DRAFT DO NOT QUOTE

SEED FIRST DEVELOPING FARMER SEED ENTERPRISES IN UGANDA FOR THE PRODUCTION AND DISTRIBUTION OF BEAN VARIETIES

Sonia David
CIAT Regional Bean Program in Eastern Africa
Kawanda Research Station Uganda

Paper presented at the Rockefeller Foundation Social Science Fellows Workshop ILCA Addis Ababa Ethiopia November 14 18 1994

SEED FIRST DEVELOPING FARMER SEED ENTERPRISES IN UGANDA FOR THE PRODUCTION AND DISTRIBUTION OF BEAN VARIETIES

INTRODUCTION

Although national bean research programs in Eastern and Southern Africa are following a strategy of increasing bean productivity through the release of high yielding stress resistant cultivars studies show that farmers rely predominantly on their own bean seed whether kept from a previous season or acquired from other farmers and have limited access to bean seed of improved varieties produced by the formal seed industry (Schonherr and Mbugua 1976 Grisley 1991 Cromwell and Zambezi 1993 Sperling 1994) In most countries in the region the formal seed industry gives low priority to self pollinating crops such as common bean (*Phaseolus vulgaris L.*) because of their unprofitability due to competition from farm saved seed Demand for clean bean seed by resource poor farmers is also depressed by the limited numbers of widely adapted improved varieties promoted by the formal seed industry the high price of certified seed and farmers limited access to that seed due to untimely and ineffective delivery systems A major bottleneck in bean research in sub Saharan Africa therefore is the lack of appropriate channels for disseminating new bean cultivars

Although local bean seed systems in Africa have proved dynamic and resilient they often cannot adequately meet the needs of farmers under present precarious production and socio economic conditions Increased land pressure changes in agricultural production conditions crop failure due to drought and other natural calamities and civil disruption in the wake of war weaken the ability of local seed systems to provide the quantities quality and types of bean varieties needed by resource poor farmers (Almekinders et al forthcoming Louwaars 1994) The genetic and physical quality of bean seed is important in the complex and diverse production environments of Eastern and Southern Africa where typically small scale farmers use few techniques and technologies to increase agricultural productivity The use of good quality seed affects bean productivity in sub Saharan Africa primarily through higher germination rates decreased seed transmission of certain diseases/pathogens (i e bean common mosaic virus common bacterial blight halo blight ashy stem blight fusarium spp) and improved plant health The maintenance of genetic diversity in beans is another issue related to seed quality and supply since varietal loss may be linked to seed viability and seed availability

An integrated approach to the production and dissemination of bean seed that draws on the comparative advantage of local seed systems and the formal seed industry could offer a solution to the problem of how to supply resource poor African farmers with good quality bean seed of improved and local varieties The first step in the process of developing an integrated seed system is an assessment of the strengths and weakness of each existing system in a country specific context In the first section of this paper the results of a study of local bean seed systems in two regions of Uganda are presented with the objective of providing quantitative data on seed sources seed management and quality A description of bean seed production by the formal seed industry in Uganda is also presented Section two outlines a CIAT project for developing small scale enterprises for the production of bean seed by farmers which involves an integration of formal and local seed systems

THE SETTING

Uganda is a land locked country of 236 000 square kilometers located in Eastern Africa surrounded by Kenya Tanzania Sudan Zaire and Rwanda Nearly seven years of political unrest between 1979 and 1986 which resulted in economic collapse a more recent AIDS epidemic and continued guerilla warfare in the North have strained the traditional agricultural sector which supports the majority of the country s 17 million people Common bean is the most widely grown and consumed

important grain legume in Uganda and is produced in all areas of the country Beans are usually intercropped with bananas cassava maize or sweet potatoes and are eaten together with these and other staples Bean yields are relatively low at 741 kg/hectare The major constraints to production include poor soils, diseases (common bacterial blight bean common mosaic virus anthracnose and angular leaf spot) and field and storage pests It appears that the predominant consumption of dried beans (as opposed to consumption in the fresh state) in many areas only dates back to the 1960s when the crop was promoted by development agencies as a protein source Women provide most of the labor in field and post harvest tasks although their control of the income from crop sale appears to differ by region In most parts of Uganda beans are grown in both seasons (March June July December) Bush beans predominate climbing varieties are only found at high altitudes in Kisoro Kabale Mbale and Kabarole Districts

METHODOLOGY

Due to limited systematic and quantitative data on farmers seed systems a diagnostic study was carried out between March and June 1994 in two districts Mubende in the central part of the country and Mbale in the East[1] Plans to carry out the survey in Northern Uganda were abandoned due to security problems in that area The two Districts were selected to represent specific bean production environments and to reflect differences in the market orientation of the crop Mubende District represents an area in the tall grass agro-ecological zone[2] where beans are an important food crop grown primarily for subsistence Mbale District falls within both the tall grass and highland zones and represents a high potential agricultural area where beans are an important cash crop Table 1 describes the agro ecological and socio economic conditions of the districts covered by the study

A two staged approach to fieldwork was adopted whereby key informant interviews were conducted first followed by a formal survey In Mubende the sampling unit for the survey was sub zones identified by an NGO while in Mbale sampling was carried out at the parish level in three targeted altitude zones 1200 1300 masl 1400 1700 masl and 1800+ masl A non random systematic sampling procedure was used to select the 235 respondents interviewed (115 cases from Mubende and 120 cases from Mbale) The vast majority of respondents (74 percent) were women living in male headed households (77 percent) but 17 percent of respondents were *de jure* female heads of household About 15 percent of households were of below average wealth

