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How Seed Works

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The purpose of this chapter is to compare formal and farmer seed systems, to describe the role of quality seed and to present the context in which small and medium-sized enterprises work in Africa, with a particular emphasis on the challenges of farmer seed enterprises. The demand for seed varies widely with the type of crop planted, and this influences which types of seed farmers want to buy. One of the most important reasons to buy formal seed is to acquire a new variety. The formal sector often ignores these reasons, and complains of how little seed farmers buy, especially smallholders in Africa and elsewhere in the tropics. Yet farmers can often obtain quite good seed from markets, their neighbours or their own farms. The formal seed system is actually a marriage between the government and the private sector, a marriage where communication and collaboration happen some of the time, but not always. While some have proposed encouraging groups of smallholders to produce formal seed for others, this has not been a success. Smallholder seed producer groups find it even more difficult than private seed companies to collaborate with the public sector for source seed supply and certification services. In light of these problems, the cases of functional African seed enterprises described in Chapters 3 to 11 seem even more remarkable.

2.1 Formal and Informal Systems

Farmers get seed from ‘formal’ or ‘informal’ systems (Sperling *et al.*, 1996; Sperling and Cooper, 2003). Formal systems are purposively composed of separate activities to provide new varieties, maintain their purity, certify the seeds and distribute them to farmers, usually through officially recognized seed outlets. De Schutter (2009) labels the formal sector the ‘commercial seed system’, which is not quite accurate, since there is much public sector involvement in it as well.

An ‘informal’, ‘traditional’ or ‘farmer’ seed system lacks public sector regulation (Thiele, 1999). Farmers frequently exchange seeds among themselves, often for sale (Almekinders *et al.*, 1994; Almekinders and Louwaars, 1999; De Schutter, 2009). Farmer seed systems also develop new varieties and maintain crop genetic diversity, but they do it as an integrated part of crop production (Almekinders and Louwaars, 2002; Brush, 2004).

The stated goal of formal systems is to maintain quality of seed, but high quality may be maintained even without legal recognition, e.g. in the UK, where seed potatoes no longer need be certified, or in the USA, where most hybrid maize seed is not certified, and yet in both cases the quality is high. There is a movement in industrialized countries towards quality declared seed (QDS), where quality is maintained

Table 2.1. Formal vs informal seed systems.

	Formal system	Informal (popular or farmer) system
<i>Goals</i>	Distribute high quality seed of modern, high yielding varieties	Obtain seed to sustain the farm every season
<i>Quality of seed</i>	Variable, but usually high	Variable, but usually high for most crops
<i>Public sector</i>	Source seed, research and certification	Not necessarily involved
<i>Private sector</i>	Multiplication and distribution by registered enterprises	All activities. Distribution by farmers, registered or unregistered traders and vendors
<i>Seed type</i>	Formal, certified seed	Common or farm-saved seed

without regulation (Graham Thiele, personal communication). Quality problems occasionally creep into formal seed systems, so there is not a simplistic correspondence between ‘formal’ seed and high quality (Table 2.1).

2.2 Demand for Seed

Farmers need a good reason to buy seed (Tripp, 2003). But there are many reasons and at least 20–30% of the non-commercial seed planted by African farmers is from off-farm (Tripp and Rohrbach, 2001).

Poverty. The poorest may be tempted to sell their entire crop at harvest, or to eat it, without saving seed. Many poor bean farmers in the Great Lakes region of Africa buy all their seed. A third of poor farmers surveyed in Rwanda bought all of their seed, while in Burundi and Zaire (DR Congo) 70% and 52% did so (Sperling *et al.*, 1996). Fresh seed is frequently sought to make up for a poor harvest, after seed stocks have been eaten or sold (Tripp and Rohrbach, 2001).

Quality problems. Some seed deteriorates after several generations. For example, viruses build up in seed potato, especially at lower altitudes. Storage conditions (too dark, too humid, too dry, tuber moths, etc.) may reduce seed quality. The rate at which planting materials deteriorate and need to be replaced varies between crops and regions and also with the skills with which farmers manage and store their crops. Farmers make economically rational decisions to renew seed, i.e. they must decide if the cost of seed replacement is compensated by the added value from the new seed. The botanical facts of life dictate that some seed must be renewed frequently to maintain quality (e.g. hybrid maize, potato in the lowland tropics), while farmers can replant some seed virtually indefinitely (e.g. self-pollinated rice or wheat varieties) with little or no loss of quality (Table 2.2).

Table 2.2. Important biological features of some major crop types. (Adapted from Lanteri and Quagliotti, 1997.)

