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LOCAL MARKETS, LOCAL VARIETIES

Rising Food Prices and Small Farmers' Access to Seed

Melinda Smale, Marc J. Cohen, and Latha Nagarajan

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There are no easy solutions to the ongoing food price crisis. Maize and wheat prices doubled between 2003 and 2008, and the price of rice doubled in the first four months of 2008, rising 33 percent in a single day. Even with declines in food prices later in 2008, prices remain well above 2000–2005 levels. To address the complex causes of this phenomenon, IFPRI has recommended a combination of "emergency" and "resilience" actions. One of the proposed policies emphasizes the need to boost agricultural production. This "emergency" agriculture package requires carefully targeted subsidies to ensure increases in production of major foodcrops (rice, wheat, and maize) in favorable environments with good soils, moisture, and market infrastructure. Following the Green Revolution model, delivery of improved varieties of seed, fertilizers, and other inputs, along with targeted, short-term subsidies, would augment production through higher yields rather than area expansion, so that scarce land can be reserved for other crops and uses.

As part of the "resilience" package, IFPRI proposes scaled-up investment in agricultural growth to bolster production responses over the longer term. Until recently, public complacency regarding food abundance has contributed to a prolonged decline in agricultural investment by aid donors and developing-country governments.

In-depth field research—undertaken by IFPRI with the Food and Agriculture Organization of the United Nations (FAO) and other partners in India, Kenya, and Mali—brings to light new evidence about farmers' access to seed and the role of village markets in supplying it, with a focus on semi-arid environments.[1] The findings point to several policy options aimed at improving the effectiveness of these markets, which can be crucial for reducing the potential negative impacts of high food prices. Such options might be considered in tandem with those recommended for more favorable environments, where seed systems already function more effectively. This brief introduces the issues that drove this research project, relevant concepts, and methods. The accompanying briefs present findings of specific country case studies.

UNDERSTANDING VULNERABILITY IN DEVELOPING COUNTRIES

Understanding the vulnerability of *consumers* in developing economies to high food prices is a first step in clarifying policy options. First, these consumers process their staple foodcrop at home rather than purchasing industrially processed food in which the staple is only one of many ingredients. Thus, a high proportion of the change in the market price of the staple foodcrop is transmitted directly to the consumer. Second, they rely on foodcrops such as rice, wheat, and maize for a large share of their daily calories. Finally, food itself represents a much larger share of developing country consumers' budgets—often between 50 and 80 percent.

Understanding the vulnerability of *farmers* in developing economies is a second step. In most low-income countries in Sub-Saharan Africa and Asia, 60–80 percent of rural households, including a large proportion of smallholder producers of foodcrops, are net purchasers of these crops. In other words, they are unable to meet the subsistence needs of their families through their own production and must purchase the remainder at higher prices. Furthermore, although farmers may now receive higher prices for their products, the rising costs of energy-intensive inputs, such as fertilizer, may cause some commercially oriented growers to shift to crops that perform better with fewer of these purchased inputs.

A third step is to understand *what* farmers in developing economies grow. Many farmers plant local varieties rather than certified seed of modern varieties and grow crops other than rice, wheat, and maize. Public concern has centered on dramatically increasing prices for these three major crops. However, price changes for these crops also have repercussions in markets for cheaper, substitute cereals such as sorghum and millet, as well as for root and tuber crops (such as cassava and sweet potatoes) that are not widely traded internationally. As incomes rise, consumption of major cereals typically increases—replacing the substitute cereals and roots and tubers. Because of their lower income elasticity of demand, the latter are considered "inferior" economic goods. Rising

[1] The project "Using Markets to Promote the Sustainable Utilization of Crop Genetic Resources" was led by FAO and conducted from April 2005 to May 2008 in collaboration with CGIAR centers, NGOs, and universities.

incomes also lead to more diverse diets that are richer in essential micronutrients, with consumption of animal-source foods, fruits, and vegetables in addition to staples. Declining incomes in this food crisis can be expected to have the opposite effects.

Rice, wheat, and maize are dubbed "major" because of their global importance in world trade and consumption. FAOSTAT 2006 reports that world production of rice, wheat, and maize (over 600 million metric tons for each), is nearly 3 times as much as cassava (218 million tons), more than 10 times as much as sorghum (56.5 million tons), and 20 times as much as millet (roughly 30 million tons). FAOSTAT 2005 data show international trade is worth US$20 billion for wheat, US$13.4 billion for maize, and US$6.5 billion for milled rice, compared to US$0.7 billion for sorghum, US$80 million for millet, and US$1,000 for cassava.

Reflecting their global importance as staple foods, there has been extensive public and private investment in breeding high-yielding, well-adapted varieties of the major cereal crops. These investments have enabled modern varieties of rice, wheat, and maize to perform relatively well in many production environments. In semi-arid and arid environments in nonindustrialized agricultural economies, however, cereals such as sorghum and millet predominate. Research investment in improving sorghum and millet has been limited, although these crops perform better in dry environments and many people depend on them for their livelihoods. Use of commercial, mineral-based fertilizers is often not economic in these environments, and much of the seed grown by farmers comes from landraces, which do not respond as well to fertilizer as modern varieties grown in wetter environments.

UNDERSTANDING VULNERABILITY IN INDIA, KENYA, AND MALI

These briefs extend IFPRI's recommendations for the food price crisis by shifting the perspective from regions with high productivity potential to those where the Green Revolution model has not yet and is not now likely to succeed—drier, riskier production environments with poorer market infrastructure. Farmers in these environments grow crops for which well adapted, high-yielding varieties have not yet been developed or are not widely adopted. Low adoption rates in these environments typically reflect a combination of seed-supply bottlenecks and lack of demand. For example, the quality of certified seed may not be assured, little information about the variety and its characteristics may be provided by the seller, or the costs of obtaining it at distant outlets from unknown sources may be prohibitive. Environments are often so

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heterogeneous that farmers have difficulty observing yield advantages of modern varieties; for subsistence foodcrops, it may not make economic sense for cash-constrained farmers to pay for seed of modern varieties.