[1] The following parishes were surveyed in Mityana County of Mubende District Busubizi Butega Ngandwe Nakaziba Mawanda, Nonve In Mbale the parishes were Buwagiyu Mahaba Bugimanyi Bugitimwa and Bunasufwa

[2] Three agro ecological zones the highlands short grass and tall grass are used to identify bean production areas by differences in altitude vegetation and rainfall

TABLE 1 SELECTED CHARACTERISTICS OF MUBENDE AND MBALE DISTRICTS

	MUBENDE	MBALE
Annual rainfall (mm)	1218	1311 1993
Dominant soil type	alfisols	humic nitisols
Slopes	3 4%	10%
Major ethnic group	Baganda	Bagisu
Average household size	not available	5 2
Average farm size	1 3 acres	< 1 ha
Population density (km^2)	not available	494
Labour availability	limited	high
Major food crops	cassava bananas beans sweet potatoes	bananas maize beans cassava sweet potatoes potatoes
Cash crops	food crops coffee	coffee food crops

sources Martin 1990 Kayiso 1993

BEAN PRODUCTION IN MUBENDE AND MBALE DISTRICTS

Beans are an important crop in the two study districts The major bean diseases in Mubende District and in the low lands of Mbale District are common bacterial blight and angular leaf spot At high altitudes in Mbale the important diseases are anthracnose halo blight angular leaf spot and bean common mosaic virus (Wortmann and Allen 1994) District level statistics show considerable differences in the level of bean production In 1990 91 Mubende District produced 39 368 tons of beans on 21 871 hectares while production in Mbale District was 5 118 tons grown on 3 656 hectares (Republic of Uganda 1992) Survey results however show a higher intensity of production in Mbale compared to Mubende which may reflect the specificity of conditions in the areas sampled On average after a normal harvest the previous season farmers in Mbale plant 46 kilos (S D = 14 57) compared to a mean of 16 kilos (S D = 36 12) in Mubende The range between farmers is considerable the smallest amount of seed sown was 1 kg in Mubende and 4 kg in Mbale while the largest quantity was 80 kg in Mubende and 200 kg in Mbale

Differences between Districts in the quantity of beans planted cannot be attributed to differences in land size holdings since roughly half of the sample in both Districts (47 percent in Mbale and 55 percent in Mubende) had a total landholding size of 1 3 acres A slightly higher number of farmers in Mbale had less than an acre (7 percent compared with 3 percent in Mubende) The greater intensity in production observed in Mbale is best explained by the superior market opportunities and production conditions in the areas of the District bordering on Mt Elgon where the survey was conducted Following the decline of coffee production in the early 1980s farmers in Mbale began to grow beans as a cash crop in response to market opportunities across the border in Kenya Although no household level data are available on bean yields in the two Districts it would be reasonable to expect higher yields in Mbale compared with Mubende due to better soils and higher and more reliable rainfall

Since the amount grown of a crop is related to its end use the difference in the amount of beans sold by respondents in the two Districts is not surprising Data on bean sales over two seasons are shown in Table 2 The data suggest that while more farmers in Mbale compared with Mubende sell beans in larger absolute quantities the proportions sold relative to the amount usually planted is higher among Mubende farmers

TABLE 2 MEAN QUANTITIES (KILOGRAMS) OF BEANS SOLD OVER DURING 1993 MUBENDE AND MBALE DISTRICT

	MUBENDE	MBALE
SALES DURING 1993A	26 (N=31) MIN 9 MAX 100	87 (N=52) MIN 2 MAX 600
SALES DURING 1993B	29 (N=18) MIN 1 MAX 100	118 (N=45) MIN 10 MAX 1000

GENETIC DIVERSITY

The findings of a postal survey of district agricultural officers in 29 districts of Uganda revealed that 135 landraces and cultivars were in common use (Grisley and Sengooba 1993) K20 a Calima seed type released in 1968 was clearly the most popular bean variety in Mubende and Mbale Districts 73 percent of farmers indicated planting the largest area to this variety Mutike Kanyebwa and Wotawa (Mbale or[1]) were other commonly grown varieties In Mubende a total of 14 bean varieties were recorded compared with a total of 12 in Mbale Few of the farmers interviewed had grown recently released improved cultivars or those still being tested on farm

The majority of farmers interviewed planted individual varieties only 3 percent planted mixtures There appears to be little seasonal variation in varieties planted The average number of bean varieties grown in the two districts differed slightly 2 97 for Mubende and 2 47 for Mbale As Table 3 shows a more diverse genetic profile exists in Mubende than in Mbale 22 percent of respondents in Mubende grew 4 or more bean varieties compared with 13 percent of farmers in Mbale This regional variation can be largely attributed to difference between the Districts in market orientation of the crop In Malawi Ferguson and Mkandawire (1993) also concur that a strong market orientation in bean production in southern areas of the country is one factor accounting for the limited number of bean varieties grown Evidence that genetic erosion is influenced by marketing considerations is shown in the reasons given by farmers for intentional varietal loss While only 8 percent of farmers in Mubende mentioned marketing problems as a reason why they stopped growing certain bean varieties since 1986 this reason was cited by 28 percent of farmers in Mbale The most important reason for intentional varietal loss among Mubende farmers was low yields (33 percent) and poor cooking qualities (23 percent) Other reasons offered by Mbale farmers were poor resistance to rain (i e disease) (29 percent) and low yields (20 percent)