	Hybrid maize	Open pollinated maize	Sorghum millet	Wheat	Rice	Beans	Potato	Groundnut
<i>Breeding system</i>	Forced out-pollination	Aggressive cross pollination	Cross pollination	Self pollination	Self pollination	Self pollination	Vegetative propagation	Self pollination
<i>Sowing rate per ha</i>	Medium (20–35 kg)	Medium (20–35 kg)	Low (10–20 kg)	High (150–200 kg)	High (70–150 kg)	High (100 kg)	High (800–2000 kg)	High (125 kg)
<i>Multiplication factor</i>	High	High	High	Low	Medium	Medium	Very low	Very low
<i>Rate of deterioration</i>	Very rapid	Potentially rapid	Medium	Slow	Slow	Very slow	Rapid at low altitudes	Very slow
<i>Type of deterioration</i>	Genetic (increased homozygosity)	Seed acquires genes from other maize varieties unless field is isolated	Acquires genes from other varieties if field is not isolated	Pollination occurs within the plant, creating genetic stability	See wheat	Like wheat only more so	Genetically stable, but disease loads build up faster in seed at lower altitudes	
<i>Frequency of purchase (average)</i>	Annual	2–3 years	3 years	4 years	4 years	Variable	Variable	Variable

New varieties. Farmers often buy seed to obtain a new variety, but, once they have the variety, farmers may be reluctant to spend money on the seed again (Sperling *et al.*, 1996). For example, in eastern Kenya 67% of farmers who adopted NPP 670, a modern variety of pigeon pea, bought the seed when first planting it, but only 38% acquired seed more than once (Jones *et al.*, 2001). A study of the adoption of high yielding maize and wheat varieties in East Africa found high levels of adoption (75 or 90%) among smallholders in higher potential regions. However, after the farmers' first experience with the variety, the use of certified or purchased seed was low (Doss *et al.*, 2003).

Crop characteristics. Table 2.2 illustrates variation in seed demand by crop. There are other crop types and other facts of life not illustrated in the table, and the features vary depending on the system (e.g. commercial potatoes in Europe, versus East Africa or subsistence farming in the Andes). But the point is that the crop one plants influences how often one seeks seed.

Vegetables. Some vegetable seeds may be too tedious to produce on a small farm, or the preferred varieties may be easier to grow in Europe or some other temperate climate. So it may be convenient for tropical smallholders to buy vegetable or lucerne seed every season.

Low seed requirements. To plant a field with coarse grains farmers require low amounts of seed so they can more easily afford to buy it (Tripp, 2003). If one is planting a hectare of maize or sorghum with 20 to 30 kg of seed, the added cost of certified seed may be affordable. But seed potato is so bulky it may take 2 tonnes to plant a hectare. The cost of certified seed would be such a big expense for potato growers that they prefer buying common seed, rather than certified (see Bentley and Vasques, 1998, for an example from Bolivia).

Hybrid maize is attractive to private seed companies because yields decline and the crop is no longer uniform if the grains are used as seed, so farmers tend to buy new seed every season. Seed companies first promoted hybrid maize seed in the United States in the 1930s as a way of forcing farmers to buy seed. Before then, companies had sold mostly vegetable seed (Kloppenburger, 1988).

The development of high yielding maize in Africa has transformed maize from a minor crop in 1900 to the largest source of calories today. Breeding was started in Zimbabwe (then Rhodesia) in the 1930s and in Kenya in the 1950s. Both countries made breakthroughs with hybrid maize in the 1960s. At independence, African countries targeted smallholders, with major surges in productivity related to marketing and input support, including seed enterprises to supply the seed (Gebre-Madhin and Haggblade, 2004).

Farmers may be reluctant to buy hybrid maize seed because its price is seven to ten times higher than the grain price. This is why only a handful of private companies produce it and multinationals have pulled out of several African countries after having tried to sell hybrid maize seed. Most rural retailers survive on the basis of rapid turnover of limited capital obtained through the sale of commodities for which demand is better known, such as vegetable seed and pesticides. These traders are reluctant to risk their scarce capital stocking commodities such as seed of cereals or legumes, for which demand is less certain (Tripp and Rohrbach, 2001).

The next section suggests that farmers can often get good seed from informal sources.

2.3 Supply of Seed

The UN recognizes that ‘States are obliged to protect their citizens’ right to food, which applies both to the regulation of commercial seed systems and to the preservation and enhancement of informal or traditional farmers’ seed systems’ (De Schutter, 2009). Although commercial seed varieties may improve yields in the short term, their higher performance often has been a response to inputs (fertilizers) and to water availability, making it difficult for farmers unable to access such inputs and conditions to reap their benefits. Therefore states must also support farmers’ seed systems (De Schutter, 2009).