PROCURING SEED: GRAIN MARKETS AS SEED MARKETS

Low-income farmers in developing countries rely heavily on informal channels for access to seed: on-farm seed saving, farmer-to-farmer exchanges, and unregulated sales. Typically, these transactions do not involve intellectual property rights. In contrast, more formal seed markets often revolve around the exchange of modern crop varieties that are subject to protections, such as plant breeders' rights or patents, which further restrict farmers' exchange or reuse of saved seed. In Southern Africa, smallholders obtain just 10 percent of their seed from formal markets, and even in India, where the seed industry and commercial farming are growing, an estimated 80 percent of farmers still rely on saved seed.

The significance of village grain markets as sources of seed has been reported in numerous studies conducted in Sub-Saharan Africa. Field-based research in selected districts of the states of Andhra Pradesh and Karnataka, India, reveal a similar role for "shandies" (village fairs) as sources of sorghum and millet seed. Generally, experts consider transactions in grain markets unfavorable because they provide no assurance of seed quality, unlike transactions with other farmers and kin, which are based on trust or direct observation. Procuring seed in village grain markets is often described as a last resort and a consequence of acute or chronic seed shortages resulting from a series of disasters, natural or human induced.

A recent seed security assessment conducted by Louise Sperling and others for Catholic Relief Services (CRS) and partners in Mali challenged this perspective. To their surprise, the study team found that following several

years of poor harvests, local traders played an important role by providing farmers with the seed of well-adapted landraces. Landrace identity, often linked to the village of origin, was preserved in seed transactions, even though the transactions occurred in grain markets. The study confirmed that in a risky production environment with a high degree of local adaptation in sorghum and millet varieties, the provenance of seed is crucial information for farmers. The authors of this study raise the possibility that, when grain is sold as seed with recognized, valued attributes, vendors are trading plant genetic resources. A better understanding of this type of trade could contribute to policies that improve access to valuable genetic resources for poor farmers in less-favored environments, enhancing their seed security and productivity.

RESEARCH METHODOLOGY

Sperling's hypothesis is a central premise of the studies undertaken by IFPRI with FAO and its partners in India, Kenya, and Mali. The objective of the overall research project was to assess the potential for these local markets to supply good quality seed. A common, general methodology was developed by project team members and applied in each of the case studies. Following a sector assessment, sites in each case study were selected as "marketsheds"—real or potential trading networks composed of a market center, interlinked market outlets, and a population living within a geographical area. Markets and farm populations participating in the markets were sampled within each marketshed.

In each market, a market infrastructure survey was conducted through interviews with key informants and local government officials, supported by direct observations. Surveys were implemented immediately before or after the onset of the planting rains, when farmers are most likely to acquire seed in grain markets. Each market was visited on the day of the weekly fair during the peak period for transactions. Overall characteristics of the markets, including product scope, size, and physical infrastructure, were identified. A vendor survey elicited characteristics of vendors, vendor seed lots, and transactions. A protocol was developed to sample seed lots from vendors, grow them on the experimental station, and classify them genetically.

In each marketshed, a random sample of farmers was selected and interviewed about household and farm characteristics, attributes of varieties grown, and participation in markets and market transactions. Seed was sampled for genetic classification to link genetic resources on farms to those supplied in village markets. The welfare of household members was measured using dietary diversity and food insecurity indicators.

The study focuses on pearl millet and sorghum in Mali, pigeonpea in Kenya, and minor millets in India. All study sites are located in semi-arid environments with relatively poor market infrastructure. Farmers in the study areas have not benefited from a Green Revolution approach and are not likely to do so in the future, given environmental constraints.

SEED POLICY OPTIONS FOR COPING WITH HIGH FOOD PRICES IN INDIA, KENYA, AND MALI

The accompanying briefs aim to provide case-specific responses to key seed policy issues, based on the relationship between seed markets and high food prices, which were discussed at the project findings meeting at FAO in May 2008. Definitions of terms used in the briefs are provided in Box 1.

This collection answers key questions in the country context for India, Kenya, and Mali, including whether high food prices will mean higher seed prices and seed insecurity for poor farmers, especially for crops other than rice, maize, and wheat in marginal environments. In addition, the briefs analyze issues related to the existing seed supply for these crops and policies to promote the increased use of quality seed by improving farmer access in weekly village markets. In each case, policies that address availability, cost, and information constraints can help farmers cope with the food price crisis in the short term. In the longer term, such policies are essential for ensuring sustainable rural livelihoods, meeting the Millennium Development Goal targets for cutting hunger and poverty, and achieving food security.

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BOX 1—DEFINITIONS

Seed system: The set of interconnected institutions involved in developing new varieties of seeds; producing, testing, and certifying them; and marketing them to farmers. It is also called the seed industry. Both the formal and informal seed sectors are part of the seed system.

Formal seed sector: The chain of seed production and marketing involving scientific plant breeding and multiplication by a seed company following established procedures including processing, bagging, labeling, certifying, and marketing.

Informal seed sector: The chain of seed production and marketing involving farmers who save seed from harvest to planting, occasionally selling or exchanging seed with other farmers, but without any mechanical processing, testing, or labeling.

Landrace: A distinct plant population recognized, developed, and reproduced by farmers. A landrace is typically considered to be more heterogeneous than a modern variety.

Local variety: A distinct plant population recognized and managed by farmers—either a landrace or a modern variety whose seed has been saved and reproduced by farmers as their own.

Modern variety: A distinct variety that is recognized and developed by plant breeders and meets official requirements for uniformity and stability; it is reproduced in the formal seed sector. Breeders generally recommend that farmers purchase hybrid seeds each season to maintain yield advantages.

Cross-pollinating species: A plant species in which pollination occurs by exchange of genetic material in the form of pollen from one plant to another.

