EVALUATION OF SORGHUM AND MILLET TECHNOLOGY AND MARKETING STRATEGY INTRODUCTION: 2006-07 CROP YEAR

PRODUCTION-MARKETING PROJECT

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Cover picture: Farmers' visit on a field day in Maraka, Niger with an improved cultivar and inorganic fertilizer.

Photo Credit: Botorou Ouendeba.

INTRODUCTION

The Production-Marketing Project with financial support from USAID Africa regional program collaborated with national research and extension institutions, local NGOs and farmers' organizations to introduce new technology and marketing strategies for sorghum and millet farmers in three Sahelian countries (Mali, Niger and Sénégal). This program has three main components: A technology component aimed at increasing output through the use of improved technologies (the combination of an improved variety, inorganic fertilizers, water harvesting techniques and other agronomic improvements), a marketing component aimed at getting a quality premium and taking advantage of the price recovery later in the year by not selling at harvest, and a capacity building component aimed at developing farmers' associations into a viable marketing organization selling the grain, providing storage and purchasing inputs in quantity. In the future they may also become micro-credit organizations. An increased supply of clean quality grain is the first prerequisite for the development of the food and feed processing industry.[1]

The program was undertaken in Sénégal, Mali and in Niger on a total of 300 ha of sorghum and 150 ha of millet in 2006. The program has worked with approximately 400 sorghum producers and 150 millet producers in the three countries in 2006. In each country farmers' groups have received credit for the costs of improved varieties, inorganic fertilizers and pesticides. This technology package of improved varieties combined with the use of fungicides and inorganic fertilizers was combined with an improved water harvesting technique, generally ridging, plus getting the threshing off the ground by introducing tarps ("Bache"). At harvest farmers pay to the farmers' organization with grain for the inputs provided to them. This credit repayment grain is stored by the farmers' organization to be sold later to purchase inputs for the next cropping season. The farmers' organizations agreed to sell later after the post harvest price recovery.[2] Farmers involved with the program make income gains from yield increase and also from the price increase (resulting from the marketing strategies).

[1] This development is a primary objective of the Production-Marketing Project. Another objective is the input of technical and economic services to this processing industry to accelerate its growth.
[2] In 2006 we also initiated a trial inventory credit program in Tingoni, Senegal and Gabi, Niger.

This report discusses the results of the evaluation of this program for 2006 in the three countries. It is composed of three main sections that include yield estimates in section I and economic evaluation (income gains) in section II. A third section then discusses benefits of the program from the processors' perspective. Finally, the report will draw some conclusions from the sorghum and millet field activities of 2006.

I. YIELD ESTIMATES

In this program evaluation is conducted at the end of every crop year. The survey is designed to interview farmers about their production and marketing strategies. Results of that survey allow the estimation of average yields for the program and contrast them with yields of farmers' traditional fields. In addition, crop cut data are collected by the field technicians working directly with the farmers. The survey was conducted in May of 2007 during the annual project evaluation field visits. In this section yield estimates from the survey and also from crop cuts are presented for each country.

1.1. Mali

In Mali the sorghum program was conducted in the regions of Bamako (Kafara village) and Koutiala[3] (see Appendix 1). For the sorghum the program has partnered with the local NGO AMEED in the Koutilala region and with AOPP (Associations des Organisations Professionnelles Paysannes) in the Kafara region. The millet part was conducted in the region of Segou (Tingoni village) in collaboration with the NGO, Sassakawa Global 2000 (SG2000). For this report we discuss results at the Kafara site for sorghum and the Tingoni site (Segou) for millet.

1.1.1. Sorghum

A total of 48 farmers participated in the program with the help of AOPP in the Bamako région (Kafara and surrounding villages) on a total of 62 ha in 2006. In Kafara, a guinea type

[3] The farmers in Koutiala were very unhappy with the guinea cultivars introduced in 2005 due to excessive growth of the stalks and lodging. So in 2006 we provided seed of an improved caudatum tested in the region and recommended by the sorghum breeder, Acar Toure. We indicated to the farmers' association that they should fund the input expenditures for fertilizer with the rotating fund from the previous year and not expand the cultivated area. We directly supported monitoring by AMEED in 2006. In 2007 AMEED and the Koutiala farmers' association asked us to rejoin the program and to expand the area in a nearby village. This activity will double the Koutiala sorghum area in 2007.

sorghum variety, Nieta, was planted. The sorghum variety was chosen by farmers who participated in initial on-farm trials with the IER sorghum program. In interviews, farmers have reported average yields of 1180 kg/ha with the Nieta cultivar and the improved agronomy (Table 1). The crop cuts estimated were a little higher at 1300 kg/ha. The best farmer group (10% of sample, 5 farmers) following the recommendations averaged 1.9 t/ha[4].

