diallo (Agronomy at Kansas State) were enrolled in Master's graduate

programs during the last quarter. Two students, Aly Ahamadou and Mamadou Dembele, were taking the top level English as a Second Language (ESLI) program at West Texas A&M University, in preparation for admission to their graduate program in Agricultural and Business Economics.

## 4. Progress

### Production – Marketing: John Sanders, Purdue University and Botorou Ouendeba

During this period we visited our sites in Koutiala, Segou and the Mopti regions. Note that sorghum suffered from the heavy rains of flooding of 2010. Sorghum is planted predominantly in the low land regions (bas fonds). When sorghum has too much rain, millet does very well as it is planted on the slope (pente) and plateau and on lighter soils. So millet producers in the Segou and Mopti regions were very happy in 2010 as yields were higher (see the preliminary reports by Jeanne Coulibaly). Due to the poor seed quality from the late rains of 2010 the Grinkan germination trials carried out by AMEDD in the spring of 2011 indicated very poor germination. So we decided against implementing a program with Grinkan in the crop year of 2011 in Koutiala. Instead we will focus on seed production in various regions so that a good supply of Grinkan is available for 2012.

In Segou we had a good joint meeting of the BNDA rep, a fertilizer dealer and SAA representative about the program for an additional 500 ha in 2011 of millet production. The BNDA rep told us that the BNDA would provide input financing for a 10 month loan for 14% annual cost for one fourth of this area. The other three fourths would be financed from the substantial profits from later sale earned from the 494 ha in millet production in 2010. Then we went to Mopti where an estimated 420 ha will be put into our pilot project in 2011. There was varying performance last year in repayment so we adjusted our area expansion depending upon this performance. We will be returning to Mopti in July 2011 focusing upon the expansion of our support to the improvement of the storage facilities.

### Food Processing: Bruce Hamaker, Purdue; Yara Koreissi, IER/LTA; Mamadou Diouff, Consultant

#### *Background of the planned activities for the reporting period*

For the processing project, two major components exist – mechanization of entrepreneur processor partners in the Mopti/Gao area and development of a Malian entrepreneur processor Incubation Centre at IER/LTA Sotuba - and have evolved to functioning levels. For both activities, our goal is to create models to improve the competitiveness of small and medium-scale food processors in the region and to drive expansion of markets for local farmers. Our design of these models is rooted in their being sustainable with high quality processed products creating successful enterprises that depend on quality raw commodities bought (with premiums attached) from local farmers or farmer organizations.

Activities for the quarter focused on: 1) details necessary to facilitate entrepreneur partners in the Mopti/Gao region to be fully functional and to begin documenting processing activities regarding purchases and sales, and 2) completion of the IER/LTA Incubation Centre in Sotuba with final work on the building structure and bringing in new cereal agglomeration equipment and technology (for Mali) for a complete processing line. A first Incubation Centre demonstration workshop was held in late June.

### **Component 1 –Mopti/Gao region entrepreneur partners**

In this period, Yara Koréissi Dembélé and three technicians from IER/LTA travelled to Gao, Mopti, Sevare and Bandiagara. The objective of this trip was to train further workers on processing equipments (one day in each unit); on how to operate and maintain the machines before and after each processing run, and how to follow/document the production of the processing units. Grain was purchased from farmers working with the team of the production-marketing project in Koutiala, Douentza and N'Garasso. Generally, quality was good for the processing units and further purchases have been sought. Two aspects of quality of grain are important to the processors to make high quality products, grain cleanliness and homogeneity of grain size. The latter factor affects ability to decorticate grains evenly and make high quality flours both for direct sale and for processing to other products. Communication from processors to farmers is important and has been established from the production-marketing project to build sustaining links between these two players in the supply chain.

