



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

**Annual Report
September 29, 2009 – September 30, 2010**

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Submitted to the USAID Mission, Mali

by

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



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Table of Contents

	Page
Introduction	3
Executive Summary	5
Management Entity	9
Production-Marketing Activities	25
Food Processing Activities	42
Décrue Sorghum Activities	48
Training Activities	61



Production-Marketing



Décrue sorghum



Processing



Training

Introduction

ENDING HUNGER IN AFRICA: CHANGE IS NOW WITHIN OUR GRASP, SAYS KOFI A. ANNAN

Thursday 14 October 2010

Des Moines, Iowa, USA – In a keynote speech today, former UN Secretary-General and Chair of the Alliance for a Green Revolution in Africa (AGRA) Kofi A. Annan underlined the urgent need for a uniquely African green revolution to bring food security and overcome hunger throughout the continent.

In his speech at the World Food Prize annual international symposium just ahead of World Food Day on 16 October, Mr. Annan:

- Described how over recent decades, Africa became the only continent which does not grow enough food to feed itself.
- Warned that food supplies will come under increasing pressure with growing populations and Africa set to be hit hardest by climate change.
- Applauded the increasing focus on food security for development from African governments, international donors, civil society and the private sector.
- Set out the steps needed to achieve a uniquely African Green Revolution.

“Ending hunger
in Africa: Change
is now within our
grasp”

Kofi Annan at the World Food
Prize, 14 October 2010

Mr. Annan said: “**Africa is the only continent which does not grow enough food to feed itself.** It alone has failed, in recent decades, to see agricultural productivity keep pace with its growing population. Africa was bypassed by the science-based agricultural development, built on the ideas of Norman Borlaug, which so dramatically transformed food production in Asia.” He recalled how desperately needed investments: for agricultural research and development, for rural infrastructure and for support to smallholder farmers, were slashed by national governments, and were made worse by the dramatic decline in ODA assistance.

Mr. Annan argued: “**Never before has there been such a collective drive for change.** This encompasses civil society organizations, philanthropic foundations and multinational corporations. Food and nutrition security now sits firmly and rightly at the top of the development agenda. And this unprecedented coalition is having an impact. **I saw some of this progress for myself when I recently visited farmers in Mali and heard from them the difference that access to high-yielding seeds and fertilizer are making to their livelihoods.**”

He explained that “the Alliance for a Green Revolution in Africa (AGRA) is helping to build the systems needed and strengthen the links in the entire value chain to make smallholder farming productive, profitable and sustainable”.

“We cannot forget that, the women who produce most of Africa’s food are particularly disadvantaged economically and socially. We need practical measures from field to market to remove these obstacles so they have a voice and a stake right through the value chain”, Mr. Annan said.

He concluded: “The way forward is clear. We need to build on our successes, listen to the farmers, innovate as we go and scale-up what we know works. Like any successful revolution, the goal must always be permanent reform. If we stand together – governments, civil society, the private sector, the scientific community and farmers – and sustain our efforts, a unique African Green Revolution is within our grasp. It will be a huge step towards banishing hunger and meeting our ambitions for a just and peaceful world.”

This report presents progress in promoting food security in Mali via the USAID/Mali Mission supported Cooperative Agreement with INTSORMIL “**Transfer of Sorghum, Millet Production, Processing and Marketing Technologies in Mali**”. It is significant to note that our development strategy is in line with that mentioned by Kofi Annan in his speech at the World Food Prize: “***We need to build on our successes, listen to the farmers, innovate as we go and scale-up what we know works. Like any successful revolution, the goal must always be permanent reform.***” This action is being done by meeting the following objectives.

Objectives

- Facilitate adoption of production and marketing technologies to improve the incomes of sorghum and millet producers
- Facilitate the development of markets for food use for millet and sorghum and as a poultry feed for sorghum
- 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.

Executive Summary

Management Entity

INTSORMIL was represented at the Partner's meeting by the Management Entity (E. A. Heinrichs), IER Coordinator (M. Diourte), Production-Marketing (B. Ouendeba), Processing (Yara Koreissi), and Décrue Sorghum (A. Wahab Toure). The INTSORMIL project was summarized and presented in the form of an attractive and informative poster produced by M. Diourte and IER staff. The meeting goal was "To support the implementing partners in operating effectively in achieving successful results."

A publicity campaign was initiated with the goal of promoting the project to more rapidly transfer sorghum and millet production, marketing and food processing technologies to farmers and entrepreneurial food processors. The campaign includes signage at project sites, t-shirts and hats with appropriate logos for collaborators, radio TV spots and submission of USAID Success Stories to the Mali Mission.

The Management Entity will be participating in the Producer/Processor Networking Workshop in Bamako November, 10-12.

In the past year the Management Entity has established several MOUs (Memorandums of Understanding) with collaborating NGOs and 12 workplans and amendments to the budget have been processed in support of the four project components.

Production-Marketing

There are now four components to the Production-Marketing project:

- Technical support to IICEM for the scaling up process
- Extension of pilot projects
- Resolving implementation and technical problems
- Publishing evaluation, marketing and gender impact studies

Technical support to IICEM for the Scaling-up process

1) In Koutiala the process of bank negotiation between the extension agency, AMEDD, and the bank, BNDA, broke down in the spring of 2010. Rather than the 3,000 ha of bank financed new technology planned there was only 85 ha. However, due to the organization of the farmers' associations implemented by AMEDD and financed by IICEM, there were an estimated 1,335 ha put into the new technology package. Almost all of these farmers obtained the DRA supplied subsidized fertilizer. The bank financing is expected to be more successful in 2011. The Koutiala area goal in 2011 is not yet decided but will probably be around **5,000 ha**.

2) In the Segou region 500 new ha was planned and implemented by Global 2000 with 8 new farmers' associations. There we experienced the same problems of poor agronomy, especially the poor handling of inorganic fertilizer, planting in poor soils and little thinning. Also, another bank source for input credit needs to be identified. A feasible area goal is probably around **3,000 ha**. Helping IICEM to scale up in the Koutiala and Segou regions is our number one priority in 2011.

3) In the Mopti region we presently have 300 ha in new technologies in six different farmers' associations. Traditional storage of leaving the stalks on the ceilings and roofs is practiced here. Farmers are happy with the new technologies. But we need to move faster with IICEM in constructing storage facilities. More concrete plans for the types of storage facilities, the division of the contributions between IICEM and the farmers' groups and the dates for initiating activities will be a priority in 2011.

Extension of pilot projects into new regions

1) In the **Mopti** region in 2010 we had 300 ha in new technology. We need a new millet cultivar as Toroniou is an old selection and there has been new breeding work with millet in Mali. Also we will need to improve the agronomy being practiced though the most effective force for improvement is the observation by farmers of other farmers' yields. However, the critical innovation is the rapid construction of storage facilities. This enables farmers to wait for better prices avoiding sales at the price collapse period after harvest. The farmers' associations can become "commercantes." They buy small quantities, store, and then systematically look for better prices for both their products and their inputs. We will raise the number of pilot project ha to 500.

2) We began work in the **Kayes** region in 2008. We are not happy with the old cultivar Seguifa here. We have been pushing IER for a new cultivar that is a Guinea-Caudatum cross, intermediate height and season length. As in Mopti there is a very good, supportive, regional DRA director. So if we can get some new cultivars, we will push to extend the area here by 300 ha and work in the three main production areas with sorghum.

3) Doumbia of IER has been introducing a new conservation technique in **Fana** with an approximate cost of 5,000 CFA/ha. We will investigate putting our technologies and marketing strategies on top of his soils technique. This technique does water retention and slows erosion. Since our combined technologies already cost 40,000 to 50,000 CFA/ha we will stay with farmers already using Doumbia's technique and then investigate the potential to diffuse the combined package.

Resolving implementation and technical problems

- 1) **Resolving the germination problem of Grinkan**- This is our number one technical problem as Grinkan is our flagship cultivar because it has been very successful in the Koutiala region. Germination rates of about 60% were very common in 2010 necessitating replanting.
- 2) **Improve seed quality**- Our participant farmers do a good job but have trouble removing the off types and are probably storing with humidity over 11% when there are late rains. We need to improve their performance but also develop a few excellent seed producers and do branding here. We will work with WASA and the seed program of IER on this.
- 3) **Improve and rapidly multiply the storage facilities**. We have a collaborative activity with IICEM designed to rapidly increase the number of storage facilities in Mopti.
- 4) **New millet and sorghum cultivars**. We need to replace both Toroniou and Seguifa with higher yielding, regionally adapted cultivars in Mopti.
- 5) **Better training for farmers in agronomy especially where we are scaling up**. We will put more effort into the agronomy training focusing on fertilizer placement, thinning, selecting good land areas and complementing inorganic with organic fertilizer.
- 6) **Training on dealing with banks**. Knowing when they are getting good interest rates and repayment terms is important for both our extension NGOs and farmers' associations. So an important sustainability issue is building up the capacities of the farmers' associations and the main extension partners to deal with the banks.

Publishing, evaluation, signage, marketing and other studies

- 1) Each year we evaluate the economic results of the previous crop season. We have already done a study of the millet food processors and the price premium for uniform, clean grain and this study needs to be updated now that there are more millet food processors and more farmers' associations selling clean cereal. We also need to do a study of the emerging intensive poultry production in Mali and its potential to use sorghum in the feed. We are collaborating with the IER Communication

Department in the construction of signs with the appropriate logos of all donors at our field sites. In 2009, women have been integrated in the production-marketing component of the IER-INTSORMIL project in Mali. Jeanne Coulibaly, PhD student at Purdue University, is doing a study on the income and welfare consequences of the new sorghum technologies in the Koutiala region with an emphasis on the effects on women. She will also look at alternative policies and technologies to increase the welfare of women and children. The goal is to help women to benefit from the adoption of new technologies which are likely to impact positively their welfare as well as the whole household's well-being.

Food Processing

Enterprise development accomplishments in the Mopti-Gao Region in the past year include 1) Market survey completed, 2) Seven partners identified, 3) Working with women processors and their associations, 4) Mechanization of entrepreneurial units with contributions made by partners for payback, 5) Building constructed with partner contribution, 6) Dehuller and 2 mills installed and optimized, 7) Two 4-day workshops conducted to train entrepreneurs in technology based improvements i.e. cereal milling and product training in Mopti/Sevare with entrepreneur partners from Sevare, Bandiagara and Gao and 8) A food technologist was recently hired and is now on site in Sevare to work with entrepreneurs and facilitate technology transfer activities.

Linkages with the Production- Marketing component, IICEM (Market evaluation and strategies to finance entrepreneurs) and NGOs (CRS, Afrique Verte and others) have been established and strengthened.

Development of Technology support, optimization and incubation center at IER Sotuba for Bamako area urban processors . Equipment for the center is being purchased and we are developing plans to assist IER in construction of a building to house the incubation center. The purpose of the unit is: 1) development and refinement of processes and products, 2) introduction of new processing technologies, 3) training of entrepreneurs, and 4) providing technological backstopping to entrepreneurs. The unit currently has installed in it the same equipment as is at the Mopti/Gao entrepreneur business sites. Two IER food technologists, Kola Mamadou Tangara and Sidi, have been partially assigned to assist on the project and are currently working on optimizing decorticating and milling processes. Another food technologist has been hired to work full time on incubation center activities. A workshop will be conducted in early 2011 at the incubation center.

A Producer/Processor Networking Workshop will be held in Bamako, November 10-12, 2010 with the objective of building a network between the eight new farmers' organizations producing clean millet in the Segou region and the millet food processors in Bamako. Additional workshops will be held to train entrepreneurs in 2011.

Décrue Sorghum

Research is being conducted to develop a recommended package of practices for each project site. The final package will include a combination of cultivar and crop/nutrient management practices. **Cultivar selection-** For the first time sorghum cultivars have been extensively tested in the northern décrue region. Thirty three cultivars were tested in farmers' fields and a few cultivars with superior agronomic characteristics (yield etc.) were selected for demonstrations. **Cropping practices-** Optimum planting density and planting dates have been identified. **On farm demonstrations-** To reach a wider area and more farmers with technology optimum cropping practices are being transferred to farmers this cropping season via demonstrations conducted with the support of partners DRA, Tombouctou; DRA, Mopti; CONFIGES, Gao and AFRICARE, Goundam.

Training

Long Term Training (Academic)

Fatimata Cisse was admitted to Purdue's Food Science Graduate Program in January 2010 and is now conducting her research and taking courses. She is on track to complete her thesis by December 2011.

Bandiougou Diawara was admitted to Kansas State's Agronomy Graduate Program in June 2010. He is taking courses this summer and starting his research here in the US. He is a bit behind the proposed schedule, and may need a one semester extension to complete his MS. **Sory Diallo** was identified as a replacement for Ms. Djeneba Dembele, who withdrew from the program due to the birth of her child. He completed the English program at the end of the summer and in August 2010 began his MS Agronomy program at Kansas State University. He is on track to complete his program by the proposed August 31, 2012 date. **Aly Ahamadou** and **Mamadou Dembele** arrived in June 2009 for the 6-month English language training and then moved to Purdue University in January 2010. In August 2010 they transferred to West Texas A&M University (WTAMU) which has a more applied Ag Economics/Agribusiness program and is a sorghum producing area so it would also be possible for them to do their thesis research locally. They are currently continuing English at West Texas A&M and they are expected to be admitted to graduate school on a conditional basis. Based on their slow progress they will require until 2013, one year beyond the termination of the award, to complete their MSc degree requirements.

Short Term Training

Abocar Oumar Toure completed in October his short term plant breeding training at Purdue with Dr. Mitch Tuinstra. His training program dates are August 1 to September 30, 2010. **Abdoul Wahab Toure** is planning to do his short-term training at Kansas State sometime between July-October 2011. He is working with Drs. Prasad and Staggenborg to determine the exact time period for maximum project benefit. A third AGEC short term trainee was included in the budget, but Dr. Sanders feels it will be more effective to work with the trainee while in Mali during his regular visits.