The gains to farmers from the technology package are still small at 317 to 434 kg. The yield gains to the best farmers are substantially higher. The cultivars introduced have been guineas. IER has also developed some high grain yielding caudatum varieties with lower grain quality that can be used in the program. Caudatums have higher yield potential especially with the moderate fertilization levels employed here.

Table 1: Program estimated yields (kg/ha) in Mali 2006

Village	**Crop**	**All Farmers**			**Maximum Interview**	**Minimum Interview**
		Interviews	Crop cuts	Best Farmers Interview		
Tingoni	Millet	1476	1481	1824	2080	1000
Kafara	Sorghum	1183	1300	1919	2966	500

Source: Interview and field technicians report.
Note: The best farmers category is the average yield of 5 farmers with sorghum yields averaging 1.9 tons and 4 farmers with millet yields averaging 1.8 tons/ha.

1.1.2. Millet

For millet in Mali, the program has collaborated with SG 2000in financing 18 farmers to produce millet on 50 ha.[5] The millet variety used was Toroniou with an intermediate cycle (60 to 75 days to flowering). Planting was in July and most farmers have followed the recommendation for water retention of tied ridges ("billons cloisonné").

Average millet yields in Tingoni were very good for this region.[6] Average yield estimated from farmers' interviews was 1476 kg/ha. This represents about a 60% average yield increase compared to the traditional yield of 912 kg/ha reported for Tingoni (Table 2). In the crop cut

[4] The crop cuts data were considered to be more accurate. In interviews farmers tend to understate their yields.
[5] We have been encouraging SG 2000, the NGO extension agency in Tingoni, to reduce the size of the individual farmer parcels and increase the number of farmers to get an average of 1 ha/farmer or lower.
[6] Millet is produced on lower quality soils with lower rainfall than sorghum.

estimates, the average millet yield reported was 1481 kg/ha (Table 2). This is almost exactly the same as the interview average reports. The continued presence and close monitoring by the NGO,SG 2000, has apparently led to trust between the farmers and the NGO, thus farmer yield reports are more consistent with crop cuts than in other regions.[7]

The best farmers have achieved millet yield of 1824 kg/ha, more than doubling traditional millet yield of 912 kg/ha for this region (Tables 1 and 2). These best farmers generally followed recommendations and have good management (especially undertaking timely farm operations) in addition to correct application of the technology.

Table 2: Traditional sorghum yields (kg/ha) in Mali 2006

Village	Crop	Average	Maximum	Minimum
Tingoni, Ségou	Millet	912	1223	601
Kafara, Bougouni	Sorghum	866	3000	266

Source: Interview data

1.2. Niger

For the 2006-2007 crop growing season, the Production-Marketing Project has teamed up again with the National Agronomique Research Institute of Niger (INRAN) and the farmers' organisation (Fuma Gaskiya) to conduct the program in the Maradi region (Gabi, Maraka and surrounding villages). INRAN staff and the village based extension agent monitored the field operations. Farmers involved in the program are well organized through the federation of farmers' organizations, Fuma Gaskiya. A total of 100 ha of sorghum were produced using improved technology by 250 farmers in the villages of Gabi and Maraka (appendix 1).

In Niger, the average farmer was cultivating less than 1 ha of land. These small farmers had limited areas of the lowland, alluvial soils traditionally planted in sorghum in the Maradi region. The program was also set up to help these farmers use the marketing strategies defined by the project in order to take advantage of the higher sorghum prices later. For the farmers of this region the 2006 program implemented a fund of six thousand dollars ($6000) for the inventory credit (warrantage) using the produced sorghum.