Farmers tend to use both formal and informal seed systems, and the same varieties may move back and forth from both. For example, breeding material may originate from landraces, and farmers may easily appropriate modern varieties (Sperling and Cooper, 2003).

2.3.1 The supply of common seed

Farmers get seed from various sources.

Farm-saved seed. The cheapest and closest source of seed is one’s own farm. A survey of maize farmers in north-west Nigeria found that 71 to 100% of their land was in improved varieties, although most were using farm-saved seed (Daniel and Adetumbi, 2006). In south-west Nigeria improved vegetables are grown widely but ‘60% of vegetable farmers save their seed’ (Daniel and Adetumbi, 2004). Farmers may well be attracted to new varieties but not buy the seed every season.

Farmer to farmer. Seed exchange networks are pervasive and yet patchy. Tripp and Rohrbach (2001) found that most smallholder farmers either give or receive seed each year, through gifts or barter and also sales. However, networks link relatives and friends more closely than neighbours (Marfo *et al.*, 2008). Seed networks may be limited by class barriers, while migration and increased market production tend to fragment seed exchange networks (Almekinders *et al.*, 2007). Commercial transactions are replacing seed exchange and gift-giving among farmers (Rubyogo *et al.*, 2010). However, smallholder farmers do not necessarily construct special seed systems; they may simply use their existing networks to get hold of seed (Badstue, 2006).

Farmer seed systems can distribute new crops quickly. In a community in Sulawesi cacao growing started in the 1980s when a woman was given seed by someone from outside the community. She planted it as an ornamental. She threw away the seeds for years, and was thrilled in the late 1990s to learn that they could be sold. Before 1990 hers was the only household that grew cacao; by 1996 75% did and by 1999 100% did. This rapid change and the spread of the cacao seed occurred without any outside support (Belsky and Siebert, 2004).

Farmer-to-farmer seed exchange may be for cash. When an attractive rice variety reached Ghana from neighbouring Côte d’Ivoire, two-thirds (67%) of farmers bought the seed from another farmer, while others received the seed as a gift or bought it in the market, while seed exchange was unimportant, just 2% (Marfo *et al.*, 2008).

Local markets sell grain and seed, including local and improved varieties. Vendors include farmers selling their own seed, wholesalers and retailers. Seed trade in markets varies considerably, but is an important source of seeds for low-income

farmers (Lipper *et al.*, 2009). When traders in Somalia invest in good seed and storage, farmers prefer buying seed from them in local markets (Longley *et al.*, 2001). Local markets are important sources of seed, especially in times of emergencies when farmers may run out of farm-saved seed (Sperling and Cooper, 2003). Many of the poorest farmers buy all of their seed from markets (Sperling *et al.*, 1996).

Sometimes quality may be a problem in market seed. A study of seed potato sold in Kenyan markets found only 27 out of 1000 tubers were virus free. Bacterial wilt, a serious potato disease transmitted in seed tubers, was found in 74% of potato farms. Of farmers interviewed in Kenya, Tanzania and Ethiopia, fewer than 5% got their seed potato from specialized seed growers. Most seed potatoes are produced as a by-product of growing ware potatoes. Most farmers surveyed got seed from their own farms or from neighbours and renewed seed only every six or seven seasons. But the article concludes that current seed potato prices justify saving seed. Research centres are the only source of clean seed (Gildermacher *et al.*, 2009), so potato seed growers must be linked to research.

Retailers. These are farm supply shops (called stockists in East Africa) that carry certified seed and agrochemicals, and so they sell more to ‘progressive’ farmers. However, few farmers in developing countries can afford to buy only certified seed, so retailers supply only a fraction of the crop seed needed in their area (Sperling, 2002).

A study in East Africa found that maize and wheat seed was readily available in shops in Kenya and Tanzania, less so in Uganda and Ethiopia (Doss *et al.*, 2003). To accommodate farmers’ demand retailers may sell non-certified seed of local or improved varieties if it comes from a trusted source.

Retailers face great risks, as farmers buy inputs within a narrow planting window, and, depending on farmers’ forecasts of conditions and their disposable cash, stockists run the risk of being left with stock which cannot be kept for another year. Seed selling also requires more knowledge than retailing drinks, soap and groceries, which can turn over their capital regularly throughout the year (Poulton *et al.*, 2006).

2.3.2 The supply of formal seed

The public and private sectors collaborate to form formal seed systems. Although differences exist between countries, the public sector (government or international research centres) generally develops improved crop varieties. National governments regulate the sector, approving and registering new varieties, and may certify seed.