Certified seed: Seed that has been verified to be varietally pure, clean, and viable (high germination rate).

Truthfully labeled seed: A category of seed that is not certified but is labeled according to the characteristics and origin of the seed.

Hybrid seed: Seed produced by crossing two or more separate in-bred lines. Hybrid seed typically produces high yields the first year, but the yield drops if recycled for a second year.

Transaction costs: The costs of buying and selling a good, including the costs of searching for a trading partner, inspecting the good, negotiating the terms of the transaction, and monitoring compliance with the agreement.

Varietal change: The practice of purchasing the seed of a new variety for the purpose of increasing yield or offsetting the natural loss of resistance to evolving pests and diseases.

Varietal release: A procedure by which a committee reviews the results of field trials and decides whether a new variety can be named and made available for sale to farmers.

Intellectual property rights: Guarantees to individuals, businesses, or organizations of exclusive rights to intangible creations, such as an invention, an industrial process, or an artistic work. The guarantees include patents, copyrights, trademarks, and legally protected trade secrets.

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At the time this brief was written, **Melinda Smale** was a senior research fellow in IFPRI's Environment and Production Technology Division, **Marc J. Cohen** was a research fellow in IFPRI's Food Consumption and Nutrition Division, and **Latha Nagarajan** was a postdoctoral fellow in IFPRI's Environment and Production Technology Division.

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
2033 K Street, NW • Washington, DC 20006-1002 • USA
T +1.202.862.5600 • Skype: ifprihomeoffice • F +1.202.467.4439 • ifpri@cgiar.org

www.ifpri.org

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

INDIA
MINOR MILLET SEED IN TAMIL NADU

Latha Nagarajan, Melinda Smale, and E. D. I. Oliver King

MINOR MILLETS IN INDIA

Minor millets are a group of annual grasses found mainly in arid and semi-arid regions. They are cultivated on 29.1 million hectares in India, accounting for nearly 25 percent of the total acreage under cereal crops. In India's drylands, they play a significant role in meeting food and fodder requirements of farming communities. Three species of minor millets—finger, foxtail, and proso, or little, millet—are widely cultivated. These crops are often classified as "minor or coarse grains" in agricultural statistics. "Minor" refers not only to the smaller size of the grains, but also to their lesser importance in trade. The scientific knowledge about them is limited. Despite national efforts to collect minor millet germplasm from farmers, research to improve these crops has been negligible.

Liberalization of the Indian seed sector in the 1990s favored dryland cereals and legumes, with little impact on research and formal distribution channels for minor millets. Currently, the states of Andhra Pradesh, Karnataka, and Tamil Nadu lead in crop improvement research on minor millets. However, the range of improved varieties is narrow. Private companies show little interest in developing new varieties, due to their lack of commercial importance and the limited scope for developing new hybrids.

Hence, seed systems of minor millet crops are mostly autarkic—farmers depend on themselves or other farmers in their community for seed. When these systems falter due to repeated crop failure or changing social relationships, local markets assume greater importance as a source of seed for locally adapted varieties. Occasionally, improved varieties of finger and little millet seeds are provided through government-sponsored agricultural extension programs. Although understanding local markets and their actors is necessary to design effective seed supply mechanisms, little is known about seed transactions in local markets for these crops. This brief examines seed transactions in one marketshed in the state of Tamil Nadu.

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STUDY SITE

Dharmapuri District is located in the northwestern part of Tamil Nadu and is a dryland, semi-arid production system. Dharmapuri leads the state in total area and production of minor millets (2004–05). The district receives only 400 to 500 millimeters of rainfall annually, and less than 10 percent of farmland is irrigated. In southern India, Dharmapuri is a major market center for the sale of finger

and little millet. Here minor millet grains and seeds are traded in local market towns located in *taluks*.[1] The research team identified five major *taluks* in Dharmapuri District (Pennagaram, Dharmapuri, Harur, Pappireddipatty, and Palacode) in which vendors regularly sell minor millets. The team collected information from 165 vendors, prior to the 2007 rainy season. In these markets, during the planting season, minor millets were traded through five channels: wholesale traders, retailers or local shops, agro-dealers, government-sponsored agro-depots, and open-air traders (Table 1). Among the markets surveyed, Pennagaram *taluk* dominated in minor millet area and the number of market transactions.

DIMENSIONS OF SEED ACCESS

Availability

Farmers in Dharmapuri often used local markets for procuring and selling minor millet grains, but they also purchased seed in grain markets more frequently than expected. While the grain market is active and large, the seed market—which exists only before planting time—is thin. Farmers procure seed in the grain market only when they do not have their own seed stocks during periods of drought or because of poor management practices. When drought is widespread, seed is scarce in farming communities. Farmers sell their minor millet grain to wholesalers who are involved in bulk grain trading and have permanent infrastructure inside markets. The wholesalers surveyed trade mostly in grain: seed sales constitute only 3–5 percent of their total minor millet sales. Retailers, who are not allowed to sell seeds legally, sell minor millet grain in small quantities, mainly for food. Of their total sales, only about 1 percent is sold as seed. Retailers often mix varieties.

Of the five types of actors, agro-dealers and agro-depots are licensed traders and are the only sources of certified seed. Sales of minor millet seed were less than an estimated 0.5 percent of their total portfolio and were mainly made up of improved varieties of finger millet, in response to farmer demand. Agro-dealers also have extensive knowledge about varieties and seed origin and sell truthfully labeled seeds, which assures quality. A narrow range of improved varieties of finger and little millet are supplied at subsidized rates through government-sponsored agro-depots found only in the Pennagaram market. Minor millet seeds sold through other agro-depots account for less than 1 percent of the total sales in the *taluk*. Although open-air vendors were present in all the markets surveyed, only the vendors who participated in the Pennagaram weekly markets sold minor millets. Most were women and part-time farmers who sold small quantities. They make little profit and sell their product to meet the immediate cash needs of the household.