TABLE 3 NUMBER OF BEAN VARIETIES USUALLY PLANTED, MUBENDE AND MBALE

NUMBER OF VARIETIES USUALLY PLANTED	PERCENT	
	MUBENDE	MBALE
1	10	13
2	31	41
3	36	33
4	10	12
5+	12	1

SEED SOURCES

Information about seed source was obtained by asking farmers where they got bean seed in most years and specifically during the first season of 1993[3] Farmers indicated the proportion of seed acquired from each source using a counter method whereby they were asked to allocate a set number of pebbles to piles representing different seed sources Over half of all respondents (64 percent) usually rely on only one source to obtain bean seed in 87 percent of cases the most important source was their own seed As Table 4 shows in 1993a most farmers (69 percent) relied totally on their own seed stocks while 30 percent obtained a portion or all of the seed they planted from other sources mainly from markets shops or as gifts from other farmers Farmers point out the following advantages of farm saved seed no cost not having to depend on others for seed availability at the required time control over the quantity desired knowledge about quality and choice over varieties The major disadvantage of depending on one s own stock is being restricted to known and available varieties and the poor quality of seed as a result of improper storage

TABLE 4 PERCENT OF FARMERS USING MAJOR BEAN SEED SOURCES BY THE AMOUNT OF SEED OBTAINED IN 1993A MUBENDE AND MBALE

SOURCE	AMOUNT OF SEED OBTAINED		
	NONE	SOME	ALL
OWN STOCK	10	20	69
MARKETS	85	10	5
SHOPS	93	4	3
GIFTS	91	8	1
PURCHASED FROM OTHER FARMERS	97	3	4
BORROWED OR EXCHANGED	99	1	0

The second most important source of seed among farmers surveyed is the commercial sector that is shops and markets In 1993a 22 percent of farmers purchased some amount of seed from shops/markets while 3 percent purchased seed from other farmers If the pattern of purchasing observed in 1993a is typically farmers tend to either purchase all (40 percent of farmers who purchased seed during that season) or relatively insignificant proportions i e less than 50 percent of their seed (36 percent) Shops are a more important source of seed in Mubende while purchases from markets are more common in Mbale In answer to a specific question about the frequency of seed purchases 23 percent of respondents indicated that they never buy seed (N = 233) Of the 178 farmers that buy seed 60 percent do so rarely (i e , on average one out of every three or more seasons) while nearly a third (29 percent) buy seed one out of every two seasons Only 10 percent of respondents who buy seed do so every season These results suggest that the vast majority of farmers in the study area are usually seed secure but most depend on other seed sources to top up their own stock to restock after a crisis or to obtain new varieties In short high risk production conditions and possibly the recent breakdown of seed networks forces farmers to depend on non farm saved bean seed A minority of farmers buy seed fairly frequently and even fewer farmers are

[3] The previous season 1992b was considered "average" in terms of climatic conditions Comparison of answers given to general questions on seed sources with answers given to questions about a specific season suggests that the former answer describes the ideal situation while the latter better reflects reality

chronically seed deficient for various reasons Preliminary data analysis shows no relationship between farmers socio economic status and dependence on seed purchases contrary to what was found in the Great Lakes Region of Eastern Africa (Sperling 1994)

Of the 160 respondents who could remember when they last bought bean seed 51 percent of purchases had been made in 1994[4] 19 percent in 1993 and 13 percent in 1992 Most purchases were made in the first season which in some parts of the country is considered the better season for planting beans due to more predictable and less heavy rainfall Farmers buy an average of 1 2 varieties and the mean quantity purchased was 7 kg in Mubende and 21 kg in Mbale

Farmers mentioned several advantages of buying bean seed from commercial outlets varietal choice availability of new varieties access to seed when needed and in the required quantity and the possibility of buying on credit On the other hand sourcing bean seed from markets outlets has a number of disadvantages poor quality of the beans distance to shops/markets and high cost Farmers attribute the poor quality of commercially purchased seed to poor management by shop keepers (i e failure to sort seed by variety poor storage) and the age of the seed The poor quality of this seed might also reflect farmers tendency to sell off their worse grain

SEED NETWORKS

In past times the only other source of bean seed for farmers besides their own stock was neighbors and relatives[5] Survey results show that respondents received very small proportions of the seed they plant from other farmers In 1993a only 8 percent of farmers planted bean seed obtained as gifts 3 percent purchased seed from other farmers and about 1 percent obtained seed through exchange (Table 4) Of the 17 farmers who received seed gifts 18 percent obtained all the seed sown from this source while 70 percent received less than 50 percent of seed sown as gifts As Table 5 shows giving away bean seed is an irregular practice among most farmers 41 percent reported doing so rarely while 21 percent never give away bean seed In 1993 however 49 percent of farmers interviewed gave out dried beans as a gift The mean amount of beans provided as a gift was 7 kg in Mubende and 11 kg in Mbale A strong social obligation continues to exist regarding the exchange of fresh beans The vast majority of farmers give and receive fresh beans every season compared to only 15 and 4 percent respectively of farmers who reported giving out and receiving gifts of dried beans on a seasonal basis

[4] It is notable that harvests in 1993b were exceptionally low due to the dry conditions that prevailed during that season in many parts of the country

[5] Interestingly regional differences exist in where a new bride traditionally got bean seed In Mubende and possibly the rest of Buganda a woman got her original bean seed supply from her in laws or husband while among the Bagisu a new bride brought bean seed (and seed of other crops) with her to her new home

