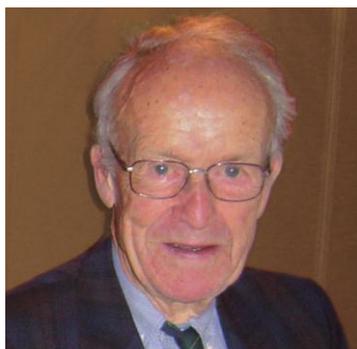


Syngenta Foundation: 30 years' experience in Mali

Starting off

The Syngenta Foundation for Sustainable Agriculture (SFSA) – and its predecessors – has been working with Mali's agricultural scientists and farmers for more than 30 years. Numerous challenges, successes, and lessons have resulted from close collaboration with the country's research organizations towards improving the Agricultural Research Station of Cinzana (SRAC) and implementing the Capacity Building for Sustainable Agriculture Project (PRECAD).



Dr. Hartmann P. Koechlin

Dr. Hartmann Peter Koechlin, former Director of the Ciba-Geigy Foundation (SFSA's predecessor), explains that the impetus to help improve conditions in developing regions initially came from company visits to those countries in the 1950s. In 1975, Ciba-Geigy held a competition for employees to submit development activity ideas, one of which was to improve millet production in Mali. Mali was a drought- and famine-prone country with extremely low millet yields and the proposal claimed yields could be raised from 500 to 1000 kg per hectare. With agrochemical expertise and a sales office in Bamako, Mali, the Ciba-Geigy Foundation launched the humanitarian project and the development partnership that has continued more than 30 years.

From the beginning, strong partnerships with the government, international research institutes, Malian research centers, and others active in development

were key. Originally set up as a five-year project, Dr. Koechlin quickly realized that tangible and sustainable results would require a long-term commitment of the kind that has since been maintained in Mali.

The initial partnership with the Malian government focused on building and supporting a research center for millet, an important orphan crop in Mali. The subsequent Agricultural Research Station of Cinzana (SRAC) was built between 1981 and 1983 on 277 hectares in the "millet granary" of Mali. With the eight main soil types and semi-arid rainfall, it serves as an ideal research station for millet and cowpea. The 30 years of research have trained a generation of scientists, laid the foundation for certified seed production, produced widely successful locally adapted varieties and developed a range of productivity-enhancing techniques.

To address other aspects of agricultural production, in particular more effective dissemination of improved varieties and techniques created at SRAC, SFSA launched the Capacity Building for Sustainable Agriculture Project (PRECAD) in 2006. It built on a wealth of experience, a network of partners, and a drive to improve the lives of Mali's smallholders. In its first 5 years, PRECAD successfully started 6 cooperatives and 42 banks for women, trained thousands of farmers and increased and diversified farmers' incomes.

SRAC and PRECAD took complementary approaches to social and economic development. Combining agricultural research and extension with farmer organizations shows replicable potential for improving rural living conditions. There is still much work to be done to empower Mali's farmers to "grow" out of poverty.

SFSA's Executive Director, Dr. Marco Ferroni, comments, "Three decades of commitment are particularly remarkable at a time when the public sector is allocating R&D funding for shorter and shorter periods. Long-term activities enable our employees and partners to build trust and to make a real difference to smallholders' lives across a wide range of areas. Some observers see a danger that farmers may become over-dependent on "external" resources and interventions. But as this book shows, project partners can avoid this danger through innovative cooperation and clear agreements with local organizations. Ownership must be firmly rooted in the local communities and in the region."

About Mali

- 80% of the population depends on income from agriculture.
- Mali is ranked 178 of 182 countries on the Human Development Index.
- Two-thirds of Malians live in areas vulnerable to climatic variations.

The Agricultural Research Station of Cinzana (SRAC)

In 1983, the Agricultural Research Station of Cinzana (SRAC) opened as one of the first research stations established under the independent Malian government. The government sought a partner to fund and set up a millet research station to address the pivotal challenge of improving livelihoods and reducing dependence on imported food. SRAC was funded primarily by the Ciba-Geigy Foundation (now SFSA), with the Malian government and other donors contributing to operational costs.

SRAC is located on 277 hectares in the “millet granary” of Mali. Traditional authorities in Cinzana were consulted and the land was handed over to research. The mission centered on developing sustainable production techniques, crop protection approaches, and soil and water management systems.

Training a Generation of Mali Researchers

At Independence in 1960, Mali had only 10 senior scientists to take over the research activities previously run by France’s Centre for International Cooperation in Agronomic Research for Development (CIRAD). From the start, SRAC offered young researchers the opportunity to learn and develop professional and field skills. With scholarships granted by French, American, and Canadian universities, many researchers later specialized and earned PhDs. In the decades following independence, 600 technicians and agricultural engineers were trained abroad. At the time of writing (2010), the SRAC team has 48 employees, including agronomists, entomologists, plant pathologists, engineers, technicians, and management. Many scientists who started out at SRAC now occupy high positions in the national research system and in CG Centers (ICRISAT, IITA, and Africa Rice).

Biotechnology – speeding up selection

SRAC employs advanced technologies, including molecular marker-assisted selection, to identify millet varieties with stay-green traits that are resistant to post-flowering drought. Testing is carried out at the Molecular Biology Laboratory of the Science and Technology Faculty at Bamako University. Results have been slow, but new markers and more research will likely lead to

SRAC’s infrastructure and staff have been involved in research with a range of international partners, including ICRAF, United States universities, AGRA and Caritas. These organizations benefit from SRAC’s expertise, while also supporting the center’s development. Numerous initiatives have been born under the flame trees shading the station’s courtyard where researchers and students meet and share their ideas and experiences. In 2010, SRAC attracted \$ 400,000 in commissions from research projects carried out with other organizations, enabling SRAC to cover research-related expenses.

Restructuring research

Through organizational management initiatives, SRAC has played a pioneering role in creating more efficient research structures in Mali. SRAC leads by example, encouraging more active involvement from farmers and extension agents in planning and evaluating research activities, as well as facilitating the interface between research and extension. The openness of the SRAC team supports a lively network of partnerships – greatly strengthening collaboration with international institutes. The quality and number of visitors to SRAC testify to these improvements to methods, programs, and outcomes.

Millet – a staple food

With an annual production of 1,175,000 tons (2008) and consumption at 83 kg/capita/year, millet is the main staple crop in Mali. SRAC is tasked with the national programs for millet and cowpea that focus on selecting varieties adapted to regional conditions while developing techniques for soil preparation, crop rotation and intercropping, soil fertility, crop protection and post-harvest handling.

SRAC is involved in plant breeding to create high yielding varieties that are well adapted to local conditions, tolerant to mildew and drought, and have desirable culinary properties. Breeders draw on the genetic diversity available in a 1,300 millet ecotype gene bank, cross-breed, and select the most desirable plants over several generations. Once the varietal

population is stable, the new varieties undergo on-farm testing for feedback from the ultimate stakeholder – the Malian farmer.

In recent years, researchers have introduced a new selection criterion based on farmers' increased use of crop residues as fodder. New breeding for stay-green varieties, whose leaves and stalks remain green until harvest, significantly improves forage quality. This supports livestock production and farmyard manure – the only fertilizer available to many producers.