Project Components

Management Entity

USAID Mali Mission Partner's Meeting June 22-24, 2010

INTSORMIL was represented at the Partner's meeting by the Management Entity (E. Heinrichs), IER Coordinator (M. Diourte), Production-Marketing (B. Ouendeba), Processing (Yara Koreissi), and Décrue Sorghum (A. Wahab Toure). The INTSORMIL project was well summarized and presented in the form of an attractive and informative poster produced by M. Diourte and IER staff. The meeting goal was "To support the implementing partners in operating effectively in achieving successful results." The objectives of the strategic planning dialogue among partners were:

- Analyze and discuss current progress in Mali agriculture and economic growth
- An overview of USAID/Mali's portfolio for economic growth
- Develop a shared understanding of the concept of scaling-up
- Identify issues associated with scaling-up Mali's programs for increased food security and economic growth
- Identify potential programs in economic growth including agriculture if money were no object
- Identify steps needed to consolidate the lessons learned from the meeting

The IER/INTSORMIL participants contributed their expertise to the strategic "brainstorming" groups in the breakout sessions which were targeted towards scaling up. The AEG Current Value Chains were evaluated for importance by the participants for use in scaling-up activity.

Publicity Campaign

Signage (Plaques)

Labels on sorghum-based foods prepared by collaborating entrepreneurs



MINISTERE DE L'AGRICULTURE

logo **IER**

logo **INTSORMIL**

logo **USAID-MALI**

**PROJET PRODUCTION, COMMERCIALISATION ET
TRANSFORMATION DU **SORGHO AMELIORE
GRINKAN SUR 2000 HA** DANS LA COMMUNE DE
ZEBALA/KOUTIALA**

logo **ICEM**

logo **AMEDD**



T Shirts and Hats



INTV

Dr Aboubacar TOURE, Directeur de Recherche, Ancien chef du projet Intsormil

Dr TOURE, Bonjour ;

1. Parlez de nos jours du projet Intsormil à l'IER, nous amène à penser directement à vous Acar,
2. Pouvez-vous me parler de quelques acquis à son actif ? nombre d'innovations technologiques,

Dr Oumar Niangado : Ancien Directeur Général de l'IER, Directeur de Recherche, Sélectionneur Mil Sorgho.

Monsieur le Directeur, Bonjour ;

1. Dr Pouvez- vous me faire sommairement l'état de lieu de la recherche sur le mil/sorgho à l'IER avant l'introduction du projet Intsormil ?
2. Ceci étant, pouvez vous me faire sommairement la genèse de ce projet ? Quelles sont les innovations apportées dans la recherche par le projet Intsormil ? En termes de coût, génération technologique et renforcement des capacités des chercheurs à travers bourses et stages au sein de l'institut ?

Dr Bino TEME, Directeur général de l'IER

Monsieur le Directeur, Bonjour ;

1. Pouvez-vous nous dire brièvement, ce que le projet INTSORMIL a apporté à l'IER ?
2. Quel a été l'effet de la spéculation sur le rendement et son impact dans la lutte contre la famine, la pauvreté dans les zones où il est cultivé et consommé ?
3. Êtes-vous satisfait du financement des volets valorisation marketing et publicité ? si oui ; pourquoi ?

Dr Aly KOURIBA, Directeur Scientifique de l'IER

Monsieur le Directeur Bonjour,

1. En votre qualité de Directeur Scientifique de l'Institution, est ce que vous pouvez nous dire aujourd'hui que le projet Intsormil a contribué à l'accroissement de la production du sorgho en milieu paysan ?
2. Est-ce un facteur de développement et de lutte contre la pauvreté au Mali ?
3. Quels conseils pratiques donneriez-vous aujourd'hui aux paysans à travers la vulgarisation pour une meilleure diffusion des technologies sur le Sorgho ?

Dr Mamouou DIOURTE, Chef du projet

Dr Bonjour,

1. Dr DIOURTE, le projet Intsormil a plus d'une décennie au Mali ; pouvez vous nous parlez de l'historique c'est à dire de la philosophie de Intsormil en privilégiant les aspects : accroissement de la production, renforcement des capacités et lutte contre la pauvreté ?
2. Quels sont les acquis du projet Intsormil ?
3. Quelles ont été les grandes innovations du projet Intsormil ?
4. Quelles sont les perspectives d'avenir ?

YARA KOURESSI, Technologue
Madame Bonjour,

1. Quelles sont les différentes transformations que vous avez faites du Sorgho dans le cadre de la technologie alimentaire.
2. Avez-vous mis au point des jus à base de Sorgho ; ou du couscous ?
3. Pouvez-vous nous faire le point des acquis (Sorgho transformé en différent produit de consommation) ? (exple pratique de transformation et les explications possibles).
4. Avez-vous formez suffisamment de privés à la fabrication des produits à base de Sorgho ?
5. Quelles sont les perspectives d'avenir ?

Report on accidents of Toyota Hi-Lux 833

This is a report of two minor accidents and a major accident

1. The first, a minor accident, happened in Bamako with Diourte on the way to the Sotuba headquarters of IER when the driver believed that he could get around a truck and the back of the car got slightly scratched.
2. The second happened on our way from Segou to Bamako. Abocar Toure and Diourte attended a field day organized by IICEM. In that case, a bus having lost his control hit the back of the car and the damage extent was more severe than the previous but was still minor and was not expensive to repair as repairs only required oly some fender straightening.
3. The third and most serious occurred in Dire on April 16, 2010. According to the official INTSORMIL Mali driver, Mr. Adama Fomba, a mechanic made some repairs and was test driving the vehicle. The mechanic was traveling at an excessive speed and lost control of the vehicle and rolled it over. The mechanic was placed in the jail by the police.



USAID
FROM THE AMERICAN PEOPLE



TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI

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The Project has 4 components:

- (1). Production Marketing
- (2). Decrue Sorghum in the Tombouctou/Goundam area
- (3). Processing
- (4). Training

WEEKLY REPORT

July 13, 2010



INTSORMIL TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

PRODUCTION-MARKETING:

Jeane Coulibaly, a Ph.D student working for Professor John Sanders conducted last week, a field survey in the village of Garasso (region of Sikasso), one of the most successful areas of the production-marketing-component of the INTSORMIL project. The objective of this survey was to investigate how the profit resulted from the adoption of the new sorghum variety "Grinkan" improved the livelihoods of individual household members. Emphasis has been put on women in those households in order to assess the direct and indirect benefits received from the increased household income and derive some specific actions that could enhance their well-being.

AN UPDATE ON THE DÉCRUE SORGHUM RESEARCH:

In Tombouctou, cultivars planned to be tested were sown the 27th of June 2010, according to a report sent by an NGO (RCGOP) at the end of this week. A woman organization associated with RCGOP is

involved in this test. They are testing the following sorghum varieties: Saba Sôtô, Saba Tienda, and Niaticama along with their local varieties.

In Goundam, moisture conditions are now favorable to apply all fertilizers planned for the soil fertility study. A trip is planned for this week to finish not only the fertilizer application but also to visit the plots conducted by other NGOs not visited so far.



Women's association Nafagoumo at the Tombouctou area

AN UPDATE ON THE PROCESSING PROJECT:

Mme Dembélé Yara Koreissi and Mr Mamadou Diouf, the consultant of the project went to Mopti, Bandiagara and Gao from July 1 to July 10, 2010 to finalize the installation work and husking mills in these locations and to start the lining improvement activities (wall and floor) on the units equipped by the Project.

Project beneficiaries program

- The relocation of the Sorghum and millet processing unit of Bandiagara in the new building of the NGO AGVF has been completed and the final work (oil painting on wall and floor) should begin the week of July 8 to 15, 2010.
- Work for the improvement of the lining of all processing units in Gao and Sévaré –Mopti has actually started on July 3rd, 2010
- The demolition of walls and soil stripping is completed at all units.
- The additional work to finalize the installation of machinery in the processing units are underway at Gao and Sévaré-Mopti. Missing items will be sent in different locations as soon as the accounting procedures are completed.
- The reliable measurement instruments such as thermometers (3) and timers (2) were delivered to beneficiaries.

Program of The Food Technology Laboratory (LTA) of Sotuba

- The LTA has received an overhead projector, computer and accessories, a camera, two tachometers, a fast moisture measurement tool for technology transfer activities.

- The trials and optimization tests of the mills have been conducted during the workshop on performance of the sieve, motor and grinding capacity and satisfactory results have been transferred to beneficiaries in Bandiagara, Mopti and Gao / Sévaré
- In terms of support to the units, two young graduates of IFS Segou (Vocational Training Institute (Agricultural Industry) have been recruited by the project. One will monitor the project activities in different areas and the second one will be based at the LTA of Sotuba.
- Discussions are underway for the improvements and the expansion of the sorghum and millet processing unit at the LTA of Sotuba to host the processing equipment provided for rolled products for the month of September 2010.

July 27, 2010



INTSORMIL TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

WEEKLY REPORT

TRAINING COMPONENT

The first short-term trainee, Abocar Touré received his visa July 20. He will train with Mitch Tuinstra at Purdue in the area of plant breeding August 1 to September 29, 2010. He will depart Bamako July 29 and return September 30.

PROCESSING COMPONENT

Mme Dembele Yara Koureissi will leave on July 30 til August 12 for Benin to collect some of her field work data for her Ph.D studies.

PRODUCTION MARKETING

The most important objective of the trip is to move ahead on the scaling up in both Koutiala and the greater Tingoni region. We want to make sure that farmers know what they need to do on the agronomy and begin the planning for the baches and the marketing. We also need to estimate the area and farmer extent of activity in the Koutiala region.

August 3, 2010



INTSORMIL TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

WEEKLY REPORT

PRODUCTION MARKETING

The INTSORMIL Production Marketing Project is successfully scaling up from its proven pilot project of 2009 with IER improved Grinkan sorghum variety. This project resulted in mean sorghum yield of 1.9 T/Ha from about 150 farmers on 150 ha and sold 205 T of grain for 105 000 FCFA/T in the Southern part of Mali at Garasso. Another 85 T were consumed by the farmers and their family members. This scaling up includes 1750 Ha with the NGO AMEDD leading the extension efforts and a Bank devoted to Agricultural development, BNDA providing lending for some of the farmer's associations. Contact Dr Mamourou Diourte at kabarasso@yahoo.fr or +223 7645 0321.

DÉCRUE SORGHUM

Saba Tienda, a local cultivar selected in the Faguibine lake has already reached the flowering stage in N'GOUMA, (Mopti). This suggest its earliness among the four cultivars being tested in 2010 around four lakes in Northern Mali (Faguibine, Tele, Horo and Haougoundou). Contact Mr Abdoul Wahab Toure at abdoulwahab.toure@yahoo.fr

August 10, 2010



TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND
MARKETING TECHNOLOGIES IN MALI.

WEEKLY REPORT

PROCESSING COMPONENT

Mme Dembélé Yara Koureissi left for Benin to be back on August 12 to collect some of her field work data for her Ph.D studies.

PRODUCTION MARKETING

Professor John Sanders is expected to be in Mali (August 5th -20) for a trip which objective is to move ahead on the scaling up in both Koutiala and the greater Tingoni region. We want to make sure that farmers know what they need to do on the agronomy and begin the planning for the baches and the marketing. We also need to estimate the area and farmer extent of activity in the Koutiala region.

DÉCRUE SORGHUM

Abdoul Wahab Toure and Abdoulaye G.Diallo visited the decrue sorghum experiments in the Gao region last week and they reported that the 35 sorghum cultivars being tested have a good adaptability so far.

August 17, 2010



INTSORMIL TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

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September 20, 2010



INTSORMIL TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

WEEKLY REPORT

PROCESSING

Dr Bruce HAMAKER , the US Processing Project Coordinator, Mamadou DIOUF, the Project consultant from Senegal and Mme DEMBELE Yara KOREISSI , the IER's Project coordinator travelled to Mopti and Bandiagara from September 5-8, 2010 to evaluate and appreciate not only the complementary works (upgrading the processing units themselves, the smoke evacuation system, and the water refreshment system of equipments and the replacement/fixation of pulleys) but also to plan the next steps of the project.

IER is ready to contribute for about 1.152.275 FCFA out of 6.791.666 FCFA to build an incubation center at the food processing laboratory (LTA), CRRRA Sotuba. This center will be unique in Mali and will insure

the development of technology, the optimization of process, entrepreneur training, technology support activities and market testing. The equipments to be used in the center are agglomerator, steam cooker, clod crusher, de-stoner, sifter calibrator, batcher filler, extruder, drier and toolbox. A workshop will be planed as soon as the center is built and the equipments installed.

October 6, 2010



INTSORMIL TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

WEEKLY REPORT

PRODUCTION MARKETING



Good news from the farmers' associations at Kolokani growing the improved sorghum cultivar Seguifa. Activities started in this location in 2008 with 50 ha of the improved cultivar and the best farmers harvested 2 tons/ha in average and the acreages were doubled in 2009. Because of their performance, the sorghum growing associations was awarded this tractor by the county representative to help them grow more sorghum in the area. Thanks to Production Marketing Project.

DÉCRUE SORGHUM

Rainy season is progressing towards its end. Sorghum start losing leaves in Goundam suggesting that physiological maturity will occur very soon. This information is conveyed by Amadou DIALLO, the student posted in Goundam.

October 12, 2010



INTSORMIL INTSORMIL: TRANSFER OF SORGHUM, MILLET PRODUCTION, PROCESSING AND MARKETING TECHNOLOGIES IN MALI.