Bruce Hamaker and Mamadou Diouf worked in Bamako and traveled to Severé and Bandiagara to work with entrepreneur partners during the period April 24 to 29, and M. Diouf thereafter traveled to Gao. During this trip, assessments were made on processing units and minor issues to be resolved for full engagement in processing activities. A meeting with USAID/Mali officials during this trip highlighted other issues to consider in the Mopti/Gao region project such as switching diesel engines for electric where desirable (due to the rapid rise in diesel prices), effective marketing as well as market assessment of processed products, and potential for incorporation of micronutrient fortification activities. We have investigated using electric motors opposed to diesel, found them to be reasonable in cost, and have discussed with our partners for change in the next few months.

In June, following our workshop at the IER/LTA Incubation Centre, a small meeting was held between the INTSORMIL processing team and the seven beneficiaries from the Mopti/Gao region. The objective of this meeting was to discuss and schedule the supply of grains, promotion plans, and to finalize and sign contracts of retrocession (payback contracts) for the mechanized units. Five contracts were signed, one beneficiary was not able to come for the workshop due to personal issues, and one other had an objection to sign due to an equipment breakdown. It was emphasized that success for the project will be assessed by demonstration of a sustaining successful model where entrepreneurs are able to process grains into high and consistent quality products that have good and continuing sales in the marketplace, and where grain purchases are made from farmers or farmer's groups that supply high quality grains to processors. If a few of the processors are not fully engaged with technical expertise not demonstrated, then our focus will go to the majority of other processors who are committed to project success and our timeline of demonstrables in the remaining period of the project.

### **Component 2 - IER/LTA Incubation Centre**

The Incubation Centre in Sotuba was nearly completed in the quarter, both from the standpoint of the building structure and processing equipment line installed. In late June, a first workshop was held with INTSORMIL Mopti/Gao entrepreneur partners and Bamako area processor partners, and IICEM processing partners in Bamako and Sikasso. While the unit is now fully functional, some further equipment/technologies are still being fabricated and final work on the building is being completed. A formal opening is scheduled for late summer/early fall and a training workshop will occur at that time. The Incubation Centre, while fairly simple in concept, requires a good amount of detailed planning to make it an effective device to support processors as they access new processing technologies for expanding markets for millet and sorghum in Mali urban areas as well as the region. We are using our experience with development of a similar Centre in Niamey, Niger, but realize that Mali offers a different set of challenges, and likely greater opportunity, for increasing processor activities.

INTSORMIL held a workshop June 21 to 23 to introduce and demonstrate new technologies for processing millet- and sorghum-based agglomerated products (*couscous* of different particle sizes, *degue*, *moni curu*) using a high-throughput technologies developed at Institut d'Technologie Alimentaire (ITA) in Dakar (with who we have worked with for many years). The objective of the workshop was to introduce millet and sorghum processors and INTSORMIL's partners (IICEM processor partners) to new processing technologies to strengthen their ability to process market

competitive sorghum and millet foods and to increase the quality and value of their product. The opening ceremony was done successively by the Director of IER CRRA Sotuba and the National Coordinator of INTSORMIL/ Mali (M. Diourte). Seven beneficiaries of INTSORMIL from Gao, Mopti and Bandiagara, 2 beneficiaries of INTSORMIL from the local processor association AMTCL/ Bamako, and four partners from IICEM millet and sorghum processors participated in the workshop. INTSORMIL as well as IICEM provided support to their partners and also to other participants.

***Décrue Sorghum: Scott Staggengborg and Vara Prasad, Kansas State University and Abdoul Wahab Toure, IER, Mali***

**Specific objectives and the progress in each objective are :**

1. To conduct a survey of farmers' perception about current management practices and their needs and preferences in the area of Gao and Kidal.

*What was done during the reporting period:*

New cultivars are already submitted to farmers' appreciation in Gao. Kayes will be concerned by September. Farmers' needs and preferences will be collected in October in Gao in December in Kayes.

2. To collect soil samples from the décrue experiments and analyze for physical and chemical properties in relation to yields of crops in the décrue systems.

*What was done during the reporting period:*

Soils collected from the décrue experiment will be brought by Abdoul Wahab TOURE during his visit in USA from July 15<sup>th</sup> to October 1<sup>st</sup> for analysis in relation to yields of crops in the décrue systems.

3. To collect samples of the cultivars grown in the region near Gao and Kidal as well as identify existing varieties that may be adapted to the region.