TABLE 5 PERCENTAGE OF FARMERS GIVING AND RECEIVING GIFTS OF FRESH AND DRIED BEANS MUBENDE AND MBALE

	GIVING GIFTS OF FRESH BEANS (N=232)	RECEIVING GIFTS OF FRESH BEANS (N=233)	GIVING GIFTS OF DRIED BEANS (N=233)	RECEIVING GIFTS OF DRIED BEANS (N=233)
SEASONALLY	75	59	15	4
SEASON A ONLY	6	13	3	3
SEASON B ONLY	4	9	13	4
SEASON A OR B	3	6	6	6
RARELY	11	17	41	56
NEVER	9	4	21	27

In 1993 gifts of dried beans given by 116 respondents went to relatives (87 percent) friends (22 percent) and neighbors (19 percent) living in the same village (53 percent of cases) In 47 percent of cases seed went to farmers living in other villages and in 38 percent of cases gifts of seed were sent to other parishes indicating that the range of farmer to farmer diffusion is quite significant Seed networks appear to be somewhat more active in Mbale relative to Mubende which challenges the premise that commercialization of a crop is responsible for the breakdown of exchange systems

Since the major reason why farmers exchange seed is to ensure reciprocation (52 percent) it is clear that bean seed networks serve to ensure seed security Therefore in most cases with the exception of gifts given on social occasions (e g funerals) or to the elderly or urban relatives farmers give out dried beans for use as seed and accordingly most farmers are selective about who they give seed to Reflecting the latter point as well as the role of beans as a social currency farmers stressed that they would not give bean seed to people whom they consider socially undesirable (21 percent in Mubende 36 percent in Mbale) to those who would not plant the seed (16 percent in Mubende 25 percent in Mbale) who do not grow beans (6 percent in Mubende 14 percent in Mbale) or those who would not keep the seed (6 percent in Mubende 10 percent in Mbale)

Despite the apparent decline in importance of seed networks in the two districts farmers rank this source second in preference because of good seed quality and the access it provides to preferred diverse varieties But dependence on other farmers for seed is not without disadvantages which include the sense of dependence lack of control over quantity and time of delivery and in some cases the poor quality of seed given as gift

SEED MANAGEMENT

For the most part Ugandan farmers like farmers in most parts of Eastern Africa do not distinguish between grain and seed at the level of field production In contrast to Rwanda (Sperling et al 1993) no evidence of seed experts i e farmers who are recognized as having superior seed or knowledge about beans was found in the two study sites Seed only becomes of concern to farmers at the time of storage and before planting The majority of farmers (66 percent) interviewed select seed for planting just after the harvest is threshed Seed selection and sorting at this stage usually involves sorting by variety and removing damaged seed Separately stored seed is sorted again before planting The second most common practice is sorting just before planting (23

percent) A minority of farmers (4 percent) claimed not to sort and select seed planting whatever seed is available and increasing sowing rates in compensation Sorting is an exclusively female task although children of both sexes can be assigned the work The majority of farmers interviewed (70 percent) store seed separately from grain In most cases beans are not stored in a special structure but keep inside the house (99 percent) in sacks open baskets and plastic containers

Nearly all farmers practice some post harvest protection of grain (91 percent) and seed beans (98 percent) The major measures used are sunning ash pepper coating the seed with banana juice soil from a termite hill and insecticide Some difference is observed in pest control practices for seed and grain where separate storage is practiced Farmers favor the use of insecticide and protectorants on seed beans probably because of the toxicity of the chemicals and the desire for better protection of seed compared to grain

SEED QUALITY

Seed quality in beans is related to 1 seed borne pathogens 2 post harvest pests and 3 seed viability (i e germination rate) Farmer management can influence quality at all three levels although the first is the most problematic due to the non visible symptoms caused by some pathogens[6] Farmers seed selection criteria views on seed quality and plant health and knowledge of diseases were elicited during the survey and key informant interviews but more detailed work is needed on these topics

Since farmers in Mubende and Mbale rarely practice in field disease control methods such as roguing of diseased plants they mainly influence seed quality during seed selection[7] The major criteria used in selecting seed are varietal characteristics physical appearance and seed size When asked to state up to three indicators of bad seed beside varietal characteristics[8] farmers mentioned ten physical qualities three of which (shriveled weevil damaged and rotten) were mentioned by nearly half of all respondents (Table 6) It is notable that four of these criteria (shriveled rotting/moulding undersized and discoloration) may be associated with diseases or physiological problems which suggests a significant degree of success by farmers in eliminating diseased seed through selection However since none of these characteristics were mentioned by the vast majority of farmers significant differences probably exist between farmers in the care taken in seed selection and possibly in knowledge about seed quality Although farmers clearly are aware of the relationship between the physical properties of seed and germination they generally appear less clear about the relationship between seed and plant health and for the most part are not aware of disease transmission through seed Farmers attribute plant health and most bean diseases to the soil insects and the weather (i e excessive rain drought) The absence of names for most bean diseases among most Ugandan ethnicities also suggests limited indigenous

---

[6] Depending on the severity of pod infection symptoms of some bacterial and fungal pathogens will be visible on seed Viral infections are asymptomatic

[7] A survey of Rakai Mpigi Mukono and Hoima Districts of Uganda also revealed that few farmers (7 percent) regularly rogue diseased bean plants (Grisley 1991)

[8] When farmers mention varietal characteristics in response to a question about seed quality it is unclear whether this reflects connections they make between variety and disease incidence and consequently seed quality or has more to do with a translation/terminology problem

knowledge about plant health[9]

TABLE 6 CRITERIA USED BY FARMERS IN SELECTING BEAN SEED MUBENDE AND MBALE

SELECTION CRITERIA	PERCENT
Shriveled	49
Weevil damaged	47
Rotten/soft	45
Germinating	28
Broken/cracked	24
Discolored	23
Moulded	20
Under sized	13
Light weight	3
Old	4
Other	17