WEEKLY REPORT

PRODUCTION MARKETING

Dr Niaba Teme, attended a farmer's field visit led by the Ministry of Agriculture in Kountogoro village, Koporo Na County, Mopti. The objective of the visit was to assess the state of the ongoing cropping

season in Seydou Togo's farm, a member of the Production Marketing Project. Other members, women and men, of their farmer's association came out in number to welcome the Ministry of agriculture who was accompanied by its National Extension Agency (DNA) Deputy Director, Mopti DRA Director, IER General Director, National Plant Protection (OPV) Director and hand full of technicians. Seydou Togo told the ministerial delegation that the Production Marketing Project of INTSORMIL is for them because it provides them with technical assistance, quality seed, fertilizer, and clean product leading to market opportunity and this is why his field has already received the visits of many farmers in the surroundings. Seydou Togo asked the ministry to advocate millet and sorghum growers' inputs subsidy case in the presidential cabinet meeting. The Ministry thanked all the participants and told them they are on the right target because crops are doing well. The president of Mali is targeting 10 million tons of cereal crops grain by the year 2012 and INTSORMIL can play a great role in the achievement of this objective.

Success Stories



SUCCESS STORY

Millet Technologies Increase Food Security and Farmers' Incomes



Photo by Ouendéba Botorou

The head of the millet farmers' association in Tingoni. The new millet cultivar "Toroniou" introduced under the IER-INTSORMIL project, sponsored by USAID, has helped the 100 members of the association to improve their production, to become more food secure and to increase their revenues.

"Before 2006, we were not self-sufficient in millet because the yields were very poor. But thanks to the introduction of the "Toroniou" cultivar from the INTSORMIL project farmers are becoming more skilled in millet production. Now many farmers in this village are able to meet their home consumption in millet and make more money." Siriki Diarra, president of the cooperative "Yeretaton" for millet production in Tingoni, expressed his appreciation for involvement in the IER-INTSORMIL project financed by USAID-Mali.

Millet is the main crop grown and consumed in the village of Tingoni. However, average yields of the local variety were usually low, no more than 0.8 to one ton/ha in good years. Farmers could barely meet their family home consumption. Continuing soil depletion in the village and the lack of access to credit for fertilizer resulted in low millet yields. Since 2006, the Production-Marketing component of the IER-INTSORMIL project has introduced a millet cultivar "Toroniou" and has trained Tingoni farmers in the use of improved agricultural techniques and marketing strategies to increase millet productivity, prices, incomes, and food security.

In 2009, a year after their graduation from the project, farmers' yields for the improved cultivar were still high. Yields average 1.5 tons/ha and reach 2.3 tons per hectare for the best farmers.

These yield achievements have no precedent in the village. Farmers used the increased income from millet to satisfy their household consumption requirements, meet family expenses and buy clothing and other gifts for women and children.

Moreover, producers in the association earned more income by following the marketing strategies. Bargaining power has increased and strong marketing ties established with food processors and other institutions. In 2009, the cooperative sold 35 metric tons of millet at a price premium of \$0.31/kg to the World Food Program (WFP) and Mme Deme, a millet food processor. At that time the millet price was \$0.26/kg in the local market. Thus, a net gain of \$1,750 was earned by the cooperative from the price premium. This gain was shared with members and the farmers association continued to use their rotating fund for fertilizer purchases in 2010. Also, in 2010 eight new farmers' producer associations with 50 to 200 members planted 500 ha under the new technologies. USAID/Mali funded project IICEM and Global 2000 coordinated the development and implementation of this scaling up of the Tingoni model. IER and INTSORMIL were involved as technical consultants.



SUCCESS STORY

USAID Sorghum Project Increases Productivity and Incomes



Photo by: Soukalo Boutare

Mr. Seydou Kone in his field of the new sorghum cultivar “Grinkan”. He is very proud and determined to continue to be a model of success in the adoption of the INTSORMI techniques supported by USAID.

Mr. Seydou Kone, a 44 year-old sorghum farmer from the village of Garasso in the region of Sikasso is a very hard worker and dedicated farmer. However, in his field, yields of the local sorghum variety have never exceeded 1.2 MT per hectare. In 2008, when he heard about the increased productivity made possible by the adoption of a new sorghum hybrid variety “Grinkan”, he saw, as many other producers in Garasso, a great opportunity to improve his sorghum productivity.

Through the technical assistance provided by the NGO AMEDD, Mr Seydou Kone remarkably improved his technical skills regarding sorghum production. First and foremost, land preparation is an essential first step in his crop management. He uses water harvesting techniques to increase the soil moisture and improve the response of the sorghum cultivar to the use of inorganic fertilizer. Organic fertilizer is used during land preparation and the seeds are sowed on ridges. The use of inorganic fertilizer in the form of Di-Ammonium Phosphate and urea provides all the nutrients necessary for plant growth. A big technical innovation is the implementation of plant thinning. Every year, this agronomic practice is performed on the basis of two plants per hole as suggested in the technical recommendations.

The rigorous application of these agricultural practices has helped Mr. Kone to make impressive yield gains. Indeed, in 2009, he was the best sorghum farmer in the village and achieved a yield of 3 MT per hectare, almost three times what he was able to harvest under the traditional technology. Mr Kone is a model of work achievement in the village and an inspiring example for other producers willing to adopt the new sorghum technology. With the adoption of sorghum technical innovations, his household grain consumption has improved, and as it has never happened in the past, sorghum is now used as a source of cash income. The profit resulting from the sales of sorghum is evaluated at \$708 per hectare. This income has helped Mr Kone to meet the necessary household expenditures and improve his family's standard of living through the purchase of a new means of transportation and some housing improvements.

Mr. Kone is highly grateful to the USAID supported INTSORMIL project and AMEDD and said that "Now with sorghum, producers are able to have some cash income thanks to the project. Sorghum is going to truly represent an alternative source of cash income to the downturn of cotton production in the village."

Producer/Processor Networking Workshop, Bamako, November 10-12, 2010

Objectives of the Workshop

- 1) Begin building a network between the eight new farmers' organizations producing clean millet in the Segou region and the millet food processors in Bamako;
- 2) Bring in the food scientists from INTSORMIL, ITA, and IER to discuss the importance of clean cereals and requirements for other markets for sorghum and millet for the various development agencies (Global 2000, AMEDD, IICEM, DRA);
- 3) Panel discussions with Tingoni farmers' organization (the model for this expansion) and millet food processors on how to build these ties between the farmers' associations and the millet food processors .

Program

November 9.

Participants arrive in Bamako from farmers' villages and from north for the five food processors of Hamaker's program.

Moderator: Diourte Mamourou

November 10.

8:15-8:30 Bino Teme offers opening remarks

8:30-8:45. USAID Rep explains AID program

8:45-9:00. E. A.Heinrichs, Assistant Director, explains the INTSORMIL program

9:00-9:15 Jean Francois explains the IICEM program in the region

9:15-9:30 Abou Berthe explains the Global 2000 program in the region.

Technical presentations

Moderator: Ndoye Ababacar

9:45-10:30 L. Rooney, Texas A&M. Creating Value Chains for Clean Cereals and Bread Production Issues.

10:30-10:45 Coffee

10:45-11:30. Sanders and B. Ouendeba, Creating Networks between Farmers' Associations and Millet Food Processors: Experience in the Project

11:30-12:15 B. Hamaker, Purdue. Applying these value chain concepts in Mali and other Sahelian countries: Problems and Prospects

12:15-1:30 Lunch

Moderator : Jean Francois Guay

1:30-2:15 Ababacar N'Doye, Director of ITA. Applying these value chain concepts in Senegal.

2:15-3:00 Dick Cook, IICEM, Value Chain Experience in Nigeria and how IICEM will apply that in Mali.

3:00-3:30 Coffee

3:30-5 Discussion of the program

November 11

Moderator Berthe Aboue

8:30-10 Round table discussion with representatives from Tingoni farmers' association and one of the new farmers' associations, Mme Deme, millet food processor, and Bougouna Sogoba from AMEDD, Koutiala. Topic. Setting up a Network in which both farmers and food processors benefit.

10-10:30 Coffee

Moderator Bougouna Sogoba

10:30-12. Panel discussion of Farmers, IICEM, Global 2000 and INTSORMIL Field implementation problems and resolving them in 2011. Improving the agronomy and getting the inputs on time. Bache and bag issues. Storage. Farmers' associations making contacts with the processors later in the year.

12-1:30 Lunch

1:30-3:00 Panel discussion. Millet food processors from Bamako and the north tell about their requirements, the value premium for clean seed and what they are prepared to do to get this network started.

3:00-3:30 Coffee

3:30-5 Group Discussion.

November 12

7:30. Leave by bus to visit millet farms and storage sites.
Box lunches provided.

17:00 return to Bamako

Production – Marketing Activities

John Sanders, Purdue University

Increasing the Incomes of Malian Sorghum and Millet Producers

May 26, 2010

John H. Sanders

Botorou Ouendeba

Niaba Teme

For the past six years the Production-Marketing project under the INTSORMIL program has been focused on getting new sorghum and millet technologies onto farmers' fields. In the summer of 2010, assuming the proposed bank financing comes through, there will be 4,340 ha involved in six major sites with approximately that number of farmers involved. There is a mistaken conception that sorghum and millet are subsistence crops and that farmers either will not use improved inputs or they cannot make money with improved inputs on these crops. Conventional wisdom is to avoid purchased inputs on sorghum and millet because they are subsistence crops. Unfortunately, low inputs result in low outputs. Moreover, soil fertility constraints are pervasive in Mali especially where these two cereals are the primary food source.

Increased inorganic fertilization is a prerequisite to any strategy to increase these crop yields. This fertilization is combined with improved fertility responsive new cultivars, better agronomic practices, and the introduction of a water harvesting technique. The Production-Marketing project of INTSORMIL has shown in Mali that sorghum and millet are not only responsive to inorganic fertilizer but also that this intensification can be highly profitable to farmers especially when combined with improved marketing practices and the development of farmers' organizations. Banks and farmers are increasingly willing to use bank credit to finance these input purchases for sorghum and millet production.

The basic premise of this program was that substantial new technologies exist for these crops. These technologies include new cultivars, moderate inorganic fertilization, and improved agronomic practices. What has been lacking has been a concern with and strategy to respond to the three principal price collapses reducing the profitability of these basic staples. Prices collapse at harvest as farmer are pressed to make a series of expenditures at that time. Prices collapse in good and sometimes even normal years as there is just so much of the staples that people can eat so new markets to put floors under staple prices or to provide value added are needed. Finally, governments often intervene in bad rainfall years when prices start going up with food aid or subsidized food imports. Putting short run consumer interests over those of producers can have a long run deleterious effect on farmers' incentives to use inputs and to make investments in their agricultural activities. So with our marketing strategies we operate on as many of these price collapses as possible. The consequence is that we increase the profitability of farmers' investments in increased input use. Not using enough inorganic fertilizer is similar to telling poor people that they should eat less. Plant nutrients are essential to any strategy to increase yields.

We now have substantial experience in introducing the combination of new technologies, marketing strategies and farmers' associations that evolve into marketing cooperatives. When the marketing strategies are introduced with the new technologies, they give farmers a price premium to pay for the higher input use required for the inorganic fertilizer, seeds and "bache" (plastic or tarp put on the ground to keep the cereal clean during threshing and thereby obtain a price premium from food processors). Moreover, the higher yields also help to pay for higher input use. Farmers following recommendations double to triple yields and get prices 20 to 50% higher than prices other farmers receive at harvest time (see our evaluation bulletins for 2005-2008. We should be able to do much even better on the price side in the future as more farmers follow the different components of the marketing strategies.

To implement the project we meet with farmers' groups in specific sites considered to be good producers of sorghum or millet. We attempt to get 50 ha in each village group with approximately one farmer/ha. Through the farmers' groups farmers receive fertilizer and improved seeds and financing for the water harvesting technique. Farmers are required to reimburse the farmers' group with grain at the harvest price. With this grain repayment and any additional grain individual farmers want the association to sell for them the farmers' group follows the program recommendations of

selling later in the season. These funds then go into a bank account to create a rotating fund for the farmers' group to continue input purchases the next year. The farmers' groups by buying and selling in quantity also have increased bargaining power. This results in a greater discount for fertilizer purchase and an increased price premium for selling the grain staple.

For the progress in developing and expanding this program see Tables 1 and 2 below.

Table 1. Malian Area in New Technology for the 2007-2009 Crop Years

Crop	2007	2008	2009	Village Site
Sorghum	48	50	69	Kaniko
Sorghum	--	50	150	Garasso
Sorghum	48	100	160	Dioila
Sorghum	56	100	100	Kafara
Sorghum	--	--	50	Zanzoni
Sorghum	--	50	110	Kolokani
Millet	150	150	150	Tingoni
Millet	--	--	60	Bankass/Pissa
Millet	--	--	60	Douenza/Wallo
Sorghum	--	--	75	Diankounte Camara
Total	302	500	984	

Source: Unpublished data from the field trips visiting the farmers' associations in the various regions.

Table 2. New areas in the Production-Marketing Project and in associated projects with IICEM for 2010 and areas in these same regions in 2009

	New (ha)	Old (ha) ¹	Total (ha)
Koutiala			
IICEM-AMEDD	2500		2500
P-M Project		270	270
Tingoni			
IICEM-Sas.2000	500		500
P-M Project		110	110
Faso-Jigi-Segou			
P-M Project	100		100
Mopti			
P-M Project	300	120	420
DRA			
Kolokani			
P-M Project	60	110	170
DRA			
Kayes			
P-M Project	195	75	270
DRA			
Total	3655	685	4340

Besides avoiding sales at harvest another important component for insuring profitability is the development of new markets. For millet this is the rapidly increasing processed food market in the urban areas. Millet farmers in the Production-Marketing project target their sales to these food processors. These millet farmers thresh on tarps (“bache”) or with mechanical threshers and thereby reduce the 13% impurities (food processors’ estimates) of grain sold on the markets. In turn the millet farmers demand a price premium of around 20 FCFA/kg for their clean grain. Clean grain is essential for establishing product quality and protecting the machines of the millet food processing industry.