*What was done during the reporting period:*

Cultivar sampling will occur at physiological maturity, which is expected by October.

Experimental sites: Tombouctou, Gao, Mopti and Kayes.

4. Establish field experiments on integrated soil, water and nutrients to develop décrue sorghum management strategies for improved productivity.

*What was done during the reporting period:*

Integrated soil nutrient and pest management strategies have been conducted in Mopti since May and will be undertaken in Kayes by December, 2011.

5. To diffuse the generated improved techniques in the new areas (expanded to Kayes).

*What was done during the reporting period:*

Personnel in Mopti and Kayes have been contacted to undertake diffusion of improved techniques

**Progress by Experiment**

**1. Evaluation of Crop Management Practices**

*What we learned as based on 2010 results:*

- ❖ Increasing plant population (minimizing spacing) increased grain yield across all genotypes, suggesting better resource use (light, nutrients and water).
- ❖ Use of seed or soil treatment with pesticides increased the number plants that survived till maturity. However, there were no clear differences for number of panicles infested with pests. Further research is necessary on use of other chemicals, rates and methods of application.
- ❖ Application of fertilizer did not increase grain yield. This suggests high fertility of the soil in the décrue system (especially in the selected sites).

## 2. Evaluation of cultivars

The demonstration plots showed superior adaptability of varieties Saba Soto and Saba Tienda when compared to Niatichama in the décrue production systems in northern regions of Mali. There is a need to test more genotypes for yield stability and grain quality in this region.

## 3. Soil nutrient deficiencies study

The response of sorghum to fertilizer depended upon the soil type and location. In poor soils such as those in Tonka, the sorghum crop responds to nutrients. Maximum decreases in grain yield were observed when N or P were deficient.

## 4. Diffusion of Improved Technologies.

-For a wide diffusion of Saba Tienda and Saba Sôtô, seed production of the former and seed purification of the latter are needed.

-Demonstration plots widely undertaken with Saba Tienda and Saba Sôtô in Mopti region. The one in Kayes region cannot be undertaken before September (beginning of the décrue system in that region).

-Demonstration plots undertaken with new cultivars in Goundam: Saba Sôtô Koreye, Saba Al Bakar, Saba Sôtô Kara.

## Training: Jess Lowenberg-DeBoer, Purdue University

### Short term training

Yara Koréissi Dembélé from the INTSORMIL CRSP attended the 9<sup>th</sup> African Nutrition Leadership Program in South Africa in March, which built capacity in leadership, communication, and advocacy skills in the area of food and nutrition science. Dembélé will apply her improved skills in the INTSORMIL Technology Transfer Project, which aims to expand markets for millet/sorghum and other grains through the promotion of high quality and market-competitive processed products.

We have plans for one more identified short term trainee. Abdoul Wahab Toure will do an 8-week agronomy crop and soil science training at Kansas State with Drs. Prasad and Staggenborg. The TraiNet entry and visa process was initiated for **Abdoul Wahab Toure's** short-term training at Kansas State July 15-September 1, 2011. Kansas State is finalizing his arrangements and we will purchase his airfare and HAC insurance as soon as the visa is issued. He will work with Drs. Prasad and Staggenborg in Agronomy. Mr. Toure will present his research to the Great Plains Sorghum Center faculty during his visit. The proposed agricultural economics short-term training is no longer planned since the identified candidate is no longer interested.

### Long term training

We have five long-term academic students from Mali studying the US. Three students, Fatimata Cisse (Food Science at Purdue), Bandiougou Diawara and Sory Diallo (Agronomy at Kansas State) were enrolled in Master's graduate programs during the last quarter. Two students, Aly Ahamadou and Mamadou Dembele, were taking the top level English as a

Second Language (ESLI) program at West Texas A&M University, in preparation for admission to their graduate program in Agricultural and Business Economics.