Twelve varieties of SRAC millet are registered in the National Catalogue of Seeds and Varieties and have been introduced throughout Mali and surrounding countries. Toroniou C1 is widely adopted in Ségou and Mopti, where 60 percent of farmers in Cinzana and Katiena cultivated it in 2008. SOXSAT has had great success in Nigeria and neighboring countries, thanks to distribution by ICRISAT.

Millet integrated pest management

Striga hermonthica is an aggressive parasitic weed that stunts growth and kills millet, sorghum and maize by attaching itself to the root system. SRAC developed “trap cropping” using Sangaranka cowpeas to trigger *Striga* germination without providing a viable root system for the parasite, causing it to die.

Head and stalk borer caterpillars can cause near-complete crop loss in millet, so SRAC investigated control methods. In addition to insecticides, intercropping, and seed treatment, the entomology team breeds *Bracon hebetor* as a biological control that kills the parasitic caterpillars by laying eggs inside their bodies. Pre-treating seed with Apron Star protects the crop against downy mildew and protects the plants against stem borers for the first 40 days. This can increase the yield by 40 percent.

Fertilizer Technology



While millet and sorghum have been considered low-yielding orphan crops, proper application of fertilizer can dramatically increase yields. Since much of the soil in semi-arid areas is both nutrient-poor and depleted from continued use, both organic and synthetic fertilizers are needed to improve yields. Before SRAC, farmers were using a broadcast fertilizer technique, where they spread expensive input over the whole field, feeding the weeds as well as the millet, at a fairly low dose. SRAC started testing a technique of micro-dosing 2 grams of fertilizer directly in the hole when planting the seed and then shared it with farmers, often increasing millet yields by 40 percent. Souaibou Touré, leader of the cereal producers' co-operative in Cinzana, explains, “Previously, we'd use 50 kilos of fertilizer per field. Now, through micro-dosing, we're using about 30 kilos.”

Cowpea – “poor man’s meat” and a cash crop

Cowpeas play a critical role in Malian nutrition as both the peas and leaves are rich in proteins and minerals, leading to the nickname “poor man’s meat.” As an increasingly important cash crop, the average cowpea harvest is worth 25 percent more than that of millet. SRAC has developed and distributed nine improved varieties to farmers, selected for grain and fodder yield, resistance to *Striga* and insects, and culinary properties. Some are drought tolerant, early maturing varieties that help producers to mitigate the effects of climate change. Adoption of improved varieties in the Ségou region exceeded 50 percent in 2010.

SRAC’s initial interest in cowpeas stemmed from the crop’s use in improving soil fertility. Cowpea’s well-developed roots and abundant foliage help stabilize soil against water and wind erosion. As a legume, it fixes atmospheric nitrogen, making it available to intercropped or rotated cereals, increasing yields up to 25 percent.

Mixed millet and cowpea flour for better weaning nutrition

Child malnutrition is very high in rural areas, with poorly managed weaning resulting in nutritional deficits of protein and lysine. SRAC worked with the Institut d'Economie Rurale's (IER) Food Technology Laboratory and a Swiss laboratory to develop an easy-to-prepare weaning food using cowpea and millet flour. In the porridge, cowpeas supply lysine and millet supplies key amino acids.

Certified Seed Production

Using quality, certified seed makes a huge difference – increasing yields by 25 percent (from 0.8 to 1 tons/ha). In 2007, the Malian government announced a goal to increase annual cereal production from 6 to 10 million tons by 2012. Quality seed development and distribution are synergistic areas between SRAC and SFSA's Capacity Building for Sustainable Agriculture Project (PRECAD). SRAC carries out agronomic research, registers improved lines and produces basic seed; PRECAD supports SRAC's seed enterprises to distribute the new varieties to farmers. The enterprise sells the basic seed to specially trained farmers who multiply it to produce certified seed. This approach is being used with millet, sorghum, and groundnut. The selling is done through agro dealers and many farmers travel a long way to buy the certified seed.

To start, SRAC selects the best lines that are preferred during on-farm testing and registers them with the government. Breeders generate basic seed, selling to cooperatives and seed companies at \$ 1.85/kg. These organizations and trained farmers then produce certified seed. Seed multiplication is strictly regulated and monitored by LABOSEM, part of the extension service. Seed producers must adhere to requirements for plot isolation, roguing to remove off-type or diseased plants, weeding, crop protection, and fertilizer application. Before sale, LABOSEM takes samples of the seed to verify purity and germination rates. Compliant seed is authorized and distributed to farmers through extension for about \$ 0.50/kg for millet and \$ 0.90/kg for cowpea.

SRAC produces one ton of millet basic seed per year, which when multiplied to certified seed sows 490,000 hectares and yields 500,000 tons. This amounts to one third of Mali's annual millet production. To reach the government's 2012 targets, two million tons of produced millet are needed. SRAC needs to quadruple millet basic seed production, which is possible, but requires additional sustained funding.

When SFSA decreased funding in 2005 as part of the handover to local stakeholders, SRAC had difficulty self-funding basic seed production. The plan was to self-fund through sale of basic seed and use the income from grain sales of buffer crops. Unfortunately, the income generated has been too low to produce enough basic seed to meet demand. Currently the West African Productivity Program (WAPP), funded by the World Bank, is multiplying R1 and R2 seeds to produce certified seed sold to farmers.

Disseminating seed to farmers

Since SRAC's research demonstrated potential for huge increases in agricultural productivity by using improved seed, seed promotion and diffusion has become one of PRECAD's key activities. The project started by distributing and promoting seed in target villages. As demand grew, farmers were trained to produce quality seed by SRAC's head seed grower, PRECAD, and the National Seed Sector Support Program. Using demonstration fields, prospective producers learn about seed production, packaging, and the quality control procedures required for certification.

In 2008, PRECAD helped Cinzana seed producers set up the marketing-focused Seed Producers' and Distributors' Cooperative of Cinzana (CPDSC), while Katiena farmers created their own cooperative. The cooperatives have 33 members and produce millet, sorghum, cowpea, and groundnut certified seed. From 2007-2010, they sold 35 tons of certified seed worth \$ 18,000. With sales and distribution chains improving, producers are getting more confident and dedicated. Challenges arise when not all the certified seed is sold during the year, and cooperatives must sell it as grain at a much lower price. SRAC's head seed grower stresses the need for better planning based on demand.

In 2009, 61 percent of cooperative seed sales were through the Input Shop started by PRECAD. The shop receives a 3-6 percent commission, the cooperative gets 7 percent, leaving the producer 87-90 percent of the selling price. Bulk sales are made with large-scale buyers, projects, or NGOs, and are often negotiated through the Cereal Exchange (Input Shop and Cereal Exchange explained later). In 2007, Cinzana producers sold 4 tons of certified sorghum seed to the Millennium Villages Project for \$ 2,000.

An indication of the increasing acceptance of certified seed: by the beginning of the 2010 rainy season all Cinzana certified seed had been sold and demand exceeded supply. The cooperatives plan on increasing production for 2011, sowing 34.25 ha to produce 35 tons of seeds, equivalent to the past 3 years combined.