For sorghum there is a secondary market for good and normal rainfall years. In these years food buyers of millet and sorghum can buy all their cereal requirements. Then the excess sorghum competes with maize as a feed for the

¹ Note that a fundamental component of the Production-Marketing project is to provide input credits that have to be repaid to the farmers’ cooperative in kind at harvest. The farmers’ coop holds on to the cereals until the post harvest price recovery. Then they are sold and these funds become a rotating fund to provide these credits in subsequent years. So we expect the old areas to continue the program so they are included here.

rapidly expanding intensive broiler and egg producers. Non-tannin² sorghum has 97% of the feed efficiency of maize (Joe Hancock, poultry nutritionist, communication). Therefore, at prices less than 97% of the maize price as during 2008 in Mali poultry producers should substitute sorghum for maize in the ration. This secondary market puts a price floor for sorghum when otherwise the excess cereals would lead to a price collapse.

The project is also using its ties to INTSORMIL to provide technical expertise to the food and feed processing sectors. Moreover, we facilitate the contacts between these companies and the farmers' groups with which we are involved. This negotiation process takes time to develop because the processors are used to dealing with individual farmers and the farmers' organizations now have more bargaining power. The food processors often resisted paying an adequate price premium to cover the increased value of the grain. But over time this price premium has been increasing.³

In conclusion sorghum and millet are no longer only low income food staples. There are important expanding markets for processing them (millet food products and poultry feed rations). New varieties available from national research activities respond well to inorganic fertilizer. Higher input use on sorghum and millet, combined with better marketing and institutional evolution of farmers' associations, leads to high outputs and profitability. The yield increases from the combined improved practices consistently increased incomes while maintaining household food security. Moreover, several components of the technology package and the marketing strategies reduce the risk of higher input use.



Head of farmers' association in Tingoni with Toroniou millet cultivar.

**Progress report- Early Crop Season 2010
Based on a trip report by Botorou Ouendeba and Niaba Teme
19 June- 12 July, 2010**

This is a report on the trip of B. Ouendeba and N. Teme throughout Mali during the period June 19-July 12. This is based on the reports of both Ouendeba and Niaba and extended conversations with Sanders during the trip. The report is composed of accomplishments, plans for the rest of 2010 and identified problems that we need to work more on. We focus on the three principal regions for our activities in 2010, Koutiala, Segou, and Mopti.

² Most of the traditional and all of the improved sorghum cultivars are low or non-tannin in Mali (Abdoulaye et al, 2006, pp. 8,9). Nevertheless, buyers of sorghum for the cereal in the ration can avoid the mixing with tannin cultivars in the open market sales by buying from the farmers' associations in the project.

³ For calculation of the increased value of the grain or the maximum food processors see Abdoulaye et al, 2007.

Regions

Koutiala. With the dramatic success of Grinkan in Garasso in the last two years, a field day was held in 2009 and the decision was made that it was time with IICEM backing to look for a substantial scaling up. Input financing was discussed with IICEM and we emphasized that we preferred not to have loans with more than 15% interest and with repayment periods several months after the harvest so that farmers were not forced to sell their sorghum at the lowest price point immediately after harvest. Then we met with two banks in Koutiala. BNDA was willing to provide credit for 10 months at 15% annual rates. IICEM agreed to guarantee the loans. Initially AMEDD estimated that 2500 ha would be involved through farmers' associations but BNDA wanted to check farmers' credit histories. Due to a misunderstanding with AMEDD personnel coordinating the activities, the BNDA still had not released the money at the time of this field visit. Ouendeba, Niaba and Bougouna, the Director of AMEDD, then visited the regional director of BNDA, who repeated what he told the AMEDD technicians. BNDA would provide vouchers (not cash) directly to the farmers' associations, with which they could buy the fertilizer from the dealers. The fertilizer price would include transportation. This is a much better arrangement than releasing money to either AMEDD or the farmers' associations. The farmers' association representatives immediately began picking up the vouchers in the BNDA branches. The latest estimates of area (ha) is 1836 ha and 1,639 farmers but this is undoubtedly too high for the recipients of the credit. The Production-Marketing project will seek to verify in August how many farmers' associations were able to obtain the vouchers and when the fertilizers arrived.

Two of the principal objectives of Production-Marketing are a rapid scaling up and turning input financing over to banks once we have demonstrated the profitability of the production and marketing practices in the region. So we have a good start in 2010 on this scaling up and making the bank contacts. Unfortunately, the system did not work well in 2010 but the BNDA lending scheme is excellent and we just have to make it operate more smoothly and earlier.⁴

Greater Tingoni, Segou region. Similar to Grinkan in Garasso for sorghum has been Toroniou for millet in Tingoni. Millet is produced in more difficult conditions so best farmer yields are lower (1.5 to 1.9 tons/ha as compared with 2 to 2.5 tons/ha for Grinkan) Nevertheless, millet yields more than double traditional farmer yields and the combined production practices are highly profitable especially when combined with better marketing practices.

Sasakawa Global 2000 had done substantial organizational activities in identifying 8 new farmers' associations with 50 to 100 ha in each and a total of 500 ha. Farmers in the greater Tingoni region had been asking for the last three years for an extension of the program. As in Koutiala there was a last minute crisis. Kondo Jigima was not one of the banks receiving loan guarantees from IICEM. So at the last minute no financing was provided. Ouendeba and Niaba helped Dr. Abou Berthe of Global 2000 resolve this problem. Then Global 2000 immediately contacted the fertilizer distributor, Amadou Ongoiba, and that process of getting fertilizer to the farms has been accomplished.

Mopti region. Various regions of concentrated millet production are still in the pilot project stage. We will have 300 new ha in 2010 and continue with the 100 ha from last year. We are including here the modification for the participation of women pointed out in the field interviews of Jeanne Coulibaly in the fall of 2009. We had been introducing this project 50 ha at a time. Then we began introducing 50 ha for men and 10 for women. We asked that participants produce on 1 ha or ½. This was much more land than women had access to in their private plots. Now we are asking that the women form associations working with the men but divide up the land according to the land area that the women have direct control of, usually 0.1 to 0.2 ha in their private plots. We will again evaluate how this is working during this crop season.

The Mopti region now has strong support from the regional agriculture director (DRA) in Mopti and he traveled to the sites with Ouendeba and Niaba. All the inputs were provided on time and the farmers have been planting the improved millet (Toroniou) package in most sites when they were visited.

In the marketing strategy the principal price problem that we first focus on avoiding is the harvest price collapse. So farmers' associations need to have local storage facilities to be capable of waiting until prices recover for the price recovery. We are collaborating with IICEM in facilitating the construction of local storage facilities. In all five sites the farmers' associations were organizing to provide the labor and IICEM has begun their evaluation for supplementary financing (doors, windows, roof, floor) for the storage facilities.

The second component of the marketing strategy is value added by producing a millet with a uniform cultivar and cleaner from not threshing on the ground. The next step with this scaling up of millet production is to strengthen the contacts between these associations and the millet food processors. By producing a uniform and cleaner millet (getting threshing off the ground) farmers are able to get a value added price premium from the food processors. Food processors are agreed that a clean, uniform grain supply is critical for them. Food processors do not always agree that they have to pay for this higher quality product. But the farmers' associations enable a wider evaluation of markets and give market power by selling in larger quantities. Bamako producers are paying a price premium of 10 to 20 CFA/kg. In Ouallou (Mopti region), farmers are selling their millet at 165FCFA/kg (Oumar Guindo, the DRA field Technician in Ouallou). Guindo reports that their millet is getting a better price because it is cleaner and more uniform compared to the millet on the market.

Kolokani and Segou (with Faso Jigi). We are expanding the activities in Kolokani by 60 ha and initiating activities with the NGO Faso Jigi of 100 ha. In both cases the new sorghum cultivar in the technology marketing package is Seguifa.

We were late with the fertilizer but fortunately Seguifa needs to be planted late. Farmers have now all received their inputs. Kolokani is an example of excellent collaboration with a strong local DRA. As in Mopti we are coordinating with IICEM to obtain support for improved storage facilities.

Faso Jigi, a large farmers' organization, has good access historically to bank loans for essentially consumption purposes. So by demonstrating the importance of the combined package we seek to convert these loans to production loans tied to program implementation.

Kayes. Our plans were to increase the area here by 195 ha. We already have had the last two year 75 ha in Diankonte Camara. Unfortunately, with all the focus on scaling up in the two prime areas of Koutiala and Segou we have had to put off this extension until 2011.

Discussion on Sorghum Cultivar Requirements for the Production-Marketing Project

One of the objectives of on-farm technology diffusion is to give feedback to researchers on what works. In 2010 we will be in our 7th year of putting technologies on farms. During most of that time we have been involved in three countries with a more recent concentration on a substantial expansion in Mali. Our basic operating philosophy is that you can not get sustained and significant yield increases without moderate to high use of inorganic fertilizer combined with varieties that respond well to inorganic fertilizer.⁵ To pay for this higher fertilization it is necessary to confront the basic problems of all staples in developing countries, ie 1) At harvest times prices collapse because farmers need to make a series of expenditures and have limited access to storage; 2) In good and even normal years prices collapse after those with sufficient incomes buy all the staples they can consume; 3) Governments in developing countries become concerned about staple prices for urban consumers when prices increase rapidly in poor rainfall years and governments often intervene to drive these prices down.

By developing marketing strategies to respond to these sources of food staple price problems we insure that farmers can pay for the increased expenditures on inorganic fertilizer and higher quality seeds and still make money. Besides the technologies and marketing strategies we also develop farmers' associations, which then become marketing cooperatives engaged in assembly, storage and product selling for higher prices for their members and buying and distributing inputs in quantity to reduce their costs.

In the introduction process we have learned a series of things about the cultivars responding best in these improved environments. The new cultivars should not be tall and should not lodge with increased fertilization. Farmers recognize that the grain has a much higher value than the forage and that the shorter, squatter plants put more of their energy into grain production and less into leaves and stems. This is the basic physiology research of the '50s, which became the center piece of international center development of the Green Revolution for wheat and rice. The economics part was the falling inorganic fertilizer price since the First World War enabled a much higher fertilization and therefore put a large premium on the development of shorter, squatter cultivars.

Many have confused drought escape with drought resistance and argued for introducing earlier and earlier cultivars. Since drought has many forms and with improved practices including water retention techniques we are responding to some of the drought risk we do not want early cultivars because then they have less time to respond to the higher input levels employed. In summary, so far we look for intermediate height and season length cultivars.

Now for some specific adaptation to Mali. Caudatums have much higher yield potential than Guineas because of the densely packed heads. Caudatums are predominant in the US. In Mali late rains have chronically produced a combination mold-headbug problem.⁶ INTSORMIL tried unsuccessfully to look for resistances in Caudatums to get around this mold-headbug problem. Most Malian sorghums are Guineas, which have more open heads and thus dry sooner and are more difficult for the headbug to multiply but yield substantially less than Caudatums. So what works best in Mali for avoiding the mold-headbug complex, but also substantially increasing yields, are the crosses between Guineas and Caudatums. We are definitely not interested in tall Guineas as they lodge and yield poorly with increased fertilization.

⁵ Water retention techniques are also included to increase the returns and to reduce the risks of inorganic fertilizers.

⁶ Also developing early Caudatums for drought escape aggravated the mold-headbug problem. Our present field recommendation is to plant these early materials, such as Seguifa late, thereby negating the desired effect of earliness in overcoming late season drought but avoiding the headbug-mold problem.

Some pictures are included of two different combinations of Guinea and Caudatum both developed by Acar Toure of IER, Mali. Niatitiama has been very successful in Kafara but the seed quality issue has still not been resolved. Grinkan has been an outstanding success in the cotton area of Koutiala and we will be attempting to substantially increase the area in Grinkan in 2010. It is too early for hybrids in most sorghum regions as farmers still need to be convinced of the need to pay higher prices for improved cultivars and to buy annually but the next step in the regions with the successful introduction of these improved Caudatum-Guinea crosses will be the introduction of hybrids.

Farmer and AMEDD NGO Agent with Grinkan, summer 2008



Production-Marketing Project Collaboration with Sasakawa Global 2000 In Farm Level Activities in the Segou Region, 2010 Crop Year

Introduction

The key components of the Production-Marketing project in the crop year of 2010 are the significant expansions of crop area in the two pilot regions with the most success. In the Koutiala region the Grinkan sorghum cultivar has consistently given yields of 2 to 3 tons over the last three years for farmers following recommendations. The national development bank has become involved with the help of IICEM and AMEDD and will be providing credit to farmers' associations in the greater Koutiala regions.

The other region of success has been in Tingoni outside Segou with Toroniou, a millet cultivar. Here best farmer yields have been in the 1.5 to 1.9 ton/ha range and there has been a price premium from the millet food processors available making this moderate yield improvement even more profitable. The objective here has also been to phase out our direct financial involvement for input credit and to get bank involvement. Global 2000 has shown a high level of commitment to this project and has organized 8 new farmers' associations with between 50 and 100 members in each. Seed was provided and farmers were organized by Sasakawa and the farmers' associations were waiting for the bank loans. One of

the prime facilitators in getting bank involvement has been the willingness of IICEM to support our project by providing loan guarantees. For some reason one of the negotiating technicians approached the wrong bank without the loan guarantee provision and at the last moment the bank has done nothing. To maintain momentum in these farmers' groups we are paying for the fertilizer and Sasakawa 2000 is paying for the other components of our normal farm level organization, ie the seeds, monitoring and the "bache" (canvas on which the threshing is done to maintain clean grain).

Work plan

The Production-Marketing project with Global 2000 and the DRA of the Segou region will collaborate in program expansion onto approximately 500 ha in the greater Segou region. This program includes new technologies (improved seeds, moderate inorganic fertilization, a water harvesting technique and improved agronomy), the introduction of improved marketing techniques, and the development of farmers' associations into marketing cooperatives. The contribution of the Production-Marketing project has been in the development and implementation of this model or pilot project in collaboration with IER, Global 2000, and the DRA of the Segou region. We will continue to support this expansion in the summer of 2010 with field visits to the farmers' associations, the farms and the collaborating agencies. In 2011 we expect to substantially expand this area and to include a bank with a loan guarantee from IICEM so that bank financing is assured.