In the absence of quantitative data, little can be said about the quality of farmers bean seed in Uganda The above information on farmers selection methods however suggests that the quality of farmers seed is reasonably good and survey results indicate that farmers are satisfied with the quality of farm saved seed Of more dubious quality is seed obtained from off farm sources i e seed purchased in markets/shops or obtained from other farmers Further research is needed on the quality of both farmers own seed and seed obtained from other sources farmers decision making about bean sales and exchange (i e which beans are sold/exchanged and the timing of these transactions) and how management of beans by sellers affects quality

While studies conducted on the quality of farmers bean seed in other countries provide locality specific information on this topic they suggest areas for further research Studies conducted in Rwanda Kenya and parts of Latin America show that the physiological and health quality of farmers seed compares favorably with clean seed (Buruchara 1990 Trutmann and Kayitare 1991 Janssen et al 1992 CIAT 1992 Mwang ombe Otieno and Shankar 1994) Most studies found no statistical difference between the yield of clean seed and farmers seed suggesting that farmers stand to gain little by buying commercially produced bean seed In Rwanda the merits of farmers seed may be attributed to adequate crop management (e g in field management practices planting of disease susceptible varieties in certain seasons) seed selection and varietal selection[10]

[9] In contrast Rwandan farmers have local names for all common bean diseases and associate "bad" seed with disease incidence (personal communication from L Sperling) The difference between Uganda and Rwanda in bean knowledge systems may be partly explained by the relatively greater importance of the crop in the domestic economies of Rwandan households

[10] Research by Opio (1993) suggests that seed plant transmission of disease in beans varies according to variety

Seed quality studies have come under recent scrutiny and questions raised about the methodologies used (Buruchara 1994) The choice of study sites might affect the results For example the major seed transmitted bean disease common bacterial blight is only of moderate importance in Rwanda and Kenya Studies in Rwanda (CIAT 1992) compare yield over a single season whereas comparison over time may give indications of changes in disease levels (due to build up effect) seed selected out and yield (Buruchara 1994) Moreover Another grey area in most studies is farmer selection Most studies give no indication of how farmers who provided seed for the experiments were selected (e g were they farmers who had been working closely with researchers?) nor do they provide a history of farmers seed used in the experiments (e g was it recently acquired?) Finally in view of evidence that the incidence of disease transmission through seed varies by variety (Opio 1993) studies on seed quality provide insufficient information on the varieties used A study on the quality of farmers seed in Uganda that builds on these methodological limitations is being planned by CIAT and national scientists

BEAN SEED PRODUCTION BY THE FORMAL SEED SYSTEM

In Uganda as in most countries in the region the formal seed system has had little sustained impact on bean production among small scale farmers Although the formal system had a major regional success story with the release of K20[11] only two improved bean varieties have been released since 1968 and as results reported in this paper indicate few farmers buy certified bean seed In Uganda the paucity of improved bean varieties and farmers limited access to certified seed can be attributed to several factors the virtual collapse of commodity research programs between 1979 and 1986 due to political unrest slowness in the release of new varieties the high price of certified seed and untimely and ineffective delivery systems

Seed production by the formal seed industry is a vertical demand driven system consisting of breeding production and marketing stages The system is only sustainable if there is sufficient demand for seed or if subsidies are maintained to enable farmers to buy seed and breaks down if one part is missing In Uganda the system begins with breeder s seed of a newly released variety being given to the Uganda Seed Project (USP) for multiplication and commercial distribution Given insufficient demand by farmers for certified bean seed the decision taken by the USP to give low priority to beans for small scale production is hardly surprising At present the Project only supplies commercial seed of K20 most of which is obtained from small scale farmers (personal communication from W Mangheni) It is notable that most of this seed is purchased by relief agencies rather than by small scale farmers

To fill the void created by the failure of the formal seed industry to multiply improved bean seed the Uganda National Bean Program (UNBP) produces limited quantities of improved bean varieties mainly for research purposes and to ensure dissemination of new varieties At present the UNBP provides seed of improved bean varieties to the extension system for distribution to farmers through demonstrations However given farmers need for constant seed restocking seed multiplication and distribution by the national program is expensive unsustainable and probably not highly effective in reaching the majority of farmers in a reasonably short period of time Moreover the research system s focus on broadly adapted improved varieties will not necessarily meet farmers demand for varieties with specific adaptation

THE NEED FOR LOCAL LEVEL BEAN SEED PRODUCTION

The results of this study raises important questions about farmers access to bean seed their perception of the quality of available seed the relationship between access to seed and genetic

[11] It is estimated that K20 is the most widely sown bean variety in Eastern Africa with 40 and 56 percent respectively of the total hectarage planted to beans in Kenya and Uganda sown with this variety (Grisley 1994)

diversity at the farm level and the efficiency of farmer seed networks as a mechanism for the distribution of improved varieties Several findings suggest that access to bean seed is problematic for small scale farmers in the two study localities (and perhaps elsewhere in Uganda) and that the quality of available seed is of some concern to farmers

1 the majority of farmers with varying degrees of frequency depend on off farm seed sources

2 although farmers prefer the quality of farm saved seed (both own seed and from other farmers) and appear satisfied with the quality of their own seed seed exchange is in reality the third most important source of seed and provides only a small proportion of the seed that farmers plant

3 market outlets are the second most important source although farmers consider seed purchased from shops and markets to be of inferior quality

