



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

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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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Introduction

This report details the recent progress achieved under the Cooperative Agreement # 688-A-00-007-00043-00. The report covers progress in the **Production-Marketing, Food Processing** and **Décrue Sorghum** components.

UN Secretary General Ban Ki-Moon has stated that we now have an historic opportunity to revitalize agriculture (see box below). In response to such comments we have designed this project specifically to move sorghum and millet production technologies onto farmers' fields, link farmers' organizations to food and feed processors and to commercialize processing technologies so as to enhance markets. To achieve this we improve the supply chain from the farm level to the consumer.

Objectives

- Facilitate adoption of production and marketing technologies to improve the productivity of sorghum and millet in targeted areas and increase the incomes of farmers
- Introduce micro fertilization strategies and associated agronomic improvements into the décrue farming systems in the northern regions
- Introduce strategies to counter output price collapses to farmers' groups while linking them to food and feed processors where they exist
- Develop stronger farmers' groups and enhance farmers' groups marketing power
- Assist in producing a cleaner supply of millet and sorghum and assisting farmers in getting paid a quality premium for the higher quality product
- Facilitate the development of markets for food use for millet and sorghum and as a poultry feed for sorghum
- Extend select mechanized processing technologies to entrepreneurs and processor groups
- Upscale the seed sector at project sites

"We have an historic opportunity to revitalize agriculture.....I call on you to take bold and urgent steps to address the root causes of this global food crisis....."

UN Secretary General Ban Ki-Moon

Production - Marketing
Dr. John Sanders

Ouendeba, Diourte¹ and Sanders spent Oct 15-30 visiting sites where we have or are planning to have new technologies in the field. We started in the two new sites in Mopti and then traveled to Segou, where we visited Tingoni and Dioila. The farmers had good turnouts in the two Mopti sites and we explained the program putting emphasis on the need to develop strong farmers' organizations. The farmers were anxious to begin the program in the summer of 2009.

Year 2008 was a very good rainfall year so the millet was impressive in Tingoni. Since the NGO SG 2000 used the rotating funds for input purchase for construction of their storage and farmers' meeting facility, the farmers' organization had to borrow money from the bank to finance the 2008 fertilizer purchase.² We expressed to SG 2000 that these rotating funds were supposed to be used for annual input purchases. The important point though is that the farmers' association here continues to use the improved technologies and to build relations with the millet food processors in Bamako, who badly need the increased quantities of the clean grain. In Dioila with the increased fertilizer price farmers cut back on fertilizer expenditures. They have switched to the improved cultivar, Nachitchama but needed more fertilizer than one and one half to two sacks. The farmers' organization should have more money in their rotating fund for input purchases from the high sorghum prices of 2007; however, the farmers' organization paid the farmers a low price at harvest and used the increased profits to finance a building for the Malian NGO emerging from the Swiss aid project.

For both Tingoni and Dioila we will continue to maintain technical ties and help the existing farmers' organization get improved seeds and monitoring but we will not extend the area until the organizing NGOs become more cognizant of the farmers' incentives and the need to make the farmers the principal beneficiaries of the higher prices especially in poor rainfall years such as 2007.

After Segou we went to our main cotton site in Koutiala. This is an old cotton region with substantial population concentration resulting in small farm size plus continuing cotton production leading to soil fertility depletion. With the declining cotton prices of the 21st century there is an increasing dissatisfaction with the historic dependence upon cotton. Moreover, farmers here understand the value of fertilization and are well diversified. Grinkan (a Caudatum-Guinea cross of Acar Toure with primarily Caudatum) was a tremendous success with yields of best farmers at 2 tons per ha and above in 2008 (see photos below). There is substantial enthusiasm here for expanding the area in Grinkan and associated technologies. We have three sites here and will be increasing the area by 200 ha in 2009.