Ph D Prospectus by

Jeanne Coulibaly

INCREASING WOMENS' WELFARE IN MALIAN RURAL HOUSEHOLDS WITH AGRICULTURAL TECHNOLOGIES

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Chair:

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Dr. Paul Preckel

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Study Objectives

- Estimate the impact of new agricultural technology and marketing strategies on the household's income
- Evaluate the impact of new technologies and marketing strategies upon income distribution within the household focusing on the effect on women's welfare
- Evaluate the effect of induced institutional change from the introduction of new technology on women's welfare and also identify policy alternatives to increase the welfare of women.

Study Areas

The areas of focus for this research are the regions of Sikasso and Segou located in the Sudanian zone of Mali. In those regions, the districts targeted are Koutiala for the region of Sikasso and Tingoni for the region of Segou. These districts have been very successful since 2007 with the adoption of sorghum and millet technological packages proposed by the IER-INTSORMIL project. The main crop produced in Koutiala is cotton while watermelon, cowpeas and millet are chiefly grown in Tingoni. In Koutiala, the current traditional technologies used for cotton and maize employ improved cultivars, inorganic fertilizer and chemicals for the control of insects. Other crops used limited amount of inorganic fertilizer. In both districts, women traditional crops include cowpea, peanuts and vegetables mainly okra. The coarse grains are traditionally used for the family consumption but with the introduction of new technologies through the IER-INTSORMIL project, sorghum and millet are becoming cash crops like cotton and watermelon.

In southern Mali, particularly in the district of Koutiala, the subsistence farming system has changed in the seventies with the introduction of cotton with new technologies. In the 1980s, substantial income gains were made with cotton that moved the traditional system to a cash economy. Since 2000, cotton revenue and production have been set back by a series of factors that led to a large reduction in the household's income from cotton. Thus, before the present introduction of new cereal technologies, the reductions of income have pushed family members to more concern with basic subsistence and to maintaining what they have come to regard as necessary household expenditures. We expect that with the increased incomes from the new technologies the conflict over the increased income streams will renew.

In the district of Tingoni, the subsistence system became more commercially oriented during the past few years with the introduction of watermelon and cowpeas as cash crops to diversify the existing sources of income. So, before the adoption of new technologies for millet, watermelon and cowpeas were the main sources of cash revenue generated in the household.

The effect of new technology on the household income will be evaluated by introducing yield improving inputs and a new marketing strategy on the communal land. Since 2007, households have adopted new technological and marketing innovations under the IER-INTSORMIL project in order to increase their income. The technology packages are high-yield inputs composed of moderate levels of fertilizer, improved seeds of sorghum "Grinkan" in Koutiala and millet "Toroniou" in Tingoni. The marketing strategies consist of storing the grain at harvest and selling the stock when prices are recovering. We will also look at the credit constraint associated with the introduction of new technologies. With the use of higher level of agricultural inputs, households can be credit constrained. The availability of credit from lending institutions may therefore benefit farmers, make their production more profitable and promote technology adoption.

In this farming economy, the household head controls the family labor allocated to those plots by defining the amount of time spent by adult household members including women. They are compensated for their work by receiving a daily subsistence allowance in cereals. This subsistence allowance can be supplemented with some gifts especially for women or cash payments depending on the size of the profit. The necessary household expenditures are also paid by the family head. In larger farms, the family head can also hire outside labor especially during the peak labor season such as weeding and harvesting. Household members can work on their private fields after meeting their work obligation on the communal plots. Women are the main managers of their private plots and control the income generated from these fields. At certain times of the year women can also find off-farm work.

Data Collection

Data will be collected through household survey in two of the project's most successful villages which are Koutiala and Tingoni. Data will be collected for the situation with and without technological change as the intensive technologies have not been applied on all cropping parcels of farmers' exploitations. Data will target yields of the main agricultural crops per quality of land, harvest and post harvest prices for these crops, quantity and cost of inputs used as well as storage costs. Household consumption and expenditures will be gathered as well.

Information regarding off-farm wages, transaction costs (distance to the market, travel costs), bonus or incentives paid to household members on farm at harvest, labor allocated across cropping seasons on the communal, private plot and the off farm employment, socio-economic characteristics of household members will be reported.

Already existing data collected by Baquedano and Sanders (2009) and those reported in the annual Intsormil-IER bulletins will also be used. Some secondary data on time series yields and prices for the crop commodities investigated in areas under study will be collected from the Famine Early Warning System (FEWS) in Bamako (Mali). These data will be useful in analyzing the distribution of the state of nature for yields and prices.

REPORT ON WOMEN'S PARTICIPATION IN THE IER-INTSORMIL/ USAID-MALI MISSION PRODUCTION-MARKETING PROJECT

Jeanne Coulibaly
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In 2009, women have been integrated in the production-marketing component of the IER-INTSORMIL project in Mali. The goal is to help women to benefit from the adoption of new technologies which are likely to impact positively their welfare as well as the whole household's well-being. Thus, this report gives an evaluation of women's participation and gains in the program for the 2009 agricultural campaign. The extent of their involvement in the project sites, difficulties encountered, as well as their traditional role in the agricultural production system will be detailed. Women's situation in the southern cotton zone presents many similarities across villages in this region but differs in some extent from the northern soudano-sahelian sites of the project. So, the analysis of women in the different villages of the cotton zone will be combined and contrasted from that of the sudano-sahelian zone.

The sites in the southern Sudano-guinean agro-ecological zone are represented by some villages in the districts of Koutiala, Dioila, Kolokani and Baraouili (Tingoni). The northern Sudano-sahelian site concerns the village of Oualo in Mopti region. In all those sites, 10% of the areas planted in 2009, have been allocated to women.

In the southern villages, women involved in the program are generally the first spouses of men already members of the project. Following the instructions of the project, every woman participating in the project has been allotted 1 ha of land by their husband or the household head to be under their own control. However, the interviews made with some women reveal a lack of effective management of the inputs and control of their harvests. Most of the time, women don't have any knowledge of the quantity of fertilizer and seeds borrowed from the cooperative and used on their plots. In fact, the management of these inputs is realized by their husbands. These latter ones control the output of women's plots as well. Women are just used as labor on the plot supposed belonging to them but don't manage the inputs neither the outputs. The hectare allocated to women works more likely as an extension of men's area under the program. As a proof, during the survey when men were asked about the areas cultivated under the project, they include women's area on their total area cultivated very often. Hence, by registering the land under their wives' name, men gain greater access to land than the project allowed.



Jeanne Coulibaly, Purdue PhD student (L) and Niaba Teme, IER sorghum breeder (R) in a discussion with farmers of Douentza Village, Mopti Region

Women in those villages are strongly influenced by the traditional farming system where the household head is the main decision maker regarding participation of adult household members including women in farming activities. In the traditional farming system, the household head is the decision maker regarding family members' labor allocation on the communal plot and the private plots. Social and religious customs prevailing in a given household dictate the extent of women involvement on the communal land. This varies from no work on the communal land or part employment only during the peak labor demand season that are planting and harvesting to a full employment throughout the agricultural campaign. Indeed, even though some families exempt women from participating in the communal work, many other households require women to be engaged in all agricultural activities. Thus, they perform the same tasks as men except for the heaviest works (land preparation or carrying heavy wood). Older women are not required to be involved in the communal work; they are also prevented from the domestic house work.

During the time of cotton prosperity, women used to be remunerated after their work on the communal plot. They were compensated in nature with some cloths "complet de pagnes", shoes, baskets of cereals or cash income. However, these days, with the cotton crisis, some of them don't perceive any payment while others are only compensated in-kind with some grains. Despite this reduction in their wages, women still allocate the same amount of time on the family field. Under a strong influence of social customs, they don't claim any compensation, or increase in their payments after their work on the communal land. They believe that they still have to participate on the communal field to help the household producing the subsistence food necessary for the family's consumption.

Women are granted an average of two days off from the communal field during the week. They are allowed to work on their private plots after performing their tasks on the communal field or during the days off from the family land. The allocation of private plot depends on the land availability and the age of the spouse. Generally younger spouse are less likely to have access to a private plot. Women with private plots usually grow rice, cowpeas, groundnuts, and some vegetables (tomato, okra). The areas of these private plots are very small, no greater than 0.25 ha on average. These are marginal lands of poor quality compared to the family land. Any attempt to increase women's private plot might not be successful because of the land constraint particularly in Koutiala. In some villages of this community such as Kaniko,

there is a land constraint due to population growth and agricultural mechanization which have led to a decreasing land-people ratio. Women are self-employed on their private plots or use their children's labor (usually children under the age of 15) as help for their activities. The output from this plot is under women's control and is used either to complement the family food, to provide for the children's clothing or for women's own financial needs.

Besides working on the family's land and private plots, during the peak labor harvesting period, women organize themselves into some gender work teams and contract their labor with some farmers for the communal field activities. The group gets in return some wage payments in cash or in nature with some baskets of grains.

The assets commonly held by women in the household are represented by small ruminants (goats and sheeps). These investments are built on the savings made from the sales of the private plots output, small trades of shee butter or other off-farm activities. Very few off-farm opportunities exist for women, especially for those located in the villages far from the main town. Also, the burden of the domestic work represents a time constraint for their participation in the off-farm labor market. Hence, it is common to see that apart from the weekly sales of vegetables at the village market, women are not involved in any off-farm employment activity. The actions identified by women to increase their income are the access to some farm equipments particularly for plowing and the development of small businesses.

In the sudano-sahelian site of the program represented by the village of Oualo, 40 women are involved in the project in a total of 10 ha. Majority of women involved in the project has been allocated 0.25 ha of land; very few were given 1 ha of plot. This allotment of smaller size of land to women is not justified by a land constraint in the area but rather by a time constraint facing women. Men argued that their wives might not have the time and labor required to cultivate individually 1 ha of land. They face a time constraint due to the domestic work load and their participation on communal and private field activities.

In this village, women have a greater control of the inputs used on their areas under the project. They have good knowledge of the quantity of fertilizer, seeds applied on their fields. They were able to follow the agronomic cultural practices necessary to get high yields. However, the main problem encountered, which is a general problem across male and female participants, was the poor rate of germination of the improved Toroniou seed. After many unsuccessful planting, women decided to abandon the improved seed and planted instead their own traditional millet. The program's chemical fertilizer was applied on the local variety. Even though they were not able to give any estimates for the 2009 yields, they seem on average very happy with their harvest. They acknowledged that they will be in control of their output which will not be mixed with their husband's crop harvest. But most of them are not very well informed about the conditions and objectives of the project. For example a significant number of them did not know about the right amount of grains to be reimbursed, neither about the fact that the reimbursement will be used as a revolving fund every year to purchase the inputs.

Regarding the household decision making, there is still a leadership of men on the main production and investment decisions but the pressure is less pronounced compared to the southern sites of the project. In those southern villages, the dominant ethnic groups are Bambara and Minianka, but in Oualo and generally in the Mopti region, the Dogon tribe is in larger number followed by the Fulani, Sonrai and Bambara. A general impression about the women interviewed in Oualo is that they showed some level of freedom, are less fearful and can talk openly about their needs. They believe that having access to some productive resources such as animals for traction, microcredit, or reducing the burden of the household chores by introducing some labor saving technologies grain mills will have potential to increase their agricultural production and welfare.

Women in this village of Oualo are generally exempt from the hardest activities on the communal plot. They bring everyday at noon the meal for men working on the communal plot and are only employed during the harvest time. Their work during the harvest consists on assembling the heads of cereals, putting the bundled heads in baskets to be carried on head load to the village. According to some men, the exemption of women from agricultural work on the communal plot is a change from the past. In the past, women used to be involved in all agricultural activities. This change came mainly from the influence of the Islamic religion. Men who follow closely the Islamic principles, tried to impose less burden on women. Their work on the communal plot is remunerated after the harvest by 2 to 5 small bundles or "fagots" of millet. This remuneration depends on women's age. Older women in the household are in general remunerated after their work on the communal plot which is not always the case for the younger one. It is also worth to say that older women have a privilege position compared to younger wives in the household. They are free from many domestic tasks particularly when their daughters in law live in the extended family, they own a larger number of assets (small ruminants) and have fewer restrictions on the use of the crop output.

If it happens that women who work on the communal land are not satisfied with the amount received for their labor work (especially during a good crop season), they initiate a bargain with their husband to increase their compensation, but this

usually fails. With social customs limiting their ability to conflict openly, some of them sometimes resist implicitly by practicing some small thefts of the cereals for the family consumption. They take furtively small portions of grains to sell at the local market. Also, when they are in charge of selling the harvest at the local market, they don't bring back all the revenue from the sales to the husband, they keep small parts of it.

Most women surveyed have access to a private plot where they grow groundnuts, millet, rice or some vegetables. They use the income from the private plots for their personal needs, the children clothing, and everything related to the kitchen (condiments, utensils, soaps...). During the dry season, some women work off farm by making and selling clay pots. One of the interviewees affirmed going to the exile in Bamako to be house maid.

In conclusion, women's labor participation was effective in 2009 under all sites of the program. However, this incorporation of women into the program is not sufficient to impact women's well-being. In the cotton zone, women are not benefiting from the introduction of new sorghum technology because men make the main decisions concerning the management of women's plot and the sales of the output. The decision making process is characterized by a strong patriarchal dominance in which women have little power. Thus, the program needs to find some strategies to empower women and assist them in getting more control over their plots. A starting point can rely on the organization of women in small associations or workgroups in the areas allotted under the project. By being in association, women can use their collective bargaining to address the issue of access to land of good quality and enhance their leadership over the management of their plots.