**Fatimata Cisse** (Purdue Food Science) has successfully completed 4 semesters of coursework and prepared her research proposal that has been submitted and accepted. Human subject's approval was received and she traveled to Mali June 20<sup>th</sup> for an 8-week visit to collect her research data. Major professor Bruce Hamaker would like change Ms. Cisse's training to a PhD program and has discussed this with the ME and IER and has begun the necessary approval process. If/when approved, her additional training would be funded through the INTSORMIL project.

**Bandiougou Diawara and Sory Diallo** continued their Master's coursework in Agronomy at Kansas State. Both are working hard and performing well. Diallo met the ESLI requirements and has been fully accepted into the Graduate School. Both students have already begun their research which will be done in the United States. Diawara's research plots have been established.

**Aly Ahamadou and Mamadou Dembele** successfully completed the Level III (top class) of West Texas A&M University's English as a Second Language (ESLI) program. Their applications to the Graduate School were submitted and as of June 1, 2011 were accepted into the Graduate School to pursue their non-thesis Master's degree in Business and Economics in the Department of Agricultural Sciences. Dr. Lal Almas is their major professor and both began their classwork in June with Dr. Almas' AGBE 7304 "Advanced Management Techniques" course. This is a required course for their degree. The course will end on August 16, 2011. Their performance in that class is satisfactory.

## 5. Gender Related Achievements

**Production- Marketing-** In our pilot project activities 10 ha of the area is reserved for women. Since women have access to very little land (1/10 to ¼ ha), we asked the women to join in an association to cover the approximately 10 ha we are offering them for each 40 to 50 ha the men receive. They still farm individually but we need large numbers as compared with the men. Previously women had claimed larger areas but they then did not control the output so that defeated the purpose of attempting to improve the welfare of women and children by making larger income streams available to the women. The women are much better than the men at loan reimbursement.

**Food Processing-** Gender also plays a large part in processing. Our seven partner entrepreneurs in Mopti/Severé, Gao and Bandiagara are women and they employ workers (both women and men) to run the processing facilities. As the project has developed, it has become apparent that some of the women were in particularly difficult situations and becoming part of the project is viewed as a significant opportunity for them. With the possible exception of one partner, the women participating in the project have expressed and have demonstrated their commitment to the success of the project.

Yara Koréissi Dembélé was supported in part from the INTSORMIL CRSP Processing Project to attend the 9th African Nutrition Leadership Program in South Africa in March, which built capacity in leadership, communication, and advocacy skills in the area of food and nutrition science. Dembélé will apply her improved skills in the INTSORMIL Technology Transfer Project, which aims to expand markets for millet/sorghum and other grains through the promotion of high quality and market-competitive processed products.

**Training-** Initially two of the five identified long term trainees were female, but one dropped out due to family issues and the USAID decision to not allow young children to accompany the trainees. However, one female trainee remained in the program and was the first to obtain the needed English skills (TOEFL score), the first to be accepted into a graduate program, and is now being considered for PhD rather than a Master's. This is both a gender achievement and a success story.

## 6. Synergistic Activities Achieved with Partners

### Production-Marketing

Our basic pilot project activities are undertaken in conjunction with IER, the national agricultural research institution, and with either the national extension agency, DRA, or with an NGO undertaking the extension agency for our technology-marketing introduction project. These NGOs include AMEDD and SAA. We also collaborate with a farmers' cooperative union, Faso Jigi. As we become involved in the scaling up activities we are collaborating with IICEM, an AID funded activity of Abt consulting. IICEM is providing the management and handling most of the USAID funding for this scaling up process of sorghum and millet technologies.

### Food Processing

In the project period, two meetings were held with IICEM at their office and B. Hamaker and M. Diouf visited with IICEM Moulin du Sahel to discuss future collaboration to facilitate larger industrial processing of sorghum and millet in Mali. Discussions are in progress regarding joint activities for assistance in industrial processing in the coming months.

