

SMALL-SCALE SEED PROVISION IN GHANA: SOCIAL RELATIONS, CONTRACTS AND INSTITUTIONS FOR MICRO-ENTERPRISE DEVELOPMENT

Fergus Lyon and Seth Afikorah-Danquah

Abstract

A large number of small-scale enterprises growing, dealing and marketing seed emerged during the economic reforms of the 1980s in Ghana. The enterprises are dynamic and able to produce and market seed, despite limits on the availability of capital. This paper examines the nature of small-scale maize and cowpea seed enterprises in the two regions of Brong Ahafo and Ashanti and describes how actors in the system learn about seed quality and the trustworthiness of people they are dealing with. It explores how farmers get access to seed and how they obtain information on what they are buying and whom they are dealing with.

The growers interviewed in the study accounted for 25 per cent of formal seed production in Ghana in 1997. Finance for seed production comes from the grower's personal income, loans from friends or family and, in a few cases, from banks. Credit given by seed dealers is also important. There are no legal contracts, so credit arrangements are based on trust, social pressure and coercion.

Seed dealers range in size, managing between one and four stores. Some also play a wholesale role, working through agents who take seed on credit. Seed dealers buy from a number of growers and obtain information on seed supply from sources including Ministry of Food and Agriculture seed inspectors acting unofficially. Growers and dealers must find ways to acquire the latest price information as prices can change at short notice when demand is high. Half of the dealers buy some of their seed on credit. Growers give credit to dealers especially if there is a reciprocal agreement involving the dealers financing the grower, but needs to be built up before credit is offered. Dealers known to growers sometimes act as guarantors for other dealers.

The case of seed enterprises in Ghana throws light on how entrepreneurs obtain information and how they build up trust based on working relations, existing links and intermediaries. Public policy needs to consider the social and economic factors underpinning the seed industry. Enterprises can reduce the transaction costs of obtaining information by building links with other enterprises. The strategies and the social capital they draw on is shaped by pre-existing knowledge, networks and social contacts. Transaction costs can be reduced by making information available to seed enterprises. Government workers, especially seed inspectors play an important, though unofficial, role in brokering information.

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CONTENTS

	Page
Abstract	i
Acronyms	iv
1 INTRODUCTION	1
Study methods	
2 MAIZE AND COWPEA IN THE STUDY AREA	1
3 SOURCES OF SEED	2
4 SEED REPLACEMENT	3
5 THE COMMERCIAL SEED SYSTEM	4
History of certified seed production in Ghana	
Who are the seed growers?	
Seed inspection and certification	
Selection of varieties and prediction of demand	
6 FINANCING SEED PRODUCTION	5
Access to conditioning equipment	
7 SEED MARKETING	6
Choice of seed growers	
Establishing the seed price	
Buying seed from producers on credit	
Dealers, agents and seed sales	
Sales to farmers	
8 POLICY IMPLICATIONS	8
Demand for different varieties	
Assessing seed demand	
Seed quality control	
Marketing of seed	
Reaching more farmers	
9 DISCUSSION AND CONCLUSIONS	9
ENDNOTES	10
REFERENCES	10

Tables and boxes

Table 1	Average farm size (acres)	1
Table 2	Use of improved varieties	2
Table 3	Source of maize seed according to gender and ethnicity	2
Table 4	Source of cowpea seed according to gender and ethnicity	3
Table 5	Percentage replacing a variety	3
Table 6	Occupations of seed growers	4
Table 7	Seed dealers/wholesale buyers giving credit for seed production	5
Table 8	Average number of buyers/growers	5
Table 9	Roles, relationships and information required in the seed industry	8
Box 1	Abukari Seidu—a community based seed grower	2
Box 2	The uncertified maize seed grower—an agricultural extension agent	3
Box 3	'Mr P'—a seed wholesaler	7

Acronyms

AEA	Agricultural extension agent
CRI	Crop Research Institute
GGLB	Ghana Grains and Legumes Board
GLDB	Grains and Legume Development Board
GSC	Ghana Seed Company
GSID	Ghana Seed Inspection Division
MoFA	Ministry of Food and Agriculture
NSC	National Seed Committee
SGA	Seed Growers Association

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1 INTRODUCTION

The past twenty years has seen a large investment in the development of new maize and cowpea varieties in Ghana. The development of new varieties must be supported by a sustainable system that provides quality seed at the right time and location. This seed can come through the 'formal' sector, where farmers buy commercial certified seed or through the 'informal' system, based on local level seed production and exchange. Since the privatisation of seed production and marketing in Ghana, a large number of small-scale enterprises have become involved in maize and cowpea certified seed production and marketing. As these businesses grow, entrepreneurs build up complex networks and links with other actors in the system that allow them access to information and finance.

This paper examines the sources of seed farmers use, concentrating on the role of the commercial seed sector in the Brong Ahafo and Ashanti regions. It examines the institutions that have grown up, the nature of information and finance flows and the social context of these links. Finally, the paper identifies the strengths and weaknesses of the existing seed system and discusses the role of policy in supporting the seed system.