Technology transfer and extension

Extension services have historically been the weak link in transferring research findings to farmers. Since the early 1990s, several extension projects, funded and orchestrated both by the Mali government and large international bodies, have unsuccessfully tried to address this.

Given these failures, SRAC decided to work with existing government bodies to develop innovative ways to pass on findings to farmers. By the 1980s, SRAC's researchers were conducting on-farm trials and demonstrations so farmers could learn about new techniques hands-on and validate the station's results at the same time. Though other research centers questioned the practices, SRAC continued and in 1986 the On-Farm Testing Department was established to pass on millet and sorghum production technologies around the rest of the country. To further communicate with farmers, SRAC set up technology "display cases," 20 to 30m-long by 10 to 15m-wide plots planted with improved varieties and techniques. They are used to demonstrate and explain new techniques to farmers early in the cropping season and are located along major roads for optimal visibility.

Mali officials and the international community acknowledge on-farm research as complementary to on-station activities. SRAC's pioneering efforts were extended to all IER centers through Production System and Natural Resources Management Teams (ESPGRNs). From 2001-2005, SFSA funded a project to engage producers on-farm using SRAC's ESPGRN team to diffuse improved varieties and cultivation techniques to four villages in Cinzana. Since the SFSA project ended, one branch office remains open in N'Gakoro, Cinzana.

SRAC – Conclusion

Through its technological and breeding accomplishments, SRAC has demonstrated that dryland regions have real agricultural potential. Investment in agricultural research can generate huge benefits for rural farmers and the Malian economy.

While improved seed uptake has been rapid, and the pioneering efforts of SRAC and its partners untiring, transferring farming technologies has remained a challenge. To achieve the maximum potential of the improved seed (yield increase of 60-120 percent), extension-lead farmer training is necessary. As the research-extension interface was fragile and contact irregular, SFSA and IER developed the Capacity Building for Sustainable Agriculture Project (PRECAD) to train and improve farmer organizations.

Capacity Building for Sustainable Agriculture Project (PRECAD)

In 2006, IER and SFSA launched PRECAD in partnership with the residents (57,000) and municipal councils of Cinzana and Katiena. Staff started by asking farmers about their needs. They said, “We know how to produce, but not how to get the fertilizer and how to sell our products.” As a proof of concept project, PRECAD showed how a holistic approach can improve food security and generate more income. Former SFSA employee Felix Nicolier explains, “The innovative part is the way we put all the pieces together. We strengthened farmer organizations and established links between farmers and markets.”

A rural rapid appraisal team with staff from diverse backgrounds visited the target villages in Cinzana and Katiena to evaluate the village and farm levels. By talking to many people, PRECAD identified projects operating in a similar area to PRECAD and set up strategic working relationships with them. Based on farmer feedback and recent studies revealing development potential and obstacles, PRECAD focused on:

- Promoting improved agricultural technologies and services (via extension) to support intensive production, access to inputs, and use of farm equipment
- Improving cereals marketing by strengthening farmer groups and improving market access
- Promoting supplementary income-generating activities through microcredit and access to favorable credit

PRECAD was designed as a lean and flexible organization, collaborating with local development entities and extension partners. Closely involving local partners from the outset helped create local ownership that ensures continuation beyond the initial 5 years of funding. In 2010, the core team consisted of six coordinators/support staff with support from two committees:

- Regional Steering Committee that determines if PRECAD is on the right track and evaluates implementation. It consists of representatives from SRAC, Regional Directorate for Agriculture, municipal councils, and SFSA.
- Communal Steering Committee that agrees on PRECAD activities, reviews current work, project improvements, and oversees the yearly village survey to assess the impact. Both Cinzana and Katiena have committees consisting of cooperative and extension representatives.

PRECAD initially used a village-based approach, training five farmers at each village as the Village Technical Team (VTT) to be project intermediaries. At the mid-term evaluation in 2008, concerns over the impact of this set-up led PRECAD to shift to a sector-based approach focusing on producers’ access to markets and production. Cooperatives for cereals, sesame, seeds, agroforestry, and an input shop were set up. PRECAD maintains the VTT members as the preferred liaisons with the villages, and plans to integrate them into the cooperatives as advisors.

Since the launch, building farmer organizations has been a priority. Savings and credit banks were set up to enable women to save and obtain microloans under fair conditions. The 42 banks allow their women members to set up or improve trade and processing activities, strengthening their social position. In 2007, PRECAD legally established cooperatives for cereals, sesame, seeds and agroforestry seedlings. In 2009 the total cooperative turnover exceeded PRECAD’s annual budget.

Buy-in and support from the local government lends credibility to PRECAD. The mayor always attends relevant project meetings and is instrumental in convincing farmers to try PRECAD approaches. His commitment is such that he visited 99 villages to share the project goals. The mayor continues to monitor activities, sharing them at the regional level. The government also pays for the agricultural extension personnel working with PRECAD, but since the team is very small they often do not have enough time for all that needs to be done.

Current government positions on farmer organizations are in line with PRECAD’s core focus – to make cooperatives more active in the commodities value chain. Previously their focus was on farming systems and natural resource management. A new law introduced in 2007 allows farmers to create agricultural organizations (cooperatives and others) as business units with government help. This law is intended to help create new economic players in Mali.

Collective action at the village level: association to cooperative

Organizing the producers was one of PRECAD's greatest challenges. Former SFSA employee Felix Nicolier explains, "Bringing all the farmers together with the common goal of producing more and marketing better is not an easy task. People ask why not just give us money. Since people have many different goals, it takes time to create a team that is able to work together to achieve common, meaningful objectives."

A study of the market players showed many intermediaries who divert potential revenue from farmers. They can buy at low monopsonistic prices and then sell higher when supply is low, causing farmers and consumers to lose out. By forming producer organizations, both producers and cooperatives benefit from these price fluctuations and middlemen are bypassed.

In partnership with an NGO (GEFRAD, PROMAVI-RANFORD), target villages were assessed on the strengths and the weaknesses of the village producers. PRECAD initiated village training courses on cooperative development to help producers better understand the roles and responsibilities of a cooperative and its members.

With PRECAD's support, Cinzana's cereal producer association evolved into the Dry Cereal Producers' Cooperative (CPC) in 2008. To strengthen village-level organization, PRECAD's original 17 cooperatives were condensed into 7 village cooperatives and grouped into a Union. At harvest, cooperative members deposit their yield intended for sale in a communal warehouse. If the cooperative has its own capital, it buys the cereal at market prices and resells when prices rise. Having larger stores of grain also increases the producer's pricing power when negotiating with traders. With CPC, farmers receive compensation when the grain is sold after prices rise. CPC keeps \$ 0.01 for each 100 kg bag to cover storage and administration costs. To help support fair prices, the World Food Program buys quality millet for a minimum price of \$ 0.25/kg. Therefore, traders who previously imposed low prices must now pay a fair market price.

PRECAD connected 14 village cooperatives with Faso Jigi, an organization specialized in cereals marketing. Cooperatives define production and marketing goals with Faso Jigi at the beginning of season. Faso Jigi extends fertilizer, inputs or cash loans to the cooperative's farmers. A second payment is made when they sell their harvest to Faso Jigi. When the organization sells the grain stocks in the lean period, farmers also receive a dividend payment, minus costs for transport, storage and cleaning. Because of difficulties transacting with Faso Jigi, only six cooperatives did business with them in 2010. Contracts and prices with intermediaries, such as PRECAD, are more attractive.