Males' control over women's field is less pronounced in the northern site of the project. In Oualo, women appeared to be the main manager of their plots. Nevertheless, they need to be assisted in handling their output for the reimbursement of the credit and the management of the surplus of production. They need also to be encouraged to sell the harvest surplus during the soudure period to take advantage of the increase in the millet prices. The resulting income can be kept as savings in a micro-finance institution and be used to finance their needs and other micro-projects. This strategy will surely impact women and the whole household's welfare.

Production-Marketing Workplan 2010-2011

Introduction

In 2009 when the **Production-Marketing project**, with IER help, put almost 1,000 ha into new technologies, it was decided that for a more rapid expansion of the cultivated area IICEM would take over the scaling up process. Production-Marketing would remain as technical advisers to IICEM. In addition, Production-Marketing would continue their pilot project activities in those regions where the technology and marketing process was still in the developmental phase and was not ready to move into a scaling up process.

In 2010 we collaborated in Koutiala and the greater Segou region with IICEM on two technology-marketing packages for the sorghum variety Grinkan and the millet cultivar Toroniou respectively. The primary innovation was the connection with the banks from the start of the process for input credit. Arranging bank financing turned out to be more difficult than expected. Nevertheless, IICEM put 2,500 ha into the new technology packages in these two regions. With the experience gained from dealing with banks in 2010 we are confident of much more success in 2011. A series of other implementation and technical problems were also identified in 2010.

After explaining where and how we will be operating in 2011 we will return to these specific implementation problems and explain how we will be responding to them. Thus there are now four components to the Production-Marketing project:

- Technical support to IICEM for the scaling up process
- Extension of pilot projects
- Resolving implementation and technical problems
- Publishing evaluation, marketing and gender impact studies

Technical support to IICEM for the Scaling-up process

1) In **Koutiala** the process of bank negotiation between the extension agency, AMEDD, and the bank, BNDA, broke down in the spring of 2010. An agreement was reached at planting time but then farmers' associations lost interest in bank financing as fertilizer became available in the region for a much lower price than was being offered through bank financing.

Rather than the 3,000 ha of bank financed new technology planned there was only 85 ha. However, due to the organization of the farmers' associations implemented by AMEDD and financed by IICEM, there were an estimated 1,335 ha put into the new technology package. Almost all of these farmers obtained the DRA supplied subsidized fertilizer. The bank financing is expected to be more successful in 2011.

However, two important problems were identified that have to be addressed in 2011. First, unlike in 2008 and 2009 there were germination problems with Grinkan all over the country. The pervasiveness of this problem from many sources of seed indicates that this probably resulted from the late rains. The second problem is the failure of farmers to follow the agronomic recommendations. It is common for farmers in the first year not to use their best lands, to implement some crop combination, or to fail to thin plants. Introducing the technology package to a group and multiple presentations to farmers generally resolves this problem because the average farmer, who is not following well the recommendations, can see the yield difference with the best farmers. Then in the second year the average farmers follow more rigorously the agronomic recommendations. However, with the scaling up the initial investments in improved agronomy have to be larger and more systematic. There will also be more focus on agronomic training for the new farmers' associations. The Koutiala area goal in 2011 is not yet decided but will probably be around **5,000 ha**.

2) In the **Segou** region 500 new ha was planned and implemented by Global 2000 with 8 new farmers' associations. There we experienced the same problems of poor agronomy, especially the poor handling of inorganic fertilizer, planting in poor soils and little thinning. Also, another bank source for input credit needs to be identified. A feasible area goal is probably around **3,000 ha**. Sanders, Ouendeba, and Teme will make regular visits to both the Koutiala and Segou regions in 2011 to provide technical inputs and to identify problems. Helping IICEM to scale up in these two regions is our number one priority in 2011.

3) In the **Mopti** region we presently have 300 ha in new technologies in six different farmers' associations. Traditional storage of leaving the stalks on the ceilings and roofs is practiced here. Farmers are happy with the new technologies. But we need to move faster with IICEM in constructing storage facilities. More concrete plans for the types of storage facilities, the division of the contributions between IICEM and the farmers' groups and the dates for initiating activities will be a priority in 2011.

Extension of pilot projects into new regions

1) In the Mopti region in 2010 we had 300 ha in new technology. We need a new millet cultivar as Toroniou is an old selection and there has been new breeding work with millet in Mali. Also we will need to improve the agronomy being practiced though the most effective force for improvement is the observation by farmers of other farmers' yields. However, the critical innovation is the rapid construction of storage facilities. This enables farmers to wait for better prices avoiding sales at the price collapse period after harvest. The farmers' associations can become "commercantes." They buy small quantities, store, and then systematically look for better prices for both their products and their inputs. We will raise the number of pilot project ha to 500.

2) We began work in the Kayes region in 2008 but due to the pressures of expansion in other regions and then the scaling up we have not been back to visit until August 2010. We are not happy with the old cultivar Seguifa here. We have been pushing IER for a new cultivar that is a Guinea-Caudatum cross, intermediate height and season length. As in Mopti there is a very good, supportive, regional DRA director. So if we can get some new cultivars, we will push to extend the area here by 300 ha and work in the three main production areas with sorghum.

3) Fana. Doumbia of IER has been introducing a new conservation technique here with an approximate cost of 5,000 CFA/ha. We will investigate putting our technologies and marketing strategies on top of his soils technique. This technique does water retention and slows erosion. Since our combined technologies already cost 40,000 to 50,000 CFA/ha we will stay with farmers already using Doumbia's technique and then investigate the potential to diffuse the combined package.

Resolving implementation and technical problems

7) Resolving the germination problem of Grinkan- This is our number one technical problem as Grinkan is our flagship cultivar because it has been very successful in the Koutiala region. Germination rates of about 60% were very common in 2010 necessitating replanting. Farmers rightfully were not happy with this. We will be introducing a simple test in 2011 for determining if the grain humidity is low enough for storage. We will also be extending the use of the plastic triple bags for all seed production and for more of the grain going into storage. There is also a simple technique

for farmers to identify good seed that would reduce the need for replanting. This now brings us to the need for a regular supply of high quality seed.

- 8) **Improve seed quality-** Our participant farmers do a good job but have trouble removing the off types and are probably storing with humidity over 11% when there are late rains. We need to improve their performance but also develop a few excellent seed producers and do branding here. We will work with WASA and the seed program of IER on this.
- 9) **Improve and rapidly multiply the storage facilities.** We have already mentioned the collaborative activity with IICEM designed to rapidly increase the number of storage facilities in Mopti. Other agencies are also involved in this. As we get all the farmers to test for excessive humidity and to use the triple sacks, these measures should take care of fungi and storage insects. But we will need to bring in the entomologists to verify this.
- 10) **New millet and sorghum cultivars.** We need to replace both Toroniou and Seguifa with higher yielding, regionally adapted cultivars. These are available at IER but we can also look in ICRISAT. There is a continual testing process going on so we should not stay with these old cultivars. Toroniou is not especially high yielding and Seguifa is susceptible the mold-head bug complex.
- 11) **Better training for farmers in agronomy especially where we are scaling up.** Fertilizer was often carelessly applied and is the most expensive and the critical input for the success of the technology. Sometimes it was broadcast, sometimes applied by children, and often not covered. It needs to be sidedressed preferably just around the plants. There will be a “fiche technique” produced covering agronomic, marketing, and association development issues in 2011. We will put more effort into the agronomy training focusing on fertilizer placement, thinning, selecting good land areas and complementing inorganic with organic fertilizer.
- 12) **Training on dealing with banks.** Knowing when they are getting good interest rates and repayment terms is important for both our extension NGOs and farmers' associations. This decision on input credits in 2010 was complicated by the availability of the subsidized fertilizer outside of the bank lending framework. That option of the availability of subsidized fertilizer will not always exist but farmers will continue to want input and “warrantage” (inventory) credits. So an important sustainability issue is building up the capacities of the farmers' associations and the main extension partners to deal with the banks.

Publishing, evaluation, signage, marketing and other studies

- 2) Each year we evaluate the economic results of the previous crop season. This includes yields, repayment of the input credits, prices received, and profits. We compare all these indicators with the performance of those not in the program. Note that for prices received we wait until the following summer after the fall harvest. One of the principal marketing recommendations is to sell later in the year to avoid the harvest price collapse. Over time an important indicator of the confidence of the farmers in the farmers' association is the quantity of the production that the farmers let the associations sell for them after repaying the input credits in kind. Farmers' associations tend to be paternalistic. Rather than sharing profits and thereby increasing incentives, they often want to tell the farmers what to do with the association's profits. As they share profits and farmers get more confidence in the associations, the farmers will let the associations sell more for them.
- 3) We have already done a study of the millet food processors and the price premium for uniform, clean cereal and this study needs to be updated now that there are more millet food processors and more farmers' associations selling clean cereal. We also need do a study of the emerging intensive chicken production in Mali and its potential to use sorghum in the feed.
- 4) We are collaborating with the IER Communication Department in the construction of signs with the appropriate logos of all donors at our field sites.
- 5) Jeanne Coulibaly, PhD student at Purdue University, is doing a study on the income and welfare consequences of the new sorghum technologies in the Koutiala region with an emphasis on the effects on women. She will also look at

alternative policies and technologies to increase the welfare of women and children. The present plans are for her to stay on in the project for a Post Doc. In this case we will expand her research to Segou and Mopti. We will also employ her to expand our pilot project activities.

Plans for the rest of the 2010 crop year:

During 2010 we anticipate three more trips to Mali. The first beginning August 5 will be to orient the farmers and to visit the fields especially in the three main zones. Since Koutiala and greater Tingoni now are part of our large scale scaling up activity, we need to make sure that there is good program understanding as well as checking for early field problems. Replanting, thinning and weeding are issues then. But also, a very important thing is to begin discussing marketing especially for the engagements with the millet processors and the importance of clean millet. Millet farmers also need to insist on a value added price differential for a uniform variety, clean millet. We need to make sure that the farmers will do the threshing on canvas or plastic or with a threshing machine. Moreover, when they first harvest, they should not put the heads on the ground.

The Production-Marketing and Food Processing components will conduct a workshop in November for representatives of these new farmers' associations and the millet food processors of Bamako. In the past these workshops have been very useful for both and have led to more bargaining and interaction. Presently, most of the millet food processors understand the importance of paying a price premium to encourage an increased supply of higher value millet.

The second trip in October will be to see the crops shortly before harvest and to have a better evaluation of performance and farmer feedback at this critical time. Also the workshop for the farmers' associations of the greater Tingoni region and the millet food processors will be held at this time. We will also evaluate other markets for sorghum especially the new USDA activity to provide food aid from local production.

The third trip in December is to continue work on the marketing and to begin planning with IICEM, the banks and the collaborating extension organizations the scaling up activities for 2011. Given the long delays in bank certification of borrowers and providing bank financing we will start this process earlier.

Progress and Challenges

Marketing of sorghum. Marketing innovations and contacts with processors are working well for millet in Tingoni. We will need to extend this to a much wider area in 2010 but this is a straight forward objective as we have already the contacts with the millet food processors and have had workshops before for them.

In poor rainfall years and even normal rainfall years sorghum also benefits from these contacts as there is substitution of sorghum for food processing when there is an insufficient supply of millet. However, in good rainfall years cereal prices collapse so we need to develop alternative markets to serve as price floors.⁷ The intensive poultry sector is expanding rapidly and cereals are approximately 50% of the ration. Non-tannin⁸ sorghum has 95 to 97% of the feed efficiency of maize (Joe Hancock, poultry nutritionist, communication). Therefore, at prices less than 95% of the maize price as during 2008 poultry producers should substitute sorghum for maize in the ration. This secondary market puts a price floor for sorghum when otherwise the excess cereals would lead to a price collapse.

With our poultry nutrition specialist we will continue the workshops for intensive poultry producers. The workshops emphasize the substitution potential of sorghum for maize in the ration. Joe Hancock, the INTSORMIL poultry ration specialist, has also been helping Malian chicken producers by providing information on low cost methods to respond to the excessive heat problem.

Besides workshops we will facilitate the contacts between the farmers' associations and the chicken producers. A union of farmers' associations in the greater Koutiala region could negotiate with the association of chicken producers in these good rainfall years when sorghum is cheaper than maize.

Improved seed production. We were disappointed with reports on poor germination rates for Grinkan on some farms in the greater Koutiala region. Niaba has suggested that we will have to produce seed in drier regions and perhaps with irrigation to avoid the late season rain effect⁹

7 This is similar to a program to expand fresh tomato production. If this is done on a big scale, a factory to produce canned tomatoes or juice then provides a price floor after the fresh market is saturated and prices decline.

8 Most of the traditional and all of the improved sorghum cultivars are low or non-tannin in Mali (Abdoulaye et al, 2006, pp. 8,9). Nevertheless, buyers of sorghum for the cereal in the ration can avoid the mixing with tannin cultivars in the open market sales by buying from the farmers' associations in the project.

11 There were also two seed sources in 2010 and those with triple bagging of the seed are expected to have had better germination. We are checking on that now.

In developed countries seed is generally produced in irrigated conditions. So we need to evaluate better the germination results and investigate the costs of producing seed under irrigation. Clearly, this will raise seed costs. But farmers are already appreciating the better cultivars and increasingly will be prepared to pay for higher quality seed. This is also an important step in getting ready to introduce hybrids. We will be collaborating with WASA on this seed quality production reevaluating our strategy during 2010. Present planning is to use seed from best farmer local production but this is not a good long term solution

Better new cultivars. We still think that Seguifa is too prone to mold-headbug attack. Therefore, we would like adapted Guinea-Caudatum crosses for the regions of Segou and Kolikani and the greater Kayes region where we have been introducing Seguifa. Similarly Toronoiu is an old selection from farmers' cultivars. Farmers like it and there has been good response to inputs but new millet cultivars need to be identified and regionally tested in both the greater Tingoni and Mopti regions. We will be interacting with IER breeders on these new cultivar requirements.