Study methods

The research was carried out between February and March 1998 and combined qualitative and quantitative methods. A survey of 159 farmers was conducted in four areas selected on the basis of accessibility, proximity to major towns and ethnic composition. Households were randomly selected. One in three of the respondents was female. In-depth interviews were held with a sample of seed growers, dealers and farmers to investigate the nature of contracts and social relations of the enterprises. Thirty-five seed growers in Brong Ahafo and Ashanti regions were selected from the lists of registered growers; their combined seed production was estimated to account for 25 per cent of commercial maize seed production in Ghana. Thirty-six seed dealers were interviewed in the towns of Sunyani, Berekum, Wenchi, Techiman, Nkoranza, Ejura, Ejisu, Kumasi and some surrounding villages. The quantitative data presented is based on a sample of 22 of these dealers who were buying direct from growers.

2 MAIZE AND COWPEA IN THE STUDY AREA

The study area lies in the transitional zone between the wet semi-equatorial forest zone (mean rainfall of 1,270-1,780 mm) and the interior savannah zone (1,000 to 1,270 mm). There is a bi-modal rainfall pattern with two growing seasons: a major season from March to August and a minor season from October to December. Maize is an important crop in the study area, while cowpea is grown by approximately 30 per cent of the farming population. Other important crops include yams, cassava, vegetables, plantain and cocoyam. Cowpea is usually mono-cropped; maize may be mono-cropped or intercropped with cassava or other crops. Almost all farmers follow the bush-fallow cultivation system, with less than one third using chemical fertiliser.

Almost all of the interviewed farmers sell some of their crop, despite small farm sizes (Table 1). Non-indigenous people have moved into the area in the past 40 years, mainly from the north of Ghana and usually live in separate settlements. Descendants of the original settlers have usufruct rights to land. There are also cases of sharecropping and renting for indigenous and non-indigenous farmers. Non-indigenous farmers have larger maize and cowpea farms, as they concentrate on these crops and do not have other sources of income. Indigenous women have access to family land in their own right, while women from non-indigenous families have to rely on their husbands.

Maize has been grown in the region since the sixteenth century. Some new varieties were introduced from Latin America and other parts of Africa in the

Table 1 Average farm size (acres)

	Size of maize farms	Size of cowpea farms
Men	3.4	2.9
Women	2.1	1.7
Indigenous	2.7	2.3
Non-indigenous	3.7	2.8
Average	2.9	2.4

Table 2 Use of improved varieties

	Percentage using improved maize	Percentage using improved cowpea
Men	81	91
Women	74	95
Indigenous	75	91
Non-indigenous	92	93
Average	79	92

colonial period. A maize improvement programme started in Ghana in 1956 and has continued through public sector research until today. Cowpea also has a long history. In the past 15 years a number of new varieties have been developed. The Crop Research Institute (CRI) and universities have been responsible for the development of cowpea and maize varieties. Although a maize hybrid was released by CRI in 1997, maize varieties examined in this study were open-pollinated. They have been bred to be higher yielding, resistant to streak virus and of shorter duration. The latest variety also has a high quality protein content.

Uptake of new varieties differs shows considerable variation between and within regions. In this study, 79 per cent of farmers interviewed were using improved varieties of maize, with a higher proportion of male adopters. Ninety-two percent were using improved cowpea varieties, with a higher proportion of female women adopters. Overall non-indigenous farmers are more likely to use improved varieties (Table 2).

The survey did not cover the forest zone, where uptake of improved varieties is lower (Tripp, pers. com.). Those rejecting the new maize varieties complain of susceptibility to insect infestation, inability to withstand rains when left to dry, processing problems and lower prices paid by traders. However, lower prices for new varieties are only found in some localities and may be a ploy by traders to increase their bargaining power (GGDP, 1991). Farmers plant only one, or occasionally two, varieties and do not knowingly mix varieties.

3 SOURCES OF SEED

Decisions on seed source are shaped by price and perceived quality. Farmers will not invest in off-farm seed if the search costs (time taken to find out about variety attributes and seed quality) are high. Farmers using their own seed do not incur transaction costs (Bockari-Kugbei, 1994; Tripp, 1997). In 1997, 79 per cent of farmers used their own cowpea and maize seed, with only small differences according to ethnicity or gender. Farm-saved seed is not stored separately and is selected just prior to planting according to visible attributes such as grain or cob size and lack of weevil damage.

Farmers can reduce transaction costs by obtaining seed from neighbours. Forty-seven percent of farmers acquired seed of a new maize variety from family or farmers in their village. Of these, almost half relied on family members (Table 3). They can see the variety in the field and make some assessment of seed quality—what some refer to as ‘neighbour certification’.

Table 3 Source of maize seed according to gender and ethnicity (%)

	Women (n=57)	Men (n=102)	Non-indigenous (n=36)	Indigenous (n=123)
Farmer in the village	49	42	53	42
Farmer/workers not in village	12	19	22	15
AEA/Agric. Office/NGO	5	12	8	10
Seed Dealer	18	15	3	20
Seed Grower	0	3	3	2
Grain Market	11	3	8	5
N/A	5	7	3	7

In many communities, there are farmers who are known for being good sources of seed. Although they may not always be the first to experiment or use a variety, they play a key role in disseminating new varieties and providing seed to farmers who have not stored seed¹. They tend to be older men, with larger farms and are motivated by altruism and social pressure. They may use also produce seed to generate income.