One challenge has been buyers undercutting cooperatives by offering short-term higher prices to regain lost market share and price controls causing cooperatives to default on contracts. Unfortunately, not all members understand that cooperatives require solidarity, democratic decision-making, and voluntary commitment to thrive. Regular and competent monitoring is crucial to ensure cooperative sustainability.

Simply establishing the cooperatives is not enough; members need to understand when and where to sell crops. A Michigan State University/SFSA project is currently working on determining and disseminating the fair market price in different areas, enabling farmers to deal with traders from a stronger position.

Souaibou Touré, leader of CPC, says *"Producing and selling as a cooperative has transformed our livelihood. Before, with no strong collective organization, the traders destroyed you. By coming together, we have changed all that."*

PRECAD's impact with cooperatives has been considerable. In 2010, CPC sold 300 tons of cereals to the World Food Program for \$ 90,000. A contract for 330 tons of millet, sorghum, and cowpea was signed for 2011 delivery. From 2006-2009, the cooperatives marketed \$ 354,000 worth of products. These volumes will increase as new cooperatives form and membership grows.

Since productive meetings are a vital aspect of successful cooperatives, PRECAD staff act as moderators, helping farmers resolve problems and implement solutions. It will take considerable effort for the cooperatives to become effective in the long term – it normally takes 3-5 years before a cooperative becomes self-sufficient. This is the main goal of the 2-year project extension.

Agricultural Input Supply Store



SFSA's Head of West Africa, Oumar Niangado, explains that when PRECAD started, "It was easy to buy a bottle of coke from an agrovet shop, but impossible to buy a kilo of fertilizer." The Village Participatory Diagnosis confirmed that farming households had huge difficulty procuring quality agricultural inputs locally. Certified seed, fertilizers, and plant protection treatments were overpriced and farmers would undergo prohibitive trips to Ségou or Bamako to find them. Seeing the strong potential to make an impact, PRECAD focused on this problem from the start. In 2006, PRECAD distributed improved seed and fertilizers at demonstrations where extension workers demonstrated their correct use. With demand quickly surpassing the project budget, PRECAD set up an Input Shop, owned and

operated by local farmer groups. Here cooperatives and associations can purchase everything a farmer needs to start the season at a reasonable price. For example, if 1 kg of millet costs \$ 0.20 at the Input Shop, it costs \$ 0.36 from a trader.

For \$ 32,800, PRECAD constructed, outfitted, and provided working capital for the Input Shop in Cinzana Gare. To ensure sustainability after the official project ends, it is managed by the Input Shop's Union of Cooperative Societies (USCABI), created solely for this purpose. Each of the 5 cooperatives paid a \$ 200 joining fee and received membership shares. All the cooperatives see the shop as a win-win partnership and through careful monitoring and evaluation along with conflict resolution, PRECAD has been able to deal with challenges as they arise.

Cooperatives now pool their input orders so the Input Shop can deal directly with suppliers in bulk. To supply the shop, PRECAD negotiated a cooperation protocol between the Input Shop and input supplier AGRI-SAHÉL SARL. Improved seed comes from the local producer cooperatives. To cover management costs, the shop receives 3-6 percent of seed sales, which came to \$ 166 in 2008-2009. The majority of sales are retail, but some NGOs buy wholesale (seed and grain).

In November 2009, with \$ 4,200 in capital and \$ 816 in inventory, the USCABI members decided to purchase a thresher for the shop. Mechanized threshing improves cereal quality and reduces processing losses. USCABI used its own funds for the \$ 3,600 investment. During 2010, farmers rented the thresher and the shop charged one 100 kg bag for each 10 threshed, earning 3 tons of cereal. The cereal was sold for \$ 900 to the WFP, enabling 25 percent of the price to be recouped.

The Input Store is overseen by a USCABI Board made up of representatives from the five cooperatives who were trained in management and marketing by the Agrodealer Strengthening Program for Mali. The store's manager and deputy are appointed by the Board. To date, management training is still a challenge and is currently inadequate. From

February-October 2009, four managers quit due to unattractive pay and misunderstandings with the Board. Financial

The Input Store in Numbers (2008-2009)

- 5 – cooperatives running the shop
- 3-6 – % of seed sales shop receives
- \$ 192 – loss from expired product
- \$ 940 – store profit
- \$ 2,400 – cooperatives owe on credit
- \$ 15,400 – store revenue



Millet thresher purchased by the Input Store.

record keeping and inventory reporting is a challenge, as an updated balance sheet is not available. The shop is a work in progress and a seven-day course is planned to improve management.

Mitigating the lean season with inventory credit

For many households, the lean season begins 5-6 months after harvest. As granaries empty, families must buy food just as prices for millet and sorghum rise. By the middle of the lean season, producers are preparing their fields and face a dual challenge – buying staple foods at high prices and investing in their farms to secure the next harvest. Food takes priority, so future harvests suffer. In an attempt to break this vicious cycle, PRECAD introduced the inventory credit system to villages, making cereal marketing more beneficial for farmers.

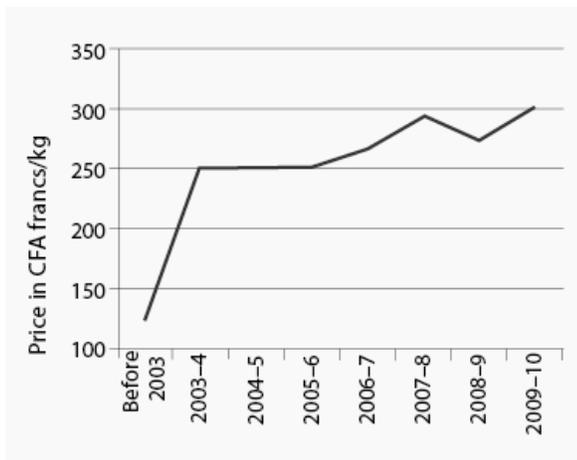
To meet farmers’ immediate financial needs, without having to sell the harvest at poor prices, PRECAD connected village associations with microfinance institutions (MFI). With inventory credit, farmers can get a bank guaranteed loan using a stock of cereal stored in a warehouse and locked with two keys as collateral. The MFI keeps one key and grants the loan to be repaid after several months. The second key remains with the association. With these loans, producers buy cereal for the lean season while prices are affordable, purchase inputs, or carry out income-generating activities like cattle fattening. By buying when prices are low, households susceptible to food shortages can reduce spending on staple foods. Producers sell their warehouse cereal when prices rise.

Sesame—expansion of a cash crop

As demand for sesame increases in China and prices rise, interest among Cinzana and Katiena farmers is growing. Sesame is relatively easy and inexpensive to grow, with its harvest before millet and a ready market available. SRAC ran trials and developed farming techniques to illustrate the crop’s potential. To engage farmers, PRECAD sponsored producer training, gave access to high-performing varieties, and effective organization to buy inputs and market sesame.

