9-2009

Transfer of Sorghum, Millet Production, Processing and Marketing Technologies in Mali September 29, 2008 - September 30, 2009.

INTSORMIL

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

Annual Report
September 29, 2008 – September 30, 2009

USAID/EGAT/AG/ATGO/Mali
Cooperative Agreement # 688-A-00-007-00043-00

Submitted to the USAID Mission, Mali

by

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

Leader with Associates Award: EPP-A-00-06-00016-00

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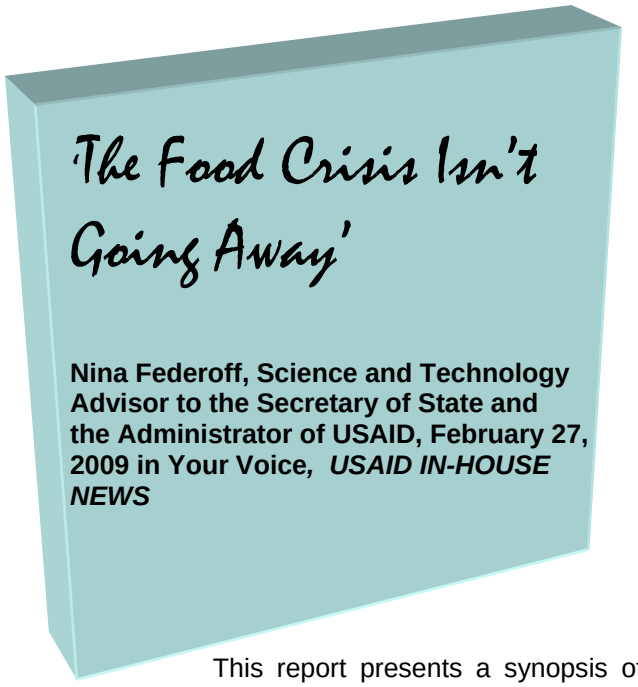
Transfer of Sorghum and Millet Production, Processing and Marketing Technologies in Mali

Introduction

This report details the progress achieved in year 1 (2008-2009) under the Cooperative Agreement # 688-A-00-007-00043-00. The report covers progress in the **Production-Marketing**, **Food Processing, Décrue Sorghum** and **Training** components.

According to Nina Federoff as reported in the USAID IN-HOUSE NEWS*…."the food crisis of 2008 called attention to how close we are to the limits of the global food supply. But unlike the financial one, the food crisis isn't going away. This is because the number of people on the planet is still growing and by mid-century we'll need to roughly double the food supply--- which, of course, starts with growing crops, whether to feed us, or to feed pigs, cows and chickens."* This well describes the project, ***Transfer of Sorghum, Millet Production, Processing and Marketing Technologies in Mali.*** This 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.

This report presents a synopsis of the progress achieved under the Cooperative Agreement # 688-A-00-007-00043-00 from July 1 to September 30, 2009. The report covers progress in the **Management, Production-Marketing**, **Food Processing, Décrue Sorghum** and **Training** components.

Project Components

Management Entity

Activities 2008-2009

- Modification of Cooperative Agreement #688-A-00-007-00043-00 to take into account the additional funding provided by the USAID Mali Mission.

- Dianne Sullivan, INTSORMIL Accounting Clerk was designated as Mali Project Assistant to assist the Assistant Director in project management which includes budget development, transfer of funds, handling of invoices and backstopping of all scientists involved in the Project.

- A subcontract for the Training component was awarded to Purdue University. Jess Lowenberg-DeBoer, Director of International Programs in Agriculture is Coordinator of the training program.

- Quarterly reports submitted to the USAID/Mali Mission

- Text and photos describing this Project were submitted to the USAID/Mali Mission for inclusion in the "Partner link" on the Mission website.

- A PowerPoint presentation describing this Project was prepared and presented to the INTSORMIL board of Directors at their annual meeting held at the Texas *Agri*Life Research & Extension Center in Lubbock, Texas September 29-30, 2009.

- An audit of Global Food Security Response (GFSR) projects was conducted by the Office of the Inspector General (OIG), Washington. The audit consisted of a conference call between the Management Entity and three members of the OIG team in Washington in which we responded to a two page list of queries submitted by the Audit team prior to the call. In addition, two members of the Audit team went to Mali where they met with Mission officials, IER scientists and John Sanders and Botorou Ouendeba and visited a project site.

- To formalize INTSORMIL collaboration with IER the Management Entity requested Dr. Bino Teme, IER Director to formally appoint Dr. Mamourou Diourte to serve as host country coordinator for the Project. His primary responsibilities as coordinator are:

  1. IER contact person for the Management Entity (ME). Responsible for in country activities of the four components of the project, (1) ***Production and Marketing***, (2) ***Décrue sorghum***, (3) ***Food Processing*** and (4) ***Training*** (Short term and Academic).
  2. Responsible for following the flow of funds from INTSORMIL ME to the bank in Mali and then to IER and to the scientists for research and technology transfer activities.
  3. Responsible for managing funds allocated and collection of receipts and sending them to the ME for reconciliation.
  4. Provides advice to the ME on in country budget development.
  5. Coordinates the visits of the US PIs by developing a program of visit, arranging

transportation, lodging and contacts with the respective Malian PIs and the USAID Mission.
6. In country backstopping of the training program including the selection of trainees and their in-country support before and during their training program activity.

General responsibilities in coordination with US PIs are to:

1. An oversight role over expenditures and activities by IER project directors (Yara Koreissi and Abdoul Wahab Toure). This is a similar role as to his current role in coordinating the ongoing INTSORMIL Regional Project.
2. Develop stronger farmers' groups and enhance farmer groups' marketing power (with Sanders)
3 Develop alternative markets for sorghum and millet (with Hamaker and Sanders)
4. Develop sorghum production technology for the décrue farming systems in the northern regions (with Prasad and Staggenborg).
5. Disseminate technology via media (with all US PIs)
6. Build institutional (IER) technology development and transfer capacity through long term (academic) and short term training (with Lowenberg-Deboer).
7. Management and maintenance of the Toyota Hi-Lux vehicle purchased by the processing unit. Priority for use of this vehicle is given those involved in the IER/LTA (processing unit) with second priority given for use to any other component of the USAID/Mali project coordinated by Dr. Diourte (i.e. Management Entity visits to Mali-Yohe and Heinrichs, Décrue project- Prasad and Staggenborg and Production-Marketing- Sanders).

Production – Marketing Activities

John Sanders, Purdue University

Activities 2008-2009

During 2009 the principal stress of the project was on increasing the area in farmers' fields in the new technologies. We expanded our activities in the regions in which we were already engaged especially in the cotton zone, Koutiala, and in Dioila (Table 1). But we also opened up new activities in the Mopti and Kayes regions.

With declining cotton prices in the last five years and falling productivity, there is substantial interest in Grinkan, the Guinea (25%)-Caudatum (75%), moderate height, intermediate season length cultivar that is giving yields of 2 to 3 tons of sorghum in the Garasso region when combined with our associated technology (see pictures 1-4).

On Oct 23, 2009 there was a field day to show farmers, bankers and others the potential of Grinkan. There were approximately 200 participants according to our NGO collaborator, AMEDD. In 2010 we will explore obtaining bank financing for a substantial area expansion in Grinkan and associated technologies. We will utilize the new seed producers in our program and from WASA.1

Table 1. Malian Area in New Technology in the Production-Marketing Project of INTSORMIL for the 2007-2009 Crop Years

Crop	2007	2008	2009	Village Site
Sorghum	50	50	59	Kaniko
Sorghum	--	50	150	Garasso
Sorghum	50	100	150	Dioila
Sorghum	78	100	100	Kafara
Sorghum	--	--	50	Zanzoni
Sorghum	--	50	110	Kolokani
Millet	150	150	150	Tingoni
Millet	--	--	60	Bankas/Pissa
Millet	--	--	60	Doutenza/Wakoro
Sorghum	--	--	75	Jangounte Camara
Total	**328**	**500**	**964**	

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

[1] We will discuss seed production techniques and problems below as that is an important area we have begun working on more in 2009.

ctor of AMEDD, Bougouna Sogoba, gave an interview to the press during the field day, Oct 23, 2009 focusing on the collaboration between AMEDD, IER, and INTSORMIL to diffuse Grinkan rapidly in the Koutiala region. (Picture Courtesy of M. Diourte)

Picture 2 Bourema Sanogo, President of the farmers' association at Garasso, explaining to the press the enthusiasm of farmers for growing Grinkan. (Picture Courtesy of M. Diourte)

Picture 3. A farmer and the head of the NGO, AMEDD, visiting a seed production plot of Grinkan in Garasso, Koutiala region. This cultivar is now being produced on more than 150 ha in 2009. (picture courtesy of B. Ouendeba).