A farmer’s ability to visit other farms is limited to fields near footpaths and to close friends and family, because of beliefs that damage can be done to crops using magic (juju); the uninvited visitor will be blamed for causing future farm problems (see Sumberg and Okali, 1997 for similar cases). Many farmers therefore rely on farmers with good reputations. Search costs are reduced by using information or gossip collected by others. In such cases, quality is assured as seed suppliers need to maintain their reputation.

57 per cent received maize seed of a new variety as a gift. The concept of reciprocity is also present in cases where farmers exchange seed for labour; many will work for another farmer to acquire certain seed. Farmers also exchange grain and other crop seed for maize seed².

17 per cent of farmers obtain maize seed from farmers and workers outside the village—often from workers in research stations, agricultural colleges or state farms. This proportion is higher for men and larger farmers who may have wider links outside the community. Farmers receive a few maize cobs from which they take seed. This is then bulked up and passed to other farmers. The extent of government involvement in agricultural production has declined dramatically and many farmers still use varieties that were available when they had links to—now privatised—state farms.

Box 1 Abukari Seidu—a community based seed grower

I got the first seed of Aburotia maize from my brother working at Ejura Agricultural College. I planted cobs and stored all the maize for seed in the following season. I planted half an acre that season and gave 15 cobs to each of the farmers in the houses around me. Now I sell to farmers in this and neighbouring villages. Some of them bring a basket of their maize in exchange for a basket of mine, others take two bowls of seed and work for me in exchange.

**Box 2 The uncertified maize seed grower—
an agricultural extension agent**

I began by selling on commission. Farmers also gave me money to buy improved seed on their behalf. I later decided to buy a few mini-bags with my own money and sell to farmers at a small profit. Three years ago I began producing and selling my own seed to these farmers who then told other farmers about my seed. Last year I planted three-quarters of an acre and harvested five maxi bags (600 kg). I obtained foundation seed from the Grains Board, through a certified grower I know who buys and shares seed with me. No one checks the quality, but I get advice from a seed grower and got a seed guidebook from the seed inspector (Ministry of Food and Agriculture, MoFA). I make sure the seed is dryer than other grain and I spray it with actellic (insecticide). I sell directly to farmers or give it to other extension officers for a commission.

Local networks are limited in coverage and highly dependent on kinship ties. Of those obtaining seed from farmers and workers outside the village, 85 per cent relied from family members. Such networks may therefore bypass certain segments of society. If the source is distant or unknown, costs of ascertaining seed quality increase and it is necessary use a trusted individual as guarantor or rely on certified seed. Vegetable farmers in the area travel long distances to get seed from certain villages with good reputations (Lyon, 1997) but this is not the case for maize and cowpea.

When using a maize variety for the first time, 27 per cent of farmers obtained seed from formal or certified sources, such as agricultural extensionists, certified growers or seed dealers. The proportion in the case of cowpea is much lower, as farmers are more confident of their ability to judge variety characteristics and seed quality from local sources. Certification systems allow trust to be extended from limited localised and personalised networks, to a form of 'institutional-based' trust in the certification agency, agricultural extension agents or the branded printed seed bags (Zucker, 1986). They allow farmer to trust those whom they do not know.

Agricultural extension agents (AEAs) provided maize seed to nine per cent of farmers through extension programmes, as part of the activities of NGOs such as Sasakawa-Global 2000, or through resale to farmers. They play an important role in farmer education though farm visits and interaction with contact farmer groups. Their impact on seed diffusion depends on location and level of motivation of farmers. Selection of contact farmers is often biased; only five per cent of women had received seed from agricultural extension agents (AEAs), compared to 12 per cent of men. Smaller farmers are also less likely to get seed from AEAs. Outside of their official role, AEAs take advantage of the trust that comes with their position by supplying seed to farmers in the following ways:

- Buying in bulk and then selling it on to farmers;
- Through contract arrangements—collecting money from farmers before buying;
- Acting as agents for seed dealers for a commission.
- Providing seed from their own maize farms (Box 2)

Table 4 Source of cowpea seed according to gender and ethnicity (%)

	Women (n=57)	Men (n=102)	Non-Indigenous (n=36)	Indigenous (n=123)	Total farmers (n=63)
Farmer in village	25	9	13	16	14
Farmer/worker outside village	10	7	13	3	8
AEA/Ag. office/NGO	0	5	0	6	3
Seed dealer	0	5	0	6	3
Seed grower	0	0	0	0	0
Grain market	65	65	68	63	65
N/A	0	9	6	6	6

The number of farmers buying from dealers or certified maize seed growers is small with the exception of those in Ejisu district. Its close proximity to Kumasi (the major marketing centre for maize seed in Ashanti region) and the presence of a maize seed grower in the past help explain the higher rate of farmers—47 per cent—buying from dealers. In the case of cowpea, 65 per cent buy seed direct from grain markets (Table 4).

Markets are usually located in local towns, although some farmers buy in the village market. The market traders are almost all women, who retail cowpea for consumption. Farmers are confident of the quality of cowpea seed they buy in the market as varieties are easily identifiable and they can make some judgement about germination capacity by visual inspection. Amongst maize farmers, 11 per cent of women and three per cent of men obtained seed from the market; it is more difficult to distinguish among maize varieties.