National and international research centres often provide the breeder or foundation seed for the industry, but inadequate production of source seed is a major constraint in sub-Saharan Africa. Sometimes public institutions produce, store and distribute seed, but governments are more likely (especially after structural adjustment in the 1990s) to allow private enterprises to multiply and distribute the seed (Tripp and Rohrbach, 2001; De Schutter, 2009).

Seed certification. Trust is important when buying seed, because the quality of seed cannot be judged until long after it is planted. Seed certification replaces trust in the seller with trust in a government seed certification agency. This is to help avoid fraudulent sale in the private seed sector (Tripp, 2001). Certification regulations

provide minimum standards of genetic purity, physical purity and germination (Rohrbach *et al.*, 2003).

Seed certification is almost always government or semi-government regulated, but there have been interesting experiences with private seed certification agencies, like the ones in Peru which were set up with support from USAID and the government of Peru (Bentley *et al.*, 2001). So seed certification can be privatized, although there are few cases, perhaps none in Africa. Seed certification is external quality control, and may not even be necessary if companies are concerned about maintaining consumer faith in their brand name (Tripp, 2001). Unfortunately, some developing countries see certification as a kind of magic bullet and adopt a model of rigorous seed regulation when they have hardly any seed industry in place. Especially in Africa, some countries insist that all seed for food crops be certified (Tripp, 2003).

Certification of quality is a kind of information sharing between buyers. Fafchamps (2006) concludes that market institutions in Africa are not so different from what they are in developed economies. For example, business ethics and informal networks matter everywhere. But certification is important for creating trust and standards in business when some formal institutions are missing, such as external audits, banking regulations and consumer protection.

Seed companies. Several seed companies may locate in the same area, often near a seed certification agency or some other facility. Seed expert Robert Tripp argues that these neighbouring seed companies then establish networks and share information and resources and reduce transaction costs (Tripp, 2001, 2003).

Seed companies often start with high value seed, like vegetables, and add lower value ones after getting clients and machinery (Tripp, 2003). They may also start with foundation seed production, which gives good value and is less bulky to market than certified seed.

As Tripp (2003) explains, unless seed is difficult to save or there is a fairly constant offering of new varieties, it is not likely that a seed enterprise will be able to base its business solely on the provision of new varieties. This is a mistake that is sometimes made in promoting new seed enterprises. Initial farmer demand for a variety gives the impression that sufficient commercial incentive is available, but after several seasons, when many farmers are growing the variety (and save their own seed or can get seed from their neighbours), any commercial advantage evaporates. Established seed companies may provide a fairly steady stream of new varieties, but such a flow is often not present in an emerging seed industry. Seed production offers economies of scope. Once a seed company has experience with a few seed products it is fairly straightforward to expand its portfolio (Tripp, 2003). Although established companies may venture in producing seed of legumes, its demand is highly unpredictable and quantities produced are often relatively low, perhaps with the exception of groundnut.

Groundnut seed is bulky and delicate. High seeding rates make farmers sensitive to price. As farmers need to store more than 10% of their harvest as seed for the next season, cash needs in the family often result in them selling off the portion kept for seed. Groundnut firms have an advantage in selling seed because they have already invested in supervising contract farmers and have ties to research (Tripp, 2003).

Varietal protection. Some form of protection is necessary to provide incentives for plant breeders. The standard argument is that protecting plant breeders' rights encourages them to create more varieties, and stimulates industry to provide those

varieties for farmers. However, results are mixed, successes are case-based and there is little hard evidence to support the standard argument as a general rule. Seed and plant breeding industries have developed in some countries without legal protection. Developing countries are now adopting overly stringent varietal protection laws (Tripp *et al.*, 2007).

All countries that belong to the WTO must provide some protection for intellectual property (Tripp *et al.*, 2007). The WTO has asked African countries to adopt the standards of the International Union for the Protection of New Varieties of Plants (UPOV), even though these place unrealistic restrictions on smallholder farmers' abilities to save and exchange seed (Rohrbach *et al.*, 2003; Tripp *et al.*, 2007).

Most major countries have signed the UPOV plant breeders' rights. The restrictive UPOV rules permit farmers to use farm-saved seed but only on their own holding. Individual signatory countries can modify the rules to make them more lenient for farmers, but few do. The UPOV's Convention on Biological Diversity has failed to generate sufficient benefits to fund the conservation of biodiversity, and has sometimes created insuperable obstacles to the access of both researchers and the bioindustry to genetic resources. An official UN report concludes that the Convention's 'access and benefit-sharing is not adequate for domesticated plant genetic resources' (De Schutter, 2009). The CGIAR system and some other public agencies have made their genetic resources common property, believing that a public pool is a better way to manage plant genetic resources (De Schutter, 2009).