For millet, the program collaborated in 2006 with the NGO, CRS Niger (Catholic Relief Services) in the Dogondoutchi region. In this region, fifty (50) ha of improved millet

[7] Farmer estimated yields tend to be understated and generally less than crop cut estimates.

production were planted by 50 farmers. Unfortunately, farmers in these villages received minimal supervision from the NGO in charge of the field supervision. Therefore farmers' understanding and application of the technology and marketing strategy of the project were very poor. In 2007 we implemented activities without this NGO in the region and substantially increased yields even with the abnormal rainfall of 2007.

1.2.1. Sorghum

The Niger program was conducted on 100 ha (60 ha in Gabi and 40 ha in Maraka). The number of farmers involved with the program also doubled compared to 2005. In Gabi, 118 producers were involved in 2006 compared to 45 farmers in 2005. The number of farmers involved with the program increased from 50 in 2005 to 134 in 2006 in Maraka. The improved variety, SEPON 82, used in 2005 was also used again this year along with inorganic fertilizer and a water harvesting technique.

Table 3: Program estimated yields (kg/ha) in Niger 2006

Village	**Crop**	**All Farmers**			**Maximum Interviews**	**Minimum Interviews**
		Interviews	Crop cuts	Best Farmers' Interview		
Dogondoutchi	Millet	694	NA	933	1567	400
Gabi, Maradi	Sorghum	1440	2140	2542	3500	470
Maraka, Maradi	Sorghum	1397	1670	2337	3176	442

Source: Interviews and field technicians' reports.
Note: The best farmers category is the average yield of 6 farmers with sorghum yields higher that 2 tons per ha and 7 farmers with millet yields higher than 700 kg/ha.

The program sorghum yields were very good in both Gabi and Maraka again in 2006 (Table 3). The interview average yields were 1.4 tons per ha in Gabi and 1.3 t/ha in Maraka compared to the traditional yields of 0.5 tons and 0.8 ton per hectare for Gabi and Maraka respectively (Table 4). The crop cut estimated of average yields was 2.1 t/ha in Gabi and 1.67 t/ha in Maraka. Again we suspect that the crop cuts are more accurate than the farmer estimates. The best farmers' average yields were above 2 t/ha in both villages (Table 3). In contrast with 2005 yields were higher in 2006 in Gabi than in Maraka. These poorer yields from Maraka were due to late planting and insect attacks (INRAN, 2007).

In Gabi, Maraka and surrounding villages, the improved variety, SEPON 82, is currently being cultivated by other farmers not involved in the program. Interviews with some of these farmers revealed that they have just observed the performance of the variety and are now buying seed of SEPON 82 for their own farms. SEPON 82 is spreading throughout this region of southern Niger and into northern Nigeria.

Moreover, farmers are increasingly utilizing inorganic fertilizer on their sorghum. The use of inorganic fertilizer in the Maradi region is not new for other crops but farmers are now observing the profitability on sorghum. The high yields achieved with the SEPON variety allow the farmers to achieve their objective of satisfying their food requirement. Even in years that prices did not go up substantially after harvest as occurs in good rainfall years, the farmers are happy because they have access to more food. They can keep their sorghum, for home consumption and sell other crops such as tobacco for their cash requirements. In Niger the farm areas in the program were very small so there was more concentration on first satisfying home consumption with the new technology in sorghum.

1.2.2. Millet

Average millet yields for the program were very low at 694 kg/ha. However, this was 44% higher than the average 480 kg/ha for the traditional millet fields (Table 3 and 4). Even the best farmers in this case have only achieved 933 kg per hectare (Table 3). There is, however, some good potential for the variety and the associated technology in this region as the maximum yield recorded was over 1.5 t/ha.

According to the farmers the low yields were due to the late planting (end of July). Actually the farmers we interviewed explained that they were lucky to get the improved variety and the fertilizer. Otherwise production would have been extremely low. According to the farmers, if it was their variety that was planted at the time, they would not have harvested anything. Therefore, in spite of the low yields, they were very happy with the program and are ready to continue next cropping season. The access to the early maturing variety and the inorganic fertilizers are very much appreciated in these drought prone regions.