Picture 4. A group of farmers increasing seed of Grinkan for planting in 2010 (picture courtesy of B. Ouendeba).

In Dioila we increased the area another 50 ha and are actively pushing Niatichama. This is another high yielding cultivar from Acar Toure, formerly of IER (75% Guinea and 25% Caudatum).It is intermediate height and season length. As with Grinkan stalks and leaves are highly appreciated for forage. Here we have an established coop, the ULPC, and have the classic problem of the cooperative imitating the "commerce." One of the bases of our project is to facilitate farmers using higher input levels with moderate fertilization (two sacks of fertilizer usually DAP and Urea) by obtaining higher prices. This means selling later, getting a price premium for quality and having a farmers' association that helps by selling in quantity and investing in market search. Established cooperatives have often figured out that they can do most of these functions and keep the profits rather than dividing them with the farmers. When they do this, farmers often lose the incentive to follow the labor intensive agronomy practices necessary to get high yields from our improved technology package. So in Dioila we are trying to improve the management practices of the cooperative by teaching them about farmer incentives and the need to convince farmers that they will benefit from greater contributions of their cereal for the coop to sell for them. We are working with IICEM on training courses for the cooperative officials and their membership. We will also be identifying and training some seed producers of Niatichama so that we can rapidly expand the area in this cultivar and associated technologies through bank financing in 2011. In Dioila there has been a problem of poor seed production with a large number of off-types (see pictures 5 and 6). In Dioila we will be concentrating on developing seed producers, doing intensive rouging and obtaining a substantial price premium for good seed production.

Picture 5. This farmer (from Nangola village, Dioila) grew Niatichama for the first time and he is pleased with both the head type and the height (Picture Courtesy of B. Ouendeba). Notice the number of off-types in the Niatichama photos. This problem will be addressed in 2010

Picture 6. Niatichama grown in Wakoro (Dioila, 2009) by farmers at high density demonstrates excellent yields (Picture Courtesy of B. Ouendeba).

In Kolokani and Jangounte Camara, Seguifa has done very well in 2009, even though it had to be planted late and/or replanted due to the erratic rainfall at the start of the season. This early Caudatum suffered in 2008 from the late rainfall resulting in the head bug-mold problem. The mold was apparently an important factor explaining the poor germination from the seeds from Kolokani planted in the Segou-Bla region in 2009. We are checking after the harvest of 2009 the farmers' response to Seguifa in Segou-Bla. In spite of the poor germination and replanting by many farmers from our field visits it appears that with the late planting, there will be good yields in the region (see photos). If farmers are interested, we will be working with Faso Jigui (a farmers' cooperative) to obtain credit for a substantial area expansion. M. Diourte of IER has organized the seed production of this cultivar in 2009 for this area expansion.[2]

[2] In the long run we need to find a Seguifa type sorghum (good height and panicle) that has some Guinea and is later. We are discussing this with IER and ICRISAT. Introducing some Guinea is a standard way to control the head bug-mold problem and often also increases the food quality.

Picture 7. Seguifa sorghum heads in Jangounte Camara (Kayes region 2009) (Picture courtesy of B. Ouendeba)

Picture 8. Farmers and Production-Marketing personnel in a Seguifa field, Kolokani region (Picture courtesy of B. Ouendeba)

Picture 9. An economist doing an impersonation of an entomologist checking for head-bugs in Seguifa in Kolokani, 2009 (Picture Courtesy of B. Ouendeba).

In Tingoni they have now graduated as a functioning farmers' association. They have introduced the new technologies and marketing methods and have sufficient size to keep going as a marketing coop buying inputs and selling millet for their members. They have good contacts with the millet food processors in Bamako and are able to get bank financing on their own. They have excellent agronomic support from Sasakawa 2000. They are also being supported by the AGRA program in 2009.

In Kafara they have long been a site for testing of the IER materials but they have been very slow in developing a functioning marketing coop from their farmers' association. We have been trying unsuccessfully to get them to move more rapidly to an effective farmers' association. We had no activity in either Tingoni or Kafara in 2009 except for training courses in cooperatives provided by IICEM.

In 2009 we began activities in two sites in the greater Mopti region, Wakoro and Pissa. In both we were introducing the millet cultivar Toroniou. We obtained the seed from the local IER substation and it was a mixture. Many farmers were unhappy with the quality of the seed. However, the fertilizer response was excellent in 2009 and farmers were very happy with that. The problem for 2010 is where to obtain higher quality seed. We are working with the very successful millet site of Tingoni to obtain higher quality seeds in 2010. We want to substantially expand the millet area in Mopti in 2010 and will be exploring for new sites before the end of 2009.

A major initiative in 2009 is the attempt to develop local seed producers. Farmers in Kolokani provided seeds to the Segou-Bla region, that were often damaged by the molds from the late season rains.3 This and the intermittent rains at the start of the 2009 season resulted in poor

[3] Another factor may be the insect problems in storage. We will be introducing the triple plastic sacks in Garasso, Dioila and Kolokani for the 2009 harvest. They are now becoming available from the PICS program being extended into Mali in 2009.

germination. Similarly, farmers in Kaniko sold local cultivar seed rather than the improved Grinkan seed to Zanzoni, a new region for expansion in the Koutiala region. This duplicity in the farmer seed sale even when they had good seed available was a major disappointment.

To respond to the lack of farmer incentive either to rogue or to provide his higher quality product we are introducing branding and a price premium. All farmer seed production from our various sites would be kept in the triple plastic sack bags with the identification of the farmer on the bags. Once this seed is sold and in the field our program monitors would identify whether the off types were less than a maximum level, probably 5%. If they are, there would be a premium paid to the farmer for his seed. This combination of branding and field verification is designed to give farmers an incentive to rogue and to deliver their higher value product. The branding is somewhat similar to the reputation that seed companies have with their name on the package.

Successes

We are happy with the success of Grinkan and the excellent seed production in Garasso and will explore bank interest in expanding this program in collaboration with AMEDD, WASA, and IICEM. In initial program expansion (before we have an established farmer' association) the bank problem is collateral. How do they insure that they will be repaid? This has not been a problem for the farmers' associations, once they are established, since they develop bank accounts and become a known financial entity. But for a rapid scale up there will be mainly new farmers' association. We will develop a collaborative program with the financial institution, in which bank representatives go out to the field with us when we are establish new farmers' associations. We will follow up with the financial institutions, which showed interest in the Garasso field day. So this is our initial procedure for scaling up without the Production-Marketing project providing the initial input credit. We will keep you posted on this in our quarterly reports.

The expansion of Seguifa in the Segou-Bla region is still a question mark. The susceptibility of Caudaturms to head bug and mold has been a major factor in the shift of breeders to Guinea-Caudatum mixes in Mali. Caudatums still tend to outyield Guineas. Seguifa is not only a Caudatum but also early. We prefer intermediate season length to give the plant more time to respond to the moderate fertilizer doses. Also with water harvesting we reduce the drought risk so we are going for higher yields rather than just trying to reduce yield variation at the low levels resulting from lack of inorganic fertilization. At any event we are getting excellent yields from Seguifa when we don't have late rains and farmers plant late. With the increased seed production of Seguifa in 2009 we will be surveying farmers for their Seguifa yields in 2008 and making a decision on whether we will promote Seguifa with the banks. Farmers will be made aware of the necessity to plant late and the potential head bug-mold problem if we go ahead with this. Stay tuned as we should be making a decision in December.

