



Men with their fonio harvest in Bolimasso village, Mali. Credit: Bioversity International/G. Meldrum

IMPACT BRIEF

Promoting Bambara groundnut, fonio, and native vegetables for resilience and nutrition in Mali

This Project was supported by the International Fund for Agricultural Development (IFAD), the European Commission and the CGIAR Research Programmes on Climate Change, Agriculture and Food Security (CCAFS) and Agriculture for Nutrition and Health (A4NH). The activities were carried out in close partnership between Bioversity International and Institut d'Economie Rurale (IER) with inputs from numerous collaborators

Increasingly arid conditions and a shortening rainy season are challenging agricultural production in Mali and exacerbating existing issues with chronic food insecurity and malnutrition. Native traditional crops are well-adapted to local growing conditions and can help secure production under climate change but they have received little attention from research and development efforts, which have focused on a narrow basket of commodities mostly introduced from outside of Africa. Traditional crops face numerous constraints to enhance their use, but with some attention they could play key roles in diversifying agriculture and food systems for better nutrition and resilience.

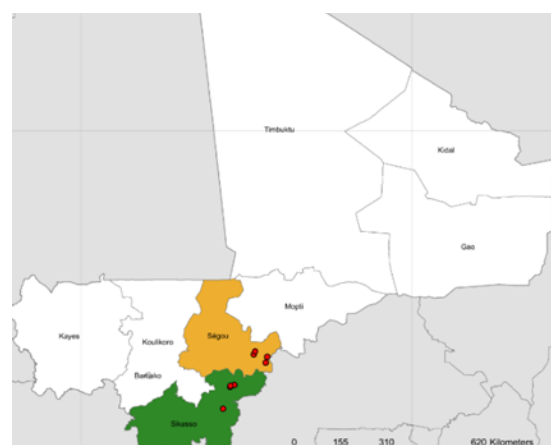
Unleashing multiple benefits from neglected African crops

The Project “Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk” aimed to strengthen the capacities of farmers to manage risks associated with climate change, poor nutrition status, and economic disempowerment by leveraging local agrobiodiversity. From 2015 to 2019, the Project in Mali focused on fonio (*Digitaria exilis*), Bambara groundnut (*Vigna subterranea*), jute mallow (*Corchorus olitorius*) and leaf amaranth (*Amaranthus* sp., e.g. *A. dubius*, *A. hybridus*, and *A. hypochondriacus*) which stood out among other crops as strong assets to improve climate change adaptation, nutrition, and income opportunities. A holistic value chain approach addressing multiple bottlenecks in supply and demand was

applied to promote more use of these crops. Activities sought specially to strengthen their seed systems, cultivation, and processing, as well as to connect producers to markets to enhance and multiply impacts for food security, conservation, profitability, and women’ empowerment.

Strengthening seed access

No improved variety of Bambara groundnut is available in Mali and although seven improved fonio varieties have been released, their adoption is low. The cultivation of these crops relies on the informal seed system, for which seed exchanges can be limited geographically or within kinship networks with variable seed quality. A **community biodiversity management approach**



The project focused on six communities in Ségou and Sikasso regions of Mali. Fonio and Bambara groundnut were in a near abandoned state in the sites in Sikasso region, where farms have shifted toward cotton and maize in previous decades. The baseline survey involved 314 households and the endline survey 180 households in the focal sites.



involving diversity field fora, community seed banks, and seed and food fairs was developed in the project sites to reinforce cultivation of these crops by increasing farmers' access to intraspecific diversity and developing capacities of community institutions for their management. **Multiple varieties of fonio (10–12) and Bambara groundnut (8–12) were established in diversity fields** in each site over two years where farmers engaged in experiential learning over the crop cycle. The capacity of **community seed banks** in each project community was strengthened to conserve and manage fonio and Bambara groundnut diversity and two community seed banks were established. **Four seed and food fairs were organized** in which 634 people (45% women) participated displaying and sharing seeds of fonio, Bambara groundnut and other local crops, as well as recipes for their preparation.



Seed and food fair in Tominian. Credit: Harouna Coulibaly/IER

- ⇒ The varieties in the diversity fields showed variable performance by site and year and none stood out for having consistently higher yields, underscoring the value of maintaining multiple varieties *in situ*
- ⇒ The number of varieties registered and managed by community seed banks increased from 1–5 varieties of each crop to 11–12 varieties in each site
- ⇒ There was significant adoption of fonio (from 43.3% to 63.7% of households) and Bambara groundnut (from 49.7% to 87.2% of households)
- ⇒ Adoption of improved fonio varieties was notable, being used by 12% of growers in 2015 and 43% in 2018
- ⇒ The number of Bambara groundnut varieties cultivated at village-level increased, while there was evidence of a slight decline in fonio diversity in some villages, which occurred because of wide adoption of varieties from the diversity fields and the fact that farmers typically plant just one variety



Farmer knowledge exchange on community seed bank operations. Credit: Harouna Coulibaly/IER



Seed of amaranth and jute mallow was collected

and producers were encouraged to plant these crops that are most often collected from field margins and the wild. Trial plots were established in the project sites to assess crop performance. Nutritional composition analysis was conducted on two varieties of amaranth and two varieties of jute mallow.