4 SEED REPLACEMENT

Only a few farmers obtain fresh seed of a variety they are already growing (Table 5). Many maize and cowpea varieties have been released over the last 15 years, so when farmers buy seed it tends to be of a new variety. The average age of farmer's seed stocks was 3.7 years for maize and 2.9 years for cowpea.

Of farmers replacing seed (for reasons including lack of money to treat seed, seed sale or consumption, poor harvest, poor germination, declining yields, mixing up of varieties), 48 per cent rely on certified seed from growers, dealers and agricultural staff.

Table 5 Percentage replacing a variety

	Maize (n=159)	Cowpea (n=63)
Women	11%	20%
Men	15%	23%
Total	13%	22%

5 THE COMMERCIAL SEED SYSTEM

Twenty-seven per cent of maize farmers used certified seed when obtaining a variety for the first time. Certified maize seed production has been rising and in 1995, reached 1,082 tonnes, an estimated seven per cent of the total seed required in 1996 (Delimini and Wobil, 1998). The majority of this is sold to dealers or AEAs, although some is sold directly to farmers. Estimates of the proportion of cowpea farmland planted with certified seed are low, ranging from 0.5 to 2 per cent.

History of certified seed production in Ghana

The commercial seed sector was established in 1958, as the Hybrid Maize Production Unit, renamed the Seed Multiplication Unit in 1961, when it moved from the production of hybrid seed to open-pollinated varieties. In 1969, the unit started a contract growers scheme while continuing to produce basic seed on its own farms (Delimini and Wobil, 1998). In 1979, seed multiplication responsibilities were transferred to the Ghana Seed Company (GSC), a government owned, semi-autonomous parastatal body. Despite substantial donor support, GSC made losses over the years because of low output, high capital investment and low seed quality (Bockari-Kugbei, 1994). It also suffered from overstaffing and a poor marketing strategy.

In 1989, GSC was privatised as part of the economic recovery programme. The new strategy aimed to revitalise the seed industry, through the development of small and medium-scale private seed enterprises. Since privatisation, the number of small-scale growers has risen from 52 in 1990 to over 100 in 1996. The role of the public sector became supportive and regulatory, restricted to policy formation, research, breeder and foundation seed production, quality control and training (Delimini and Wobil, 1998). Some of the infrastructure of GSC was taken over by the Grains and Legume Development Board (GLDB) and seed enterprises are charged for using it. Many GSC workers have gone into seed production and marketing. The present seed system has therefore benefited from its inheritance of conditioning equipment and human resources to produce and market quality seed (Bockari-Kugbei, 1994). The privatised industry was given considerable support from the Sasakawa-Global 2000 Project in the form of credit, packaging materials and training. This support has declined dramatically since 1995.

Certified maize seed production increased from 317 tonnes in 1990 to 1,082 tonnes in 1995. The 1996 harvest was poor due to a lack of rainfall increasing prices dramatically and causing a large increase in production in 1997. The amount of cowpea produced is much smaller; in 1996, there were 21 growers producing 21 tonnes of certified seed.

Table 6 Occupations of seed growers

Occupation	Number	Percentage
Farming only	10	29
Agricultural Officer	9	26
Input Dealer	3	9
Ex-GSC	6	17
Teacher	2	5
Traders/Shop owner	5	14
Total	35	100

Who are the seed growers?

The Ministry of Food and Agriculture (MoFA) selected many of the larger growers after they had won annual Farmers' Day awards. Some were also contract growers for the GSC before privatisation. The growers often engage in a range of occupations as well as farming, the most common being as agricultural officers with the MoFA or research institutions (Table 6).

Only three of the growers are also dealers. Dealers considered seed growing to be too time consuming because of high monitoring costs and preferred to rely on contract growers or to pre-finance their seed suppliers. The sample of growers also included members of small seed co-operatives, each of whom is registered separately and operates as an individual for production and marketing. Three of these co-operatives are comprised of re-deployed GSC and other parastatal workers. They still farm MoFA government land.

Seed growers tend to be individuals working with family support and relying on casual labour. Over half the growers grew less than seven tonnes of seed on farms of less than eight hectares. The larger farmers have been growing seed since privatisation and employ more full time workers.

Sasakawa-Global 2000 encouraged seed growers to form three Seed Growers Associations (SGAs). They meet two to three times a year to share information, serve as lobby groups and provide a forum for channelling training and other external resources to seed growers. They have also attempted to play a role in marketing and price setting but this has been unsuccessful. Many seed growers are not members and do not consider the association to important—the main reason for registering was the expectation of cheap credit and equipment.

Seed inspection and certification

Seed growers have to register with the Ghana Seed Inspection Division (GSID) of the MoFA. Twenty-five seed inspectors based in seed growing areas inspect the land and make follow up visits to farms throughout the season. As the number of growers increases, inspectors find it harder to fulfil their obligations. The inspectors also check seed quality and moisture content after harvest and give approval for bagging seed in certified bags. GSID prepares specially printed polythene bags, which are sold

Table 7 Seed dealers/wholesale buyers giving credit for seed production

Quantity of seed sold (Mini bags 45kg)	Number of dealers	% giving credit	Average credit (Cedis ³)
0-30	5	0	0
31-60	6	67	249,000
61-300	6	50	834,000
301+	5	80	1,182,000
Total	22	50	609,000

Table 8 Average number of buyers/ grower

Amount of maize grown (Mini bags of 45 kg)	Number of growers	Average number of buyers
1-50	5	1.2
51-150	6	3.0
151-500	8	4.5
500+	6	7.4
Total	25	4.0

to growers when the amount of seed they have produced is known. Each grower writes his/her name on each bag.