Excessive protection of breeders' rights and patents may actually discourage innovation, because plant breeding is a cumulative process, based on earlier plant material (De Schutter, 2009).

Plant variety protection often makes little sense in developing countries. Kenya is considering tightening regulations to forbid informal trade in wheat seed among farmers. Yet there is only one private producer of wheat seed, a company with government ties. And the restrictions will be impossible to enforce on many smallholder farmers. An overly rigid varietal protection scheme may actually reduce the flexibility required to nurture an emerging commercial seed system, and enforcing it may be too costly or impossible (and politically damaging) (Tripp *et al.*, 2007).

Temporary monopoly privileges granted to plant breeders and patent-holders through the tools of intellectual property supposedly encourage research in plant breeding. However, the poorest farmers may become dependent on expensive inputs. The farmers' seed systems may be put in jeopardy, even though the farmers still need them for their economic independence and to manage pests, diseases and climate change. The spread of the commercial seed system may damage farmers' ability to retain varieties suited to marginal conditions and may lead to the loss of genetic material which should be preserved for plant breeding. Sub-Saharan Africa is especially dependent on farmer seed systems (De Schutter, 2009).

In 2006 the African Intellectual Property Organization (OAPI) made up of 16 mostly francophone West and Central African countries implemented a single plant variety protection system, where one application covers all countries. This may make sense if it allows varieties to be shared more widely between countries.

Countries in West, Eastern and Southern Africa are pursuing the regional harmonization of their seed laws and regulations. This harmonization will help in removing the bottleneck of variety release committees and as such reduce the time and costs involved in releasing good varieties. Common regulatory frameworks are also expected

to reduce the costs of trading seed and encourage scale economies in seed production. As a result, commercial seed production is expected to expand, providing farmers with improved access to new varieties and stimulating productivity growth. This implies greater regional interdependence of seed supply (Rohrbach *et al.*, 2003).

2.4 Enterprises in Africa

2.4.1 From colonial to global market forces

The colonial governments did little to prepare an African entrepreneurial group. In 1950 only one Nigerian had graduated from university. Britain, France and Belgium pulled out of their African colonies in 1960 or soon thereafter. Many of them hoped to hand over administration to Africans, but to continue profiting from African business themselves. Most African countries came under autocratic rule, which led to big wasteful projects. In Ghana, for example, Kwame Nkrumah set up big, money-losing corporations based on the Soviet model and large mechanized farms that steadily decreased production (Meredith, 2006).

Many national governments retained the agricultural marketing boards that had been set up by colonial governments to earn revenue through monopoly purchasing of commodities. In 1981 the Malian government paid rice growers 63 francs for a kilo of rice that cost 80 francs to produce (Meredith, 2006).

The 1980s was a lost decade for Africa. In the 1960s import substitution via industry had been popular, but industrialization collapsed in the 1980s. Civil servants' salaries fell. Many managers left and informal economies grew. In 1979 Senegal became the first to take a structural adjustment loan from the International Monetary Fund (IMF), dictating devalued currency, an end to subsidies, reduced tariffs, fewer government jobs, privatization of state enterprises and fewer restrictions on foreign investment. In the 1980s 36 African governments signed up with the IMF (Meredith, 2006). Structural adjustment was not successful, even by the standards of *Economist* writer Robert Guest (2004). Many privatized parastatals were sold to cronies at low prices. National per capita incomes declined and debts mounted (Meredith, 2006). Countries with IMF loans had zero or negative growth and often collapsed into anarchy (Easterly, 2006).

By the end of the 1980s the World Bank was getting tired of Africa, and the people of Africa were tired of their governments. In 1989 only three countries had multiparty politics, namely Senegal, The Gambia and Botswana (Meredith, 2006).

Thirty per cent of Africa's population lives in landlocked, resource-scarce countries (Collier, 2008). Being landlocked makes it especially difficult to export agricultural commodities (which stimulates demand for seed), and to import machinery (like, say, seed processing equipment). International trade is even more difficult and expensive if it has to pass through the destroyed infrastructure of a country like Mozambique (Collier, 2008).

Rich countries that subsidize their agriculture hurt African economies (Collier, 2008). Farm subsidies run at a billion dollars a day, equivalent to the GDP of Africa. Surpluses are dumped on Africa, which lowers the prices African farmers get for their products (Guest, 2004). Foreign companies investing in Africa demand higher returns than on other continents because they perceive risks to be higher (Guest, 2004).