Table 1—Characteristics of vendors, transactions, and seed/grain sold in local markets for minor millets, Dharmapuri District, Tamil Nadu, India

Vendors	Agro-dealer	Wholesaler	Retailer	Open-air	All vendors
Characteristic	58	36	54	17	165
Mean age	39.2	47.9	44.2	53.8	44.2
Mean number of crops sold	5.4	5.1	4.5	2.6	4.8
Female vendors (%)	3.5	0.0	1.9	82.4	10.3
Literate vendors (%)	100.0	100.0	94.4	64.7	94.6
Vendors owning a mobile phone (%)	72.4	66.7	55.6	5.9	58.8
Vendors owning a bicycle (%)	56.1	37.1	53.7	0.0	45.4
Transactions					
Buyers purchasing grain for seed after a poor harvest (%)	45.4	72.5	32.0	79.5	57.6
Transport					
Mean transport and other costs (Rs/100-kg. Bag)	4.24	11.0	8.33	12.06	8.9
Seed/grain					
Vendors differentiating between seed and grain (%)	96.8	58.2	24.8	76.5	63.9

Source: Authors

[1] A *taluk* is an administrative unit comprising 4 or 5 village communities known as *panchayats*.

Cost

Farmers in Dharmapuri District prefer rural market towns to larger city markets because of their agricultural focus and proximity, yet they may have to travel as far as 30 kilometers simply to participate in these rural markets. Often, farmers from the same village pool their grain and arrange with traders to collect and transport it by truck. The usual price spread between grain traders and farmers is approximately 15–20 percent of the final price paid to farmers.

Farmers surveyed did not earn a price premium for the sale of minor millet grain as seed in their transactions with wholesale or retail traders. During the planting season, farmers paid a 1–2 percent premium to purchase grain for seed from these traders. The premium covers the costs of cleaning and storing the seed separately from grain to maintain its physical purity. By contrast, farmers who sold minor millet grain as seed to agro-dealers and agro-depots received a 5–10 percent premium. The price of minor millet seeds among agro-dealers and depots is fixed, based on existing government rates. Vendors, other than wholesalers, did not extend credit to farmers for seed. Wholesalers at the market typically fix prices based on the current market supply and demand conditions.

Information

Minor millet growers in Dharmapuri are aware of prices before participating in the market. Neighbors are the most frequent source of information, followed by village traders, the mass media, and extension agents. Farmers also receive information about new varieties of minor millets when they visit agro-dealers and depots.

Among vendors in general, increased use of mobile and fixed phones has improved the flow of price information among markets. In the survey, farmers were the primary source of information about minor millet varieties for 90 percent of the vendors. In addition, 70 percent of vendors received information related to consumption and production traits from farmers. However, only 25 percent of vendors (mostly open air and agro-dealers) shared information on variety identity and other technical information with their clients.

Although most of the vendors in these local markets specialize in grain trading, the price premium differentiates seed from grain in the grain market. Yet, other than trust conferred through social relationships such as clan identity, there appears to be little assurance of seed quality and variety identity. Although quality assurance seems to be greater among agro-dealers and agro-depots, these sources supply improved finger millet materials only. Often, farmers cannot afford the price differential—10–15 percent higher than grain prices. In periods of high demand, there are also several reported instances of agro-dealers supplying varieties that were not adapted to local environments. Farm households reported that the government-owned agro-depots often could not supply seeds as quickly as needed during the planting season.

POLICY IMPLICATIONS

Improved seed supply systems

Minor millet crop production is still dominated by farmers' varieties, with many seed exchanges taking place through local markets and social networks. The local supply channels for seed and grain often overlap. Yet a significant price premium for both quality seeds and varietal information exists. The Indian seed certification system allows truthful labeling of popular, local, and improved varieties. This offers more opportunities for vendors—especially agro-depots and agro-dealers, the two formal actors in the existing supply chain—to provide quality seeds. The availability and distribution of seed and grain could also be improved by creating awareness among farmers and open-air farmer traders of improved storage practices to avoid losses of saved seeds and ensure quality in local markets. This could be done by

1. providing selected farmers and agro-dealers with improved materials from research centers to sow and multiply,
2. supplying small packets of minor millet seeds through formal actors in the supply chain during planting season,
3. enforcing strict quality control and grading of materials supplied through grain traders and agro-dealers,
4. monitoring prices "fixed" by grain traders in the markets,
5. utilizing existing village-level social networks and other intervention mechanisms to provide timely market information on crops and availability, and
6. increasing market infrastructure facilities for open-air vendors to improve market access and participation.

The impact of rising food prices on access to seed

Over the last 15 years, as a result of increased demand from North Indian food processing industries, farm households have been selling more minor millets. Their prices have doubled, and trade in minor millets has tripled over the last decade. Rising food prices could have two possible effects on these farm households. Net surplus producers of minor millets could benefit from the rise in prices, and these benefits might compensate for rising prices of other food items and agricultural inputs. However, nearly 70 percent of minor millet growers produce little or no surplus of minor millets. The rise in food prices has not affected them directly, as rice and wheat are being supplied at very low prices through government-sponsored public distribution systems. Nevertheless, nearly 90 percent of minor millet growers have been affected indirectly through the purchase of agricultural inputs (fertilizer, fuel) and supplementary food items (cooking oil, spices). The prices of minor millets are always higher than rice and wheat, so consumers are not likely to shift to increased minor millet consumption.

For many farmers living in these dryland environments, with few alternative crops, minor millets are the major source of crop income. The rise in food prices could particularly affect farmers who produce limited or no surplus of minor millets. Both seed and food shortages would be inevitable for them. In the short run, it is important to improve their access to quality seed stocks for the immediate planting season. This could be done effectively by supplying small seed packets or mini-kits (that include seeds and inputs) at subsidized rates through existing programs for dryland crops. In the long run, a more focused breeding strategy, coupled with participatory approaches and strengthened local seed supply systems, will prove vital for yield stability and increased genetic diversity of minor millet crops in these dryland areas.