We also visited Kafara and Kolokani with Mary Lou Carlson of the USAID office and to Kafara with the Peace Corps Associate Director, Kristine Hoffer. The Kafara region also showed the effects of cutting back on the fertilizer use. Moreover, the growth of the farmers' organization in Kafara has been seriously hampered by their long standing relationship with IER. They are accustomed to just receiving subsidized inputs and we did not push hard enough here initially to organize an independent farmers' organization. A local merchant and an outstanding farmer and his family participants largely dominate this organization. Nevertheless, many farmers here are doing very well with Nachitchama (primarily Guinea but some Caudatum) so we will continue to

¹ We also brought Diourte with us to Senegal in early October to see the millet and sorghum sites there. Our program in Thiare is an especially good model of collaboration between the millet farmers and the millet processors' association. The latter organization buys approximately 20 tons of millet per month in the Thiare region and especially appreciates the uniform cultivars and the cleaner grain from avoiding the threshing on the ground. Both of the above characteristics are fundamental to the Production-Marketing program.

² It is a program achievement that the farmers' association had sufficiently evolved as an economic unit to obtain a bank loan.

facilitate the technology introduction and attempt to increase the rotating fund³ so as to moderately increase the use of inorganic fertilizer. Kolokani is the site that M. Diourte has worked with for a long time. It was a new site in 2008 and the farmers there were very successful with the new sorghum cultivar, Seguifa. We will firm up our expansion plans in Kolokani in a March visit but are tentatively planning a substantial expansion there.

On Dec 11- 22 Ouendeba, Diourte, and Sanders again visited sites in Mali for our on-going fieldwork. Along with Short Heinrichs and Jeremy Foltz, a Fulbright scholar and Agricultural Economist from the University of Wisconsin, we visited the new site (Diangounte Camara near Nioro) in the Kayes region identified by M. Diourte in his field trip earlier in the month. Diourte had done a similar site identification job for the two Mopti sites. In Diangounte Camara there was an excellent farmers' group meeting and substantial enthusiasm about planting 75 ha in Seguifa and associated new technologies (see photos in photo gallery below).

Later on in this trip we went to Koutiala to see all three sites and are substantially expanding our activities there. Garasso is doing very well and we are opening another site at Finkolani (Table 1).

We also met with Mekan Fofani, who runs the IER Seed Unit and with Mme Sanogo Diarata Traore, who runs the intensive poultry producers' association. Note that, according to Mme Traore, of the 200 intensive producers of chickens in this association approximately 100 are producing broilers with the other 50% engaged in egg production

Activities planned for 2009

- 1) Table 1 summarizes our plans for the summer of 2009. We are making a shift northwards with the initiation of activities in the Mopti and Kayes regions. We will be making a big push in the degraded cotton zone of Koutiala. In several regions we will not be expanding since we need to improve the farmers' organizations first. But we will continue to monitor, to introduce new technologies, and to help them with the marketing. We will also be collaborating with IICEM in 2009 to become involved in training for the farmers' organizations and identifying sources of financing for inventory credit (warrantage). There are now 10 farmers' associations involved in this project and will be doing more training in the future and engaging with other agencies to seek support for inventory credit and for linking to other programs, especially the continuing flow of new technologies into these associations, and ten onto the farms of their members.
- 2) We plan to connect better with the intensive poultry sector for our sorghum producing regions. Most important for this sector is getting substantially higher yields for sorghum. We will be beginning our poultry sector survey in 2009.
- 3) We need to systematically analyze how we should move to local seed production of high quality. This means increased uniformity with sufficient rouging and field isolation
- 4) The initial agronomy of new participants in the program has been poor. A better initial orientation of new participants is needed to improve initial performance. We will do this with the monitoring services we provide but more effort is necessary.
- 5) As we have farmers' groups reaching 150 ha and 150 members we will conduct training courses in business and coop management and improve the transparency of the organization. This transparency is a critical point. These organizations need to win farmer confidence in order to be able to sell more of their grain in addition to the repayment of the input credits. They also need to be well managed to get bank loans. We will find

³ We will not put more money into this rotating fund but help them with their marketing and encourage them to increase farmers' incentives by guaranteeing a larger share of any increased revenue from the farmers contributing more than just their input loan repayment.

- NGOs that can conduct the training and present it in modules in the local languages, first in Bambara for Mali.
- 6) We will set up a better system to regularly incorporate new technologies. Presently, we have extended our local seed production activities to include some regional testing of new cultivars. We need to incorporate into our field operations evaluation of a series of technologies starting with different storage pest control techniques, secondly evaluating legume-cereal rotations with an emphasis on just fertilizing with P. The later is especially important as we move outside the cotton zone into the north of Mali.
 - 7) We will identify how to get involvement of local banks by developing the credibility and business management ability of the farmers' organizations. One goal is to get bank representatives involved early in the process of developing these farmer organizations. We should have a strategy for this from the initiation of the program with the first 50 ha.