Seed inspectors are not originally from the areas where they work and come from a range of ethnic groups. Farmers perceive them as helpers, who give advice and support to their enterprises. Inspectors control the growers' access to markets and can cause delays and extra costs if seed is not up to the necessary quality. There is no cost to growers although they are obliged to give the inspectors gifts and pay for fuel costs at times to ensure continued timely support.

Selection of varieties and prediction of demand

Breeder seed is supplied by the CRI to the GLDB who multiplies the seed. The foundation seed is then supplied to growers. There are no clear guidelines or channels for assessing variety demand; CRI and GLDB rely on information gathered by the Seed Technical Advisory Committee or the National Seed Committee (NSC), which are made up of researchers, seed inspectors and dealer/grower representatives. The quantity of foundation seed produced depends on the amount sold in previous years, the predictions of GSID and committee members.

A large proportion of the maize seed produced is of one variety, *Obatanpa*, a quality protein maize being promoted by government agencies. Other varieties available include *Abeleehi* and *Okomasa*. No seed growers or dealers reported having links with breeders, which would enable them to pass on information about desired characteristics for future breeding programmes⁴.

When seed growers are deciding what variety to grow they consider the sales and demand from seed dealers in previous years and estimate demand for each variety. One of the factors for selecting *Obatanpa* is continued publicity and promotion by AEAs. Many growers also stated that they grew *Obatanpa* because seed inspectors, researchers and NGOs have told them about its quality protein content. Some chose to grow *Abeleehi* to fill a niche in the market as everyone else was growing *Obatanpa*.

6 FINANCING SEED PRODUCTION

Finance for seed production comes from farmers' other occupations and farming activities or from friends, family or church members who lend money. Some seed growers get help from Sasakawa-Global 2000, in the form of chemicals on credit. The role of bank credit is difficult to ascertain as growers were not willing to admit receiving it. There were complaints that procedures were inconvenient and time consuming, that requirements for collateral were restrictive and it was necessary to have political influence and "see a lot of people at the back door".

The main source of credit is seed dealers. They pre-finance many seed growers and are repaid at the end of the season. Credit is given to ensure a good seed supply and a cheaper price. Credit comes in the form of cash (for buying foundation seed and hiring labour) and in material terms (as fertiliser, herbicide and insecticide). Half the dealers—usually those dealing in large quantities—were found to be providing credit (Table 7). Many dealers also give credit or advance payments to cover conditioning costs.

Similarly, larger growers receive more credit due to their links with dealers. In addition to labour costs, growers have to hire or buy equipment such as tarpaulins for drying and sealers for the plastic bags. In the major season, when seed cannot be sun dried, it must be taken to the dryer in Kumasi. The length of the credit period depends on the capital requirements of the dealers. Some are willing to be paid in seed, while others require the farmers to pay back sooner. The grower is obliged to provide the sponsor with whatever amount is required and should also ask the dealer's permission before they sell seed to anyone else. However, as Table 8 shows, most growers sell to more than one dealer.

Seed prices vary and are determined by a bargaining process between grower and dealer. The rate of interest can vary dramatically depending on the bargaining power of each party, which will vary through the season and depend on seed availability. When there is a glut, growers have to accept lower prices. In 1997, estimated implicit rates of interest over a 6-month period ranged from 20 to 170 per cent. Estimates can be higher if the grower is obliged

to sell the whole crop at the lower price. While these rates are much higher than bank rates, farmers have no alternative credit sources. While there were no cases reported of growers being tied into debt to certain dealers, some saw this as a form of cheating.

Credit contracts are not based on any legally binding agreement but on trust, social pressure or coercion. Before a dealer will give money they must invest time and effort in building up a relationship. While this increases transaction costs and the risk of opportunism, legal contracts are expensive to enforce and destroy relationships based on trust. Trust develops from existing links (living in the same village or worked together previously), working relationships (long term business links, reciprocal credit arrangements) or through intermediaries (church members, friends, family and seed inspectors). A small number of growers give collateral to cover the loan. The most important information needed is the location of the borrower's house.

Access to conditioning equipment

While growers can multiply seed independently, the cost of conditioning equipment requires them to co-operate or hire the services of those with equipment. Growers are responsible for seed conditioning; dealers help by giving credit to 43 per cent of the growers (Table 7) and by supervising the conditioning process. The largest wholesalers are also involved in cleaning and bagging of seed.

Smaller equipment (such as portable cleaners and shellers) is managed by the GSID, while the larger equipment (such as dryers) is owned and managed by GLDB. This equipment was supplied to the now defunct GSC by various donors during the 1980s. In the past, the seed industry was dependent on this equipment, but some growers and dealers are beginning to invest in their own dryers. After harvest, seed growers in Ashanti and Brong Ahafo take their produce to Kumasi, where the ability to dry seed quickly differs amongst growers. While there is a system for queuing, growers with better links to operators can ensure fewer delays by putting pressure on key people when there is a need to repair the machine. Those with close links to the operators of the conditioning equipment are able to pay for conditioning costs after the seed has been sold.