Table 4: Traditional estimated yields (kg/ha) in Niger 2006

Village	Crop	Average	Maximum	Minimum
Dogondoutchi	Millet	486	900	200
Gabi, Maradi	Sorghum	553	1550	175
Maraka, Maradi	Sorghum	806	1733	96

Source**: Interview data**

1.3. Sénégal

The sorghum program was conducted in five sites and the millet program in one site in Sénégal (Appendix 1). Here we discuss results from one sorghum site and one millet site. Both sorghum and millet sites are located in the Kaolack region where the program was conducted in collaboration with ANCAR (the national agricultural extension service). No crop cut data was available to us for comparison with farmers' reports. Therefore we had to rely on farmers' interviews for evaluation. Unfortunately, it is noticeably clear that farmers were under reporting yields especially for the sorghum.

1.3.1. Sorghum

The sorghum variety used was CE 180-33, an improved variety with tannin from ISRA, for the Kaolack region. However, sorghum yields were very poor due mainly to the marginal crop land in which it was planted. Farmers interviewed mentioned that they would have preferred receiving millet from the program instead of the sorghum that was used. Most of their cropping land is light sandy soil suitable mainly for millet.

In addition to the low yields achieved in Ndiobene for the sorghum, there is serious yield under reporting problem in this village. These farmers are probably trying to avoid repaying or have not applied the fertilizer to their sorghum crop. Their average reported yield of 300 kg/ha is far below the 500 kg/ha for traditional sorghum in the same village (table 5 and 6). Even the 700 kg/ha average reported by the 3 best farmers is below expectation.

Picture 2: Farmers threshing sorghum on a tarp in Tingoni Mali.
Picture courtesy of Sandina Camera, SG, 2000.

Historically, sorghum has received less attention compared to millet in breeding programs in Sénégal. However, sorghum breeding work is being conducted now as it is becoming clear that it has substantial potential especially for supplying the rapidly growing poultry industry in Senegal. More improved sorghum varieties are being developed and tested by ISRA scientists in recent years.

Table 5: Program estimated yields (kg/ha) in Sénégal 2006

Village	**Crop**	**Average**			**Maximum**	**Minimum**
		Farmer yield estimates	Crop cuts	Best farmers' yields		
Ndiobene, Kaolack	Sorghum	311	NA	711	1000	107
Thiaré, Kaolack	Millet	1135	NA	1903	2500	300

Source: Farmer Interviews.
Note: The best farmers category is the average sorghum yield higher than t 700 kg/ha with three farmers in this category. Four farmers had millet yields higher than 1500 kg/ha.

1.3.2. Millet

Millet in Tchiare is the main success story in Senegal associated with the rapid growth of food processing of millet in the greater Dakar region. For millet the variety Thialack is appreciated by the processors in Dakar and Thiès. The Thiaré farmers' organization with the help of ANCAR technicians have set up the program nicely. The average yield of millet in the program from farmers' interviews is 1135 kg/ha, which is 400 kg higher thaan the traditional yield of 728 kg/ha. The best millet farmers in Thiaré have achieved yields of 1.9 tons per hectare. Two tons/ha of millet is an excellent achievement. This is a rapidly expanding program in Thiare. It is being well administered and there are an increasing number of farmers in the region wanting to become involved.

Table 6: Traditional estimated yields (kg/ha) in Sénégal 2006

Village	Crop	Average	Maximum	Minimum
Ndiobene, Kaolack	Sorghum	506	1000	18
Thiaré, Kaolack	Millet	728	1266	333

Source: Interview data

II. INCOME GAIN ESTIMATES PER HECTARE

Net income per hectare is estimated as the value of increased production from using the higher input levels minus the costs of the additional inputs utilized. Income gains per hectare are the sum of the returns to labor and management. Gains to participating farmers come from higher yields due to the use of improved technologies and from the higher prices received from the marketing strategies.

Income gains due to technology effects (or yield effects) are calculated by comparing net income gains over traditional yields while holding prices constant (using harvest prices for both). Gains due to prices are then the increases in incomes resulting from the higher prices received by farmers as compared with the prices in the region at harvest (Table 7). Price effects are then estimated by deducting the technology effect from total income.[8] For each

[8] In the sites where technology effects are negligible, price effect is equal to total income gain.

site, income gains were estimated twice based on average yields from interviews and also based on best farmers yields.[9]

As explained earlier, there are two components to the income gain by farmers. First the technology effect which is based on yield increases. The second component is the marketing strategy effect, which results from the price increase of the marketing strategies.