Niatichama is giving excellent yields of 1.5 to 2 tons/ha in Dioila. Seed quality has been very poor with insufficient rouging. Since the ULPC has been the principal beneficiary of the higher seasonal prices farmers have felt little incentive to follow the intensive agronomic practices required for the new cultivars. These include higher density, replanting, thinning, two to three weedings, and constructing the ridges for water harvesting. So we need to train farmers in Dioila in doing isolation and rouging and then initiate branding and a price premium after the seed is in the field Both of these measures will increase the incentives to produce quality seed. This seed production will be a priority in 2010. But the large number of off-types will require substantial rouging thus reduced yields so we may have to offer high premiums in the first year.

We have substantial farmer enthusiasm in the Mopti area with the good response to fertilizer. There was good rainfall after the early lack and irregularity at the start of the season. The Toroniou seed was very poor, a mixture, so we will look for another seed source in 2010. We will be working more closely with DRA and substantially expanding area in the Production-Marketing project.

In the Kayes region USAID-Mali has been pushing for rapid expansion. Farmers in the new site of Jangounte Camara (near Nioro du Sahel) were very happy with the yield results for Seguifa here. Again this demonstrates the importance of moderate fertilization. Farmers were forced by the lack of initial rainfall to plant late or to replant, which is necessary for this early Caudatum. Again we would rather have a cultivar with some Guinea. So this is our third area of priority behind the cotton zone (Koitala and Dioila) and the Mopti region. But we intend to look for one or two new sites in this region.

Difficulties

The next major step is bringing in the financial institutions. Our program initially provides input credit, which has to be repaid to the farmers' association and then becomes a rotating fund. We take the initial risks in the jump to moderate fertilization and a new cultivar. As we identify good new cultivars and are successful in creating new farmers' associations that employ the marketing strategies as well as their members following the technology recommendations, interest increases in the program by farmers in the immediate neighborhood and even further away. Then we should be able to start bringing in financial institutions for the initial input credits. The banks need to see the technologies in the field. We need to convince the banks to send out reps with us on initial visits. Without collateral or the farmers' association having an account in the bank will the banks feel that the risk of default is not serious enough to prevent their lending. We will be talking to banks about that in both the Koutiala region and the Bla-Segou region.

Seed quality. Individual farmers have a terrible time convincing themselves to rogue. They have to eliminate (uproot) the taller plants that they would normally select. As mentioned above with branding and a price premium we will try to convince the farmers we work with that even reducing their yields with the rouging the price premium will guarantee that seed production is profitable. This has been successful with Grinkan in Garasso where the initial seed quality (few off-types) was very high. It will be more difficult in Dioila with Niatichama as the initial seed quality is very poor, greater than 10% off types. The quality of the seed was also a factor in the Mopti area with farmers emphatically telling us that the Toroniou introduced was not Toroniou. This again was a problem of the regional production system of IER. We need to find some ways to help IER to produce a quality seed because the off types were very high in both Dioila and the Mopti region. WASA is collaborating with IER on improving seed quality and we will be engaging more with WASA in the future.

Finally even with the bank financing and seed improvement activities we need a large expansion of the areas in our conventional program in the Mopti region and a moderate growth in the Kayes region. Unfortunately, Seguifa has the problems of head bug-mold and we have not identified a better new cultivar than Seguifa for a wide area range. But improving on Seguifa is definitely a long term goal even though largely outside of our central focus on getting existent new technology onto farmers' fields. We need to identify the ways that we can have more impact on the breeding programs of IER and ICRISAT.

Projections for 2010

1. Build bank (or other financial institution) ties for a more rapid scaling up of Grinkan in the Koutiala region. One approach is to obtain the improved seed from Garasso and WASA and obtain input credits directly from the financial institution. Another is to build a partnership in which bank representatives accompany us on our organizational wok with the farmers' organizations. Once the farmers' organizations are mature (approximately 150 ha and that many members) they will have had bank accounts for several years and members are then accustomed to repaying the input

credits, even in adverse years. Then it will be easy for the farmers' association to obtain the bank credits. The trick here is to shorten the time length and to get the banks involved earlier.

2. Evaluate the success of the extended program of technology introduction with Seguifa in the Bla-Segou region. If successful (high farm yields) and there is farmer support for repaying the input credits, then develop a similar program to 1) above for the Segou-Bla region.
3. Continue the development of seed production capacity especially good quality control of Grinkan by working with the farmer-seed producers in Garasso and Kaniko and by collaborating with WASA. Develop the seed production capacity of Niatichama in Dioila for a major expansion of area in 2011. Obtain higher quality seed of Toroniou for the Mopti region.
4. Expand the conventional Production-Marketing project of technology-marketing-institutional development with a focus on Mopti first and the Kayes region secondly. Depending upon the amount of time required for 1) to 3) above expand the area covered in the Production-Marketing project by 500 to 1,000 ha.

Food Processing Technology Activities

Bruce Hamaker, Purdue University

The overall goal of the cereal **processing technology and training** component of the project is to establish a successful model of entrepreneurial sorghum/millet processing to competitive marketed food products. Year 2 activities focus on organization of the project, strengthening the IER Food Technology unit, establishing entrepreneurial incubator units and training of processors in the incubator units. The processing team consisted of Bruce Hamaker, Project Leader (Purdue University), Yara Koréissi, Host Country Coordinator (IER, Sotuba) and Mamadou Diouf, Consultant (ITA, retired).

Activities 2008-2009

- A questionnaire was developed and a survey conducted in the Mopti and Gao area to determine the current status and opportunities for sorghum and millet processed foods in the Mopti/Gao, Bamako, and broader regions. The results were presented at the May Processing Workshop be held in Mopti and selected results are given below..

- The project is setting up an incubation unit at the 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 the same equipment as has recently been put at the Mopti/Gao entrepreneur business sites. The new equipment pieces include cereal processing units for production of high quality sorghum/millet flours and grits, agglomerated products (couscous, degué, etc.), and pregelatinized 'instant' flours for thin and thick porridges. For IER/Mopti we are also considering purchase of a grain cleaner, decorticator, and mill for training and demonstration purposes to entrepreneurs of the northern region. Two food technologists, Seydou Malie and Sidi, have been assigned to assist on the project and are currently working on optimizing decorticating and milling processes. Results will be transferred to the Mopti/Gao partners.

- In the Mopti/Gao region, continuation and expansion of activities with six current processor groups. Linkages with Bamako and other regional markets will be explored through studies set up with an IER market economist. Increase number of entrepreneur partners in the project.

- Contractualization linkages with the production-marketing project to provide high quality grains to processors and markets to producers. A joint workshop will be proposed with the production-marketing group in the Mopti/Gao region to bring the actors together and show advantages to contractualization and improved returns to producers.

- In this period, the project procured a vehicle, Toyota Hilux double-cab, for travel to the Mopti/Gao project site, as well as for transportation needs for those involved in other components of the USAID/Mali Mission project.

- In June a workshop was conducted for food processing entrepreneur partners at IER/Mopti on the topic: *Primary education of technologies of processing of high quality,*

competitive millet and sorghum products, the fundamentals of quality management and packaging, and contracting farmers for high quality grains. A second workshop will be planned for late summer in Gao. The workshop topic is "*Marketing and management of a unit of local cereal transformation."*

Mamadou Diouf (foreground) discussing food processing topics with the entrepreneurs at the Mopti/IER workshop.

Yara Koreissi IER/Sotuba (left) and Mamodou Diouf (consultant) examining a hammer mill, one piece of equipment provided Mme. Cisse's incubator unit.

- Following the 4-day cereal milling and product training workshop with entrepreneur partners the processing project a follow-up visit was made by Y. Kouressi, IER project leader, to arrange for adjustments to decorticators and mills and to correct minor mistakes made during their installation. The six entrepreneur partners provided buildings, with specifications set by the project, to house initially one 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 six units are in somewhat different stages of processing activity. Plans are for all units to be fully functional and full-scale production to begin following our second workshop in January, 2010.

International Sorghum, Millet and Other Grains Collaborative Research Program Support (INTSORMIL CRSP)

Transfer of Sorghum, Millet Production, Processing and Marketing Technologies in Mali
Funded by USAID/Mali Mission

Enquête sur la Situation de la transformation des céréales à Mopti-Sévaré, Bandiagara et Gao

Survey on the Processing of Cereals at Mopti-Sevare, Bandiagara and Gao

August 2009
Yara KOREISSI
Mamadou DIOUF
Bruce HAMAKER

Note: This is only a summary of a 37 page document. Contact the authors for the complete document.