A second set of issues raised by the study is the relationship between access to bean seed and genetic diversity Although considerable genetic diversity of beans exists in Uganda the study shows that farmers in the study areas grow few varieties Yet the demand for new varieties is high among Ugandan bean farmers as shown by their willingness to pay high prices (up to 4 times the market price of grain) for seed of unknown improved varieties (David et al 1994 David and Kasozi 1994) Seed availability along with several other factors (e g market forces in Mbale) probably accounts for the limited number of bean varieties grown by farmers

Finally survey results suggest that due to the declining importance of farmer to farmer seed exchange use of this channel for the dissemination of new bean varieties would likely result in slow diffusion The limitations of seed exchange as a mechanism for the diffusion of new varieties is also confirmed by evidence from Rwanda and Uganda showing that farmers only exchange seed of new varieties after several seasons of multiplication and testing (Sperling and Loevinsohn 1993 David et al 1994)

These conclusions suggest that there is room for improving local bean seed supply systems and that demand exists for good quality low cost bean seed of improved and local varieties It can be postulated that an appropriate seed supply system for small scale bean growers in sub Saharan Africa must meet the following requirements

1 Quality the system should supply reasonably good quality bean seed (i e quality declared rather than certified) of both improved and local varieties

2 Cost seed must be produced at a low cost and sold at a price that competes favorably with grain

3 Sustainable the system should be horizontal and flexible in nature to ensure that it continues to function even if one component is missing or breaks down

4 Economies of scale the system should produce small quantities of seed in accordance with localized demand

In essence the proposed system requires an integration of local and formal seed systems whereby small farmers undertake specialized production of bean seed with input of improved varieties from the formal system While artisinal production of certified bean seed by farmers in various Latin American countries has proven highly successful (Garay 1993 Lepiz 1994) this approach has not been tried in Africa It is notable that with the exception of Rwanda and perhaps elsewhere in the Great Lakes Region specialized bean seed production by small scale farmers in Eastern and

Southern Africa is rare[12]

Farmer involvement in the multiplication and distribution of new varieties as a business venture is likely to have several advantages over formal sector production lower production cost and hence lower seed price the likelihood of timely seed delivery and varietal selection by farmers themselves in accordance with local preferences The less structured nature of farmer seed enterprises may also mean that alternative means of selling seed (e g in kind exchange labor exchange) could be explored with the result that the poorest farmers may adopt improved varieties Small scale farmer seed enterprises are also likely to have a spin off effect on income generation and small enterprise building capacity To assess the feasibility of artisinal bean seed production CIAT s Regional Bean Program in Eastern Africa initiated research in 1994 on strategies for developing small scale farmer bean seed enterprises

RESEARCH ON FARMER SEED ENTERPRISES (FSE)

Farmer seed enterprises are proposed as a strategy for 1 the distribution and promotion of improved varieties 2 increasing the adoption of improved varieties 3 involving farmers in the selection of improved varieties to be multiplied and 4 ensuring a supply of better quality seed of local varieties which could contribute to the preserving of genetic diversity Although such enterprises could be established by medium to large commercial farmers the present discussion will focus on seed production by small scale farmers

The pilot project in Uganda is designed to explore a number of issues which fall in three broad categories organization of production production and distribution Tables 7 9 outlines son e of the pertinent research questions

TABLE 7 RESEARCH ISSUES ON THE ORGANIZATION OF FARMER BEAN SEED ENTERPRISES

ISSUES	RESEARCH QUESTIONS
TYPE OF PRODUCER	INDIVIDUALS VS GROUPS KIND OF GROUP HOW TO SELECT GROUP? SMALL SCALE OR MEDIUM/LARGE SCALE FARMERS?
SELECTION OF PRODUCTION AREA	ECOLOGICALLY OPTIMUM VS LOW POTENTIAL AREAS WHERE SEED AVAILABILITY MIGHT BE A GREATER PROBLEM?
TYPE OF SUPPORT REQUIRED	PROVIDE LOANS GRANT INPUTS ONLY?
TRAINING NEEDS	IS TRAINING NECESSARY? WHEN TO TRAIN? TYPE OF TRAINING MATERIALS? TRAINING OF TRAINERS?
LINKAGE BETWEEN PRODUCERS RESEARCH AND EXTENSION	HOW TO ENSURE REGULAR SUPPLY OF BASIC SEED? PLANT BREEDERS RIGHTS ISSUES?

[12] The institutionalization of seed production by small farmers appears rare worldwide An exception is specialized production of rice and soya bean seed by farmer groups (organized on their own accord) in Java in response to seed storage problems (personal communication Neils Louwaars)

TABLE 8 RESEARCH ISSUES ON PRODUCTION BY FARMER BEAN SEED ENTERPRISES

ISSUES	RESEARCH QUESTIONS
SCALE OF PRODUCTION	START SMALL? RELATIONSHIP BETWEEN SCALE AND SEED QUALITY? HOW MUCH SEED CAN BE PRODUCED? HOW MANY PRODUCERS NEEDED TO MEET DEMAND?
VARIETIES	HOW MANY? IMPROVED VS LOCAL? HOW TO SELECT LOCAL VARIETIES FOR MULTIPLICATION? DIVISION OF RESPONSIBILITIES AMONG PRODUCERS BY VARIETY?
SEED QUALITY	WHICH QUALITY STANDARDS FULL CERTIFICATION LIMITED CERTIFICATION SELF CHECKED? IS QUALITY BETTER THAN THA OF AVAILABLE SEED?
LEGAL RESTRICTIONS	DO SEED LAWS RESTRICT FARMER SEED PRODUCTION?
EQUIPMENT INPUTS AND TECHNOLOGIES	ARE APPROPRIATE POST HARVEST ECHNOLOGIES AVAILABLE? WHICH SEED TREATMENT?