Price data for both millet and sorghum in all three countries showed very little variation (Table 7 and 8). The highest sorghum price increase of 63% was realized in Maraka, Niger. Kafara, Mali had the lowest price increase of only 31%.

Table 7: Sorghum market prices in production sites

	Harvest Price (FCFA[10]/kg)	**Sale price (FCFA/kg)**
Gabi, Niger	80	120
Maraka, Niger	80	130
Ndiobene, Sénégal	90	140
Kafara, Mali	80	105

Source: Interviews.

In all three countries, millet prices stayed fairly low all season as it was a good rainfall year (Table 8). The highest price increase of 35% between harvest and sale period happened in Dogondoutchi, Niger. In Sénégal and Mali the price increases were 30 and 33%. Millet prices stayed high at harvest (100 or more) in Niger and Sénégal as farmers were reacting to the bad cropping season of the previous year (2005) and consequently farmers were reluctant to put too much grain on the market. Since prices started high at harvest they did not move much all year long as the market was aware of the existence of food stock in villages and government warehouses.[11]

[9] We originally also included the income gains from the crop cut estimates of yields. This was too confusing in the tables. Since the crop cut data were greater than the farmer estimates we stayed with these lower estimates of yields. There can also be errors in crop cuts depending upon the sampling of the fields.

[10] FCFA is the currency for the UMEOA countries. In January 2007, $1 = 497 FCFA (source: www. x-rates.com)

[11] The Niger government renewed in 2006 the food security stock with imported sorghum and rice, some of which was donations from developed countries.

Table 8: Millet market prices in production sites

	Harvest Price (FCFA/kg)	Sale price (FCFA/kg)
Dogondoutchi, Niger	100	135
Thiaré, Sénégal	115	150
Tingoni, Mali	75	100

Source: Interview data

2.1. Mali

The average total income gains were only 43% in sorghum and 54% for millet farmers (Table 9). However, for both millet and sorghum, the best farmers achieved total income gains of 121% for sorghum farmers and 96% for the millet farmers (Table 9).

Table 9: Estimated income gains from technology and price effects based on average and best farmers' yields, Mali 2006.

	Kafara (Sorghum)		Tingoni (Millet)	
	Average	**Best Farmers**	**Average**	**Best Farmers**
Technology effect, %	-	52	-	29
Price effect, %	43	69	54	67
Total gain, %	43	121	54	96

Source: Interviews and authors calculations.

The technology effect income gain was not achieved in Mali due to the cost of the technology in both cases. The Tingoni group for example estimated the average production cost of the hectare of millet to be 48,450 FCFA (not including labor). This included 10,000 FCFA per hectare for the land preparation (tied ridges) as budgeted. Normally farmers in this region already do ridges for both sorghum and millet on the traditional plots. Therefore, the evaluation for Tingoni should have not included the cost of the tied ridges (or include only a small percent corresponding to the cost of tying the ridges) since the traditional land also has ridges. Therefore, income gains for Tingoni have been recalculated witout the cost of the tied ridges. When income gains are recalculated with the cost of tied ridges left out, the farmers achieved 6% technology gain raising their total income gain to 60% instead of 54%.

2.2. Niger

In Niger in 2006 very good income gains were realized by the sorghum farmers in the Gabi and Maraka villages. This is mainly due to the higher yield levels achieved in those villages. These farmers have not only good land for sorghum but they have also mastered and applied very well the technology recommendations. When these technology gains are combined with the improved marketing strategy, income gains become very high. The average total income gain in Gabi is 179% and 136% in Maraka. In Gabi, the technology effect and price effects are almost equal at 92% and 87%. In Maraka, with the lower yields the price effect was 108% as compared to a technology effect of only 28%. Because Maraka is much closer to Nigeria, the price of sorghum started at the same level as in Gabi but has risen to a higher level of 130 FCFA/kg compared to 120 FCFA/kg in Gabi (Table 7), thus enabling Maraka farmers to achieve substantial price increases; 108% and 212% for the average and the best farmers respectively (Table 10).

Table 10: Estimated income gains from technology and price effects based on average and best farmers' yields, Niger 2006.