I. CONTEXTE ET JUSTIFICATION

L'étude se place dans le cadre du projet INTSORMIL de « Transfert de technologies de production, transformation et commercialisation du mil et du sorgho au Mali » (Transfer of Sorghum and Millet Production, Processing and Marketing Technologies in Mali): Composante transformation ». L'objectif de cette composante est de bâtir un modèle de valorisation du mil et du sorgho, récoltés dans les zones du projet qui sont Mopti et Gao. Ce modèle devra être assez pertinent pour pouvoir créer de la valeur ajoutée d'une part et générer des profits qui augmenteraient les revenus des acteurs et de leurs familles d'autre part. Ce modèle devrait être également attrayant au point d'être adopté par un nombre significatif de personnes dans les zones concernées par le projet, ce qui contribuerait certainement à y réduire la pauvreté.

Cet objectif sera atteint par (1) la dotation des bénéficiaires du projet, en cas de besoin, d'équipements de base (décortiqueuse, broyeur à marteaux (moulin), épierreur et d'autres petits matériels, (2) la promotion des produits alimentaires locaux fabriqués au Mali et (3) la formation des bénéficiaires pour la production des produits du mil et du sorgho de bonne qualité et compétitive.

En effet, selon les statistiques Projet Diagnostic Permanent (DIAPER), le mil et le sorgho constituent les cultures de premier rang au Mali, représentant à peu près les 52% de la production céréalière totale à partir de 1999 et plus de 53% en 2007-2008 suivant les statistiques de la Cellule de Planification et de la Statistique (CPS) du Ministère de l'Agriculture.
La production du mil tourne autour de 1, 175,000 tonnes (soit 30%) et celle du sorgho autour de 900,000 tonnes (soit 23%). Ces deux spéculations occupaient environ 75% des emblavures.
La région de Mopti contribue elle seule à plus de 27 % de la production nationale des mil/sorgho (CPS/Ministère de l'Agriculture).

La disponibilité des mil/sorgho, leur adaptation aux différentes zones agro-écologiques du pays et leur convenance à une large gamme d'utilisations font qu'ils jouent un rôle primordial dans la sécurité alimentaire, la diversification et l'amélioration du revenu des différents acteurs.

Malgré ces potentialités, les produits de ces cultures restent insuffisamment valorisés. Cette situation est imputable à diverses raisons liées, entre autres, aux insuffisances de performance et de compétitivité des systèmes techniques et entreprises de transformation. Pour une meilleure connaissance de l'impact du projet dans les zones concernées, il est nécessaire de faire un diagnostic de départ avant le démarrage des activités des unités de transformation mises en place avec l'appui du projet.

La présente étude se propose de faire l'état des lieux de la transformation (typologie des transformateurs, itinéraires technologiques utilisés, nature et performance des équipements disponibles, conditions de marché, contraintes au développement du sous secteur) des mils et sorghos dans les régions de Mopti et de Gao, zone d'intervention du projet. Elle doit sur la base de ce diagnostic, proposer une stratégie adéquate de développement du sous secteur transformation et identifier les atouts et opportunités à capitaliser dans ce cadre.

II. OBJECTIFS DE L'ÉTUDE

2.1. Objectif Général

L'objectif global de l'étude est de faire un état des lieux de la situation de la transformation du mil et du sorgho dans les régions de Mopti et Gao avant le démarrage des activités des unités de transformation en cours d'implantation avec l'appui du projet.

2.2. Objectifs spécifiques

- Avoir une meilleure connaissance des transformateurs de céréales en particulier ceux du mil et du sorgho ;
- Faire l'inventaire des pratiques existantes (technologie et équipements de transformation) ;
- Identifier les produits à base de mil/sorgho et les différentes technologies utilisées;
- Identifier les principales contraintes liées à la transformation et à la commercialisation des mil et sorgho ainsi que les actions nécessaires pour les juguler ;
- Étudier les conditions du marché.

III. RÉSULTATS CHOISIS

Tableau 1 : Liste des produits transformés par localité

Produit transformé	Mopti-Sévaré	Bandiagara	Gao
Dégué	+	+	-
Mugu fara	+	+	-
Djimita (riz)	+	-	-
Bérédegué	+	-	-
Bière	+	+	-
Farine fortifiée à base de mil (Misola)	+	+	-
Fonio précuit	+	+	-
Tianguiri	+	-	-
Larougnènè (Sorgho)	+	-	-
Farine de sorgho	+	-	+
Grain décortiqué mil/sorgho	+	-	+
Gningnin	+	-	+
Couscous	+	+	+
Bibita	+	-	-
Farine fortifiée à base de mil (wassa)	+	-	+
Diouga	+	-	-
Nio Séri	+	-	-
Crème	-	-	-
Boule d'akassa	-	-	-
Gâteau	-	+	-

+ : Présence du produit transformé
- : Absence du produit transformé

Tableau 2: Contribution des produits au chiffre d'affaire annuel (CAA) à Mopti – Sévaré.

Produits transformés	Contribution des produits au CAA					
	2006		2007		2008	
	CAA (Fcfa)	%	CAA (Fcfa)	%	CAA (Fcfa)	%
Degué	217.071	1	416.758	2	651.778	3
Mugu fara	98.004	1	97.120	1	150.200	1
Djimita(riz)	53.750	<1	107.333	1	89.833	1
Bérédegué	37.500	<1	52.250	<1	114.500	1
Bière	15.950.000	87	15.750.000	77	12.600.000	63
Farine (Misola)	720.000	4	1.440.000	7	2.160.000	11
Fonio précuit	-	-	-	-	60.000	<1
Tianguiri	80.000	<1	160.000	1	240.000	1
Larougnènè (Sorgho)	72.000	<1	144.000	1	216.000	1
Farine de sorgho	36.000	<1	72.000	<1	108.000	1
Gningnin	103.957	1	209.584	1	318.125	2
Couscous	59.580	<1	128.750	1	173.500	1
Bibita	169.200	1	338.400	2	507.600	3
Farine wassa (mil)	112.000	1	224.000	1	336.000	2
Diouga	-	-	125.000	1	348.500	2
Nio Séri	600.000	3	1.200.000	6	1.800.000	9
Total	**18.309.062**	**100**	**20.465.195**	**100**	**20.465.195**	**100**

Tableau 3 : Contribution des produits au chiffre d'affaire annuel (CAA) à Bandiagara.

Produits transformés	Contribution des produits au CAA					
	2006		2007		2008	
	CAA (Fcfa)	%	CAA (Fcfa)	%	CAA (Fcfa)	%
Degué	312.000	2	312.000	2	312.000	2
Mugu fara	261.000	2	261.000	2	261.000	2
Bière	840.000	6	840.000	6	840.000	5
Farine (Misola)	9.264.000	64	10.264.000	67	11.264.000	69
Fonio précuit	362.800	3	362.800	2	363.300	2
Couscous	72.000	<1	72.000	<1	72.000	<1
Gâteau	3.240.000	23	3.240.000	21	3.240.000	20
Total	**14.357.800**	**100**	**15.357.800**	**100**	**16.358.300**	**100**

Tableau 4: Contribution des produits au chiffre d'affaire annuel (CAA) à Gao.

Produits transformés	Contribution des produits au CAA					
	2006		2007		2008	
	CAA(Fcfa)	%	CAA (Fcfa)	%	CAA (Fcfa)	%
Farine de sorgho	250.000	29	375.000	22	465.000	22
Gningnin	-		310.000	19	400.000	18
Couscous	189.686	22	268.273	16	361.765	17
Farine wassa (mil)	113.293	13	194.390	12	256.900	12
Crème	186.196	22	378.280	23	490.770	23
Boule d'Akassa	120.913	14	138.303	8	182.475	8
Total	**860.088**	**100**	**1.664.246**	**100**	**2.156.910**	**100**

Tableau 5 : Coût de production et de vente des produits (exprimé en FCFA/kg par produit).