Table 1. Planned area increase and total area in new cultivars and associated technologies in Mali for the crop year, 2009.

| Region | New Cultivar | Partners in extension ⁴ | Increase in area in 2009 (ha) | Total area in 2009 (ha) |
|--|-----------------------|---|-------------------------------|-------------------------|
| 1. Mopti: Bankas/Pizza Dwanza/Wakoro | Toroniou (millet) | DRA (the Malian national extension agency) | 60 | 60 |
| | Toroniou (millet) | | 60 | 60 |
| 2. Koutiala Garasso Finkolani Kaniko | Grinkan (sorghum) | AMEDD (Malian NGO concentrating in southern Mali) | 100 | 150 |
| | Grinkan | | 50 | 50 |
| | Grinkan | | 50 | 100 |
| 3. Kayes Diang. Camara | Seguifa (sorghum) | DRA | 75 | 75 |
| 4. Segou Tingoni Dioila | Toroniou | SG2000 ⁵ ULPC ⁶ | | 150 |
| | Nachitchama (sorghum) | | | 100 |
| 5. Koulikoro Kafara Kolokani | Nachitchama | IER ⁷ DRA | | 100 |
| | Seguifa | | 105 ⁸ | 155 |
| Total Area | | | 500 | 1000 |

⁴ Note that IER, the national agricultural research agency, is our principal partner in all our activities. We work together with them and the new cultivars come out of their breeding programs.

⁵ Japanese supported NGO that collaborates with the Jimmy Carter Foundation and is largely staffed by former CIMMYT employees. Focus on extension of new agricultural technologies in developing countries.

⁶ Malian NGO evolving from a Swiss development project that focused on storage and marketing a range of agricultural products in Dioila.

⁷ This is the traditional region where the breeding program of IER has tested their new material. So they have done the extension work here.

⁸ Area still to be confirmed in March of 2009.



Happy farmers showing a new, highly productive sorghum cultivar, Grinkan, grown in the Production-Marketing project at the Garasso/Koutiala site. October, 2008.



A highly productive sorghum cultivar, Grinkan grown in the Production-Marketing project at the Garasso/Koutiala site. October, 2008.



Garasso farmers in the Production-Marketing project showing the very large panicle of the sorghum cultivar, Grinkan. October 2008.



A farmer's plot of Grinkan at Garasso/Koutiala, October 2008.



A local sorghum (4-5 m tall) that is highly susceptible to lodging and is low yielding. Garasso/Koutiala, 2008.



John Sanders INTSORMIL PI with Sekou Cissé a collaborator in the Production-Marketing Project who obtained 38 000 FCFA from growing the improved sorghum variety Grinkan and following the recommended agronomic practices. For years Sekou has been growing cotton and after reimbursing for the cost of the inputs making very little profit. 2008.



Mamourou Diourte, IER sorghum program leader with Amadou Dembélé who obtained 25 000 FCFA by growing the improved sorghum variety Gringkan and following recommended cultural practices in the Production-Marketing Project. For ten years Amadou has been growing cotton and after reimbursing for the cost of the inputs he never returned home with one FCFA. Now with 25 000 FCFA from growing Grinkan sorghum he was so happy that he bought candy for children in the surrounding villages. 2008.



John Sanders INTSORMIL PI showing the large panicle of Grinkan (a word that means that the cultivar is so attractive that many farmers have selected it) at KANIKO village, 18 km from Koutiala, Mali, October, 2008.



An attractive;, high yielding farmer's field of Grinkan, a short, intermediate caudatum-guineense type sorghum at KANIKO village, 18 km from Koutiala, Mali, October, 2008.



An attractive, high yielding farmer's field of Grinkan at KANIKO village, 18 km from Koutiala, Mali, October, 2008.



John Sanders INTSORMIL PI (R) and Mamourou Diourte, IER Sorghum Program Leader in a field of Grinkan grown by a farmer (white cap). This field will produce a high yield of quality grain and will make a handsome profit for the farmer. KANIKO village, 18 km from Koutiala, Mali, October, 2008.