	Gabi (Sorghum)		**Maraka (Sorghum)**		**Dogondoutchi (Millet)**	
	Average	**Best Farmers**	**Average**	**Best Farmers**	**Average**	**Best Farmers**
Technology effect, %	92	292	28	193	-	16
Price effect, %	87	153	108	212	48	64
Total gain, %	179	445	136	405	48	80

Source: Interviews and author's calculations

The total income gains for the best farmers in Gabi and Maraka are exceptional at 445% and 405% respectively. These yields are the frontier of gains reached by the exceptional farmers, who have applied correctly the technology and also have the best field management. Therefore these gains are rewarding not only technology and marketing but also good management by those best farmers.

An inventory credit (warrantage) system was also initiated in 2006 to help farmers take advantage of the seasonal variations. The program set up a fund for warrantage of 3,000,000

FCFA[12] (three million francs CFA) for the 2006 year. In Gabi 52 of the 118 producers involved with the program took advantage of the warrantage system. They have stocked 160 bags of 100kg of sorghum at 100 FCFA/kg for a total value of 1 600 000 FCFA. In Maraka, 26 producers only, out of the 134 involved farmers took part in warrantage program with 50 bags of 100 kg of sorghum at 100 FCFA/kg for a total value of 500,000 FCFA. Until the end of the evaluation, the stocks were still in the warehouses[13] because the price has not risen to a level at which farmers wanted to sell. Getting farmers to wait for higher prices is not risk free but often especially in poor rainfall year offers substantial potential for profits. In any event these are farmer association decisions and farmers learn quickly with experience.

The millet farmers in Dogondoutchi, despite their low yields (see footnote 14) through the program were able to achieve some income gain by holding on to their grain longer. Their total income gain was 48% coming all from the price effect. The best farmers among them have actually achieved 16% income gain due to technology effect and 64% due to the price effect for a total income gain of 80% (Table 10).

2.3. Sénégal

In Sénégal, the millet farmers have done very well with the program while the sorghum farmers have performed badly even though they were all being helped by ANCAR. This contrasts with Niger where sorghum farmers did well and millet farmers did poorly.[14] The Thiaré, Senegal millet farmers, had an average income gain of 58%. This is composed of 47% due to the technology effect and only 11% from the marketing strategy. Again this due to the low price variation observed in this year in Sénégal This small price variation is characteristic of a good weather year. The Thiaré best farmers have a total income gain of 196% coming from 116% technology effect and 80% price effect.

[12] $1 =497 FCFA (Jan, 2007, source: www.x-rates.com)
[13] A few bags of sorghum were sold with the help of INRAN as seed to other farmers.
[14] It should be noted that the millet farmers of Niger did not receive the same technical assistance as the sorghum farmers. The millet farmers in Niger received minimal agronomic support from CRS.

Table 11: Estimated income gains from technology and price effects based on average and best farmers' yields effect, Sénégal 2006.

	Thiaré (Millet)		Ndiobene (Sorgho)	
	Average	**Best Farmers**	**Average**	**Best Farmers**
Technology effect, %	47	116	-	-
Price effect, %	11	80	16	70
Total gain, %	58	196	16	70

Source: Interviews and author's calculations

The sorghum producers of the Sénégal in Ndiobene have performed poorly with no technology effect for any them. They have just achieved a small price effect of 16% on average. For the best among the sorghum farmers, there was a larger price effect of 70%.

In Thiare, Sénégal (millet) the program has also set up an inventory credit (warrantage) scheme to allow farmers to take advantage of the higher prices later in the year. However, the warrantage was not included in the evaluation because the farmers had just finished collecting the grain when the field interviews were conducted.

III. BENEFITS TO PROCESSORS

Even though the Production-Marketing Project is focused on raising incomes for small farmers, the program is bringing benefits to processors in all three countries. The presence of the Production-Marketing Project has strengthened the collaboration between farmers and processors. We have already discussed benefits to farmers in the previous section on income gains. This section focuses on the benefits to processors.

Since the start of the program, a link has been established between the processors and the farmers' organizations. Farmers are supplying clean grain to processors in Dakar and Thiès for Sénégal, Niamey and Maradi, Niger and Bamako for Mail. Farmers involved in the program are supplying the processors with clean grain, which has many benefits to them. For the type of products most of the processors are making (Picture 1), clean grain is critical for the quality of the final product.