2.4.2 Market institutions

According to Dorward *et al.* (2009) neither state-led nor liberalized market developments have yielded the desired results in Africa. Markets are thin and have high transaction costs. More efforts are needed to better understand and strengthen the institutional environment, including: (i) economic institutions and rules (the political dimension); (ii) values and norms that influence transactions of goods and services; and (iii) social networks.

Marcel Fafchamps argues that, in an unpredictable world, contracts are not always respected. In sub-Saharan Africa, contract agreements are limited by the absence of large hierarchies (both corporate and governmental), so they must depend to a greater degree than in more developed economies on social networks and personal trust (Fafchamps, 2004). Following the privatization in the 1980s, small-scale maize and cowpea seed entrepreneurs in Ghana never established contracts, but, as these businesses grew, they expanded their complex networks of trust with other actors in the system that allowed them access to information and finance (Lyon and Afikorah-Danquah, 1998). Similarly, many of the seed enterprises described in this book have extensive personal ties with the public sector and developed trust with outgrowers, credit suppliers, traders and clients.

Fafchamps (2004) argues that any market transaction is a contract, with mutual obligations and many opportunities for cheating: from faking quality to absconding with payment to diversion of sales by outgrowers to alternative buyers (see also Stringfellow, 1996). For market exchange to take place, buyer and seller must trust each other.

Legal means are not the only way to enforce contracts. Refusing to trade with a person is the most common form of retaliation. Seed dealers who fail to pay their bill to a seed company will soon be marked as non-reliable business people, and depending on the type of interactions between companies may then be refused by the entire seed industry.

Search costs also enforce contracts. If the buyer has gone to a lot of trouble to find a reliable supplier, he or she does not want to start looking all over again, and will be motivated to honour the contract.

In a risky business environment, such as the one in much of the developing world, economic agents face many shocks that make it difficult for them to comply with contractual obligations. African firms may realize that it is difficult for partners to meet all their contractual obligations, and be more lenient with them.

Markets based on 'relational contracting' from social networks can be unfriendly for newcomers, which reduces competition. 'Add a corrupt government and an incestuous banking sector, and you get a business mentality that does not favour growth' (Fafchamps, 2006).

Inadequate market institutions in Africa hinder the activities of small and medium-size firms, which is one reason there are relatively few middle-size firms in sub-Saharan Africa (Fafchamps, 1994, cited in Fafchamps, 2006).

Yet perhaps Fafchamps protests too much and is overly mechanistic. Others argue that in times of uncertainty personal trust becomes even more important. Nigeria has seen its share of ethnic conflict. In 2001, 3000 people died on the Jos Plateau and main markets were destroyed by fire (Porter *et al.*, 2010). (During our fieldwork in 2010 the team was forced to avoid the Jos Plateau because of fighting, and the secretary of one of the seed companies had her house set on fire while she

was inside.) Yet Berom tomato retailers in the Jos urban markets can borrow large sums of money from Hausa and Fulani wholesalers without collateral, referring to their long-standing trading relationships. Trust can cut across ethnic lines. People often telephone contacts of other tribes or religions, and tell them not to come to market on a violent day. People say that once in the market they are all Nigerians, that the market belongs to everyone (Porter *et al.*, 2010).

Beer is one of the most commonly sold products in Africa, and is an agro-industrial product. Robert Guest describes a trip to deliver Guinness with a trucker and his assistant in Cameroon. Muddy roads made the 18-hour trip last for 4 days. There were 47 roadblocks and numerous bribes to be paid to the police. Wholesalers in the bush have to carry 5 months' stock (Guest, 2004). Even with these inefficiencies it is profitable to sell beer in Africa, but the brew has certain advantages: fierce demand, low unit price, little specialist knowledge needed to sell or consume it and a long shelf life. Seed has none of those advantages, except low unit price under some conditions.

Molony studied three women in Tanzania exporting high end woodcarvings to the US, Europe and Japan. They all spoke good English. Two had wealthy husbands. They had good contacts locally, started travelling and meeting foreign buyers at trade shows, and now they fund their frequent international travel through the sale of these woodcarvings. They use e-mail to send text messages to clients, but they do not use websites or advertise over the Internet (Molony, 2009).

2.4.3 Financial institutions

A study of traders in Benin and Malawi found that loans and other external finance were rare. Most of the traders owned almost nothing and had few employees. Traders are widely accused of speculating, but the study found that buyers of agricultural commodities did little speculative storage. Most sold as quickly as possible. Buying a bad load could wipe them out, so traders who bought grain almost always transferred it from the sellers' bags to their own bags after buying it, which was tedious but allowed them to assess volume and quality accurately, seeing what was at the bottom of the bag. This quality control meant that the traders had to travel often, to be present at each purchase, adding transaction costs and making it difficult for trading enterprises to grow (Fafchamps and Gabre-Madhin, 2006).