TABLE 9 RESEARCH ISSUES ON SEED DISTRIBUTION BY FARMER BEAN SEED ENTERPRISES

ISSUES	RESEARCH QUESTIONS
DEMAND FOR SEED/ SYSTEM SUSTAINABILITY	CAN FARMERS CONDUCT A FEASIBILITY STUDY? DOES DEMAND EXIST? HOW TO CREATE DEMAND? RELATIONSHIP BETWEEN PRICE AND DEMAND? HOW TO ESTIMATE PRODUCTION TARGETS?WILL DEMAND DROP ONCE FARMERS OBTAIN SEED OF NEW VARIETIES?
MARKETING	WHAT ARE THE BEST MARKETING STRATEGIES? CAN MARKETING BE DIRECTED TO SPECIFIC TARGET GROUPS? PACKAGING? STRATEGIES FOR DISTINGUISHING PRODUCT?
PROMOTION	CAN PRODUCERS BE INVOLVED IN SEED EDUCATION? MESSAGES FOR BETTER SEED CAMPAIGN?

At present the Project only supports one group but work will be initiated with three additional groups in Mbale and Masaka Districts of Uganda in 1995 Although work with FSEs was only recently started an overview of the activities of the first group supported by the Project provides some insight into problems and prospects of farmer run seed enterprises

THE IKULWE BEAN FARMERS ASSOCIATION

The idea of specialized bean seed production was first proposed in 1993 by a group of farmers in Ikulwe Iganga District where CIAT and the Uganda National Bean Program have conducted on farm varietal trials and participatory research for several years[13] Although beans are an important food crop in Iganga District parts of the District (including Ikulwe) suffer from erratic rainfall[14] which together with low phosphorus and diseases (notably common bacterial blight) constitute the major constraints to bean production

The Ikulwe Bean Farmers Association (IBFA) was established in 1993 specifically for the purpose of multiplying bean seed of improved varieties Membership consists of about 15 families most of whom are collaborators in bean research The Project provided support to the group in the form of a grant to pay for land preparation and seed of improved varieties an improved thresher and sorter and plastic sheets for drying Association members participated in a five day training workshop in May 1994 sponsored by the Project Topics covered included the distinction between seed and grain in field management of bean diseases improved post harvest activities marketing and promotion costing of the seed simple bookkeeping and group management

Seed production started in the second season of 1993 and has been carried out for three seasons The group initially rented 2 1/4 acres of land for seed multiplication but began individual production in 1994b to cut down on costs Three varieties two improved (MCM 5001 and CAL 96) and one local (K20) were multiplied Table 10 shows the quantities of seed planted and the amounts harvested No harvest was realized in 1993b due to drought but low yields in 1994a are attributed to soil fertility problems

---

[13] A CIAT agronomist initiated the work with seed multiplication In 1994 the responsibility for this activity was turned over to the author

[14] For example total rainfall in Ikulwe in 1993 was 838 mm 510 mm less that the mean recorded over a 22 year period

TABLE 10 VARIETIES AND QUANTITIES PLANTED AND QUANTITIES OF SEED PRODUCED BY THE IBFA 1993 94

BEAN VARIETY	AMOUNT PLANTED (KG)	QUANTITIES OF SEED PRODUCED (KG)
1993B		
MCM 5001	40	NONE
CAL 96	10	NONE
K20	50	20
1994A		
MCM 5001	50	700
CAL 96	50	115
K20	50	215

A major problem faced by the IBFA is marketing of the seed which is being sold at Ush 1200/kg ($1 30) for the improved varieties approximately 3 6 times the price of grain of local varieties The Association insists on maintaining this price in order to ensure a profit At the time of writing of the total of 815 kg of MCM 5001 and CAL 96 produced in 1994a only about 356 kg have been sold Notably since 300 kg was sold to a local NGO through an arrangement made by the present author the Association can only take credit for selling 56 kg The group promotes the seed through word of mouth and has explored sales through markets house to house visits and clinics Slow sales are attributed to the high price of the seed buyers concerns about a market for MCM 5001 an unfamiliar seed type and low demand for bean seed during the second season

After two seasons of seed multiplication a number of important lessons have been learned about approaches to establishing small scale FSEs

1 To avoid creating a sense of dependency and to ensure maximum commitment to the undertaking on the part of the farmers involved grants should be avoided and producers required to make some level of financial contribution (e g half of all inputs and other costs)

2 The first few seasons should be considered a market trial so that only small quantities of seed (e g 10 20 kg per variety) should be multiplied and limited investment made in equipment etc

3 Avoid high risk production environment at the research stage

4 Training before seed production begins is important in the Ugandan context where indigenous knowledge about seed health is limited

CONCLUSIONS

Through a case study of bean seed systems in Uganda this paper has stressed the need to combine certain elements of local and formal seed systems in order to improve the supply of bean seed (in terms of quality and varieties) available to small scale African bean farmers Although the creation of farmer seed enterprises is proposed primarily as a channel for the distribution and promotion of improved bean varieties several other concerns can be addressed simultaneously These include the preservation of genetic diversity through the multiplication of valued local varieties and access to a stable supply of quality seed of local varieties