Project size. Our principal 2010 activity has been supporting the scaling up activity. We had to cut back on our pilot project activity in Kayes to focus on extension with other agency collaboration in Koutiala and Segou. Now with this continued scaling up we need to further increase our involvement in marketing studies, marketing contacts, and instruction to the farmers' associations on marketing and efficient economic functioning of cooperatives. We also need to expand the field research and implementation activities to increase the impact on women farmers that Jeanne Coulibaly has been providing since the fall.

Food Processing Technology Activities

Bruce Hamaker, Y. Kouressi and M. Diouf

Introduction

The processing part of the Production-Marketing project has two major activities and progress is reported on each below. Towards our goal of expanding processed markets for sorghum and millet in Mali, we are equipping and training seven women entrepreneur processing groups in the Mopti/Sevare and Gao regions, and are setting up an incubation unit at the food technology unit (LTA) of IER/Sotuba for training on cereal processing technologies for Mali food processors and to work more specifically with the Bamako area processors to strengthen their ability to process market competitive sorghum and millet foods.

Goal and Objectives of Millet/Sorghum Processing Project

Goal

Expand markets for millet/sorghum through **high and consistent quality market-competitive processed products**

Objectives

- Enterprise development
 - ◆ Mopti-Gao region - Introduce and train in technology-based improvements to entrepreneur processors
 - ◆ Bamako area – Set up technology support and incubation center for urban processors
- Link with Production-Marketing project to contract farmers for grain supplies
- Target markets – local, urban, regional

The Team

IER/LTA

- ◆ Yara Kouressi – food scientist/nutritionist, Ph.D. candidate, Wageningen University (photo right)
- ◆ Seydou Malle – food technologist
- ◆ Sidi Kone – food technologist
- ◆ Mme Traore – food technologist
- ◆ Two new technologists to be located in Bamako and Mopti/Sevare



Cereal Processing Expert

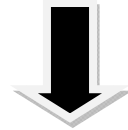
Mamadou Diouf, formerly with l'Institut de Technologie Alimentaire/Dakar and PROCELOS-CILSS/Ouagadougou
(photo right)



Principal Investigator, Bruce Hamaker, Purdue with entrepreneurs at workshop

Entrepreneur Project Mopti/Gao/Bandiagara

Grain Producers
Clean and Good Quality Grain



Entrepreneur Processor Partners (7)
Mechanization and Technology Transfer, Training,
Individual Unit Optimization, Technology Support Activities



**High Quality Marketed
Products**

‘Bad quality grain in, bad product out’

In the past year, we have held two 4-day cereal milling and product training workshops in Mopti/Sevare with entrepreneur partners from Sevare, Bandiagara and Gao. The first has been reported in an earlier quarterly report and was an intensive training on sorghum and millet milling and product processing using the new equipment procured for the entrepreneur (and LTA/Sotuba) facilities. A number of follow-up visits were made by Y. Kouressi and her IER team for the purpose of getting the seven units ready for commercial operation. Most recently in the last quarter, a follow-up visit was made to arrange for adjustments to decorticators and mills and to correct minor mistakes made during their installation. The seven entrepreneur partners provided buildings, with specifications set by the project, to house initially 1 millet/sorghum decorticator and two flour mills – a hammer mill for fine grind flours, semolina and grits, and an abrasive disc mill for coarse flours preferred for some prepared dishes of the region. Currently, the units are in somewhat different stages of processing activity, though all near to completion (see photos below). Plans are for all units to be fully functional and in full-scale production to begin following our next workshop in December or January. A food technologist was recently hired and is now on site in Sevare to work with entrepreneurs and facilitate technology transfer activities.

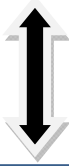


Processing units under development in the Mopti/Gao/Bandiagara area

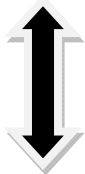
IER/LTA Incubation Center

Technology-Driven Process Development

Grain Producers
Clean and Good Quality Grain

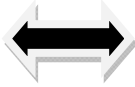


Incubation Center
Charge: Technology Development, Process Optimization
Training, Technology Support Activities, Entrepreneur Testing

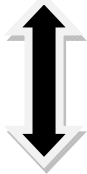


Equipment Usage, Market Testing

Entrepreneur Processors



**Equipment
Procurement/Financing**



**High Quality Marketed
Products**

The second component of the project is the setting up of an incubation unit at IER Food Technology Unit in Sotuba. The purpose of the unit is: 1) development and refinement of processes and products, 2) introduction of new processing technologies, 3) training of entrepreneurs, and 4) providing technological backstopping to entrepreneurs. The unit currently has installed in it the same equipment as is at the Mopti/Gao entrepreneur business sites. Two IER food technologists, Kola Mamadou Tangara and Sidi, have been partially assigned to assist on the project and are currently working on optimizing decorticating and milling processes. Another food technologist has been hired to work full time on incubation center activities. Currently a new building to house incubation center equipment is being constructed and additional processing equipment is being procured with the plan to introduce key new technologies to Bamako area and other Mali processors. We are planning a workshop in early 2011 at the incubation center.



Food Processing Workplan 2010-2011

The overall goal of the cereal **processing technology and training** component of the project is to establish a successful model of entrepreneurial processing of competitive millet and sorghum food products for expansion of the grains in the marketplace. The project is managed out of IER/Sotuba by Yara Kouriessi and recently the project hired two young food technologists, one located in Sevaré to work with processors in the Mopti/Gao region and one located at IER/Sotuba to work at the Incubation Center. Our cereal processing technology consultant, Mr. Mamadou Diouf, has extensive expertise and experience in sorghum/millet processing and working with entrepreneurs. He was the director for 9 years of the CILS PROCELOS project that organized and worked with food processor groups in the region and was stationed in Ouagadougou, and was a food technologist with the Institut de Technologie Alimentaire, ITA, Dakar. He currently lives in Dakar.

Year 4 activities will focus on further training and working with entrepreneur partners in the Mopti/Gao region to process and market high quality products. Additionally, in Year 4, the IER/LTA Incubation Center established in Year 2, will be used for a training workshop for Bamako-area processing entrepreneurs. The Center, which currently has the same decortication and milling equipment as placed in the Mopti/Gao partner units, will be expanded with new cereal processing equipment, including an agglomerated products line for *couscous*, *degue*, etc. and an extruder for pregelatinized instant flours, deemed promising for urban entrepreneurs to use and purchase for their existing processing enterprises. The appropriate logos are being placed on the equipment and on the bags of new food products being tested in the market.

Three training workshops are planned for Year 4 of the project to include:

- 1) Participation in a Production-Marketing workshop with Sanders/Botorou's project in Segou in November 2010,
- 2) A first workshop on primary and secondary cereal processing to be held in January 2011 at the IER/Sotuba Incubation Center for Bamako area processors and representatives from the 7 entrepreneurial units the project works with in the Mopti/Gao region, and
- 3) A workshop to be held at Mopti/Sevaré in August or September 2011 on use of selected secondary processing equipment for agglomerated products and further linkage with the production side of the project.

Décrue Sorghum Activities

Scott Staggenborg and Vara Prasad, Kansas State University

Update on Decrue Sorghum Activities

1. Cultural practices / where we are.

Fertilizer application on sorghum in the décrue system did not lead to a statistically significant effect, although a 17% yield increase was observed, as compared to the check treatment (Goundam 2009 result).

Seed and soil treatment increased grain yields about 17 % compared to the check treatment, but the effect was not significant (Goundam 2009 result)

The combination of seed and soil treatment with fertilizer application resulted to a **66% grain yield increase** (Goundam 2009 result). This result requires to be confirmed prior to recommending for future transfer to farmers.

2. Cultural practices / where we go next.

On going studies: Seed and soil protection in combination with planting density

A split-plot design has been used since 2010 for this study in the décrue area of Goundam. The main plots (soil protection) have been composed of 1): soil not treated; 2) soil treated. The sub plots (planting density) have been composed of DP1:farmer's practice; DP2:0.75 m x 0.50 m 2 plants per hill; DP3:0.75 m x 0.50 m 3 plants per hill; DP4: DP2 + seed treatment; DP5: DP3 + seed treatment;

The objective has been to identify the best combination between seed and soil protection, plant population and grain yield performance.

Lakes	Sites	Names of producers	Status of experiment	Planting dates	Number of treatments	Number of replications	Comments	Varieties used
Faguibine	Bintagoungou	Hameye Hamadou	established	4/25/2010	5	2	Well conducted plots good results expected	Saba Tienda
Télé	Bougoumaïra	Hamir Alhousseyni Aldani	established	4/24 15/05	5	2	Well conducted plots good results expected	Saba Tienda
Télé	Goundam	Abdramane CISSE	established	5/13/2010	5	2	Well conducted plots good results expected	Saba Tienda

Nota: Number of rows = 3 as expected from the workplan
 Length of rows = 6m;
 Between rows: 1 m for DP1 and 0.80 m for DP2, DP3, DP4 and DP5
 Within rows : 1 m for DP1 and 0.60 m for DP2, DP3, DP4 and DP5

Used design : Split-plot
 Main plot: (Var 1, 2 and 3)
 Sub-plots : (DP 1,Var 1, 2 and 3)

Expected results:

An efficient combination between soil and seed protection in one hand and the plant population in another will be identified. This study will be expanded in year 2011.

Locations involved in 2010: Tele lake in Goundam (Timbuctu region).

Further study on cultural practices: Plant population

A plant population study will be conducted in year 2011. It will be based on the results recorded from the 2010 study on seed and soil protection in combination with plant populations. The split-plot will be used. Fertilizer will be used as the main plot and the combination of plant population and the soil and seed protection as the sub-plot.

Expected results:

An efficient cultural practice combining fertilizer on one hand and seed and soil protection in another will be identified.

Locations to be involved by 2011: Timbuctu, Gao and Mopti and Kayes.

Testing cultivars for adaptation and high yield**3.1 Where we are.**

Local cultivars (**Saba Soto**, **Vrac de Bintagoungou** and **Saba Tienda**) were respectively identified for yield performance and adaptability while an introduced cultivar (Niatichama) was identified for its grain quality in spite of its low stability. All of them were among cultivars initially selected by farmers in 2008, based on their preferences. Yield performance was observed in all of them in 2008 but with less stability in Niatichama in 2009.

Lakes	Sites	Names of producers	Status of experiment	Planting dates	Number of treatments	Number of replications	Difficulties
Faguibine	Bintagoungou	Hameye Hamadou	established	4/18/2010	15	1	No comment
Faguibine	Bintagoungou	Mamadou I Yattara	established	4/18/2010	15	2	Niatichama damaged by pest attacks
Télé	Goundam	Ousmane SANGHO	established	?	15	1	Niatichama damaged by pest attacks
Télé	Goundam	Bakaïna BORY	established	?	15	1	No comment

Nota Béma: V1 stands for SabaTienda; V2 stands for Saba Sôtô; et V3 for Niatichama
 Number of rows per plot: 4 in BTG et 3 in Goundam : 4 rows were planned
 Row length = 6m;
 Between rows: 1 m for PC1 and 0.80 m for PC2, PC3, PC4 and PC5
 Within rows : 1 m for PC1 and 0.60 m for PC2, PC3, PC4 and PC5

3.2 Where we go.

3.2.1 **Expanding the use of well adapted cultivars of sorghum found for the decrue system.**

Cultivars such as *Saba Soto*, *Vrac de Bintagoungou* and *Saba Tienda*, were selected in 2008 as farmer's preferences. Because of their high yield performance in 2008 and 2009 they were further evaluated in 2010 by an expanded group of farmers in the lake Faguibine Lakearea as well as the Tacle and Horo Lakes area., Two of them (*Saba Sôtô* and *Saba Tienda*) were similar to *Niaticama* which is known for its high grain quality. All of them were compared to check cultivars, one of which was a local cultivar. The four genotypes have been tested in farmers' fields in 2010.

Locations involved in 2010: Timbuctu, Gao and Mopti regions.

3.2.2 **Pursuing identification of high yielding well adapted cultivars through the use of accumulated knowledge from farmers and science.**

Constraints and strategies related to cropping sorghum in the decrue system will be identified through the use of MARP (Méthode Accélérée de Recherche) in Gao, Mopti and Kayes to enhance scientific knowledge. One village per lake will be selected to complete database on the decrue sorghum. Existing cultivars and strategies for water, nutrient and pest management). ONG and public extension services, will be involved for the use of any existing information on constraints related to sorghum production, as well as strategies to tackle them.

Locations to investigate: Gao, Mopti, and Kayes.

Expected output:

- 1 Constraints related to sorghum cultivation in the decrue system in the new areas of Gao, Mopti and Kayes are identified.
- 2 Farmers' strategies in the 'decrue system' of Gao, Mopti and Kayes are identified through a listing of available cultivars and cultural practices on sorghum, in relation to crop, water, nutrient, and pest management.

Soil nutrient deficiencies studies in the decrue system.

Nutrients availability in soils of the 'decrue system' will be assessed using sorghum response to the following fertilizers treatments:

- 1 NPKS
- 2 NPKS (-P)
- 3 NPKS (-N)
- 4 NPKS (-S)
- 5 NPKS (-K)
- 6 No fertilizer

Lakes	Sites	Names of producers	Status of experiment	Planting dates	Number of treatments	Number of replications	Difficulties
Faguibine	Bintagoungou	Mamadou I Yattara	established	4/19/2010	6	3	Animal invasion
Télé	Goundam	Mahamane Issa	established	5/13/2010	6	3	Fertilizer was applied in August
Télé	Goundam	Moussa Amadou	established	6/3/2010	6	3	The crop died because of pests (miellat in French)

Nota: Number of rows reduced from 6 to 3 in Télé lake (Goundam); in Faguibine lake (BTG) 6 rows were maintained
 Rows length = 6 m ; Between rows = 0.75 m; within rows = 0.50 m.