Farmers' organizations are starting to police themselves to watch for the quality of their grain. In Thiaré, Sénégal for example, this year the farmers' organization has returned some of the grain to farmers due to poor quality (Appendix 2). The millet grain was labeled of poor quality because it was mixed with sorghum and small stones, thus the farmer organization did not want that included in their stock of grain to be supplied to the processors. This is a significant change for this region where mixing sorghum and millet and other materials is quite common for traditional uses. The farmers' organization is trying to send the message of quality, which includes not only cleanliness but also purity from a uniform cultivar.

Picture 3: Processed millet based products ready for sale, Beau Cereales, Bamako, Mali 2007. Picture courtesy of Tahirou Abdoulaye, formerly of INRAN, Niamey, Niger.

The second benefit to processors is the regular supply of quality grain. The Thiaré farmers have promised to deliver monthly 10 tons of millets to the TCL processors' group they are working with. In Niger, the STA processing company, Mme Cisse, has bought 8 tons of sorghum from the farmers in Gabi and Maraka. In 2005, Harouna Labo, the largest producer

of eggs in Niger, bought 14 tons of sorghum from the Gabi farmers' association.[15] In Mali, 10 tons of millet from the Tingoni farmers was purchased by two millet food processors in Bamako.

CONCLUSIONS

Crop cut data were generally considered to be more accurate than farmers' estimates and were generally higher than these estimates. Where the farmers had more confidence in the program, there were little differences from the farmers' estimates. Since the farmers' estimates were generally lower than the crop cut, the farmers' estimates were used in the income estimations so as not to overstate income gains.

In this second year of the program performance has been good especially in Niger where program sorghum yields more than doubled the traditional sorghum yields again as in 2005. In millet in Niger, however, the program has not performed well. Millet yields in the program were not significantly different from traditional ones. A better NGO or other operating entity will be sought for Doutchi in 2007. Food and feed processors are limited in Niger but their number and scale of operation will increase rapidly with income growth.

In Sénégal the millet marketing part of the program went very well with farmers receiving much higher than market price and doubling traditional millet yields in the region. The program has help established a link between farmers' organization in Thiaré and processors in Dakar. On the production side, millet is doing much better compared to sorghum in Sénégal. Improvement in sorghum seed quality and varietal choice can increase program impact here. The Senegalese sorghum breeder of ISRA, Ndiaga Cisse, is working closely with us and attempting to develop more tannin free sorghum cultivars and to produce) higher quality seed in Bambeye station (ISRA).

An important objective of the Production-Marketing Program is to provide feedback to scientists on how their technologies performed and the farmers' reactions to them. This performance helps define future activity for researchers and for our program. This is

[15] This year he could not buy sorghum because his stock of chicken had to be sold off due to bird flu outbreaks and the resulting public sector responses in Niger and northern Nigeria.

especially important in Senegal where the lack of previous sorghum breeding means that most traditional and some new cultivars still have tannin.

In Mali yields were generally much lower than expected for sorghum. The introduction of shorter stature, higher grain yielding varieties (more responsive to inputs for grain production) will help improve gains by farmers. The primary sorghum breeder of IER, Acar Toure, provided more caudatum sorghum cultivars in 2007 for our Malian field work. The millet production in Mali did very well with millet yields of almost 1.5 tons. The best farmers here got 1.8 tons/ha, excellent yields for millet.

Overall, farmers in all villages (even in Ndiobene, where no yield gain was reported) have expressed their willingness to continue working with the program. Farmers' appreciation of the program is coming from the potential they see in the technology and the access to inputs. In villages where yields were lower than traditional ones, one might expect those farmers to be angry and not wanting to continue with the program. Instead they all want to continue the program next year. A hypothesis is that in those villages, inorganic fertilizers were not applied to the sorghum, thus farmers would have income gains instead of the yield losses reported in Dogondoutchi and Ndiobene. As farmers see the gains to fertilized millet and sorghum at the higher prices they have consistently switched their fertilizer use to sorghum and millet in the other sites.

