

Mali Farmers are Willing to Pay for Quality Seeds

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Mali, like most sub-Saharan countries relies on agriculture as the backbone of its economic growth as the sector employs roughly 80% of the active population, and constitutes the main source of food. Previous studies have shown that access to productive resources/inputs including high quality seeds is one of the obstacles to agricultural growth in Africa. In Mali, most farmers are poor, and cannot afford high quality inputs; this explains why about 80% of the seeds used are from the local seed sector. The use of local seeds is most important for the subsistence crops (sorghum, millet and groundnut). In the study area, sorghum and millet constitute the main food crops for almost all of the population, while groundnut constitutes the main source of income for women and condiments for the household. To reduce poverty and more especially to obtain food security in Mali, improving farmers' access to productive resources, including high quality seeds, is an important step. Thus, to contribute to Mali's economic growth, and more specifically to the realization of food security, this study investigated farmers' seed quality for the three socio-economically important crops: sorghum, millet, and groundnut in southern Mali. Informal and formal surveys were conducted in conjunction with seed collection from farmers, and seed quality performance testing. The preliminary results show that farmers' self produced seeds are of generally high quality when compared to researchers' seeds. Furthermore, despite saving their own high quality seeds, farmers are also willing to pay for improved seed varieties, and prefer seeds with a variety of non-yield specific attributes such as drought tolerance and enhanced cooking traits, a finding with major implications for seed companies, who should program seed development based on actual farmer demand.

Background

Access to productive resources/inputs including good quality seed is one the seven obstacles to agricultural growth in Africa identified by the International Food Policy Research Institute (IFPRI). In Mali, most farmers are poor. Therefore, they cannot afford high quality inputs and have limited access to agricultural services and markets due to poor infrastructure. Farmers in Mali use mainly seeds from the informal sector, which are seeds from local and very old varieties (about 80% of seed used). These seeds, while cheap, are thought by some researchers to have various limitations (e.g. low germination rates, low yielding varieties, and weak resistance to climatic stress from rainfall) in improving agricultural production. These limitations may help to explain why agricultural productivity growth in sub-Saharan Africa (SSA) has not been as strong when compared to Asia, where the development, distribution (marketing) and use of improved seeds of new varieties were important components of the Green Revolution. The use of local seeds is most important for grain crops including sorghum and millet produced mostly for subsistence (Yapi et al. 2000), and legume crops (groundnut) grown mainly by women and characterized by their difficult storage, disease susceptibility, and low multiplication and high seeding rates. Thus, seed suppliers find it too risky to invest in these grain and legume seed sectors, as there is no sure demand (Tripp et al. 2001).

Recent seed system analyses in Mali have shown that farmers are interested in trying new types of varieties that combine socio-economic qualities (IFAD, 2005). As a result, it was discovered that some of the farmers' preferred varieties are not currently being supplied in local seed markets. Understanding seed system functioning through assessing farmers' seed quality, their preferred varietal traits and their willingness to pay for seeds that meet their needs, will contribute significantly to the development of good quality seed production and marketing systems in Mali.

Mali, like most SSA countries, relies on agriculture as the backbone of its economic growth, as the sector employs more than 80% of the active population and constitutes the main source of food. In all of Mali, more particularly in Koulikoro region (the study area), sorghum and millet are subsistence crops for the majority of the population, and the total areas occupied by the cereal grains are larger than that of all other crops. Groundnut on the other hand, constitutes the main source of income for women, as well as the primary source of condiments for households in the study area. All told, these crops are grown by most farmers in the region as they are more suited to the drier climate and poorer soils than other crops. The three crops, sorghum, millet, and groundnut, all play important roles in agricultural growth, yet share constraints related to seed quality and access. To understand agricultural

development in such an area, it is wise to investigate the crops grown by smallholders, as well as gender specific crops, cultivated traditionally by either men or women. The research problem investigated by this study focused on the following three questions:

- 1) What is the quality of seeds that farmers are planting?
- 2) What variety traits are preferred by farmers' when looking for seeds?
- 3) How can we improve farmers' access to seeds of their preferred varieties?

Farmers' responses to these questions constitute an important step that needs to be taken to ensure economic growth and food security in Mali. They are also important in helping researchers and policy makers to set priorities and investments that address the problem of seed systems functioning. In this study, informal and formal surveys were conducted in conjunction with seed collection from a range of sources, followed by testing for seed quality performance. The first set of quality tests was done at the laboratory. A secondary field test was also done to assess the varietal purity in addition to the lab test parameters. These tests were linked to the farmer assessment of seed quality and variety quality obtained through surveys. The study was conducted in two zones of the second administrative region of Mali (Koulikoro): Dioila and Mande. In each zone the study targeted four villages: Magnambougou, Seribila, Wakoro, and Wobogou in Dioila zone, and Gonsolo, Keniero, Siby and Siranikoro in the Mande zone.