Produits transformés	Mopti		Bandiagara		Gao	
	Coût de production (Fcfa /kg)	Prix de vente (Fcfa /kg)	Coût de production (Fcfa /kg)	Prix de vente (Fcfa /kg)	Coût de production (Fcfa /kg)	Prix de vente (Fcfa /kg)
Degué	345	803	175	250	-	-
Mugu fara	295	720	150	500	-	-
Djimita (riz)	660	1233	-	-	-	-
Bérédegué	593	1000	-	-	-	-
Bière	150	250	88	125	-	-
Farine (Misola)	385	600	493	700	-	-
Fonio précuit	450	1000	400	600	-	-
Tianguiri	367	1000	-	-	-	-
Larougnènè (Sorgho)	400	600	-	-	-	-
Farine de sorgho	205	300	-	-	400	475
Gningnin	264	475	-	-	250	325
Couscous	263	417	150	200	585	660
Bibita	400	900	-	-	-	-
Farine wassa (mil)	316	350	-	-	444	556
Diouga	440	1000	-	-	-	-
Nio Séri	275	500	-	-	-	-
Gateau		-	1500	1917	-	-
Crême		-	-	-	432	498
Boule d'akassa		-	-	-	550	631
Moyenne produits transformés	**363**	**697**	**422**	**613**	**444**	**524**

IV. Conclusion

Cette enquête sur la situation de la transformation des Mil et Sorgho a permis de :

- Faire l'état des lieux de la transformation des mil/sorgho à Gao, Bandiagara et Mopti-Sévaré en faisant ressortir les atouts et les faiblesses ;
- Aboutir à une meilleure connaissance des transformateurs de céréales et les pratiques courantes
- Inventorier les technologies existantes (technologie et équipements de transformation) ;
- Identifier les produits à base de mil/sorgho et les différentes technologies utilisées;
- Étudier les conditions du marché ;
- Identifier les principales contraintes liées à la transformation et à la commercialisation des mil/sorgho ainsi que les actions nécessaires pour les juguler.

D'une manière générale, l'enquête a confirmé que les mil/sorgho constituent les principales cultures céréalières au Mali.

Si les programmes d'appui ont permis d'obtenir une production excédentaire de mil/sorgho depuis plus d'une décennie, à travers l'amélioration de la productivité, force est de constater que le sous secteur de la transformation reste peu développé.

La transformation artisanale de type traditionnelle reste dominante, offrant des produits finis peu compétitifs.

Les unités transformant les mil/sorgho sont de taille plus réduite comparativement aux autres transformateurs de produits agricoles. En outre, il faut aussi reconnaître que l'existence de micro unités traditionnelles de transformation est presque spécifique à cette filière. Les 80-90% des infrastructures recensées ne répondaient pas aux BPH/BPF et ne disposaient pas de locaux appropriés pour l'activité de transformation. Presque tous les équipements de transformation recensés dans les différentes localités avaient été importés à l'exception de quelques uns qui étaient de fabrication locale. Des efforts d'analyses prospectives sont donc nécessaires afin de mettre en place des dispositifs adéquats de soutien de la transformation dans les deux régions. Il s'agit notamment :

- de renforcer la capacité d'investissement des unités ;
- de soutenir les entreprises pilotes de transformation par la formation, le suivi – évaluation et l'accompagnement;
- de faciliter la mise en relation des producteurs et transformateurs à travers le système de contractualisation ;
- de promouvoir l'utilisation des équipements adaptés de fabrication locale ;
- d'assurer la promotion des produits.

La mise en place d'un tel dispositif passe par la traduction des résultats de cette enquête en plan d'action opérationnel fixant les échéances ainsi que les rôles et responsabilités des différents acteurs.

Il parait également impérieux d'approfondir l'analyse économique de la sous filière transformation dans les deux régions afin de cerner les coûts et l'impact de la transformation sur le niveau des acteurs. Ceci permettra de mieux cibler les actions à entreprendre pour assurer une promotion harmonieuse et durable de la transformation au niveau du mil et du sorgho.

Projections for 2010

- Introduce more processed products into the market
- Introduce new technologies to four entrepreneurs
- Continue the training workshops for entrepreneurs
- Conduct training workshops for urban food processors
- Bring new processing technologies to the Incubator Center at IER, Sotuba

Décrue Sorghum Activities

Scott Staggenborg and Vara Prasad, Kansas State University

Introduction

The ***décrue sorghum*** activities are conducted in collaboration with the sorghum program scientists from IER, Sotuba and are conducted in the Bintagoungou and Goundam area. The goal is to identify agronomic practices that lead to increased yields and increased quality of post water recession grown sorghum. The project is being coordinated by Abdoul Wahab Toure, IER Agronomist. Wahab is being assisted by two Institut Rural de Katibougou students who are located at the décrue sites and are conducting their theses based on the project results. Activities conducted by IER scientists will include and testing to identify most suitable cultivars for the region, testing of various cultural practices (cultivars, planting techniques, fertilizer regimes, pest management strategies and transfer of suitable technologies identified to farmers.

Global Objective

To generate improved agronomic techniques along with appropriate décrue sorghum cultivars to sustain food production and foster economic improvement of northern Mali

Specific Objectives

1. To determine farmers' perceptions and knowledge about current management practices and farmers' needs and preferences and at the same time to collect the sorghum cultivars grown in the area.
2. To conduct experiments on integrated soil, water, nutrient and décrue sorghum management strategies for improved productivity.
3. To diffuse the generated improved techniques.

Activities and Results

Activity 1. Assessing Farmers' Cultural Practices on Sorghum in the Décrue System

I Global objective:
To assess on décrue sorghum, research findings (recommended cultural practices) on rainfed sorghum.

Specific objectives:
-To assess integrated plant, pest and soil management technology on décrue sorghum.
-To assess sorghum response to fertilizer in the décrue system

II Materials and methods:

In 2009, a randomized complete block design experiment was conducted in Bintagoungou (4 replications) and Goundam (2 replications), with 5 integrated cultural practices (PC) as treatments:

PC1: 1m x 1 m, no thinning.

PC2: 0.80 m x 0.60 m 3 plants per hill
[In 2008, PC2 was standing for: (PC1 + the use of Furadan for soil treatment and Apron Starr for seed treatment)].

PC3: 0.80 m x 0.60 m 3 plants per hill +
the use of Furadan for soil treatment and 'Apron Star' for seed treatment.

PC4: PC3 + 1.5 g of Diammonium phosphate (DAP) per hill.
PC5 PC3 + 3.0 g of Diammonium phosphate (DAP) per hill.

Data collection:

Soil was sampled in both Bintagoungou and Goundam sites at 0-20 cm and 20-40 cm layers, on the basis of one sample per replication. Twelve samples were available for soil analysis: texture, organic matter, pH, total and available P, sum of exchangeable cations (Na, Ca, K and Mg) were the soil parameters of interest.

Spatial occupation by the crops was appreciated in each treatment on: a) the basis of actual number of germinated hills per ha; b) the ratio of actual to planned number of hills on % basis. Number of hills, of stems, of panicles as well as panicle and grain weight will be recorded at harvest.

NOTA BEMA:

1: In 2008, CP2 was conducted similarly to CP3 (0.80 m x 0.60 m 3 plants per hill + the use of Furadan for soil treatment and 'Apron Star' for seed treatment) on Experiment 1.

2: In 2009, DAP was applied on May the 16th, 4 weeks later from planting date (19th of April); in 2008, DAP was applied when planting sorghum at rates of 4 and 8 g per hill on respectively CP4 and CP5.

3: In 2009, Furadan applied at a rate of 1.5 g per hill, was used for soil treatment.

III Results and discussion:

Table 1: Parameters related to décrue sorghum establishment in an 'Integrated Cultural Practices Experiment'. Bintagoungou 2009-10 crop season

		Germinated hills per ha	Thinned Plant population	Germination percent	Thinned plant per hill	Spatial Occupation % PC!
PC1	**Farmer's practice (1 m x 1 m)**	10694	45070	60	4	100
PC2	**0.80 m x 0.60 m 3 plants per hill**	19167	45278	86	3	179
PC3	**PC2 + seed and soil treatment**	17500	43611	79	2	164
PC4	**PC3 + 1.5 g of DAP per hill**	16945	47222	76	3	158
PC5	**PC3 + 3.0 g of DAP per hill**	16667	39167	75	3	156
Mean		**16195**	**44069**	**75**	**3**	**151**

Significant differences were observed between cultural practices for only germinated hills per ha and the number of plant per hill after thinning. Inferior number of germinated hills per ha was observed in farmers' practice, compared to research practices (PC2, PC3, PC4, and PC5). Besides, superior thinned plant per hill was observed in farmers' practice compared to research practices.