Extension agents have promoted sesame cultivation since 2003 and encouraged Cinzana producers to form the Sesame Producers’ Association. PRECAD helped transform this into the Sesame Producers’ Cooperative (CPS) in 2008, placing emphasis on marketing. CPS unites 40 producers from 17 villages and by 2010 it had sold 108 tons of sesame with a value of \$ 652,000 to wholesalers for export to China.

Development of sesame prices paid to producers in Cinzana Gare



Warehouse storage has been particularly beneficial to sesame sales since prices can jump from \$ 0.50 to 0.80 per kg in the three months after harvest. To take advantage of these fluctuations, CPS intended to use its capital to buy sesame at harvest time from its members, who need cash to pay bills. The sesame would then be stored in warehouses and later resold at a profit. With this goal, the cooperatives formed a Union that would be better placed to obtain bank loans.

Regular monitoring and conflict resolution is essential for the Union and cooperatives, especially in regard to member loyalty. Produce sold through CPS represents only one third of the members’ harvest, while the rest is sold to buyers who offer more attractive prices. This competition, practiced even by members of the Board, weakens the cooperative and puts it at risk.

With \$ 1,050 in capital in 2010, CPS lacks the finances to play a significant role in the sesame trade for which at least \$ 5,000-10,000 would be necessary. So the cooperative serves as an

intermediary between producers and trading companies. It sets up production, minimum price levels, and sales contracts. If further buyers appear at harvest, the agreed prices may be renegotiated upwards.

At harvest, trading companies give the cooperative an advance to purchase and store a specific quantity. For the 2008-2009 crops, CPS obtained an advance of \$ 19,500. However, as the cooperative cannot control the quantities delivered by individual farmers, it cannot guarantee there will be enough to fulfill the contract.

In 2010, PRECAD helped CPS restructure in order to address several problems. While initially uniting different villages, there are now 13 individual village cooperatives in Cinzana, making up a Union of 376 producers. The Union explores the market, negotiates purchase prices with the producers, and enters into contracts with trading companies. It coordinates with members to ensure clarity in regard to the quantity and quality of the goods. CPS charges \$ 0.02/kg marketed to cover costs and increase internal capital.

Community Warehouses



Community warehouse of Fambougou

farmers contributed 10 percent (\$ 720 per warehouse) to their construction. Each community cereal storage facility selects

a warehouse management committee to oversee operations and set the monthly storage prices. The local cooperative and the young villagers' association can store their harvest free of charge, while \$ 0.20/bag/month is charged to non-members to support warehouse upkeep and running costs.

Since Katiena farmers could not form cooperatives due to intra-village conflict, PRECAD built a storage warehouse so they could still bulk sell their harvest. Since the price of sesame varies greatly and rapidly, having access to safe storage can mean a huge difference in income for local farmers. The village of Welentiguila is a large sesame producer and uses its warehouse, along with the surrounding villages, to sell to buyers facilitated by PRECAD. In 2009, 92 percent of sesame produced in Katiena was sold via the warehouse in Welentiguila.

Post-harvest losses due to improper storage are a major problem throughout Africa. Madou Tangara, a farmer in Falema village, says, "If we keep our produce at home to wait for a better price, it spoils or gets eaten by insects and rats. If we sell to the trader right away, we have to accept their low prices." It is a scenario that has kept many smallholders in Mali locked in poverty. "Without proper storage, post-harvest losses are a huge problem," says Tobias Bauer of the World Food Program (WFP). "Those who sell immediately have no bargaining power. Those who wait can lose 30 percent of their crop."

To improve post-harvest storage, and improve the farmers' selling position, PRECAD built five storage warehouses, each with a capacity of 120 tons. To create a feeling of ownership and ensure sustainable commitment at the village level, local

From an article in *the Guardian*

The warehouse manager in Falema village says, "Traders now accept the farmers' terms since the farmers can hold onto their grain until the prices improve." Before the construction of their communal warehouse, seed producers would travel miles to sell their goods. With nowhere to store their grain, they would load up their carts soon after harvest and ride the long road to Ségou. When they arrived, desperate for money, they would take whatever price was offered. The warehouse "has made a huge difference for the village."

National Cereal Stock Exchange

Traditionally, farmers bring small quantities of their produce to the market each week, selling to monopolistic wholesalers, who set artificially low prices. Farmers lack transportation, pricing power, safe grain storage, and the financial stability to wait for prices to improve. In more developed countries, farmers often use cereals exchanges to sell their harvest before they have even started planting at the beginning of the season. This helps them to negotiate a fair price with the buyers – high enough for producers in case there is a bumper year and prices drop, and low enough for buyers if there is a bad year and prices jump. It helps mitigate the price risk for both the sellers and the buyers.

PRECAD's most innovative and unique solution for Mali was the National Cereal Stock Exchange. Working together with other cereal sector development organizations, PRECAD helped organize and launch the exchange in 2007. Over 3 years, more than 500 tons of grain were bought and sold through the exchange that runs from March to April each year in Ségou.



Since traders have difficulty getting enough sesame and seed in Cinzana and Katiéna, as an extension of the exchange, PRECAD works to bring farmers, traders, researchers, and extension services to a joint planning session. Buyers clarify their needs, enabling cooperatives to set production goals. For it to be a win-win proposition, a price must be agreed by all the parties involved before the start of the rainy season. In 2011, the full projected sesame harvest was sold at this session as well as 75 percent of the cereal crop. Farmers were able to improve their production and invest more since they were assured of a fair price.

At the exchange, cooperatives bring a sample of their harvest to demonstrate seed quality and talk about the quantity in storage. Farmers negotiate with graders and buyers, coming to a fair price determined by the open market. PRECAD does not intervene in the negotiations. In the first year, farmers came thinking they would get a very high selling price. They were disappointed in the market set price and went home only to sell their harvest at much lower price to the monopolistic middle men buying from the villages. The following year they came with more realistic expectations. The exchange is also used by the government to find out where and when there is a surplus or deficit in production.

Although on-site transaction volumes are currently low, they have grown each year and the exchange enables local cooperatives to sign contracts and negotiate sales. The World Food Program entered into a contract with the Cinzana produce coop to buy 200 tons of cereal at the end of 2011. PRECAD is working with the cooperatives to ensure an adequate supply as the focus of the WFP is on sourcing grain from African countries.