Preliminary Findings

Research data is still being analyzed: both the laboratory seed quality analyses and the surveys of farmers and seed fair participants. Findings presented here are preliminary results obtained from frequency tables and simple descriptive statistics. However, these preliminary overviews of the initial data analyses show some very intriguing results.

The laboratory analyses were conducted in three main steps: physical purity (percentage of the weight of impurities), physiological quality (germination percentage), and the health status before germination test (percent of anthracnose, or percent of various fungal infestation for sorghum) with the germination test (the percentage of young plant infected). The following table summarizes the descriptive results from the lab-analyses of seed samples collected from farmers for the three crops: sorghum, millet and groundnut.

All infestation levels <10% of anthracnose are acceptable, but above 20% the problem becomes worrisome and the seed lot is generally recommended for destruction, as an infestation level above 20% risks germinating a crop with serious potential for fungal disease and subsequent crop loss and field contamination. In the study, only a few samples (two in Dioila and one in Mande) are in that critical zone. The remainder of the analyses will investigate the levels of anthracnose infection in Magnambougou and Wobogou in Dioila zone, and Siby in Mande zone, in order to identify potential causes for the high infestation levels.

Table 1. Summary of Seed Quality Analyses.

Summary of Seed Quality Laboratory Analyses: Means (Standard Deviations in parentheses)						
	Sorghum (n=201)		Millet (n=61)		Groundnut (n=163)	
Crop Types	Modern	Local	Modern	Local	Modern	Local
%Impurity	2.5(5.6)	2.7(5.2)	-	3.62(5.4)	20.1(14.4)	21.9(12.9)
%Germination	88(11)	88(13.2)	-	82.4(8.1)	87.4(7.1)	80(14.5)
%Infested plant	8(5.6)	7.5(7.5)	-	2.5(2)	11.6(13.5)	21.1(16.1)
Zones	Dioila	Mande	Dioila	Mande	Dioila	Mande
%Impurity	3.4(5.4)	1.3(1.9)	4.4(6.0)	1.3(1)	17(10)	25.8(13.8)
%Germination	88(16)	88(5.2)	81.1(8.4)	85.7(6.3)	85.4(9.7)	76.2(16)
%Infested plant	9.4(8)	5.6(5.5)	2.8(2.1)	1.6(1.5)	16.5(14.2)	23.7(16.9)
Seed sources	Own	Market	Own	Market	Own	Market
%Impurity	2.48(4.2)	1.22(0.9)	3.1(3.8)	3.4	22(13.1)	18(3.8)
%Germination	88(12.9)	90.7(6.6)	82.5(8.1)	85.7	80.2(14.4)	86.7(7.9)
%Infested plant	7.5(7.2)	9.9(6.1)	2.45(1.9)	1.5	20.6(16.3)	13.5(6.4)

In the laboratory analyses, the level of impurities was less than 10% for all seed samples of sorghum and millet. This indicates that farmers handle their seeds well. The germination rates of sorghum and millet were over 70% in all cases, and over 85% in many cases, which indicates that storage on-farm and seed sourced from farmers can meet important quality characteristics such as viability. It is only the groundnut samples that have shown some concerns regarding physical purity and health status. For certified groundnut seed, according to CILSS (the Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel) harmonized seed certification standards, the maximum percentage of allowable impurities is 4%, which is lower compared to samples in this study. From the same source, the maximum level of all possible contaminations from seed should be 12%, and only the modern variety seed met this requirement in the current study. These groundnut problems are more serious in the Mande zone and with farmers' self produced seeds, both factors requiring further investigation.

The field trial analyses also showed that there are not significant differences between seeds of modern varieties in production at the farmers' level and foundation seeds in terms of the number of off-types, uniformity, duration of flowering and weight of panicles. This indicates that farmers are doing a good job of selecting seeds from their fields due to the longevity of the varieties (some dating to 2003).

The descriptive results of the survey of farmers' willingness to pay for their preferred sorghum varieties are described in Table 2. This analysis shows that all farmers in the two study zones were willing to pay on average 150 Fcfa (roughly \$0.30 US) for a kilo of seeds. This is a surprisingly high investment given the low-incomes in the study area, and the limited cultural concepts of paying for the seeds. In addition to weakly developed seed markets throughout the study area, seeds are traditionally exchanged as gifts or through non-monetary means, an issue identified as a challenge to seed market development by previous research. There will be important implications for policy and seed system recommendations if the remaining analyses document the extent and circumstances under which seed purchase is becoming a more widely accepted practice for sorghum and millet.