There are restrictions on access to bag sealers. These are often owned by dealers, who lend them to 'their' growers or provide them on a hire/purchase basis. Seed is stored in farmers' cribs or houses, or in GLDB cold stores near Kumasi. Payment for storage is made when seed leaves the cold store.

7 SEED MARKETING

The basis of the market for certified seed is the guarantee of quality. While seed inspectors can check the quality of the seed, there are cases of dealers selling grain in certified seed bags. This occurred in the 1997 farming season when seed prices rose dramatically and there was a seed shortage. Growers, dealers and farmers can report the matter to seed inspectors who can confiscate the seed and threaten the dealers concerned.

The location of sale depends on the relative bargaining position of growers and dealers. Growers usually sell seed from their house or the cold store. When there is a glut however growers have to actively seek buyers, incurring transport costs.

While most dealers buy seed in small quantities before the farming season, some will buy in bulk earlier to ensure a guaranteed supply. Wholesalers who buy in bulk have to forecast demand for the following year. While many base their decisions on previous years' sales, they also take into consideration farmers' own seed stocks. Dealers must also predict the area of maize that will be planted; this will increase if there are early rains and if the price of grain harvested the previous year was high. There are no formal channels for collecting and disseminating this information.

Choice of seed growers

Dealers buy from an average of three growers, with few relying on a single grower. Some dealers reported it did not matter where you bought seed from as it was all certified. Other dealers gather information on the quality of different growers and availability of seed. Growers' reputations are built up over time through recommendations from farmers and MoFA staff and through dealers' visits to growers' fields. Details of seed availability are held by the seed inspectors and dealers will enquire where they can buy seed of particular variety. The inspectors also know where each grower lives and can direct dealers to them. There is no charge for this service, but inspectors expect a token of appreciation.

Establishing the seed price

In the past, seed prices were set at a meeting hosted by the SGAs with dealer and MoFA representatives. Prices were set to cover growers' costs, whilst ensuring that this would not reduce farmers' demand. However, larger scale maize seed growers are often forced to sell in bulk following harvest, to pass on storage costs and risks and must therefore accept a lower price.

It is now accepted that the market will set the price. In 1997, maize seed prices rose as growers raised their prices following retail price increases in the market.

In order to establish prices, growers and dealers need information on supply and prices in different producing areas and in the market. The focus of attention is Kejetia market in Kumasi, which is the main seed selling point in

the central Ghana. Price changes there are quickly reflected in prices elsewhere. Those with the most up to date information can make a quick profit by buying in the producing areas and selling in Kumasi, when there has been a delay in the spread of price information.

Buying seed from producers on credit

Half of the dealers in the study were buying some of their seed on credit. All of the smaller scale growers were selling some seed on credit (at a rough estimation over half of their output is sold on credit), with larger scale growers selling approximately 10 per cent of seed on credit. The credit period ranges from two weeks to two months. There is a risk that growers will face difficulties in collecting money, especially if the dealer has passed the seed on to other agents, who have not yet paid for it. Growers are able to demand C1-2000 per 45 kg bag more when giving on credit.

Growers have to decide who to offer credit to. When there is a seed surplus, growers will have less choice, as dealers can threaten to buy elsewhere. When a grower has a close 'customer' relationship with a dealer, there may be an obligation to reciprocate the provision of credit for production with the provision of credit when selling.

Information on who is trustworthy and creditworthy is necessary and takes time and resources to acquire (Box 3). Some growers rely on existing contacts, while those who have been in the business for longer are able to test dealers by supplying small amounts of seed on credit before selecting those who they feel are trustworthy. Just as dealers rely on intermediaries when giving credit, growers use recommendations and guarantors when selling on credit. Seed inspectors play a key, though unofficial, role witnessing many deals. They hold information on dealers who have defaulted and act as arbitrators in case of disputes. Local seed dealers also act as guarantors for seed dealers not known to growers.

To collect debts and ensure money is repaid, growers have several options:

- Personal visits to dealers houses—often accompanied by an elder or pastor to assert social pressure;
- Growers can threaten to go to the police, but this is widely seen as ineffective;
- Threats to blacklist defaulting dealers by informing other growers.

Dealers, agents and seed sales

Agrochemical businesses who trade in seed tend to be small, with up to four outlets and a number of agents. Smaller businesses tend to have only one shop and an average of two agents. Some dealers act as agents for larger wholesale enterprises, located in larger towns. Larger enterprises have retail outlets in the towns and in some villages. Stores in large towns tend to be located in the

markets or near the 'lorry and bus parks'.

Wholesalers agents take seed and agrochemicals on a credit or commission basis. Agents depend on goods given on credit for the viability of their business as their capital base is small. Wholesalers monitor their agents closely, many visiting them weekly to check that they have not sold their seed and are using the money for other purposes. Agents range in size from medium sized businesses with agents themselves, to farmers who buy on behalf of others. Dealers use strategies similar to growers when gathering information on who is creditworthy and can be trusted.

Many dealers and several growers reported using AEAs to sell seed. While all AEAs advise farmers to buy from certain dealers, many go further and take money from farmers to buy seed on contract when they travel to towns. Many AEAs are also working as commission agents for dealers and growers. Although this is not their official duty, they possess valuable information on buyers and are able to introduce new varieties into remote areas.