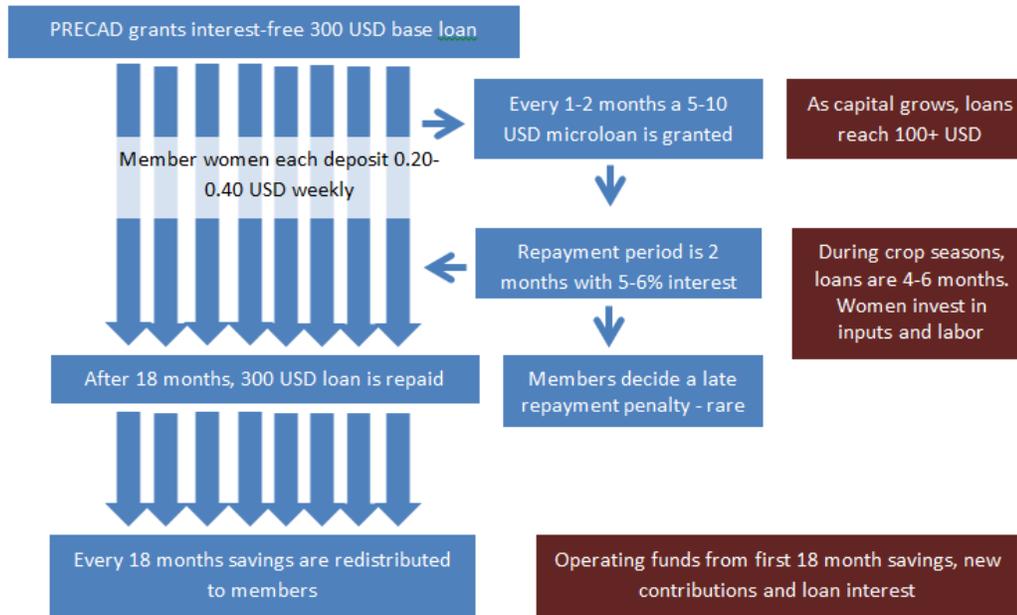
At the WFP's Purchase for Progress (P4P) annual meeting, PRECAD was recognized as one of the project's best clients due to the high quality grain sourced from the target areas. Members of PRECAD cooperatives understand quality control and P4P intends to continue this partnership.

Mali's government is supportive of the exchange, with the Minister of Agriculture attending the annual meeting each year. They have even started efforts to have it scaled up. Associations, donors, and extension service from Burkina Faso, Niger, Senegal, Togo, and Chad have visited the exchange, with Amassa/Afrique Verte and Sasakawa Africa Association (SAA) trying to start cereal exchanges in these countries. PRECAD personnel have also visited Burkina Faso and Senegal to share Cereal Exchange lessons with other projects and organizations there. In a bid to avoid expectations that the state will supply what is necessary, governments are encouraging private sector partners to bring products and technologies to market and to work directly with farmers in mutually beneficial arrangements.

Women's savings and microcredit banks

In order to avoid the necessity of selling crops intended for family consumption to cover basic expenses and also to support alternate sources of income for farmers, PRECAD trained and supported women to set up and manage savings and credit banks.

Monetary Inflows and Outflows for Individual PRECAD Banks



Microloans

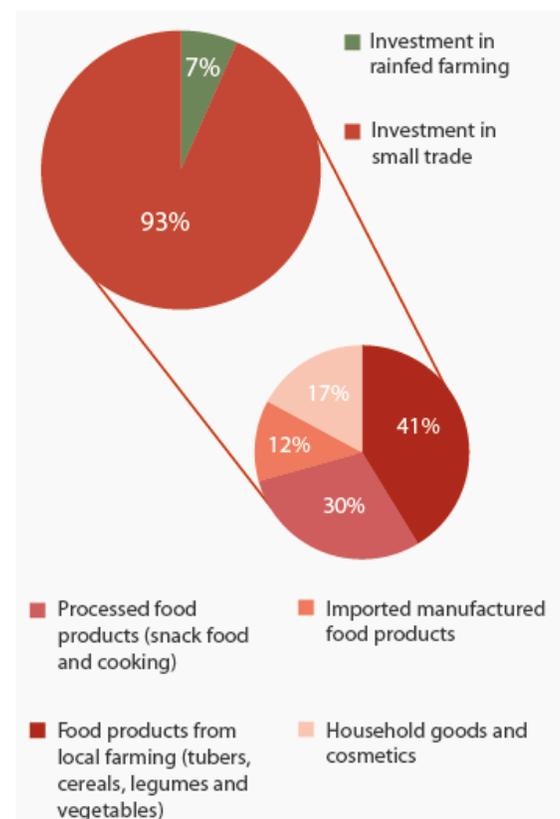
Women use most loans to set up or expand microenterprises. Sometimes they need money to meet family needs or deal with isolated problems. A 2007 study showed that profits made by women from their bank loans benefit at least six close relatives. These funds play an important role in income generation and household activities relating to food, education, health, housing, protection and natural resource conservation.

Examples

Village of Bouawèrè: Bouawèrè bank is exemplary with 91 women members and \$ 2,233 in available resources. With excess liquidity, the members decided to stop the weekly savings and reduce loan interest rates from 5 to 2.5 percent per month. They split the \$ 1,183 in savings and gave the secretaries and cashier an incentive payment of \$ 30.

Village of Dialabougou: Dialabougou bank has 62 members and \$ 1,733 in available resources. 32 village women got together and borrowed \$ 384 to each buy a bag of millet (3 tons total). They sorted and cleaned the grain, selling it to the World Food Program for \$ 938.

Fig. 3.17 Portion of the sum total of the loans allocated to different activities by the women. Example of five new banks created in 2010



Once the loan and interest were repaid, and cleaning costs deducted, each woman earned \$ 11, almost a 100 percent return.

Djénéba Samaké is a member of the Cinzana village bank. Every two months, Djénéba borrows \$ 50, at 10 percent interest, to buy shelled peanuts. She resells a portion in a shop and makes peanut paste with the rest. She roasts the peanuts then mills them into a paste, obtaining one vat of paste from 17 kg of peanuts. She sells the paste at the market and when demand is good, she can sell 50 kg of peanut paste in one day. She also buys rice wholesale for \$ 0.50/kg and resells it in a shop for 20 percent more. She can afford to buy food, pay for healthcare and school fees, and still has money left over. Djénéba has been doing business for decades, but she says the bank helped her business grow and prosper.

Lessons Learned

Early attempts to introduce microcredit came up against problems: 1. bank interest rates were very high, 2. banks required a guarantee on loans so that the woman had to inform her husband and seek his permission.

Since PRECAD's activities were user-driven, initially a village woman was recruited to help the project planners understand the local situation. In Mali a traditional system was already in place where a group of women meet every week, each bringing \$ 0.20-0.50, and decide who the money should be given to. They agree on a loan period and create a repayment schedule. This method does not make it possible to extend loans to many women, so PRECAD decided to strengthen the existing concept, add more funds, and develop a more organized system.

First 4 Years in Numbers

- 42** – Village banks operating
- 100** – % banks repaying the base loan
- 2,600** – Active women members
- 48,000** – \$ in available resources
- 274,000** – \$ total loaned amount



Future

PRECAD is bringing this approach to other villages. The goal is to develop diverse activities - rice cultivation, poultry production, livestock fattening - and to train women in managing businesses. The team will conduct a survey to understand how profits are used and their real impact. SFSA is convinced that this approach can be used to alleviate poverty.

Extension and Training/Learnings

PRECAD’s next challenge was to pass on the SRAC results to farmers - a conservative estimate of the increase in yield using improved seed and cultivation techniques is around 60 percent. Unlike most donors, SFSa chose to support and develop existing extension capacity rather than starting its own project. Through close collaboration with the state extension services and other regional partners, PRECAD helped organize the sector and shape activities so that local people could take over implementation when the project ended.