E. A. "Short" Heinrich's Visit to Mali

December 12-16, 2008

Photo Gallery

Production-Marketing Project in the Kayes Region

Cercles in Kayes Region. Nioro Cercle in green and Diema in yellow. The Production-Marketing Project will expand into these cercles in west Mali



Mayor, Nioro du Sahel, Kayes Region. Encourages Production-Marketing group to introduce the sorghum production-marketing package in Nioro area.

Newspaper article on the desk of the Mayor, Nioro du Sahel entitled “Les récoltes menacées par les sauteriaux” = “*Harvest destroyed by grasshoppers*” referring to the sorghum and millet harvest in Kayes Region, Mali. Grasshoppers and locusts are a perennial problem in the region. Recently blister beetles have become destructive pests of millet where they feed on the head. Blister beetle larvae feed on grasshopper eggs in the soil indicating a relationship between grasshopper and blister beetle populations.



Pathe Kebe, Chef Secteur Agricultura, Nioro du Sahel exhibiting head of improved sorghum variety grown in the Nioro area.

- He reported that 50% of millet in area destroyed by blister beetles in 2008. Farmers have drastically cut millet hectareage due to the beetles.
- Birds and grasshoppers are major pest constraints in sorghum and millet.

Mamourou Diourte, IER Sorghum Program Leader exhibiting head of improved sorghum variety grown in the Nioro area.



Office of the Diema Sector of Agriculture which handles the extension in the area. Diakalidia Traoré, Chef Secteur Agriculture , Diema du Sahel arranged the meeting with the farmers detailed in the photos below.



Botourou Ouendeba and John Sanders (INTSORMIL), Mamourou Diourte (IER) AND Jeremy Foltz (University of Wisconsin Ag Econ. Dept.), Fulbright Fellow presenting the Production-Marketing project to Diema farmers

Diema sorghum farmers listening to an explanation of the Production-Marketing Project. After understanding the risks and advantages all farmers indicated an interest to collaborate with the project. We had hoped for 50 collaborators of 1 ha each but the farmers wanted 75 ha as they indicated that several farmers not at the meeting should not be excluded from this opportunity.



Diema women sorghum farmers listening to an explanation of the Production-Marketing Project. Of the 42 farmers present, 5 were women and 37 were men.




INTSORMIL PI John Sanders, Production-Marketing Project Leader showing a Diema sorghum farmer photos of the lush sorghum plots in the Production-Marketing Project at Kolokani. The women farmers expressed their desire to grow sorghum as seen in the photos.



Diema women farmers smiling after the close of the meeting where they learned about the potential of being a collaborator in the Production-Marketing Project in 2009.

Happy Diema woman who will collaborate with the Production-Marketing Project with the hope of being able to provide more food and income for her family.



| | |
|---|--|
|  | <p>Diseased sorghum head remaining in a harvested field near Diema, Mali.</p> |
| <p>Diseased sorghum head remaining in a harvested field near Diema, Mali.</p> |  |
|  | <p>Jeremy Foltz, Univ. of Wisconsin agricultural economist and Fulbright Fellow at harvested Production-Marketing plots, Seguifa Village, Kolokani Region, Mali.</p> |

Seguifa Production-Marketing plots before planting showing ridged rows for water harvesting.



Sikasso Region, M'Pegneso Village, Mali

Women threshing millet in M'Pegneso Village, Sikasso Region, Mali.





Threshing millet heads with the M'Pegneso Village children gathered around millet heads.

M'Pegneso Village children gathered around millet heads. Millet based foods are an important component in the diet of the villagers.





PLATE FORME DES FEMMES-
M'PEGNESO

Grain mill of the women of M'Pegneso village, Sikasso Region, Mali. The mill grinds sorghum, rice and maize grains into flour.

Milling flour in the grain mill of the women of M'Pegneso village, Sikasso Region, Mali. The mill grinds sorghum, rice and maize grains into flour.



| | |
|---|---|
|  | <p>Mud walled and thatched roof grain storage structure (rear) in M'Pegneso Village, Sikasso Region, Mali</p> |
| <p>M'Pegneso villagers carrying grain to the village cooperative storage facilities</p> |  |



M'Pegneso Village women delivering grain from the recent harvest to the village cooperative storage facilities.