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At the time this brief was written, **Latha Nagarajan** was a postdoctoral fellow and **Melinda Smale** was a senior research fellow in IFPRI's Environment and Production Technology Division. **E. D. I. Oliver King** is a senior scientist at the M.S. Swaminathan Research Foundation.

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KENYA

PIGEONPEA SEED IN SEMI-ARID AREAS

Patrick Audi, Latha Nagarajan, Richard Jones, and Melinda Smale

Liberalization of agricultural input markets in the early 1990s has enabled several multinational seed companies to enter the Kenyan market and more than 50 local seed companies to be established. Most sell hybrid maize seed. In semi-arid areas of the country, cultivation of pigeonpea, a dryland legume crop, has provided cash opportunities for farmers through the sale both of fresh green pigeonpeas and dry grain. Research investments made by national and international agricultural researchers working in partnership have been successful in developing several improved high-yielding varieties with both farmer- and market-preferred traits, but the benefit to smallholder producers has been limited because legume seed systems are poorly developed. Since improved pigeonpea varieties are not hybrids, there is little incentive for commercial seed supply. Compulsory seed certification for major dryland cereals and legumes also acts as a disincentive to private firms' participation in seed-related activities because of the high transaction costs in complying with existing seed regulations on variety release and compulsory seed certification.

Most farmers in Eastern Kenya use seed they have saved for planting, but farmers without saved seed search for seed immediately before the rains. While farmers can purchase certified maize and bean seed through agro-dealer networks, seed of dryland cereals and legumes is not available for purchase through the same channels. Farmers who face chronic food and seed shortages due to frequent droughts depend on local markets for their seed and grain needs.

Over the years Kenya has initiated a range of seed development interventions, in partnership with non-governmental and research organizations, to try to improve farmers' access to seed of dryland crops, but these efforts have had limited and localized success that is not sustained beyond the seed development intervention. Market linkages remain poor, and farmer groups have not internalized systems that provide reliable sources of new seed varieties and then maintain varietal integrity over time.

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In this study, IFPRI and its partners sought to better understand constraints to commercializing improved pigeonpea varieties in Eastern Kenya, and to determine how farmers gain access to pigeonpea seed in local markets. This was done by determining the amounts of seed traded and vendor and transaction characteristics in local markets during the 2006/07 short rainy season.

STUDY SITE

The study area was Makueni District, which is classified as arid to semi-arid. The District has two rainy seasons: the more reliable short rainy reason from October to December, and the less reliable long rainy season from March to May. Markets were selected across the district to reflect the existing rainfall gradient. They were also selected for study if regular seed or grain transactions that involved both traditional and modern pigeonpea varieties were observed in those markets. The study also examined whether communities located around the markets had benefited from publicly funded seed programs over the last 10 years by comparing pigeonpea quantities and seed types sold by vendors in intervention and non-intervention areas. The survey sample consisted of 167 vendors in seven local market centers of Emali, Kalawa, Kasikeu, Kathonzweni, Mulala, Sultan Hamud, and Wote villages.

DIMENSIONS OF SEED ACCESS

Availability

Five vendor types were found and classified into the following groups: i) local shop owners, ii) farmer-traders, iii) mobile traders, iv) agro-dealers, and v) grain traders (Table 1). Nearly three-quarters of all vendors surveyed were women. Most farmer-traders consider farming their primary occupation, and, except for agro-dealers who only sell certified maize and bean seed, all other vendor types trade pigeonpea as either grain or seed. Grain vendors trade throughout the year and have permanent shops, but only sell seed just before the planting season. Farmer-traders and mobile traders transact only during weekly open-air markets. Some farmer-traders were found to have adopted simple sales techniques such as offering clean, sorted seed in small packs.

Weekly markets serve farmers living within a 50–100 kilometer radius. Markets located in wetter areas offer more varieties and handle higher sales volumes than those in dry regions. Markets in the wetter areas are very close to a major road connecting Nairobi to the Mombasa port, which enables traders to transport their produce more efficiently. Markets in the drier interior have poorly developed transportation and road networks.

Local markets complement publicly funded seed intervention programs in Eastern Kenya. More than 70 percent of the seed distributed to farmers through seed vouchers and fairs conducted as part of an emergency seed relief program were sold through local market vendors,[1] and survey data confirm that vendors located in seed intervention areas sold more pigeonpeas than those in non-intervention areas. The overlap of seed and grain trade in these markets means that drought years have repercussions for both food and seed.

Table 1—Characteristics of vendors, transactions, and seed/grain sold in local markets for pigeon pea, Makueni District, Eastern Kenya

Vendors	Local shops	Grain trader	Local farmer vendor	One-time farmer vendor	Mobile trader	All vendors
Characteristic						
Number	64	36	30	23	14	167
Mean age	38.0	40.7	43.7	46.4	41.9	41.1
Mean years in school	10.3	10.1	6.9	5.3	7.9	8.8
Mean years selling in market	7.8	6.1	9.2	6.5	9.8	7.7
Number of crops sold	4.3	4.8	3.6	2.7	3.6	4.0
Number of named pigeonpea seed lots per vendor	1.3	1.5	1.1	1.2	1.2	1.3
Share of female vendors (%)	60.9	52.8	96.7	95.7	92.9	73.1
Share who farm as primary occupation (%)	28.1	16.7	63.3	82.6	50.0	41.3
Share owning a mobile phone (%)	43.8	55.6	43.8	0.0	25.0	43.2
Share owning a weighing scale (%)	94	95	24	9	29	64
Transactions						
Amount of pigeonpea sold (kgs)						
Normal year	651.8	315.0	132.5	109.7	161.4	371.1
Bad year	216.6	209.3	69.7	44.3	76.1	149.7
Share selling seed/grain in small packs (%)	16	17	14	17	36	17
Share offering negotiated prices to buyers (%)	27	56	52	35	43	40
Seed/grain sources						
Own farm (%)	41.9	29.2	63.9	96.0	60.0	51.0

Source: Authors

[1] Since 2002, Catholic Relief Services has given vouchers to the seed-insecure that they can exchange for seed sold by vendors.