#### 1.1. Information and demonstration workshop

INTSORMIL conducted a workshop to introduce and demonstrate new technologies for processing millet - and sorghum-based products (agglomerated products). The workshop was held at the new incubation center set up by INTSORMIL and IER at the Laboratory of Food Technology of the Institute for Rural Economy from June 21 to 23. The objective of the workshop was to introduce millet and sorghum processors and INTSORMIL's partners to new processing technologies to strengthen their ability to process market competitive sorghum and millet foods and to increase the quality and value of their product. The opening ceremony was done successively by the Director of CRRRA Sotuba and the National Coordinator of INTSORMIL/ Mali on behalf of the US Coordinator who was stranded in Paris because of mechanical problems of the plane. Seven beneficiaries of INTSORMIL from Gao, Mopti and Bandiagara, 2 beneficiaries of INTSORMIL from AMTCL/ Bamako, 4 partners from IICEM millet and sorghum processors participated in the workshop. INTSORMIL as well as IICEM provide support to their partners and also to other participants.

#### 1.2. Processing project meeting with processors

Beyond this workshop, a small meeting was scheduled on 24<sup>th</sup> June only for INTSORMIL processing team and the seven beneficiaries from Gao, Mopti and Bandiagara. The objective of this meeting was to finalize and to sign the contract of retrocession (payback contract) on hand and to discuss and schedule for the supply of grains. Five contracts were signed. One beneficiary was not able to come for the workshop for social issues, and one other objected to signing the contract because, according to her, of the current situation of the equipments she has.

- 
- Follow up of beneficiaries for utilization of good quality grain and production of high quality and value added sorghum and millet products.

Follow up and maintenance of equipments in Gao, Mopti, Sevare and Bandiagara, and AMTCL beneficiaries

### Décrue sorghum

Synergic activities achieved with other partners ( US and non US including Government of Mali, other donors and local NGOs)

Synergistic Activities	U.S. Partners	Non-U.S. Partners	Details
Technology development and transfer in the decrue area	<p>USAID-MALI for financial support</p> <p>INTSORMIL for scientific support in technology development for millet and sorghum.</p> <p>AGRA for financial support in hybrids development</p> <p>ICRISAT for regional approach in sorghum research within West Africa</p>	<p>-Regional direction of Agriculture for technology test and expansion: ( Tombouctou, Gao, Mopti Kayes)</p> <p>- NGOs for technology test and expansion in Tombouctou and Gao regions</p> <p>-Noragric for technology development, financial support in technology development focused on main décrue crops by year 2011</p>	<p>-Involvement of Noragric in financial support will give more opportunity to invest USAID money in providing more equipment to monitor water dynamics in the soil profile.</p>

#### 1.2.1. Current activities

- LTA incubation unit: Finalization of the building, purchasing of complementary equipments from Niger (3 agglomerators) and Senegal (1 sieve), continuation of LTA technician training, grain supply etc.

## 7. Indicator Data

### Production-Marketing

There are three major components to our indicators corresponding to activities for Koutiala, Segou and Mopti:

#### **Koutiala-**

We have a contract with IER to take the lead in seed production to resolve the problems with Grinkan due to the late rains of 2010. The contract specifies 3 ha in Koutiala and 2 ha in Tomian under the supervision of AMEDD with the seed and technical inputs from Niaba Teme. Then there is 2 ha in Cinzana and 2 ha in Kogoni to be implemented by the IER stations. Expected production at one to 1.5 tons/ha (lower yields due to roguing) is 12.5 tons. At 8 kg/ha this is sufficient seed for 1,563 ha. We would like to be expanding faster but we first need to demonstrate that we can produce quality seed at a cost the farmers can afford. The projected price is 300 CFA/kg. We have to get back to high quality seed and then we can renew our activities with BNDA (national ag development bank) credits in 2012. We started this association with IICEM and BNDA financing in 2010.