While this willingness to pay is intriguing, several key questions remain:

- Are these prices high enough to create incentives for seed companies or other seed sellers to invest in these areas?
- Is there a real demand for seeds large enough to under take the business of producing and distributing them?

Table 2. Farmers' Willingness To Pay.

Farmers' Willingness To Pay for their Preferred Varieties (per Zone)		
	Dioila (n=141)	Mande (n=89)
Average Price (Fcfa)*	176	244
Max	300	1167
Min	52	83
STDEV	39.87	155

*Fcfa = Malian currency: \$1 US was approximately 450 Fcfa in 2008.

Another major finding from the farmers' survey was that there are additional traits beyond yield, which interest farmers in both zones when assessing varieties. In Dioila, these include cooking traits (easy processing, good taste, easy storage, among others), while the farmers in Mande, are mainly interested in varieties with drought tolerance, or that mature early so as to avoid the harmful effects of drought.

Practical Implications

- Seed quality concerns related to the recycling of seeds over years, the conditions of production and storage of seeds that most farmers use in Mali for sorghum, groundnut, and millet are not constraining. All quality parameter tests done in the laboratory as well as in the field trial showed that farmers' seeds are of better quality compared to researchers' seeds. This appears to support the hypotheses that informal seed systems can potentially produce high quality seeds meeting farmers' requirements. The problem of low agricultural productivity for these crops may in fact not be due to seed, but to other constraining factors.
- Farmers' willingness to pay for their preferred varieties of sorghum seeds also challenges the preconceived notion that improved varieties have no marketability due to cultural prohibitions on seeds sales for sorghum. This finding is important as it may encourage seed companies to invest in the sector if both demand and prices remain attractive.
- Farmers in Dioila zone preferred seed varieties with high yield and good cooking habits while Mande farmers are more interested in varieties with high yield and drought resistance. Thus, in developing new varieties for these two zones, researchers should pay attention to these varietal traits and other farmers' needs. This will help researchers and/or seed companies to plan and program seed production in relationship to actual demand, both in terms of users' needs and varietal preferences.

Further Reading

Almekinders, C. and J. Hardon (eds.). 2006. *Bringing Farmers Back into Breeding: Experiences with Participatory Plant Breeding and Challenges for Institutionalization*. Agromisa Special 5, Agromisa, Wageningen.

Almekinders, C. and N. Louwaars. 1999. *Farmers' Seed Production: New Approaches and Practices*. London: Intermediate Technology Publication.

Coulibaly, S. 2004. "Characteristics of the seed sector in the Republic of Mali." *WASNET News, the Newsletter of West Africa Seed Network (WASNET)* 12: 23-26.

IFAD. 2005. "Annex II: Growing out of Poverty: Intensification of Sorghum and Millet Systems using Local Biodiversity and Market Opportunities in Semi-Arid West Africa." In: *Report and Recommendation to the President on Proposed Grants under the Global/Regional Grants Window to CGIAR Supported International Centers, International Fund for Agriculture Development Executive Board - 86th Session*. Rome: IFAD. 11-19.

Ntare, B.R., A.T. Diallo, J. Ndjeunga, and F. Waliyar. 2008. *Groundnut Seed Production Manual*. Andhra Pradesh: International Crops Research Institute for the Semi-arid Tropics (ICRISAT).

Siart, S. 2008. *Strengthening Local Seed Systems: Options for Enhancing Diffusion of Varietal Diversity of Sorghum in Southern Mali*. Weikersheim: Margraf Publishers.

Venkatesan, V. 1994. *Seed Systems in Sub-Saharan Africa: Issues and Options*. World Bank Discussion Papers: Africa Technical Department Series No. 266, Washington, D.C.: World Bank.

Yapi, A.M., A.O. Kergna, S.K. Debrah, A. Sidibe, and O. Sanogo. 2000. "Analysis of the economic impact of sorghum and millet research in Mali." In: *Impact-Series No. 8*, Andhra Pradesh: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

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This project, funded in part by the Norman E. Borlaug LEAP Program, aims to assess seed quality for three of the most important and popular crops grown in Mali: Sorghum, groundnut and millet in two different socio-economic zones in the second administrative region of Mali: Dioila and Mande.

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