The strategy was geared to long-term sustainability, but PRECAD came up against obstacles in trying to implement it. Firstly, the internal organization and decision makers in the partner organizations frequently changed, undermining the success of the strategy. Secondly, having local communities implement activities is not only a long process, but requires management and basic training unrelated to the core project. Thirdly, developing local cooperatives and training people to run them requires considerable resources, especially for activities that encourage and enable producers to take over the management and organizational responsibilities in sometimes conflicted village settings.

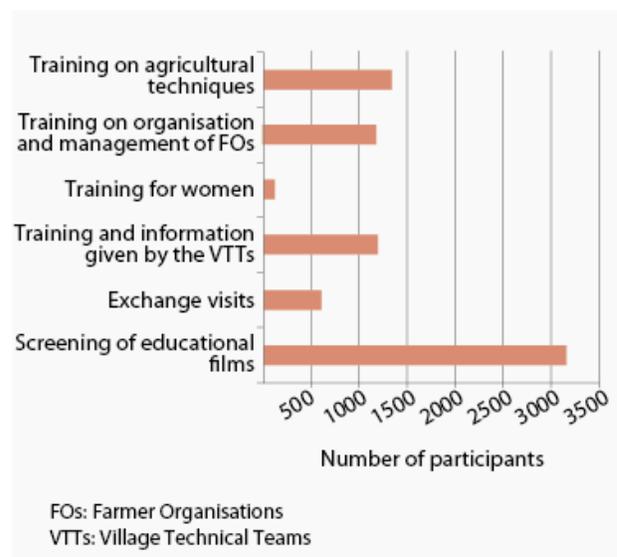
One of the extension programs PRECAD organized was a “train the trainers” course. SRAC scientists intensively trained lead farmers using seven internally developed training curricula on improved seed, fertilization techniques, etc. The villages selected lead farmers who were thought would be able to do a good job of training the village and cooperative members. The challenge with extension is how to share technologies with farmers in a way they can understand and use. All the new trainers were evaluated and prizes given to the best among them.

PRECAD relies on government-paid extension workers to conduct technology dissemination via group training. To make training more attractive and effective, 12 sets of illustrated posters on improved agricultural techniques were developed by PRECAD and SRAC. 1,343 people attended sessions ranging from demonstration-plot training on seeds, compost, and improved manure preparations to women-focused sessions on soap-making and sheep fattening. The free sessions also support farmer organizations (cooperatives and women’s banks) in learning about organizational management and product marketing skills. To reinforce the training, 3,171 people attended educational film screenings. Exchange visits allow for discussion of personal experience using improved techniques and running cooperatives so farmers can hear about new solutions to their challenges. These visits were popular among producers, with 607 participating in one or more.

A testament to PRECAD training and improved SRAC seed, the area sown with improved varieties has continuously increased in recent years in Cinzana and Katiena, and taking up 60 percent of the cultivated land in 2008. 43 farmers carried out new variety demonstrations for visiting farmers, who were then much more likely to plant improved seed. Thanks to the overall training effort, production of new crops (sesame, gum tree, physic nut) and improved farming techniques (land preparation, crop rotation, sowing date) has increased.

Although SRAC has been working to disseminate varieties and techniques since 1986, many farmers agree – among them a woman from Cinzana village: “It was thanks to PRECAD that people here truly recognized the importance of SRAC’s research and were made aware of its results.”

Fig. 3.16 Number of participants at the PRECAD training events and activities



Replication and Exit Strategy

PRECAD was a proof of concept project to try out new strategies, quickly implement improvements, and ensure a long-term effect by handing over to local stakeholders. Dr. Marco Ferroni, Executive Director of the Syngenta Foundation for Sustainable Agriculture, explains that PRECAD worked towards “innovative cooperation and clear agreements with local organizations that root ownership in the communities and the region.” He says, “Replication and scale-up are now necessary to maximize the insights and successful techniques developed during the project.”

Felix Nicolier worked for SFSA for many years, with a particular focus on Mali. He explains what is required for scale-up:

“Communication: PRECAD is working in two communes and there are 700 in Mali. Farmer organizations need to present and share with others what they have achieved through the project, how it changed their lives, and what their plans are for the future. People from other countries also need to visit to find out about and understand what we are doing.”

As an initial step in communication, in 2011 PRECAD wrote a paper on the cereals stock exchange to help spread the concept. It was published in regional and local journals and shared in the international development community. SFSA’s Oumar Niangado thinks, “The best way to make people aware of the exchange is to get them to visit, see it in action and talk to the farmer cooperatives and buyers.” SFSA has shown willing to help organize and improve the stock exchange concept in other countries and expand the exchanges to include other agricultural products.

In terms of scale-up within Mali, PRECAD is expanding from 25 villages in 2010, to reach 99 villages and 60,000 farmers in phase 2. This had been the objective in 2006, but due to bottlenecks and management issues, only 25 villages were chosen. The smaller pilot size may have been more effective in the long run, allowing the PRECAD team to more easily implement changes and ensure the soundness of the approach. The goal, at the end of phase 1, was to motivate farmers to take over activity leadership, continuing to run the cooperatives themselves.

PRECAD phase 2 will give farmer organizations more responsibility and focus on developing their marketing and production capabilities. It is common in such projects for the project team to run everything, and when the project is over, the farmers lose the knowledge. PRECAD is striving to avoid this.

Putting experience to use

Understanding how the private sector approaches new markets can enhance the way development projects are evaluated. Companies normally invest substantially in developing specific skills and customer loyalty before products are launched in a market. They define a niche based on their expertise and then develop a customer base. In development, the opposite is frequently the case. Project cycles are shortened, quantity trumps quality, and long-term impact is not the priority. SFSA offers a counterexample to this trend with its more than 30 years in Mali, remaining focused on the three orphans of the Sahel: the people, the soil, and the crops.

The program developed by SFSA and its partners is innovative and forward-looking. With considerable experience and expertise, this knowledge should be applied on a larger scale. Since continued training is key to technology dissemination, new approaches using radio and mobile technologies can more systematically inform producers over larger areas. Through effective coordination of research, extension, cooperatives, and banks, coupled with effective communication to enhance information flow between stakeholders, more farmers can benefit from SFSA’s insights gathered over 30 years.

Current Sustainability

To assess the current sustainability of a project, the team can look at what would happen if the project suddenly ended. Management feels that the women’s microcredit system will become self-sufficient and able to continue. The cereals, sesame, and seed cooperatives need more time, perhaps 3-5 years of additional project support. There needs to be considerably more management capacity, so producers have a better understanding of how to plan as a cooperative and negotiate with banks and other business partners.

The certified seed growers know how to access the basic seed, multiply and sell it to farmers. But they need credit from banks to finance the initial input purchases. The seed cooperative has been trained how to demonstrate new seed at villages and run sample plots close to main roads. The project team is working with cooperatives and banks on funding issues, but greater transparency within the organization is necessary for bank loans to be assured.

Changes during PRECAD

Built into PRECAD's lean structure was the ability to adjust to changing circumstances. For example, at the beginning the focus was on village level development. This shifted to a value chain approach, focusing on productivity and links to markets. PRECAD was then reviewed by outside experts who recommended work should also be done on income generation. With this in mind, project staff asked villagers if they wanted to work together to improve productivity of millet and sell in new markets at a better price. Through work with the Malian government and NGO partners, cooperatives for the commercialization of milk, jatropha, millet, seed, and sesame are running.