M'Pegneso Village farmers and their INTSORMIL guest.



A dry season sunset over Nioro du Sahel, Mali.....

End of Photo Gallery

Décrue Sorghum ***Drs. Vara Prasad and Scott Staggenborg***

The following trials have been completed and data are being analyzed:

Varietal trials

33 cultivars in 4 replications, one farmer's field considered to be the replication. We have 2 farmers at Bintagoundoun and 2 farmers at Takabangoun.

Breeding plots

These cultivars were planted from March, 29th to April, 1st 2008. Twenty varieties from the IER sorghum breeding program and thirteen from the farmers were planted at Bintagoundoun (2 sites) and Toukabangou (2 sites).

Agronomy trials

Experiment 1: Compare improved technologies to farmer's cultural practices.

Location: Bintagoundou. Randomized complete block design was used with five replications.

Experiment 2. Effect of thinning, soil and seed treatment on plant population and yield

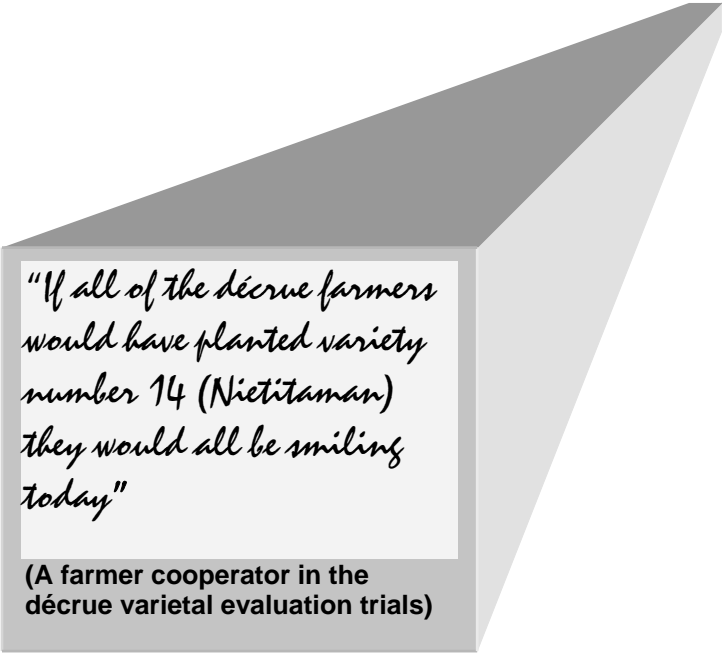
**Observations based on a Trip Report by
Abdoul Wahab TOURE, Sorghum Agronomist
and Niaba TEME, Sorghum Breeder to
Goundam, site of the décrue trials
23 October to 1 November**

Objectives

The objectives of the visit were to (1) conduct the final observations of the first field season at the Lac Faguibine site and (2) harvest the study plots.