Sales to farmers

Although growers sell a large proportion of their seed to dealers, they also sell some direct to farmers. Large farmers buy certified seed in bulk and local farmers buy from growers' houses. Farmers like to buy direct from growers as they can see the farm, know the grower's reputation and suspect dealers of selling fraudulent seed. Seed from growers is also cheaper. Growers are restricted from selling more seed in this way as they do not have the time or resources to invest in building up a reputation.

Promotion of seed to farmers has been limited since the reduction of Sasakawa-Global 2000 activities a few years ago, although AEAs continue to advise farmers to buy seed. Dealers advise those farmers who come to the shop; one dealer had a demonstration near his shop and another had a farm at a key vantage point near the road. Some dealers encourage farmers to experiment by repackaging certified seed into 250 gram packets, rather than the usual one kilogram. Finally two of the larger dealers are using local FM radio stations to advertise their seed.

Box 3 'Mr P'— a seed wholesaler

In 1997 and 1998, Mr P bought 90 tonnes of maize seed and stored it before sending it to agents around the country. Mr P is the agent for a fertiliser company and is trying to link his fertiliser sales with seed sales. He has a network of 200 fertiliser agents in Brong Ahafo and Ashanti regions, most of whom take fertiliser on credit. These customers have been built up over eight years. He gives up to 200 bags of fertiliser on credit at a time, collecting the money and giving more supplies on credit each week. He uses no legal contracts as past experience shows that 'the judicial system is not correct ... I gave a case to a lawyer who took my money and I have heard nothing since ... contracts are a matter of trust, I know who is good and who is bad'. Mr P ensures that the agent has a shop and a house and asks established dealers for recommendations.

8 POLICY IMPLICATIONS

Table 9 summarises the roles and relationships underpinning the Ghanaian seed industry.

Demand for different varieties

At present there is a limited range of improved maize and cowpea varieties available. The development of hybrids may suit larger scale farmers, but there will be continued demand from resource poor farmers for quality seed that does not need to be replaced every year and which performs well under sub-optimal conditions.

Assessing seed demand

There is a need for better information on the demand for different varieties at different locations. The NSC has been established to share information, but there are no guidelines on how to collect information on future demand. The SGAs were established to play this role but growers do not find them useful and lend little support to their activities. In the meantime, there is no accurate way to plan production of breeder or foundation seed.

Seed quality control

With the growing demand for seed, the existing certification system which depends on government funding, is hard pressed to provide adequate attention to all growers. Future options include monitoring a random sample of growers or concentrating on checking seed quality in the market. However the latter strategy is

restricted by the lack of legal powers given to seed inspectors. Another option would be for growers to fund the certification process—it is in their own interest that the certification system functions well.

Marketing of seed

Seed marketing and promotion is the major constraint in the Ghanaian seed system. This paper has highlighted the need to recognise the costs and risks incurred, including the pre-financing that dealers give to growers, the development of agent networks and the need for dealers to sell a range of agricultural inputs (and not just seed). The seed inspectors of the GSID and the AEAs play an important role in the marketing process because of their close links with farmers, dealers and growers. Seed inspectors support the private marketing system by acting as information brokers and many AEAs act as dealers agents.

Reaching more farmers

There are close links between the commercial and informal systems, as commercial seed is multiplied and spreads to other farmers. Most farmers will continue to rely on the informal seed supply system. The informal system can be improved by providing training to farmers who are producing seed and have established reputations. Improving the provision of cowpea seed must recognise the role of market traders, who are the main source of cowpea seed.

Function	Actor	Necessary relationships	Information and links required
Plant breeding	CRI	Farmers, Extension Funders and donors	Farmers' preferences and demands Policy and preferences
Breeder/ foundation seed	CRI and GLDB	National Seed Committee	Quantity of seed demanded of each variety
Seed multiplication	Seed growers	GSID/MoFA Dealers Banks	How to become a registered grower Quantity of seed demanded of each variety Links to projects and finance. Quantity of seed demanded of each variety Trusting relationship to get finance through existing links, long term working relations, reciprocal credit giving and intermediaries/ guarantors (friends, family, church members, seed inspectors) Political and personal acquaintances for loans
Quality control	GSID	Growers, dealers and MoFA staff	Locations and conditions of seed growers Who is selling fraudulent seed
Conditioning	Seed growers	Dealers GLDB/GSID	Trusting relationship to get finance How to get access to processing equipment and ability to pay for it later
Storage	Growers dealers		How to get links to buyers who will pay for the cost How to get access to credit and finance
Marketing	Seed growers Dealers Growers GSID	Dealers Farmers Agents/Extension staff	Who to trust when selling on credit How to collect money Predicting supply and demand of each variety Information on which growers have the best seed Knowing which seed grower will give seed on credit Recommendations on who has quality seed available Trustworthiness when selling on credit

9 DISCUSSION AND CONCLUSIONS

The state and the private sector have comparative advantages in different areas. The seed system has developed through a large number of small enterprises. The present seed system benefited from the infrastructure and experience gained in the previous 30 years of state involvement in seed delivery. Privatisation was accompanied by NGO investment in training, credit and infrastructure for small enterprises. The public sector maize breeding programme developed a range of varieties for the seed industry; the private sector would not have been willing to invest in such long term projects, with difficulty in protecting their property rights (Tripp, 1993). There is public sector involvement in the production of breeder and foundation seed, the provision of conditioning equipment and MoFA provides the seed industry with a certification and extension system. Entrepreneurs have also been able to draw on Ghana's long experience with rural marketing and many of the institutions and contract forms are copied from other sectors (Lyon, 1998). As the seed industry grows, the private sector may be able to take over some public sector roles, but there will always be a clear role for the state in setting policy and legislation.