The study is being conducted on farms (9 producers per location) with the basis of 3 farmers per frange and three franges involved (low, medium and high).

Data will be recorded on: a) plant parameters (sorghum grain, stems and biomass yield) and soil parameters (granulometry, pH, and organic matter, P available, Ca, Mg and Na).

The study started in 2010 in Timbouctou (Goundam) and Mopti and should be extended to Kayes by year 2011.

Expected output:

Soil nutrient deficiencies are ranked in the décrue system, based on sorghum response to applied fertilizer.

The best efficient combination of nutrients will be identified for the decrue system, based on recorded results.

3.2.2 Further expansion of new findings in more extended areas through the diffusion of more integrated technologies.

3.2.2.1 Training of partners

3.2.2.2 Dissemination of information through TV and radio

Demonstration plots

Lakes	Sites and partners	Type of test	# of involved producers	Planting dates	Status of experiment	Status of funding		Difficulties
						Funds to send (cfa)	Remaining (cfa)	
TELE	AFRICARE GOUNDAM	variety	4	June	Lastly visited in August. Panicle emergence occurred in August	450000	0	Late payment is due Africare management
	CONFIGES Gao	variety	6	May	Lastly visited in August.	450000	0	
	TOMBOUCT RGCOP	variety	6	June	Lastly visited in August.	450000	50%	Installation was noticed in August
Aougoundoun	DRA MOPTI	variety	6	4/28/ to 05/05	Lastly visited in August. Panicle emergence occurred on Saba Tienda at the end of July	450000	0	Not easy to access
HORO	DRA TOMBOUCTOU	variety	6	4/12/ to 05/08	Lastly visited in August.	450000	0	Used seeds were not pure enough
Aougoundoun	DRA MOPTI	mineral deficiency test	9		Nine producers installed the test Three out of nine plots were invaded by animals	675000	2943	Three out of nine plots Invaded by animals
HORO	DRA TOMBOUCTOU	mineral deficiency test	9		Nine producers installed the test	675000	0	Randomization was not respected

Decrue Sorghum Project Activities

Photo Gallery

July-August, 2010



Abdoul W. TOURE, IER scientist and Noel (Configes technician) and a collaborating farmer on variety test in Gao. July 2010.



Abdoulaye G.DIALLO, IER breeder and Noel (Configes technician) and a collaborating farmer visiting a variety test in Bourem(GAO). July 2010.



Abdoulaye G. DIALLO and Noel
visiting on-farm test in Bourem.
July 2010.



Sorghum plots of a variety test
in Bourem under IER-
INTSORMIL-USAID MALI
partnership. July 2010.



Sorghum variety test under irrigation in Tombouctou (Koriome) conducted under partnership between a women association, RCGOP, IER, INTSORMIL and USAID-MALI



Sorghum variety test under irrigation in Tombouctou (Koriome) conducted under partnership between a women association, RCGOP, IER, INTSORMIL and USAID-MALI



Abdoul W. TOURE and RCGOP technicians during a meeting of a women's association working with RCGOP, IER, INTSORMIL under USAID Mali financial support. Koriome, Tombouctou.



Abdoul W. TOURE and RCGOP technicians during a meeting of a women's association working with RCGOP, IER, INTSORMIL under USAID Mali financial support. Koriome, Tombouctou.



Soil sampling before fertilizer application. Soil nutrient deficiency plot in Mopti



Mixing fertilizer before its application on sorghum. Soil nutrient deficiency study in Goundam



Fertilizer application on soil nutrient deficiency plot in Mopti. July 2010.



Sorghum plots of a variety test in Bourem. July 2010.



Sorghum plot on soil nutrient deficiency study. Goundam, Tele lake. August 2010

Decrue – Tour - 2009



Niaticama sorghum grown under décrue conditions

1. Introduction

Décrue sorghum is an activity identified by USAID-Mali and IER in northern Mali as having substantial promise but little base research or extension activity. The Décrue Sorghum project, led by Kansas State University has been engaged in farm level applied research of new cultivars and improved agronomy and has identified several new technologies, which it will now be retesting and then disseminating on a wider scale. Presently, the project is constrained by the security situation in the north. To overcome the limitations of travel restrictions on the U.S. scientists to the north, planning meetings are being held in southern locations like Mopti. At these meetings, NGOs and DRA personnel have been engaged to assist in research and demonstration sites throughout the north. Targeted areas are near Mopti, Goundam, Tombouktu, Gao, and Kidal. Addition of the Kayes Region is under discussion and we are likely to expand our demonstration/field research efforts with DRA over in the west near Kayes and integrate our activities there with the Production-Marketing Project. This and other Décrue Sorghum project changes will be discussed in a meeting with the USAID Mission in Bamako in early November 2010.

2. Global Objective

To determine needs and generate improved sorghum production techniques with emphasis on décrue sorghum production systems to sustain food and economy of northern Mali.

3. Specific Objectives

1. To conduct a survey of farmers' perception in the Gao and Kidal area about current management practices and their needs and preferences.
2. 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.
3. Establish field experiments on focused on integrated soil, water, nutrient and décrue sorghum management strategies for improved productivity.
4. To diffuse the generated improved techniques.

4. Schedule

Activity	08-09	09-10	10-11	11-12	12-13
1. To conduct a survey of farmers' perception about current management practices and their needs and preferences. To collect samples of cultivars grown in the areas. Sites of the survey: Lake Faguibine, Gao and Kidal <i>Scientists involved: Agronomist, Breeder, Pathologist, Entomologist and a socio-economist</i>	X	X	X	X	
2. To set up experiments on integrated soil, water, nutrient and décrue sorghum management strategies for improved productivity. Sites of the study: Lake Faguibine and farmers fields in the Gao and Kidal, Mopti, Goundam, Tombouktu and Kayes areas. <i>Scientists involved: Agronomist, plant physiologist</i>	X	X	X	X	X
3. To diffuse the generated improved techniques Sites of the diffusion: Gao and Kidal, Mopti, Goundam, Tombouktu and Kayes areas. <i>Scientists involved: Agronomist, CRRA GAO</i>		X	X	X	X

5. Methods and Experiments to be Conducted

I. Cultural practices

Current status

Fertilizer application on sorghum in the decrue system did not lead to a significant effect, although a 17% yield increase observed as its effect, compared to the check treatment (Goundam 2009 result).

Seed and soil treatment effect was about 17 % of the grain yield recorded on the check treatment, but the effect was not significant (Goundam 2009 result)

The combination of seed and soil treatment with fertilizer application resulted to a **66%** of grain yield increase (Goundam 2009 result). This result will be confirmed in 2011 for future transfer to farmers.

Year 4 studies

1. Seed and soil protection in combination with planting density

The objective is to identify the best combination between seed and soil protection, plant population and grain yield performance. A split-plot design will be used for this study in the decrue area of Goundam. The main plots (soil protection) will be composed of 1): soil not treated; 2) soil treated. The sub plots (planting density) will be composed of DP1:farmer's practice; DP2:0.75 m x 0.50 m 2 plants per hill; DP3:0.75 m x 0.50 m 3 plants per hill; DP4: DP2 + seed treatment; DP5: DP3 + seed treatment;

Expected results:

An efficient combination between soil and seed protection in one hand and the plant population in another will be identified. This result will be expanded by year 2011.

Locations involved in 2010: Tele lake in Goundam (Timbuctu region).

2. Continued study on the effect of cultural practices plant population and grain yield

A plant population study will be conducted in Year 2011. It will be based on the results recorded from 2010 study related to seed and soil protection combination with the plant population. A split-plot design will be used. Fertilizer will be used as the main plot and the combination of plant population and the soil and seed protection as the sub-plot.

Expected results:

An efficient cultural practice combining fertilizer in one hand, seed and soil protection in another will be identified.

Locations to be involved by 2011: Timbuctu, Gao and Mopti and Kayes.

II. Testing cultivars for adaptation and high yield

Current status

Local cultivars (***Saba Soto***, ***Vrac de Bintagoungou*** and ***Saba Tienda***) were identified for respectively yield performance and adaptability while an introduced one (Niatichama) was identified for its grain quality although its low stability. All of them were among cultivars initially selected by farmers in 2008, based on their preferences. Yield performance was observed in all of them in 2008 but with less stability in Niatichama in 2009.

Year 4 studies

1. Expanding the use of well adapted cultivars of sorghum found for the decrue system

Cultivars such as *Saba Soto*, *Vrac de Bintagoungou* and *Saba Tienda*, were selected in 2008 as farmer's preferences. Their high yield performance in 2008 and 2009 suggested their use in 2010 by more farmers out of the faguibine lake, for testing. Two of them (*Saba Sôtô* and *Saba Tienda*) were completed by Niatichama for its high grain quality and by a local cultivar to use as a check. The four genotypes have been testing in 2010 on farms levels. Locations involved in Year 4: Timbuctu, Gao and Mopti regions.

2. Continuing the identification of high yielding well adapted cultivars through the use of accumulated knowledge from farmers and science.

Constraints and strategies related to cropping sorghum in the décrue system will be identified through the use of MARP in Gao, Mopti and Kayes to enhance scientific knowledge. One village per lake will be selected to complete the database on the décrue sorghum. Existing cultivars and strategies for water, nutrient and pest management, will be evaluated for

the use of any existing information on constraints related to sorghum production, as well as strategies to tackle them. Collaboration with NGOs and public extension services.

Locations: Mopti, and Kayes.

Expected output:

1 Constraints related to sorghum cultivation in the *décrue* system in the new areas of Gao, Mopti and Kayes will be identified.

2 Farmers' strategies in the '*décrue* system' of Gao, Mopti and Kayes will be identified through a listing of available cultivars and cultural practices on sorghum, in relation to crop, water, nutrient, and pest management.

3. Soil nutrient deficiencies studies in the *décrue* system.

Nutrients availability in soils of the '*décrue* system' will be assessed using sorghum response to the following fertilizers treatments:

7	NPKS
8	NPKS (-P)
9	NPKS (-N)
10	NPKS (-S)
11	NPKS (-K)
12	No fertilizer

The study is being conducted on farms (9 producers per location) with the basis of 3 farmers per frange and three franges involved (low, medium and high). Data will be recorded on: a) plant parameters (sorghum grain, stems and biomass yield) and soil parameters (granulometry, pH, and organic matter, P available, Ca, Mg and Na).

Locations: This study started in 2010 in Timbouctou (Goundam) and Mopti and will be extended to Kayes by year 2011.

Expected output:

Soil nutrient deficiencies are ranked in the *décrue* system, based on sorghum response to applied fertilizer. The best efficient combination of nutrients will be identified for the *décrue* system, based on recorded results.

III. Further expansion of new findings in more extended areas through the diffusion of generated improved technologies.

Year 4 activities

To transfer generated technologies to more farmers we will 1) *train partners who will assist in the technology transfer activities and disseminate *décrue* sorghum technologies via TV and radio.* The results from 2008, 2009 and 2010 will be extended to as many villages and farmers as possible in 2011. This will be accomplished through visits to these and surrounding villages where presentations will be made. We will also be meeting with farmers and NGO participants in the Gao area to not only expand the impact of the research, but to serve as a means of stimulating the same type of work in that region. We will be expanding the diffusion activities to include the Kayes Region. We will first make contact with the DRA faculty member Fofana. Our goal is to support him in extending our knowledge to the Kayes Region. It would be similar to work we tried to get done in Mopti last year. We would give him support to establish extension and demonstration plots based on knowledge we have gained in the North.

Training Activities

Jess Lowenberg-DeBoer, Purdue University

Academic and Short Term Training Workplan | 2010-2011

Long term training

Fatimata Cisse arrived in June 2009 for the 6-month English language training and began her MS degree program at Purdue/Food Science in January 2010 as planned. She is on track to complete her thesis by December 2011.

Bandiougou Diawara arrived in June 2009 for the 6-month English language training and then moved to Kansas State University (KSU) in January 2010. He is a bit behind the proposed schedule, and may need a one semester extension to complete his MS.

Aly Ahamadou and **Mamadou Dembele** arrived in June 2009 for the 6-month English language training and then moved to Purdue University in January 2010. In August 2010 they transferred to West Texas A&M University (WTAMU) which has a more applied Ag Economics/Agribusiness program and is a sorghum producing area so it would also be possible for them to do their thesis research locally. They are currently continuing English at West Texas A&M and they are expected to be admitted to graduate school on a conditional basis. Based on their slow progress they will require until 2013, one year beyond the termination of the award, to complete their MSc degree requirements.

Sory Diallo arrived in January 2010 for the 6-month English language training at Kansas State University January 2010. He completed the English program at the end of the summer and in August 2010 began his MS Agronomy program. He is on track to complete his program by the proposed August 31, 2012 date.

Short term training

Abocar Oumar Toure is currently (September 2010) in short term training at Purdue with Dr. Mitch Tuinstra. He is working on plant breeding. His training program dates are August 1 to September 30, 2010.

Abdoul Wahab Toure is planning to do his short-term training at Kansas State sometime between July-October 2011. He is working with Drs. Prasad and Staggenborg to determine the exact time period for maximum project benefit.

A third AGECE short term trainee was included in the budget, but Dr. Sanders feels it will be more effective to work with researchers in Mali during his visits.

Academic and Short Term Training Workplan | 2010-2011

Year 3 training activities will include:

- (1) Completion of English Language Training for the 5th academic student after which he will begin his MSc program in Agronomy at Kansas State University the Spring semester 2011.
- (2) Completion of English Language Training at the English as a Second Language Institute (ESLI) at West Texas A&M University for the two Agricultural Economics students. Upon successful completion, and acceptance they will begin their MSc program at West Texas A&M University (June 2011).
- (3) Continuation of MSc degree coursework and research for two students (one in Food Science at Purdue; and one in Agronomy at Kansas State University). Field research in Mali is planned for both students.
- (4) Short term training of one IER scientist in the USA (Agronomy at Kansas State University) will be completed.

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