#### **Segou-**

Our long term model of Tingoni was used by SAA (Sasakawa Foundation) and DRA (national extension service) to increase the area in new millet technologies by 494 ha in 2010. The high rainfall of 2010 flooded the sorghum and was responsible for mold at harvest but was excellent for millet yields in this region (and in Mopti). Average millet yields were 1.2 to 1.4 tons per ha in most of the farmers' associations (SAA report, 2010). Most of the millet reimbursed to the farmers' associations was sold to PAM (World Food Program) at 140 CFA/kg as compared with 90 to 100 CFA for millet at harvest. With these profits SAA was expanding the program another 500 ha in this region. One-fourth of the area expansion will be financed by the BNDA at 14% interest and a ten month repayment period. Last year we financed the fertilizer. Our interest in this program is now to evaluate procedures to get bank financing involved more rapidly in this process as well as tying this project to a series of other projects in the region. Early bank involvement is now the critical piece necessary to enable a rapid scaling up process for the new technologies. We are negotiating our involvement with this SAA program and will probably return to Tingoni in July to help Tingoni rebuild their storage facilities.

#### **Mopti-**

In collaboration with the DRA of Mopti we are expanding our program by 340 ha in 2011. Last year was a good year for millet production. Where farmers followed the recommendations and planted on good land, they averaged 930 to 1200 kg/ha with best farmers getting up to two tons (j. Coulibaly, unpublished data from farm interviews). These are excellent yields for this region. Prices were also good for the farmers' associations as they received 120 to 140 CFA/kg as compared with harvest prices around 100 CFA/kg. Three hundred ha were planted last year in the pilot project and 340 ha are anticipated for this year.

We are also supporting the expansion of new sorghum cultivars by Diourte of IER of 120 ha in Bellaco and Kita following the project model and extending the CORAF financed Striga resistance program. We are increasingly trying to tie into other on-going projects to expand our area covered.

In all of these activities except for the seed component there is a component of area and production separated for and benefiting women.

### Collaboration with IICEM

We also collaborate with IICEM. The IICEM program included 1700 ha in Koutiala in 2010 and another 700 ha in the Segou region in addition to our 500 ha there. The IICEM project was asked by USAID-Mali to do the scaling up of our pilot project. In the IICEM, 2011 program are 2,500 ha in the Koutiala region and 3,000 ha in the Mopti Region. So this area increase would be in addition to our area increase here of 950 for a total of 6,450 ha through IICEM/INTSORMIL collaboration.

### Décrue

Activities	Expected results	Actual results	Perspectives
Technology development for décrue sorghum	At least one variety is identified as well adapted with improved yield and grain quality	<p>Saba Sôtô is identified as well adapted to the décrue area, tolerant to honey dew, but with less grain quality.</p> <p>Saba Tienda is identified as well adapted variety with a better grain quality compared to Saba Sôtô</p> <p>Niatichama was well appreciated by women for its grain quality, but too late for the décrue area of Mali north and very susceptible to honey dew.</p>	To identify a well adapted variety, with a very good grain quality and tolerant to honey dew.
	At least an improved crop management practice is identified	<p>Space reduction between rows from 1 m to 0.75 m may help in increasing grain yield.</p> <p>P and N fertilizer may be a tool to increase sorghum yield depending on the soil type.</p>	Soil and plant analyses of ongoing experiments will help to better understand sorghum response to fertilizer in ongoing experiments.

## 8. Problems and Challenges

### Production-Marketing

Management wise we have to insure that people take responsibility and make decisions when stochastic factors affecting agriculture come up. We have to engage more in training to have a rapid program expansion and we are only in 2011 getting the published materials systematically laying out the program (see the Production-Marketing fiches for sorghum and millet). We are beginning to see the way to bring the banks in systematically for input financing. Given the lack of collateral and the many small farmers without personal contacts with the banks, bank reticence was expected

### Food Processing

The processing project has had some technical and management problems in their component 1 activities in the Mopti/Gao region, though these are currently all being addressed. One entrepreneur has not been fully engaged in learning the technical side of processing and, is being considered to be dropped from the project. If so, this equipment will be quickly transferred to another processor. For the Incubation Centre, there are some minor improvements that are needed on the agglomeration equipment and this has been discussed with the fabricator from Senegal and will be soon done.

### Décrue

Honey dew caused by insect feeding was found as a very limiting factor for sorghum yield in the decrue system. More integrated strategy (involving a better knowledge of causal insect species, rotation etc.) is needed to overcome this constraint.