Impact

In the 1970s, at the start of SFSA's involvement, most producers used poorly diversified extensive farming techniques, were not organized for marketing, lacked access to credit, and had low productivity. Over 30 years, SRAC and PRECAD have had a tangible, and hopefully sustainable, impact on the Malians of Cinzana and Katiena. A key element of a sustainable impact is empowering farmer organizations to make the right production and management choices themselves. This makes a sustainable impact, rather than just a short-term show.

Social impact:

- Build a network of local, regional, national, and international partners with a wealth of trust. This can only result from a long history of collaboration marked by a spirit of mutual respect, transparency, and flexibility.
- Investments in Malian professional development with PRECAD training producers and SRAC offering research conditions in which scientists gain experience and improve skills.
- Innovative redesign of how Malian agricultural research is conducted. Now, producers are involved in planning and evaluating research activities. PRECAD innovated in project organization, using a network of partnerships instead of a bulky management structure.

Social needs:

- Significant efforts are still needed to expand links between SRAC's research, extension, and the end users – producers.
- Farmer organizations and cooperatives will require continued training with external monitoring for conflict resolution to enhance management skills and a cooperative spirit.
- SRAC needs new life and must develop a shared vision to sustain and improve on past research success.

Economic impact:

- Based on an intensive study by the University of Bern, the average income increased by 70 percent for PRECAD-trained farmers adopting SRAC's improved seed/methods. Increased use of improved seeds, crop protection, tillage, and women's banks were key contributors to this gain.
- Strengthening marketing cooperatives increased producer bargaining power as well as the prices subsequently paid to them. The additional income allows farmers to invest in inputs, raising yields.
- The women's banks support businesses through microloans and encourage savings to safeguard against unexpected events, thereby diversifying income and reducing risk.
- By addressing agricultural productivity, market access, and savings/credit, SFSA provided economic leadership and support to farming households, instilling an enthusiasm for economic development.

Economic needs:

- Areas that have a good deal of unfulfilled potential include implementation of sowing techniques, soil fertilization, crop rotation/intercropping, and cooperative membership. Future efforts could work towards innovative solutions in these areas.

Survey Results

To assess the impact and changes perceived by the population due to PRECAD, surveys were conducted in 2010. These were kept similar to previous surveys, so that results could be compared. The analysis provides a snapshot of the current situation for farmers in Cinzana and Katiena.

- 82 percent of men and women felt their socio-economic situation had significantly improved since 2005. The greatest improvements were felt in capacity building and higher incomes.
- Many food-insecure participants indicated the lean season had been shortened by 2-3 months over the past five years. The additional income-generating activities helped, since women are now able to purchase millet using income from activities promoted by the women's banks when the grain runs out.

- Women were three times more likely to refer to higher incomes and income diversification, attributed to the small business support provided by the savings and credit banks.
- Training in farm management was seen as directly improving food security. It also taught farmers how to calculate how much millet is needed to feed their families until the next harvest.
- Greater knowledge and higher production, supported by access to improved seed and fertilizer, were singled out by the men who dominate grain production.
- Marketing farm products continues to be a weak point. Even though it is one of the key areas focused on by PRECAD, the small improvements in market access may be explained by the newness of the activities and the relatively low cooperative penetration. The new cooperatives are starting to have an impact, but it will take time and much larger membership to see the full impact.
- Cooperatives need to be better organized, which will come with continued project work and more technical and management training.

Interview with SFSA's Delegate for West Africa, Oumar Niangado

What are the three main lessons that readers should take away from SFSA's 30 years in Mali?

1. Long-term partner commitment and involvement of the end stakeholders (farmers) is critical. Development is a long-term process and it happens in phases. In Mali we moved from building up SRAC for technology generation and new variety development, to testing the viability of the new technology on-farm with producers, followed by the transfer to villages, and finally with PRECAD for livelihood improvements through community organizations.
2. Running a research station in Mali to address specific challenges faced in the semi-arid and Sahelian zones is necessary to breed adapted varieties, develop links between Sahelian countries, and share experiences and innovations. SRAC plays a key role facilitating joint projects with West African organizations, the international research center, and universities in the US, France and Mali.
3. The approach SFSA took in Mali was not just about research, but about improvements all along the regional agricultural value chains – the goal was livelihood improvement. With PRECAD, we had to understand how cooperatives worked and then how we could make them more professional. This took practical experimentation on PRECAD's side as members had to learn follow democratic processes and set rules. Farmers were willing to learn and become businessmen so they could have more negotiating and pricing power with traders.

What is the most important element of project design or execution that enables long-term sustainability after funding ends?

A strong, flexible partnership with good communication between Mali and SFSA proved key in designing a successful project. For long-term sustainability, PRECAD focused on strengthening the organizational capacity of farmers, and improving links with traders and banks. From the start, links were set up between the cooperatives and other organizations, at the same time as supporting the government in establishing an improved and permanent extension service.

Will the foundations that SFSA laid with SRAC and PRECAD continue when funding ends?

SRAC, with its strong experience running innovative and applied research, is a good candidate for funding from other organizations that take an interest in Mali, such as AGRA and the World Bank. The scientists at SRAC are also taking part in competitive grant funding proposals to secure funding on a project-by-project basis.

SRAC was set up as an IER station, part of the national research network. As such it will continue to receive some government funds, but it is unclear if the current allocations will be enough to maintain the equipment and infrastructure in addition to funding operational costs. AGRA has indicated they will step in, though SFSA will not be involved in these negotiations.

Given everything you know now, what are two things you would change if you could do the projects again?

1. In semi-arid zones, innovations in seed, technology, and crop protection are important to create a resilient system. It's critical to link development projects with research stations from the start to ensure farmers have access to the best technology possible, but that comes down to improving the way we approach and think about technology transfers. This is what SRAC attempted to do with PRECAD, but more work is needed for farmers to fully assess and utilize the available technologies.
2. A focus on improving market access is important to food security in semi-arid locations, but diversification of crops and approaches also have to be addressed.

What was the most important impact, or set of impacts, from SRAC and PRECAD on the lives of smallholders in Mali?

In Mali, SFSA started to develop good varieties and technologies suitable for smallholders. Today, there are many varieties available for such farmers, and many tried-and-tested cropping systems – intercropping, alley cropping, rotation system – to improve productivity at the household level. I think we have made a breakthrough in this context. But the adoption rates for some technologies are low because the extension service is not effective.

With PRECAD, we demonstrated that by linking producers with markets and supporting them to create cooperatives for collective selling, farmers can raise their income by selling at competitive prices and producing more by investing more heavily in improved seed and technology. In this way, farmers improve their quality of life.

This online-only English text is a summary of the 112-page study “Quand les greniers se remplissent” (S. Ferroni & E. Gabathuler, CDE, Bern, 2011, ISBN 978-3-905835-29-0). A link to the French original is available on www.syngentafoundation.org. SFSA gratefully acknowledges the work of Laura Johnson, Oumar Niangado and Ania Dardas in preparing this summary.

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