Conclusions:

1. Spatial occupation was improved with research practices (+56 % for the least and 79 % for the most).

2. Plant population establishment, depending on both germinated hills per ha and the number of plants per hills, requires more investigation on the two parameters.

Activity 2. Plant population Effect on Décrue Sorghum Production

I Objectives:

1.1 Global objective

To assess on décrue sorghum, research findings (recommended cultural practices) on rainfed sorghum.

1.2 Specific objectives:

-To assess the contribution of thinning, and plant population on sorghum grain yield in the décrue system.

II Materials and methods:

The trial was conducted in Bintagoungou (Hameye farm) in a completely randomized design with 5 treatments, in 4 replications:

DP1 = 1m x 1m, 1 plant per hill;
DP2 = 1m x 1m, 2 plants per hill;
DP3 = 1m x 1m, 3 plants per hill;
DP4 = 1m x 1m, no thinning;
DP5 = 0.75 m x 0.50 m, 2 plants per hill (53 333 plants per ha).

Data collection: Spatial occupation by the crops was appreciated on the basis of actual number of germinated hills per ha. Germination was appreciated by the ratio of actual to planned number of hills (expressed in %). Number of hills, of stems, of panicles as well as panicle and grain weight will be recorded at harvest.

III Results and discussion:

Table 2: Parameters related to décrue sorghum establishment in a plant population trial. Bintagoungou, 2009 crop season.

		Germinated hills per ha	Germination percentage	Spatial Occupation % DP4
DP1	1 m x 1 m (1 plant per hill)	4750	48	90
DP2	1 m x 1 m (2 plants per hill)	4750	48	90
DP3	1 m x 1 m (3 plants per hill)	4500	45	86
DP4	1 m x 1 m (No thinning)	5250	53	100
DP5	0.75 m x 0.50 m (2 plants per hill)	13333	50	254
Mean		**6517**	**48**	**124**

NB: DP4 stands for famer's practice while DP5 stands for research practice.

Germination percentage was generally low (48 % in average). Besides, in DP2 and DP3, no more than 1 plant per hill was observed, which may negatively affect final plant population when assessing grain yield.

Sorghum spatial occupation, expressed through germinated hills per ha, was improved with recommended cultural practice, compared to farmers' practice (DP4). This improvement could be estimated to + 154 %.

Conclusion:

The general low germination percentage, particularly on DP5 suggested the need to investigate ways to increase plant population establishment in décrue sorghum. Changing plant geometry from 0.75 m x 0.50 m to 0.75 m x 0.25 m, transplanting sown sorghum at 3 plants per hill at 20 days after emergence (20 DAE), should be explored to reach required plant population in the décrue system.

Activity 3. Evaluation of Sorghum Breeding Materials for Adaptation to the Décrue System

3.1 Observation plots:

Sixty six varieties and cultivars (collected from both the National program and farmers in villages around the Faguibine lake, and the Tele lake were planted in Bintagoungou (2 replications); Bougumeira (1 replication) and Goundam (one replication). The objective was to select, with farmers' participation, well adapted plant materials to the décrue zone, with respect to famers' point of view.

The three best cultivars will be selected in the field, by farmers in descending order, using the following scoring method:
1st best = 16 grade;
2nd best = 12 grade ;
3rd best = 8 grade.
All the remaining will be graded as 0.

At least, 30 women will be involved in selecting the cultivars, after harvesting, threshing and cleaning. The procedure will be the same as used in the field. It will consist for the ladies, of selecting out of the field, based on their own criteria, the best three cultivars among the sixty six which would have also been observed by men farmers in the field. Grain of the all cultivars harvested in the field will be threshed, cleaned and presented in plastic pots. Each of the ladies (30) will have to show the grain she likes the most among the sixteen harvested cultivars. The survey will be conducted by two graduate Students of "Institut Polytechnique Rural / Institut de Formation et de Recherche Appliquée IPR / IFRA".

Results will be available by the end of November.In 2008 the women chose Niatichama.

3.2 Seeking optimal date for selected plant materials in the décrue system

3.2.1 Global objective:

To determine the optimal planting date for sorghum in the décrue system.

3.2.2 Specific objectives:

To determine for each of the seven varieties selected by farmers in 2008, the optimal date in the décrue system.
To determine the sensitivity of the seven varieties development to a change of planting date.

3.2.3 Materials and methods:

From the 33 varieties and cultivars tested in Bintagoungou in 2008, seven were selected by farmers. In 2009, the seven varieties and cultivars were tested at four equally spaced planting dates (17 days): (D1 , D2 , D3 and D4).

Strip-plot experiment was used with planting date as horizontal factor and varieties as vertical factor. Two farmers were used as replications.

Horizontal plots (planting dates) were composed of 21 rows, seven varieties, three rows per variety. Each variety was 5 m in length and 2.25 m wide.
Vertical plots (varieties) were composed of four planting dates. Each planting date was 2.25 m wide (three rows) and 5 m length.

Plants in three rows, 5 m in length and 0.75 m wide, were thinned to 0.5 m between plants, which was equivalent to 53 333 plants per ha.

Several components were measured : number of germinated hills, of plants after thinning, and the percentage of germination.

3.2.4 Results and discussion:

The number of germinated hills observed in average (17 508 per ha) was about 75 % of the expected one. From Planting date 1 (PC1 =April 22nd) to Planting date 4 (June 12th) a decrease of the number of germinated hills was observed with the number of days from April 22nd , particularly between May the 9th and June 12th (Table 3).

Table 3: Number of germinated hills per ha in Bougoumeïra, 2009 season.

	Planting date 1 2009 / 04 / 22 0 DAP	Planting date 2 2009 / 05 / 09 17 DAP	Planting date 3 2009 / 05 / 26 34 DAP	Planting date 4 2009 / 06 / 12 51 DAP	Mean
Cultivars					
V1:Saba Tienda (22)	13778	26223	19112	17334	19111
V2:Saba Sôtô (23)	12889	25334	23111	8889	17556
V3:Vrac de BTG (27)	12000	24889	20000	11111	17000
V4:Saba Tienda (28)	12000	24889	21334	11111	17333
V5:04-SB-F5DT-42 (5)	15556	22223	22222	7112	16778
V6:00-CZ-F5P-135 (9)	12445	25334	20000	8000	16445
V7:Niatichama (14)	23111	24445	14667	11112	18333
Mean	**14540**	**24762**	**20064**	**10667**	**17508**

Conclusions:
1. The highest number of germinated hills was observed at 9th of May planting date.

2. Saba Tienda and Niatichama had the most germinated hills.

Table 4: Number of plants per ha, after thinning, in Bougoumeïra, 2009 season.

	Planting date 1 2009 / 04 / 22 0 DAP	Planting date 2 2009 / 05 / 09 17 DAP	Planting date 3 2009 / 05 / 26 34 DAP	Planting date 4 2009 / 06 / 12 51 DAP	Mean
Cultivars					
V1:Saba Tienda (22)	27111	52000	34667	34223	37000
V2:Saba Sôtô (23)	24889	50222	41334	16889	33333
V3:Vrac de BTG (27)	24000	50667	36445	20000	32778
V4:Saba Tienda (28)	23556	46667	40000	22222	33111
V5:04-SB-F5DT-42 (5)	31111	43556	39111	13333	31778
V6:00-CZ-F5P-135 (9)	23556	49778	38667	14223	31556
V7:Niatichama : (14)	42667	48889	24444	19556	33889
Mean	**28127**	**48825**	**36381**	**20063**	**33349**

Plant population after thinning, was on average 33,349 plants per ha, which corresponded to 53 % of the expected plant population (53,333 plants per ha). The tendency of plant population to decrease with respect to the number of days after planting (DAP) was observed from PC2 to PC4. PC1 cannot be ranged in this tendency. Plant population ranged from 31556 plants per ha (V6) to 37 000 (V1).

Conclusion:

The highest plant population was observed at the 9th of May planting date.