### Training (long term academic)

Our initial proposal strongly suggested that selected participants acquire the needed English language skills in Mali, and then the training program would include a 6-month intensive English language component to bring them to the needed English skill level (TOEFL requirement) for graduate school admission. The five identified candidates were not already proficient in English and the time and resources were not available for English training in Mali. So our challenge has been to adjust our program plan, budget and timeline to first get all participants to the required English skill level to succeed in Master's programs; and second to identify Master's programs that would fulfill their training needs. To date we have accomplished English skill development and admission to graduate programs for all five participants. We will soon request that the University of Nebraska submit a no-cost extension to USAID/Mali to allow all of the participants to complete their Master's programs by mid-2013.

## 9. Success Stories

Jeanne Coulibaly is in the process of producing a report on the 2010 activities of the Production-Marketing project. This should be ready before the end of 2011.

## 10. Activities Planned for Next Reporting Period

### Production-Marketing

#### During the July/August 2011 trip to Mali:

- Continue the critical inputs into the planning of the seed production activities in Koutiala.
- Work out with SAA how we are going to collaborate in the expansion of the Segou program.
- In Mopti , design and implement some supplementary financing for improved village storage capacity.
- Investigate the expansion of local storage facilities with the villages providing the labor and building materials and some financing for cements, doors, roofs.
- Training sessions for participating farmers in the Mopti region.

### Décrue Sorghum

- Training on insect identification and pest management for all technicians involved in research of the décrue system.
- Crossing Saba Sôtô (found as tolerant to honey dew) with varieties such as Saba Tienda, Niaticama
- Expand the use of Saba Sôtô and Saba Tienda in the décrue systems of other regions.
- Better understand water dynamics in the soil profile of the décrue system through the use of appropriate equipment.
- Better understand response and non response to fertilizer of sorghum thru soil and plant analysis from experiments conducted in the decrue systems.
- Demonstration plots on Saba Tienda and Saba Sôtô are installed in Mopti region (with more farmers involved compared to 2010). They will be installed in Kayes for performance and adaptability test by September 2011.
- New cultivars will be introduced in Gao, Mopti and Kayes for adaptation testing.

- Soil nutrient study will be conducted in Tombouctou and Mopti regions. Kayes region will be involved by September (the décrue system will start in September in that region).
- Half to one ha will be planted during the rainy season with Saba Tienda for seed production in 2011. In the same time, purification of Saba Sôtô will be undertaken through panicle selection and laboratory analysis.

### Food Processing

- LTA incubation unit: finalization of the building, purchasing of complementary equipments from Niger (2 agglomerators using a CIRAD-developed technology) and Senegal (1 sieve), continuation of LTA technician training and grain supplies.
- Follow up of beneficiaries for utilization of good quality grain and production of high quality and value-added sorghum and millet products.
- Follow up and maintenance of equipments in Gao, Mopti, Sevare and Bandiagara, and AMTCL/Bamako beneficiaries.
- Documentation of Mopti/Gao region millet and sorghum processed product processing output and sales.
- Formal launching ceremony of the IER/LTA Incubation Centre in late summer/early fall and training workshop for INTSORMIL and IICEM processors.
- In the next quarter, our expectation is to have at least four units in the Mopti/Gao region component 1 project to be fully functioning and putting high quality of sorghum and millet value-added products into the marketplace.
- Signature of contract with mechanic for maintenance of equipments in Mopti, Gao and Bandiagara.
- Market survey for millet and sorghum products
- Before October 2011, our expectation is to have at least four (04) units working properly and putting into the market high quality of sorghum and millet value added products.

### Training

- Short-term training for Abdoul Wahab Toure – July 15 to September 1, 2011.
- Completion of Fatimata Cissé's research visit to Mali – June 20 to August 20, 2011.
- Aly Ahamadou and Mamadou Dembele will continue class work started June 1. They also plan to take another 3 hour graduate course AGBE 6095 "Research Problems in Agricultural Business and Economics" during the second summer session, 2011 (July through August); and will attend Agricultural and Applied Economics Association annual meeting to be held in Pittsburgh, PA in July 2011.

**Report submitted by:**

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