Observations

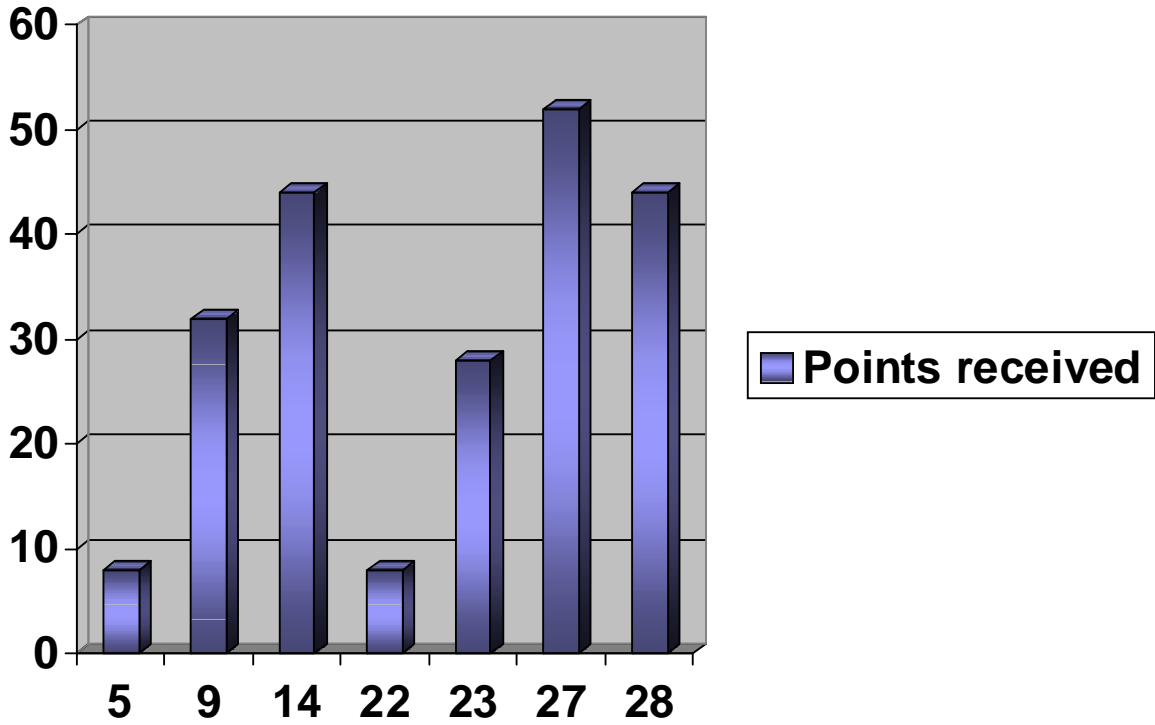
Of the 33 sorghum varieties evaluated in the varietal evaluation trials seven varieties were selected by cooperating farmers for their high yields, high quality grain and good flowering characteristics. Those selected included two local cultivars (nos. 27 and 28) and no. 14, Nietitaman, which is a product of the IER breeding program. Forty four percent of the farmers selected Nietitaman (see graph).



*"If all of the décrue farmers
would have planted variety
number 14 (Nietitaman)
they would all be smiling
today"*

**(A farmer cooperor in the
décrue varietal evaluation trials)**

Farmer participatory selection of décrue sorghum cultivars at Bintagoungou, campagne 2008-2009.





Abdoul Wahab Toure, IER Agronomist, Décrue Sorghum Project.

Processing Technology

Dr. Bruce Hamaker

The INTSORMIL PI for the Processing Technology component, Dr. Bruce Hamaker, Purdue University visited Mali in December. A project planning meeting was held from December 16-18, 2008 with B. Hamaker (Purdue), M. Diourte (IER), M. Diouf (consultant), and Y. Kouressi (IER); M.L. Carlson and J. Harman were updated on project activities at the USAID/Mali office.

- Project for sorghum/millet processing of commercial products was launched in the Mopti/Gao area in 2008 with the goal of expanding grain markets through sustainable entrepreneurial-scale mechanized units to produce high quality, competitive processed products. The Mopti mayor's office was represented at the launch event.
- Six partner entrepreneur groups were chosen to participate in the initial phase from an existing association of women entrepreneur groups - 3 in Mopti/Sevare, 1 in Bandiagara, 2 in Gao. Partners are currently finishing the building of new or the upgrading of existing structures to house processing equipment that will be used initially to produce high quality debranned and milled products; equipment will be delivered in February 2009 and contracts will be signed for their pay back.
- A recent trip to the Mopti-Gao region in mid-December by Mamadou Diouf (consultant from ITA/Dakar) and Yara Kouressi (PI from IER/Sotuba) was done to organize delivery and future activities with partners, and to set up a market survey that will be done in January 2009.
- For the processing project, the six partner entrepreneurs in the Mopti-Gao region are currently preparing structures, as in-kind contributions, to house new decorticators and mills for delivery in February 2009.
- Linkages are being developed to the production-marketing segment of the overall program; entrepreneur partners will be contracting quality grain through farmers.
- Workshops in March and June 2009 will train partner groups on equipment usage, high quality processing including good manufacturing practices, packaging, management skills, and marketing. Expansion activities in the coming year will include adding diversified products and establishment of an incubation center at IER.
- The aim is to develop a working model of successful processing entrepreneurs that are linked to farmer's groups that can be expanded to other areas of the country.



Female entrepreneurs in the Processing workshop held in Mopti, 2008.



Participants in the Processing workshop held in Mopti, 2008.

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