Table 5: Percentage of germination per planting date and per varieties. Bougoumeïra, 2009 season

	Planting date 1 2009 / 04 / 22 0 DAP	Planting date 2 2009 / 05 / 09 17 DAP	Planting date 3 2009 / 05 / 26 34 DAP	Planting date 4 2009 / 06 / 12 51 DAP	Mean
Cultivars					
V1:Saba Tienda (22)	52	99	72	65	72
V2:Saba Sôtô (23)	49	95	87	34	66
V3:Vrac de BTG (27)	45	95	75	42	64
V4:Saba Tienda (28)	45	94	80	42	65
V5:04-SB-F5DT-42 (5)	59	84	84	27	63
V6:00-CZ-F5P-135 (9)	47	95	75	30	62
V7:Niatichama : (14)	87	92	55	42	69
Mean	**55**	**93**	**75**	**40**	**66**

Averaged over varieties, planting dates showed a tendency of germination percentage to decrease from the 9th of May to 12th of June (PC1 is not taken into account in this tendency) The

average germination percentage was 66 %. Germination percentage per varieties was ranged from 62 (V6) to 72 % (V1). The highest % of germination was observed at 9th of May planting date.

Conclusion:

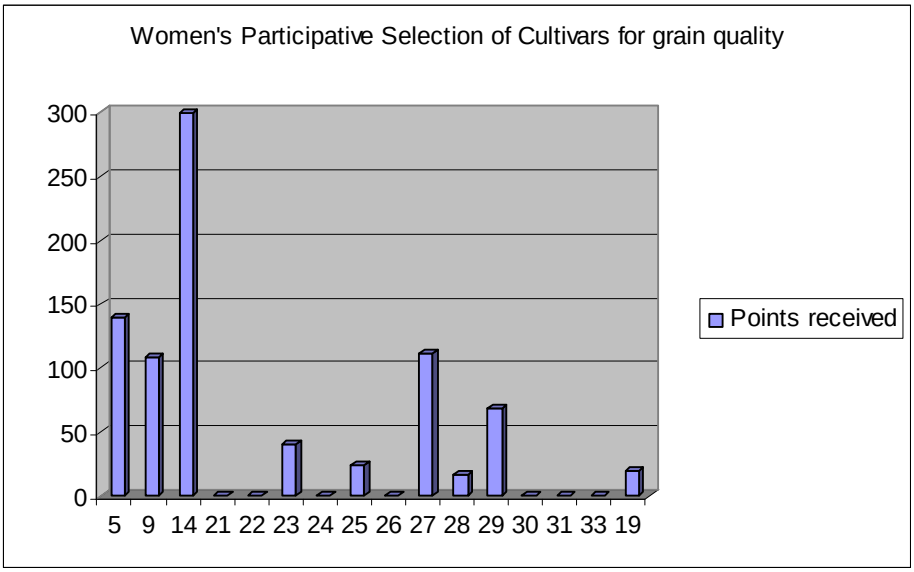
Seven selected varieties and cultivars were selected by famers in 2008. The selected materials were submitted to 4 planting dates (equally spaced by 17 days), from 22nd of April to 12th of June. Preliminary results indicated that the 9th of May (Planting date 2) lead to a better germinated hills, germination percentage and plant population. The grain yield data yet to be collected are required to confirm these results

Preparing a décrue sorghum field trial as the Lake Faguibine, Tomboctou, Mali water recedes at the end of the rainy season. Student assistant, Ibrahim TOURE (above) of the Institut Rural de Katibougou is using the results for a thesis.

Ousmane SANGHO from OMVSF (Office pour la mise en valeur du système Faguibine) and Abdoul Wahab TOURE from IER taking notes in a décrue sorghum field trial prior to harvest at Bintagounou, Lake Faguibine area, Mali.

Décrue sorghum panicles ("Niatichama") in INTSORMIL/IER studies in a farmer's field, Bintagoungou, Tomboctou Region, Mali.

2008 Results



Women chose Niatichama (No. 14) as the best cultivar for grain quality of 33 cultivars tested in 2008. This test was repeated in 2009 and data will be available December, 2009.

Mamadou Abba YATTARA, a collaborative farmer with IER is very happy with his "hands full" of the new décrue sorghum variety "Niatichama." Bintagoungou, Tomboctou Region, Mali,r. October 2009.

Projections for 2010

- Continue the studies started in 2010 with refinements based on 2009 results.
- Expand the number of locations in the Lakes area.
- Consider expanding to include the Gao area. This is somewhat difficult because farmers in the Gao area plant earlier (December) than in the Lake Faguibine and Goundam area and thus it is difficult to coordinate activities such a distance apart.
- Select a variety preferred by farmers and farmer women and approved by scientists for seed multiplication and diffusion to a wide area of the décrue region.

Training Activities

Jess Lowenberg-DeBoer, Purdue University

Activities 2008-2009

A subcontract for training was awarded to Purdue University with funding starting April 1, 2009. Activities included:

- IER identified and recommended five candidates for Masters' training.
- Four of the five students received their visas and arrived in June to begin their 6 month Intensive English Language Training Program at the Indiana Center for Intercultural Communication (ICIC) in Indianapolis. They are: Aly Ahamadou (Ag Economics), Mamadou Dembele (Ag Economics, Bandiougou Diawara (Agronomy) and Fatimata Cisse (Food Science).
- The fifth student, Sory Diallo (Agronomy), was selected late to replace a female candidate that withdrew.
- Sory Diallo was entered into TraiNet with a program start date of January 6, 2010. The four students in the US made application to the Graduate School at Purdue (Food Science and Ag Economic students) and Kansas State (Agronomy student). Their graduate school acceptance is awaiting their TOEFL score.

Accomplishments 2009

- One female student is currently in the US participating in the long term training component, which helps meet the Mission's goal for training women researchers from Mali.
- The Mali students in the US have improved their English language skills- doubling their initial assessment score in the first 3 months. They will take the TOEFL exam November 20th.
- The Mali students have increased their understanding of American culture and the US educational system through their intensive English Language Training Program at the ICIC.

Difficulties

- The Mission has expressed the goal to include females in the long term and short term training. IER initially identified two female students for the long term training. Since both

women had an infant child, the Mali Mission pursued USAID approval and support for the infants to accompany the female students. Purdue made all the necessary arrangements for the female students to bring one child. In the end, USAID denied this request and one of the female candidates dropped out. It may be difficult to recruit females for extended study outside of Mali if they must leave infant children behind.

- The 6 months of intensive English may not be sufficient to bring non-English speakers up to the required TOEFL score required by US Graduate Schools.

Projected activities for 2010

- Sory Diallo, final Masters' student, will do his 6 month English Language training at Kansas State University (KSU) and then begin his Masters' program in Agronomy at KSU.

- Bandiougou Diawara will be admitted as a graduate research assistant at KSU and will complete his first year of his Masters' program in Agronomy.

- Fatimata Cisse will be admitted as a graduate research assistant at Purdue and will complete her first year of her Masters' program in Food Science.

- Aly Ahamadou and Mamadou Dembele will be admitted as graduate research assistants at Purdue and will complete their first year of their Masters' program in Agricultural Economics.

	Long term training (academic)			
	Candidates	**Mentor**	**Field of study**	**Status 11/2009**
	Aly Ahamadou	Sanders	Agricultural Economics	English training at IUPUI
	Mamadou Dembele	Sanders	Agricultural Economics	English training at IUPUI
	Fatimata Cisse	Hamaker	Food Science	English training at IUPUI
	Bandiougou Diawara	Prasad/Staggenborg	Agronomy	English training at IUPUI
	Sory Diallo	Prasad/Staggenborg	Agronomy/GIS	Arrives 1/2009

Short term training areas*	Location	Period
• **Agronomy**		
Procedures for conducting on station and on farm agronomic experiments and technology transfer strategies	USA Kansas State University	**TBD**
• **Plant Breeding**		
Train farmers in seed production including hybrid seeds Awareness of crop losses by pests during storage	USA Purdue University	**TBD**
• **Agricultural Economics**		
Basic concepts for the production-marketing project Value chain analysis Data analysis	USA Purdue University	**TBD**

*Short term training plans will begin as soon as the academic students have arrived and started their English Language Training.