Costs

Pigeonpea prices seldom varied in weekly markets. Prices were fixed at the beginning of each day and all vendors charged the same. Almost 50 percent of the farmer-traders sold their produce early in the market day to local shops and grain traders for prices lower than the fixed price, allowing them to avoid paying market fees and to make other purchases and return home. There was no significant price premium for seed compared to grain.

Farmers reported that immediately after droughts, seed and grain prices increased. Pigeonpea prices were lower in markets located in seed intervention areas, due to increased seed availability, and more pigeonpea types were offered.

Information

Farmer-traders generally knew about attributes and seed quality of their own produce and that of other local farmers, but all other vendors were less likely to offer good quality seed of known origin as they often pooled produce from different farmers. Sometimes traders did not know the variety name. Only farmer-traders were likely to differentiate seed from grain based on physical purity (size, color, and cleanliness) and origin/variety. In recent years, mobile phones have had a significant positive impact on pigeonpea sales among grain traders, helping them to exchange pricing information with outside markets. Shops and grain traders are more likely to own mobile phones than are farmer-traders.

POLICY IMPLICATIONS

Improved seed supply

Local markets appear to meet farmers' needs fairly well. However, high rainfall variability in pigeonpea-producing areas affects productivity, which creates some volatility in both seed and grain supply. Seed quality is sometimes questionable, and the distinction between grain and seed is often unclear, especially when sold by local shop owners, mobile traders, and grain traders as opposed to farmer-traders. What is lacking is a regular supply of affordable, high-quality seed of known variety that is accessible to farmers in local markets.

Improved access to information and quality standards for seed sold through vendors would create incentives for sales and purchase of well-adapted, high-quality seeds in local markets. Amending Kenya's Seed and Plant Varieties Act to allow local production and sales of either truthfully labeled or quality-declared seed in local markets would enhance market efficiency and improve the supply of well-adapted varieties both from farmer-selection and formal research.

Existing fee structures in local markets are high and not commensurate with the marketing infrastructure provided. Reducing explicit market charges would lower transaction costs and prices. Publicly funded seed programs appear to have had an impact on seed quality and participation in the surveyed markets. During and after droughts, however, farmer participation in these local markets was constrained both by lack of seed availability and lack of purchasing power on the part of farmers.

The impact of rising food prices on access to seed

Pigeonpea growers in semi-arid Kenya are net buyers of the staples, maize and beans. Pigeonpea is an important dietary supplement as well as a source of cash from sales in local markets. The current rise in food prices along with lack of rain is expected to affect access to, and availability of, good-quality pigeonpea seed and grain, especially among farmers who produce little or no surplus.[2] With rising food prices, farm households may substitute pigeonpea seed reserves for high-priced maize and beans, creating shortages in local markets. Key measures for supplying seeds in these markets include

1. providing vouchers for agricultural inputs and food from local markets;
2. mobilizing seed/input fairs in local communities to improve seed availability;
3. coordinating among the implementing agencies to monitor the sources of seed under relief programs to ensure good quality and well-adapted varieties;
4. encouraging the supply of improved varieties in small seed packs through traders, in exchange for vouchers to improve yields;
5. linking local markets and their vendors to seed sources, such as existing seed intervention programs and producer groups, to improve supplies of well-adapted, quality seed types;
6. educating traders and farmers about the benefits of differentiating seed and grain and supporting this through the introduction of locally implemented seed-quality standards; and
7. improving the supply of foundation seed from research to local producers and involving local producers more closely in variety release and quality control.

In the long run, it is important to strengthen local market infrastructure and vendor capacity through improved roads, facilities, and information on prices and varieties.

[2] The price of pigeonpea during the peak marketing season (September 2008) rose from 20 to 50 Kenyan shillings (Kshs). A further increase to 70 Kshs is expected during the planting season.

The potential for credit provision for traders or farmers also needs to be examined. Finally, any mechanism to deliver improved quality and varieties of pigeonpea through local market actors would contribute eventually to price stabilization.

For further reading

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Patrick Audi is a research associate at ICRISAT, Eastern and Southern Africa Division, Nairobi, Kenya. At the time this brief was written, **Latha Nagarajan** was a postdoctoral fellow and **Melinda Smale** was a senior research fellow in IFPRI's Environment and Production Technology Division. **Richard Jones** is assistant director at ICRISAT, Eastern & Southern Africa Division, Nairobi, Kenya.

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

MALI
MILLET AND SORGHUM SEED IN THE SAHEL

Melinda Smale, Lamissa Diakité, and Mikkel Grum

THE ROLE OF MILLET AND SORGHUM IN MALI

Malian farmers have accumulated knowledge about managing millet and sorghum seed over thousands of years in the Sahel. In response to climatic changes in this harsh environment, they have selected the varieties that continue to perform best. Millet and sorghum are the food staples for a majority of rural Malians, although rice is preferred in the Niger delta and in urban areas. While most producers of these crops are subsistence oriented, active and well-integrated grain markets confirm that some farmers produce surpluses and some regions export.

Millet and sorghum seed are traded principally through social networks in noncash transactions, and most exchanges involve noncertified seed. The right to millet and sorghum seed, and having one's own seed, are strong customary norms in the villages studied. For a farmer to be without seed or to exchange seed for cash carries social stigma.

But the farmer seed system does not always suffice: after several years of local crop failure, many communities facing similar environmental stresses run short of well-adapted seed. A Catholic Relief Services (CRS) assessment conducted in the Cercle of Douentza (an administrative region) documented that after several years of poor harvests, local traders provided a missing link by circulating the seed of early maturing landraces from nearby villages to seed-deficit areas. Landrace identity, linked to the seed's village of origin, was preserved in transactions, even though these occurred in local grain markets, which are generally viewed as last-resort seed markets. Knowledge of the seed's origin is critical due to heterogeneous growing conditions. Research conducted by IFPRI and partners confirmed this finding for the Douentza study site, but not for a second site.