Understanding the growth of seed enterprises in less developed countries requires the analysis of the institutional aspects and the conditions necessary for the emergence of firms (Tripp, 1997). Of particular importance is the issue of transaction costs. These include the costs of obtaining information on quality, price, demand, supply and the other enterprises with whom they are working, as well as costs of bargaining and enforcing agreements. These costs increase over longer distances and where they involve impersonal contacts. All enterprises have to take these costs into consideration, although calculating them can be difficult. One way of reducing transaction costs is by developing integrated firms, such as the seed enterprises found in many developed countries (Tripp, 1997). Another option is to reduce the need for information by using or building relationships based on trust.

Trust is defined as the shared expectation of good and likely behaviour⁵ (Gambetta, 1988: 217; Humphrey and Schmitz, 1996:5; Zucker, 1986: 54) and can come about through existing links such as kinship groups or intermediaries who are known to both parties, as well as through working relationships. Moore (1994:882) stresses the importance of inter-business trust relations based on repeated transactions with people who may be from outside the persons' community. Trust lessens the risk of opportunism and reduces the transaction costs involved in getting information. The enforcement of trust through working relationships is based on the knowledge that to act opportunistically would result in the loss of future benefits. However, working relationships can also lead to friendships and the development of moral or social obligations which are the basis of enforcing trust (Lyon, 1998).

The development of small and medium enterprises in Ghana is dependent on social, as well as economic, factors. It takes time to build up links; they do not simply come through a change of ownership or privatisation. At present, resources are in the hands of small organisations and individuals as large seed companies are not willing to invest. While these larger firms would bring economies of scale and an ability to invest in research, this would require capital and organisational skills which are in short supply (Tripp, 1997).

Farmers obtain seed from local sources as it is cheaper and they can see the seed for themselves. When this is not possible, they obtain seed from someone they know or who has an established reputation. In such cases, transaction costs are low. However, these networks are limited to kin groups and close neighbours and so are restricted by their nature. Where trust is based on existing links, actors will not cheat because of shared values and the threat of coercion and sanctions from a third party or the wider community. In this case study, the vital information needed was the location of a persons house. There are also individuals who can act as guarantors because they know both parties. While the actors can follow various strategies to build up trust and reduce the transaction costs associated with getting market and participant information, their strategies are also shaped by the links, knowledge, networks and social contacts that they have before becoming entrepreneurs in the seed sector.

If the private sector is to take over the provision of agricultural services (such as seed supply), support should be given to those individuals and enterprises with established relationships. Interventions can also be designed to reduce the cost of building links and finding information. The case of the certification system for the Ghanaian seed industry supports the argument that the state can promote the growth of trust or social capital. By removing some of the risks, the actors involved can reduce their transaction costs, devote more time and resources to collecting other forms of information and initiate business arrangements that lead to the formation of trust between the parties involved.

This study has highlighted some unexpected roles of individuals and organisations involved in the seed system (see Table 9). Much of the financing for growers comes from small scale seed dealers. Extension services continue to play a major role in the promotion of seed through their role as agents. Information needs have been met through the emergence of "information brokers"—seed inspectors being a prime example. The success of a seed system not only requires basic technical and organisational infrastructure, it also is dependent on demand for seed and the capacity to move information and finance. It illustrates the complexity of the process and the need for sufficient social capital to be available when formal mechanisms do not exist.

ENDNOTES

1 This supports the study by Sumberg and Okali (1997) who were not able to identify a clear group of research minded farmers or innovators. Those known in the communities for being well informed and sources of information were local subject matter specialists, technical agents, successful farmers or prime movers who are associated with a major change or introduction. They found that most farmers are experimenters as experimentation is an essential mechanism for integrating new technology into their existing farming practice

2 The issue of seed theft came up during discussions with farmers although none of the farmers openly admitted to it.

3 The exchange rate in February 1997 was £1=C3700-3900

4 The new varieties to be released are all hybrid which are not expected to be used by the poorer farmers as they need to be replaced every year and they require the correct agronomic practices. The agricultural policy and more specifically the varietal release policy has shifted to meeting the needs of the medium scale farmers and those who can establish out-grower schemes with contract farmers.

5 The concept of trust has been loosely defined by many authors and this limits its use as an analytical tool. The extent to which trust is based on a calculation or ingrained into individuals as habits, routines and conventions is discussed in detail by Humphrey and Schmitz (1996). Trust is also seen as a form of 'social capital', a term popularised in Putnam (1993), who defines social capital as "norms of reciprocity and networks of civic engagement" and "features of social organisation, such as, trust, norms and networks, that can improve the efficiency of society by facilitating coordinated actions".

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