Providing institutional credit for poor borrowers is difficult because: (i) they are usually too poor to provide collateral; (ii) the small loans are too costly to administer individually; and (iii) it is almost impossible to sanction a defaulting borrower. So traditional commercial banks have shown no interest in serving poor farmers. On the other hand, the vast majority of the so-called 'agricultural development banks', which provide subsidized credit, have failed to achieve their objectives both to serve the rural poor and to be sustainable credit institutions (Adams and Vogel, 1985; Braverman and Guasch, 1986). Across sub-Saharan Africa, however, subsidized debt is slowly being replaced by commercial funding, with more emphasis on savings (e.g. saving and credit cooperatives – SACCOs) and more demand-led financial products and services (Green *et al.*, 2006; Nagarajan and Meyer, 2006; AMT, 2008). Farmer seed enterprises, and traders in particular, will benefit from this evolution since they need loans with different payback conditions from agricultural producers. No trader can sell seed at harvest, but must wait until the next cropping season.

Since 1990, group lending with joint liability is the lending model of choice for micro-finance institutions, largely due to the success of the Grameen Bank, which has used the model to achieve high repayment rates on loans to poor rural people of Bangladesh. It is widely believed that the incentives of peer selection, peer monitoring and peer pressure resulting from the joint liability clause are responsible for the high repayment rates. But ample empirical evidence suggests that high repayment rates are also influenced by: (i) the borrower's expectations to access future credit, which would be jeopardized by defaulting on a loan; (ii) screening and monitoring by bank workers in the field; (iii) the local institutional and cultural context; and (iv) the macroeconomic and pricing policies of the government. The failure to appreciate these contributing factors may explain the mixed performance of group lending programmes in other countries (Desai, 1983; Wenner, 1995; Diagne and Zeller, 2001). And even in the case of the Grameen Bank the joint liability clause is often not enforced anyway (Jain, 1996). For seed, even in the informal sector, peer pressure, expectations of future business deals, screening, monitoring and local institutions and culture may also help to ensure that contracts are honoured.

2.4.4 Emerging seed companies

Since the late 1990s, sub-Saharan Africa has seen a four- to fivefold increase in the number of seed companies selling improved maize seed. A survey in Angola, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia and Zimbabwe found that seed companies complained about the high cost of starting a seed company, the difficulties of finding and retaining good staff and of getting source seed, the remoteness of customers and the lack of credit. The companies perceived adoption rates to be low. In some countries where top government officials own shares in seed companies, such companies may be favoured at the expense of others. Most of the enterprises surveyed said that they wanted to produce their own seed, but did not have enough land, so they contracted to outgrowers, although this exposed them to problems from pollen contamination (Langyintuo *et al.*, 2008).

A review published in 2001 found that in Africa, except for a few countries like South Africa and a few crops like hybrid maize, 'there is very little evidence of successful commercial seed sector development' (Tripp and Rohrbach, 2001). In the following chapters we will see that things have changed. Perhaps deregulation and market liberalization have made a difference, along with donor support to market and financial institutions. Before the 1990s, most African countries had large, parastatal seed companies, which failed after structural adjustment. All the parastatals were money losers, producing a limited number of varieties at a high cost (Tripp and Rohrbach, 2001).

The same authors also noted that there was often no budget for maintaining breeder seed, and breeders are rewarded for new varieties, not for maintaining old ones. This led to problems with supply and quality of breeder seed. That much has stayed the same.

Of course, there was political value in handing out free seed, which encouraged governments, donors and NGOs to do so. But the disincentives of these giveaways, the inefficiencies of public seed producers and 'restrictive regulatory regimes' all inhibited the development of a commercial seed sector in Africa (Tripp and Rohrbach, 2001).

2.5 Organizing Farmers to Produce Seed

2.5.1 Neglect by the formal sector

The formal seed sector by itself is generally insufficiently equipped to provide seed for all the smallholder farmers who need it. It is often unprofitable for seed companies to distribute seed to smallholder farmers in low potential areas (Langyintuo *et al.*, 2008), in part because most varieties are bred for high potential areas, but also because reaching many remote smallholder customers requires working with small-scale seed dealers, who often need credit to buy seed and may not be able to store it properly, so they may return unsold seed to the supplier in poor condition.