- ⇒ 5.37 kg of jute mallow seed and 8.79 kg of amaranth seed was gathered and planted.
- ⇒ Germination and production of jute mallow was low in Sikasso region and better in Ségou region, where the 'small leaf' variety had higher yield than the 'large leaf' variety (6,400 kg/ha dry leaves vs 3,107 kg/ha).
- ⇒ Amaranth had low germination success in Ségou region, while in Sikasso region the Cohet variety out-yielded the Camara variety (5,005 kg/ha vs 3,250 kg/ha dry leaves).
- ⇒ The amaranth and jute mallow varieties tested had good iron content with a mean 2,34 and 1,42 mg/100 g for respective crops



Women display processed products from Bambara groundnut, fonio, and jute mallow. Credit: G. Meldrum / Bioversity International.

Value chain development

Several fonio products were being marketed in Mali at the start of the initiative, including paddy, milled, washed, precooked, and *djouka* fonio (mixed with peanut). Several women's processing groups were marketing fonio products in Bamako and fonio was available in supermarkets and grocery stores throughout the city, as well as in restaurants. By contrast, no processing group was found to be working with Bambara groundnut and the crop was only found on sale in traditional wet markets, primarily in the rural study areas. Women were typically the primary actors selling roasted or boiled Bambara groundnut as a small-scale operation. Jute mallow was sold as fresh leaves, dry leaves and powder. Dry and powder jute leaves were especially consumed in urban areas and some processing groups were marketing these products, which could be found in some stores around Bamako.

Crop-specific stakeholder workshops were organized for fonio

and Bambara groundnut in 2018 that explored solutions to bottlenecks in the value chains for these crops and strengthened linkages between actors. The need for organizing producers and securing a more reliable market for these crops was raised, along with the need to support processing groups in preparing these foods with attractive new recipes, and raising awareness of the values of these crops as strategic actions to increase consumer demand, among other suggestions.

Food technologists developed **ten novel culturally acceptable recipes** for fonio, Bambara groundnut, jute mallow and amaranth. The recipes were analyzed for their nutrient contents; underwent sensory evaluation tests; and were instructed to women processors in the participating communities, district centers, and Bamako to promote their uptake for domestic and commercial use. **Processing equipment needed for the recipes was distributed** to 167 women in the participating villages.

The small size of the grain and numerous seed coats makes fonio tedious and time consuming to process, which has been a primary driver of its abandonment as farmers have little support to access machines to ease de-hulling. Mills have been installed in San, Tominian and Koutiala through previous initiatives that are accessible to some of the communities engaged in the project. **A dehuller was installed** in the village of Boumboro, which was the furthest site from a processing center and where there was great willingness and potential for its installation to relieve women's burden in processing this crop.

Consumer awareness was raised on the contribution of local crops for balanced diets and nutrition. Posters with a **seasonal calendar of fruits and vegetables** were distributed to the participating communities and radio broadcasts were made highlighting the role agrobiodiversity in resilient production systems in five languages over a period of one month, reaching up to 1,431,170 people.

- ⇒ The number of households consuming fonio in the previous year increased from 47% in 2015 to 100% in 2018; and for Bambara groundnut it increased from 54% to 99.4%
- ⇒ The number of women consuming dark green leafy vegetables in the last 24 hours increased from 68.2% to 86.7%
- ⇒ The number of households selling fonio increased between 2015 and 2018 (from 14% to 20%); as it did for Bambara groundnut (from 19.4% to 27.2%) and jute mallow (from 1.3% to 31.1%)
- ⇒ The majority of respondents gained knowledge on the nutritional value of fonio (73.9%), Bambara groundnut (70.6%) and jute mallow (71.6%) in the past 3 years
- ⇒ The number of households selling processed products increased for fonio from 0 to 1.6%; Bambara groundnut from 1.2% to 6.7% and jute mallow from 0% to 31.1%

Conclusions

In its five years of implementation, the Project has shed light on factors hindering the sustainable use of fonio, Bambara groundnut, jute mallow and amaranth in Mali and contributed to bring these strategic resources back in support of better livelihoods in the participating communities and beyond. In the sites in Ségou region, the Project supported cultivation of crops that retain a strong livelihood role but which are not well supported by agricultural research and extension or marketing systems. In Sikasso region, the project activities encouraged use of crops that had been abandoned by previous generations, but which show new potentials for diversifying farm production in the face of climate change. The community biodiversity management system has shown to be an effective means of fostering local engagement in evaluating and testing underutilized crops, while contributing to their conservation and sustainable use. Continued investments in improving productivity, diversified seed systems, processing and marketing local crops will help secure their role in Malian food systems.



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Community members weeding the fonio diversity fields in N'Goutjina. Credit CAAD