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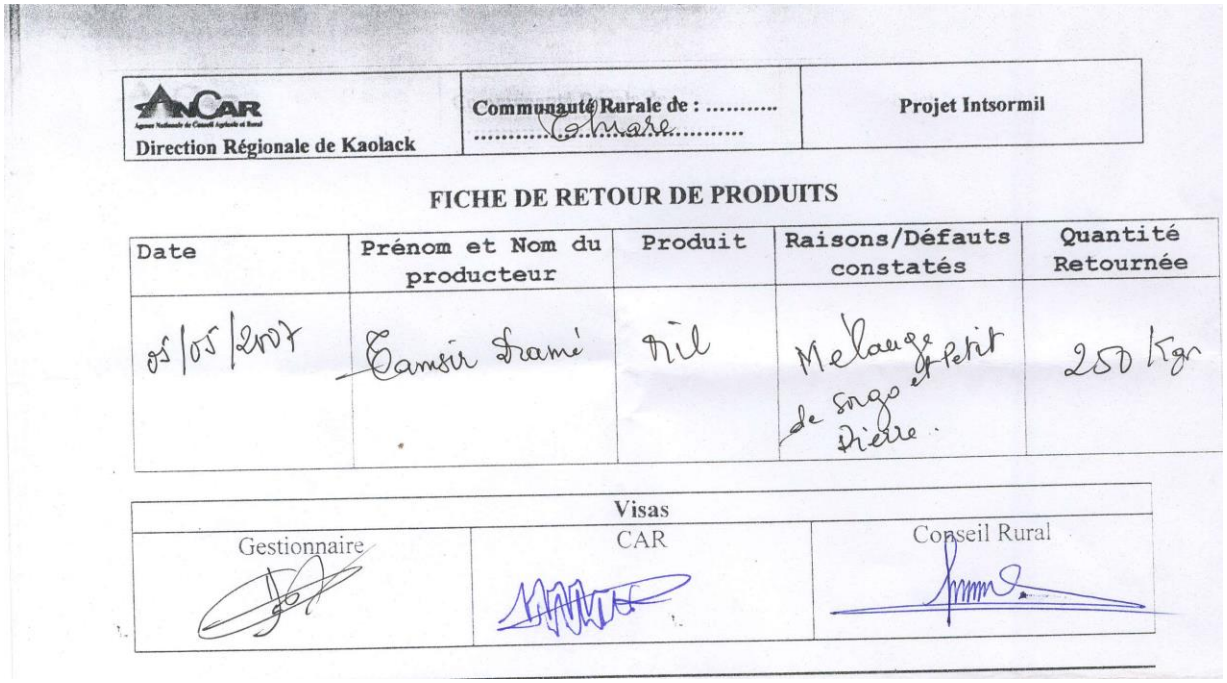
APPENDICES:

Appendix 1: Location, Area and Number of farmers involved with the program in 2006

Country and locations	Sorghum area	Sorghum farmers	Millet area	Millet farmers
Mali				
1. Koutiala	50	41	-	-
2. Kafara	62.5	48	-	-
3. Tingoni	-	-	50	50
Niger				
1. Gabi	60	118	-	-
2. Maraka	40	134	-	-
3. Dogondoutchi	-	-	50	50
Sénégal				
1. Diobene Talene	25	25	-	-
2. Mbodiene	20	20	-	-
3. Ndianda	20	20	-	-
4. Thiaré	-	-	50	50
5. Dianke Souf	20	9		
6. Nganda	5	4		
TOTAL:	302.5	399	150	150

Appendix 2: Document accompanying returned grain to farmer due to low quality, Thiaré, Sénégal 2007.



ANCAR
Agence Nationale du Conseil Agricole et Rural
Direction Régionale de Kaolack

Communauté Rurale de : .....Thiaré.....

Projet Intsormil

FICHE DE RETOUR DE PRODUITS

Date	Prénom et Nom du producteur	Produit	Raisons/Défauts constatés	Quantité Retournée
05/05/2007	Camsir Framé	Nil	Melange de petit de sorgo et Pierre.	250 Kgr

Visas		
Gestionnaire	CAR	Conseil Rural

The new sorghum cultivar (Guinea-Caudatum cross) recently introduced by the Production-Marketing project in Mali (Kafara)