As a result, private seed companies are often unwilling to deal with many of the improved varieties coming from public research for marginal ecologies. The high costs of producing and distributing certified seed mean that even if such varieties are offered for sale to poor farmers they will only buy a little to try out, and if they like it they will prefer producing their own seed rather than buying it every year.

Improved varieties for marginal conditions may move sluggishly even through informal networks if poor farmers do not produce enough surplus seeds to exchange (Sperling *et al.*, 1996).

2.5.2 Farmers in the formal sector

After disappointing experiences with formal-sector seed projects, ‘the idea gained ground that farmers can produce and sell quality seed more cost-effectively than the formal sector’. Basically, the seed provision strategy foresaw that a few specialized farmers or groups could produce seed for a wider area (Almekinders *et al.*, 2007: 367). Thus institutions could sell foundation seed to groups of farmers who would then produce, process and market the seed (Lanteri and Quagliotti, 1997).

A key constraint is the limited market demand for the products of each farmer seed enterprise. To some extent this is because a single village does not provide enough demand to sustain a viable seed business, while farmer seed enterprises usually have few contacts outside their own villages. ‘None of these projects have developed retail trading networks’ (Tripp and Rohrbach, 2001). And smallholder farmers are reluctant to spend money on quality seed unless it is of a promising new variety (Almekinders and Thiele, 2003). This limits the prices so the farmer seed enterprises may be unable to recover their full costs, and fail (Tripp and Rohrbach, 2001). Most efforts to establish farmer seed-producer groups have had little impact, despite success during the pilot phase.

David (2004) studied three farmer seed enterprises in Uganda. The producers multiplied two bean varieties that had been released in 1994, the first year of her study. They were encouraged to multiply seed of local varieties but showed little interest in doing so, partly because they anticipated low demand. A follow-up survey in 2001 revealed that most of their customers had been one-time buyers. One of the farmer seed enterprises had sold seed to just 4% of the households surveyed in nearby villages. So it sold seed to the district farmers’ association and diversified into cassava

planting material. The productivity of all three of the enterprises was ‘disappointingly low’, with yields being ‘modest for sole cropping’ due to drought, hailstorms, heavy rains, pests and diseases, poor land preparation, late planting, wide spacing, lack of access to land or oxen, and poor soils.

Farmer seed enterprises may be hampered by the lack of adequate resources, as well as facilities such as a well-maintained threshing floor and adequate storage (Tripp and Pal, 2001). One group in Kenya was able to produce high quality maize seed as long as they were given free source seed, fertilizer and pesticides, but their true production costs were well above the sale price of the seed (Chivatsi *et al.*, 2002).

Farmer seed enterprises have been tried scores of times for 15 years and there are basically no success stories. They have problems getting source seed and the donor or NGO does that for them. When the NGO goes, the farmers have nowhere else to turn. They can’t do all the storage, inventory, wholesaling and promotion (Tripp, 2003). When projects leave seed sales to farmers, they are rarely able to sell much seed (Tripp, 2001). Many seed projects bypass local seed markets and direct seed company attention away from farmers’ needs towards those of projects and governments (Tripp, 2001).

Farmers are good at growing seed, but to make a successful enterprise they may need to link up with other actors, even with input dealers (Tripp and Pal, 2001; Tripp and Rohrbach, 2001; Rubyogo *et al.*, 2010), or else sell to NGOs or government programmes.

Linking multiple actors proved crucial to the success of farmer seed enterprises. In Benin, for about a decade the NGO Songhai has been marketing its alumni (young agricultural entrepreneurs) by projecting their technical skills and entrepreneurial competences before credit establishments (Dalohoun *et al.*, 2009). Currently, the Banque Régionale de Solidarité (BRS) finances Nerica-related business investments that Songhai alumni propose for seed and paddy.

2.6 Conclusion

Most efforts to encourage farmers to grow formal seed have failed, and perhaps only succeed where an institution provides transport, technical advice, moral support and marketing; so private companies may be a viable alternative. Of course, it is difficult to maintain a profitable small business anywhere, especially in Africa, and seed is an especially challenging product to sell.

Farmers have reasons for buying seed, even if the reasons are not always as compelling in every case as the formal sector would like to believe. A pattern is emerging for many of Africa’s food security crops, especially rice, maize, millet, cowpea and others, where farmers acquire new high yielding varieties and then reproduce the seed on their own farms. This may seem like bad news to private seed companies, but changes in marketing, especially the use of media and small seed packages, may lead to a more regular demand and more stable seed markets.

The examples presented in this book show how various people have made seed enterprises work, either with or without modest external interventions. We hope that these cases will inspire others and reveal some of the underlying keys to success.

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