Indicator table with actual numbers and targets for Yr 1- Yr 4, 10/01/2007 – 9/30/2011
Results reported in 2009 with modifications and explanations

Indicators/Targets	10/01/07 9/30/08	10/01/08 9/30/09	10/01/09 9/30/10	10/01/10 To 9/30/11
1. Number of new technologies or management practices under field testing as a result of USG assistance.	4	5	6	8
2. Number of new technologies or management practices made available for transfer as a result of USG assistance.	4	5	6	8
3. Number of additional hectares under improved technologies or management practices as a result of USG assistance.	500	974	1,500	2,500
4. Number of individuals who have received USG-supported short-term agricultural sector productivity training.	500 375 male/125 female)	1,000 800 male/200 female)	1,500 900 male/300 female)	2500 1800 male and 700 female
5. Number of individuals who have received USG-supported long-term agricultural sector productivity training.	0	4	5	5
6. No. of farmers adopting new technologies or management practices.	500 375 male/125 female)	1,000 800 male/200 female)	1,500 1,200male/300 female)	2500 1800 male and 700 female
7. No. of processors or businesses/individuals involved in any form or post harvest activity.	6 1 male/5 female	18 3 male/15 female	42 10 male/32 female	50 20 male/30 female
IEHA: Number of Farmers/producers or processors adopting new technologies. Relevant technologies include: -Mechanical and physical: new land preparation, harvesting, processing and product handling technologies including packaging -Biological: new germplasm that could be higher-yielding or higher in nutritional content, affordable food-based nutritional supplementation such as vitamin A-rich sweet potatoes or rice, or high-protein maize, or improved livestock breeds, and livestock health services & products such as vaccines	nr 500	nr 1,000	nr 1,500	nr 2,500

IEHA: Number of farmers. Vitamin A-rich sweet potatoes or rice, or high-protein maize, or improved livestock breeds, and livestock health services and products such as vaccines -Chemical: fertilizers, insecticides and pesticides - Management and cultural practices: information technology, improved agricultural production and marketing practices, better natural resource management practices.	500 500	1000 1000	1,500 1,500	2,000 2,500

Notes on amendments to the tables

1. Number of new technologies or management practices under field testing as a result of INTSORMIL assistance.

2. Number of new technologies or management practices made available for transfer as a result of INTSORMIL assistance

We introduce the same basic technology in all the regions but the cultivar is different and adapted to the region. So where the cultivar is different we call it a different technology. I have corrected these from the earlier levels. This is a definitional problem of new technologies rather than a change in indicators

3. Number of additional hectares under improved technologies or management practices as a result of INTSORMIL assistance

We had a goal of 1,005 ha in new technologies for 2009 but in Kaniko we were 31 short. This is substantially more than our original objective of 800 ha and we appreciate the pushing of USAID to increase this area. We increased our area objective to 1,500 in 2010 but if we are able to obtain bank financing for the Koutiala and Segou-Bla region as we are planning to pursue, then we will have another 1,000 ha. We try to be conservative in our projections but we were able to expand our area substantially with good support from our collaborators and from AID and from increased interest of farmers in the program.

4. Number of individuals who have received USG-supported short-term agricultural sector productivity training.

As the Production-Marketing Project has significantly expanded the number of farmers collaborating in the project has significantly increased from year to year and this increase will continue as the project is continued.

5. Number of individuals who have received INTSORMIL-supported long-term agricultural sector productivity training.

The increase in long term agricultural sector training from 08 to 09 was due to the fact that the candidate trainees were selected and training began in 09. One additional trainee will begin his training activity in the 09-10 period at Kansas State University. All five trainees will continue through 2010-2011.

6. Number of farmers adopting new technologies or management practices

We obtained higher numbers of farmers as well as increased area. We limit area participation to one ha/farmer but in areas of high population concentration and limited land area farmers sometimes choose smaller areas. Chiefs and officials in the farmers' association sometimes take more than one ha and we work to limit this. The area limitation is to maximize the extension effect of the new technologies and marketing strategies. Same comments about the increases in the numbers of farmers..

7. Number of processors or businesses/individuals involved in any form of post harvest activity

Note that Hamaker's work is listed here rather than under "IEHA: … processing and product handling technologies"…. The 300% increase in 08-09 was due to the expansion of the food processing project into the Mopti and Gao area and further expansion at Sotuba/Bamako area will occur in 09-10. Connection to the food and feed processors is important to the evolution of this project. The millet food processors are now well connected to the farmers' association in Tingoni producing millet. Unfortunately for our sorghum productivity efforts, most food processors prefer millet. We are looking to extend connections of the sorghum producers to the intensive producers of poultry but first need lower prices for sorghum than for millet and that will come from increasing productivity of sorghum in our technology introduction program. We have initiated millet production activities in Mopti and there are millet processors there that the Food Processing project of Bruce Hamaker has now provided with machines. Counting them if they buy from our millet producers raises this total by 12 individuals in 2009. We get further increases in 2010 and 2011 if we are able to sell to feed mixtures or intensive chicken producers. These will be predominantly male.

IEHA

These figures refer to numbers of farmers. These are not cumulative since the area in the previous year is repeated in the subsequent year. Last year they were presented as cumulative measures, which is not correct if with the rotating fund they continue to plant this same area and these same farmers continue to be in the program. We are introducing improved fertilization at moderate levels, better agronomy- a series of practices, a water harvesting technique and new cultivars adapted to the region and responsive to fertilizer. Under "Mechanical and physical: new land preparation," you could put our water harvesting techniques. Note the repetition above. We have reduced the area expansion for 2010 as a further expansion will be dependent upon bank financing and we will only know about that when we begin to negotiate with the banks for the farmers' associations. If we can get the banks involved in the initial financing, we can substantially increase the area and farmers involved. In this case we will also need to develop a good process of seed production probably largely within the project.

Achievement of Objectives Yr 2, 2008-2009

Objective	Targets	Current Status
Objective 1. Develop stronger farmers' groups and enhance farmers' groups marketing power	Increased joint programs with partners	❖ Extensive partnerships have been developed by all project components involving collaboration with most major stakeholders.
Objective 2: Facilitate adoption of production and marketing technologies to improve the productivity of sorghum and millet and increase farmer incomes	Increased yields and incomes	❖5 new technologies introduced by the Production-Marketing Project ❖The number of ha under the Production-Marketing Project doubled from 500 to 1,000 in Yr 2 ❖ Grain price increase due to marketing strategy of 31% ❖Income gain due to increased yields of 43%-121%
Objective 3: Developing alternative markets (food, beverages and feed) for sorghum and millet	Decreased costs of inputs to farmers	❖ Extensive progress in developing markets for sorghum as a poultry feed ❖ 18 entrepreneurs trained in development or improvement of food processing activities ❖ Food processing incubator units installed at IER Mopti and Sotuba and in several entrepreneurial groups (including provision of equipment)
Objective 4: Develop sorghum production technology for the décrue farming systems in the northern regions	Increased yields and incomes	❖ 6 new management practices evaluated ❖ Farmer selection of sorghum varieties for further evaluation and seed production prior to diffusion ❖ Cultural management practices that significantly increase yield and grain quality identified

Objective 5: Up scaling the sorghum and millet seed production industry in collaboration with other agencies	Increased availability of seed of improved sorghum and millet cultivars	❖ Partnerships developed to promote the production of sorghum and millet seed of high yielding and good grain quality varieties suitable for human food and poultry feed ❖ Working with the farmer-seed producers in Garasso and Kaniko and collaborating with WASA.
Objective 6: Disseminate technology via media (communications/ publications/ website)	Increased awareness by entrepreneurs of opportunities for use of sorghum and millet in the food processing and poultry feed industries	❖ Several workshops conducted ❖ Farmers' Field Days held ❖ Field Day press releases ❖ Articles posted on INTSORMIL website ❖ Bulletins published ❖ Survey taken
Objective 7: Build institutional (IER) technology development and transfer capacity through long term (academic) and short term training	Increased ability of IER to conduct sorghum and millet research and transfer technology	❖ IER Sotuba and Mopti Incubator Food Technology labs developed ❖ Four IER scientists in English language training in U.S. for M.Sc. studies ❖ One IER candidate selected for M.Sc training at KSU

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