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STUDY SITE CHARACTERISTICS

Roughly 150 farmers were randomly sampled and surveyed in two sites located in the marketsheds of San and Douentza. Based on survey responses, six of the most frequently cited markets were selected in each site, and 100 vendors were interviewed.

Farmers in Douentza can count on only 200–400 millimeters (mm) of rainfall per year, and they depend almost entirely on millet, sorghum, and cowpea production. Rainfall at the San site is higher but rarely exceeds 600 mm. While sorghum is the principal cereal around San, followed by millet, farmers surveyed also grew groundnuts, fonio, and Bambara nut and planted some fields with maize, watermelon, sesame, and vegetables.

The extent and permanence of physical infrastructure, the range of products sold, and the number of traders are much greater in the markets of San. More wild fruits and leaves were on sale in the Douentza markets, while other crops found in San, such as maize, were entirely absent. Millet and sorghum prices were on average higher in the Douentza markets than in San's.

San is located in the Segou region, which is a major producer and exporter of sorghum. The villages in and around San are also known for the grain quality of the millet they sell. Wholesalers in the Douentza town markets import and trade this grain, as well as lower-quality millet from other regions. Both are suitable only for food because they are mixtures of varieties that are not well adapted to the growing environments around Douentza. The villages in the Douentza marketshed generally do not export millet to other regions.

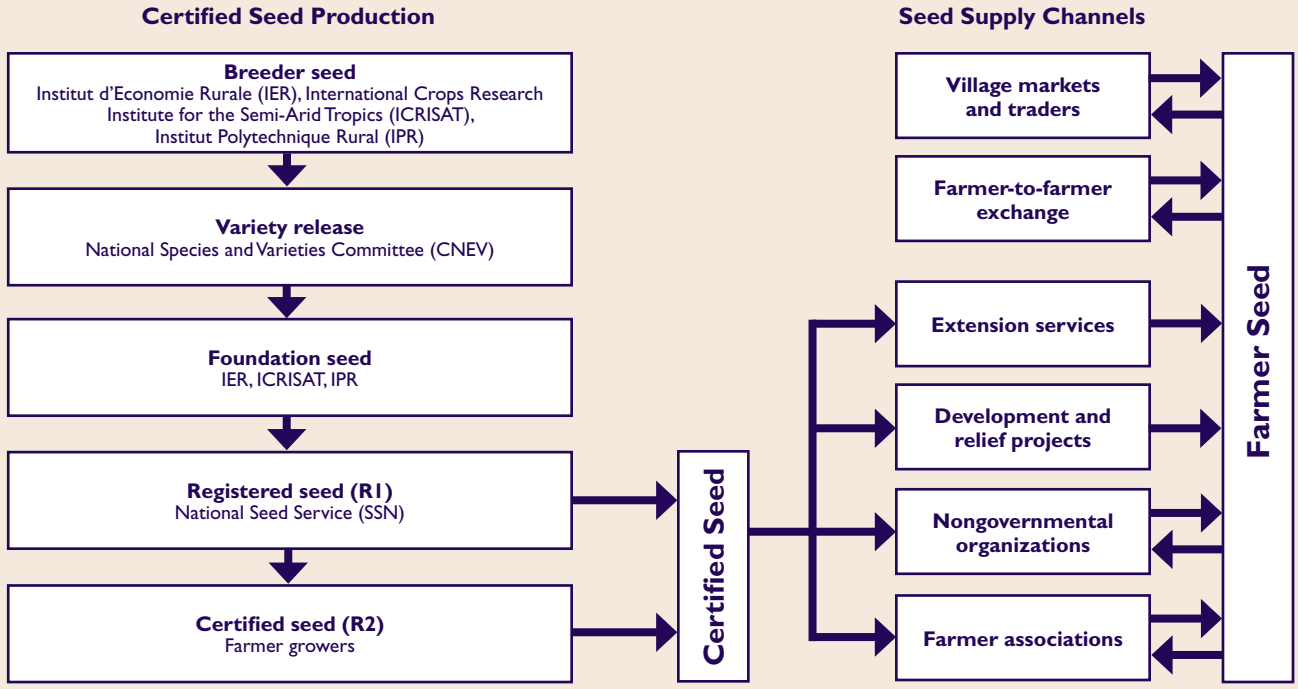
Seed trade displays the opposite pattern. None of the farmers reported procuring seed with cash in the San site; all seed transactions were reported as gifts or noncash exchanges. Farming communities in San, although not necessarily individual farmers, are generally self-sufficient in millet and sorghum seed. On the other hand, farmers in Douentza reported both cash and noncash seed transactions. The most recent year of seed procurement they described was 2005—a planting season that followed two seasons of bad weather and a devastating locust attack. Considering both sites, only 17 percent of farmers reported self-sufficiency in millet seed varieties. Two-thirds of farmers had procured seed through noncash transactions at least once, and 16 percent had purchased seed with cash. Cash transactions among farmers in Douentza occurred primarily during weekly grain markets.

DIMENSIONS OF SEED ACCESS

Availability

Seed sector reform for sorghum and millet has not advanced at the same rate or with the same success as grain market liberalization. Despite continued releases of improved varieties of millet and sorghum that are adapted to varying amounts of rainfall, the use of certified seed by farmers remains limited. Certified seed is multiplied by contracted farmers and seed producer groups and supplied to farmers through farmers' associations, development organizations, and extension services. No certified seed was sold in any of the 12 local markets surveyed. In the informal sector, farmers supply other farmers with noncertified seed through social networks or village grain markets, typically to trustworthy members of their clan and ethno-linguistic

Figure 1—Millet and sorghum seed channels in Mali



Source: Adapted from Touré, A., O. Sanogo, L. Diakité, and A. Sidibé. 2006. Program for Africa's Seed Systems (PASS). Country Report: Mali. Bamako: Institut d'Economie Rurale.

Table 1—Millet market characteristics in the Douentza site, Mali

Vendors	
Female	98.6%
Literacy (including adult literacy training)	7.8%
Farming as primary occupation	93.5%
Mean age	37.1
Transactions	
Buyers purchasing grain for seed after a good harvest	23.9%
Buyers purchasing grain for seed after a poor harvest	47.2%
Vendors selling at fixed prices	94.2%
Farmers knowing market price	99.6%
Transport	
Mean distance (kilometers) from farmer to all markets frequented	11.8
Mean total transport and other costs (Malian FCFA) per transaction	225.9
Seed/grain	
Vendors providing seed/grain directly from family fields or granary	84.1%
Vendors providing some product information to purchaser	62.1%

Source: Authors

group. The quality of this seed is generally considered to be good. Formal and informal channels for millet and sorghum are largely disjointed, but both are dominated by the farmers themselves (Figure 1). Still, estimated adoption rates for improved millet and sorghum seed (under 10 and 20 percent of crop area, respectively) may be as high as can be expected in this challenging natural environment and institutional context.

Since seed trade in local markets is only common in Douentza, all statistics reported in Table 1 refer to this site. Petty vendors are the only source of millet or sorghum grain that is suitable for seed. They are generally illiterate women whose principal occupation is farming, with an average age of 37. Each usually sells only one or two millet or sorghum varieties at a time, and millet is more common. Vendors surveyed estimated that, on average, two out of every 10 clients purchased grain for seed after a good harvest, and as many as 50 percent sought seed after a poor harvest.

Costs

Price premiums for millet seed are rare, compared with grain, because seed purchased in the market is procured from grain vendors. Anecdotal evidence suggests that in years of seed scarcity, such as 2005, farmers are willing to pay a premium for locally adapted varieties. In addition to women farmers who are part-time vendors, professional traders participated in seed transactions during that season. Daily prices are fixed by market authorities and cultural norms, although there is some variation during the day and among vendors. Credit arrangements are rare and usually occur among kin.

Market day is an opportunity for farmers to engage in buying, selling, obtaining information, and socializing. Gender differences were apparent in transaction costs—men traveled farther and paid many times more in transport and other costs. For both men and women, the average time to complete a seed/grain transaction was only 20 minutes, and none of the transactions involved intermediaries. Women more often sold millet to a farmer from the same village, whereas men sold more frequently to farmers from other villages.

Information

More than 99 percent of farmers surveyed in the Douentza site were aware of the market price for millet, and farmers were unanimous in stating that this knowledge is important. However, market information is obtained only by word of mouth or by a previous trip to the market. Only 1 percent of farmers reported that they had received price information by radio.

When approaching petty grain vendors, seed clients will most often ask the village provenance of the seed or about attributes such as yield or early maturity. About two-thirds of vendors said they provide some information to the purchaser. With a cross-pollinating crop such as millet—especially in a heterogeneous, risky production environment where varieties have a narrow range of adaptation—village provenance is a reasonable indicator of whether the variety is suitable for a farmer's conditions. Seed is more likely

to be true to type and to germinate if it has been brought directly from the farmer's granary.

POLICY IMPLICATIONS

Seed system development

There is no consensus about whether it is lack of effective demand or supply that constrains farmer's use of certified sorghum and millet seed in Mali. Experts generally conclude that (1) the process of certifying seed should be shortened, (2) a mechanism must be established for production and trade of locally adapted landraces, and (3) Mali's farmers' associations could play a more prominent role in testing and promoting demand for certified seed. Recommendations include introducing small seed packs and seed auctions where market infrastructure is sparse.

This study has confirmed the hypothesis that local markets are more important sources of seed in the riskier, more isolated villages of Douentza than in the more productive, market-integrated San site. Despite the evidence that local markets for millet grain perform fairly well as de facto seed markets in the drier zone, local seed supply channels cannot be strengthened unless they are separated from grain supply channels. Although the market infrastructure exists in San to support provision of certified seed by traders and agro-dealers along with other farm inputs, these opportunities have not been fully exploited.

The impact of rising food prices on access to seed

Prices have risen for all cereals in Mali during this global crisis, compounding problems caused by low productivity and insufficient food supply. In response, the government has undertaken an emergency initiative to stimulate national rice production. Depending on demand elasticities, urban consumers may be shifting from rice, which is preferred, to sorghum and pearl millet, contributing to higher prices for these grains in cities. Economic principles predict that surplus-producing farmers in San, which is well integrated into regional markets in Mali, will sell more and benefit when sorghum and millet prices rise. Smallholder farmers who are net consumers in that region will pay more for food. In contrast, given the high costs of commerce and crop production in the Douentza site, even substantial changes in the price of imported grain may not affect the equilibrium price appreciably in more remote village markets because they trade so little.

For surplus producers of sorghum and millet, it is important to continue investing in developing improved varieties and reforming seed systems, including better market information. The search for improved germplasm is best combined with farmer participatory evaluations, given environmental heterogeneity in Mali. Net-consumer households rely on their own sources of seed, and food aid could help ensure that they do not consume their seed as food. Imported, improved varieties are not likely to perform as well as local varieties, and seed system interventions should aim to enhance access to good quality, local seed. Policy reforms to permit local seed multiplication and diffusion may have a greater impact in the short run than introducing modern varieties. In areas such as Douentza, local seed supply could be strengthened by legitimizing local seed markets and separating them from grain markets by providing product information, such as denomination of origin.

For further reading

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At the time this brief was written, **Melinda Smale** was a senior research fellow in IFPRI's Environment and Production Technology Division. **Lamissa Diakité** is an economist at the Institut d'Economie Rurale. **Mikkel Grum** is a scientist, Genetic Diversity, at Bioversity International.

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