However farmer seed production should constitute only one component of an integrated seed supply system and in many contexts will function best if accompanied by changes in breeding strategy varietal release regulations and seed laws In most African countries there is room for improvement in how and when farmers preferences are taken into consideration by plant breeders The tendency to base knowledge about farmer preferences on survey results assumes these preferences are static (since diagnostic surveys are usually not repeated) that results can be widely extrapolated and gives too much weight to the credibility of those data Moreover when varietal evaluations are conducted at the on farm testing stage the opportunity for meaningful farmer input is lost since lines that farmers might prefer may have been eliminated by scientists in earlier on station selection In short with this approach farmers are presented with a finished product which they either accept or reject (Sperling et al 1993) Members of specialized seed producer groups could assist scientists in early selection of promising lines or breeding materials using methodologies being developed for farmer scientist participation in breeding (Sperling et al 1993 per commun from L Butler)

Since part of the rationale for releasing a few widely adapted cultivars is accommodation of large scale centralized seed production the development of artisinal and other alternative seed production units calls for the liberalization of breeding strategies and varietal release regulations to encourage the release of a large number of improved varieties In some countries the emphasis in seed laws on quality parameters and patenting (see Cordeiro 1993) would have to be modified to encourage farmer seed production efforts Thus integration should not be a one way process whereby the formal system seeks to improve or modify local systems through the distribution of modern varieties Research and seed institutions stand to benefit from a closer interaction with farmers as clients and research collaborators The challenges for researchers seed technologists and farmers lies in developing the institutional framework for integrating seed systems

REFERENCES

Almekinders C J M N P Louwaars and G H de Bruijn forthcoming Local seed systems and their importance for an improved seed supply in developing countries" Euphytica

Buruchara R 1994 Bean seed quality the knowledge and implications in informal seed production systems Paper presented at the workshop on Alternative approaches to bean seed production and multiplication in Eastern and Southern Africa Kampala Uganda October 10 13

Buruchara R 1990 Preliminary information on seed borne fungi of beans (*Phaseolus vulgaris L*) in Kenya In Proceedings of the second workshop on bean research in Eastern Africa Nairobi Kenya 5 8 March CIAT African Working Paper Series no 7

CIAT 1992 Annual Report Bean Program CIAT Cali

Cordeiro A 1993 Rediscovering local varieties of maize challenging seed policy in Brazil in W de Boef K Amanor and K Wellard (eds) Cultivating knowledge genetic diversity, farmer experimentation and crop research Intermediate Technology Publications London

Cromwell E and Zambezi B 1993 The performance of the seed sector in Malawi An analysis of the influence of the organisational Structure ODI London

David S C Wortmann M Isabirye S Kasozi and M Mugisha Mutetika 1994 Distribution of new bean varieties through market outlets in Uganda" Paper presented at the workshop on Alternative approaches to bean seed production and multiplication in Eastern and Southern Africa Kampala Uganda October 10 13

David S and S Kasozi 1994 Distribution of new bean varieties through rural markets in Uganda Paper presented at the workshop on Alternative approaches to bean seed production and multiplication in Eastern and Southern Africa Kampala Uganda October 10 13

Ferguson A and R Makandawire 1993 Common beans and farmer managed diversity regional variation in Malawi Culture and Agriculture no 45 46

Garay A 1993 Artisanal seed supply schemes a strategy to extend the development of organized seed supply to medium and small farmers in N Thomas and N Mateo Seed Production Mechanisms Proceedings of a workshop held in Singapore, 5 9 November 1990 IDRC Ottawa

Grisley W 1994 The Bean Revolution CERES no 149 26 (5) pp 27 30

Grisley W 1991 A survey of four villages in the Districts of Rakai Mpigi Mukono and Hoima Bean grain storage problem a tabular summary of the results Unpublished paper CIAT Kawanda Research Station Kampala Uganda

Grisley W and T Sengooba 1993 Bean cultivars sown by farmers in Uganda during 1989 90 Results of a survey of district agricultural officers in W Grisley A collection of papers on the economics of beans in Uganda and Eastern and Southern Africa CIAT Uganda

Janssen W C Luna and M Duque 1992 Small farmer behaviour towards bean seed evidence from Colombia Journal of Applied Seed Production Vol 10 43 51

Kayiso P K 1993 Socio economic baseline survey Mount Elgon Conservation and Development Project report no 10 IUCN Regional Office Nairobi/Ministry of Water Energy Minerals and Environment Republic of Uganda

Lepiz R J Ashby and J Roa 1994 Artisanal bean seed production experiences in Latin America Paper presented at the workshop on Alternative approaches to bean seed production and multiplication in Eastern and Southern Africa Kampala Uganda October 10 13

Louwaars N forthcoming Integrated Seed Supply A flexible approach In J Hanson (ed) Proceedings of the ILCA/ICARDA workshop on alternative seed systems ILCA Addis Ababa June 12 15 1994

Martin A 1990 Feasibility study on farmer participatory research with Action Aid, Uganda NRI

Mwang ombe A S O Otieno and M Shankar 1994 Assessment of bean Phaseolus vulgaris L cv Rosecoco GLP 2 seed infection/contamination by Pseudomones syringae pv phaseolicola in Kenya Paper presented at the Pan Africa Working Group Meeting on Bean Bacterial and Viral Diseases Kampala Uganda 13 16 June

Opio A F 1993 Pathogenic variation, seed transmission and survival of *Xanthomonas campestris* pv *phaseoli* in *Phaseolus* beans Ph D thesis Sokoine University

Republic of Uganda 1992 Report on Uganda national census of agriculture and livestock (1990 91) Vol III Ministry of Agriculture Animal Industry and Fisheries

Schonherr S E Mbugua 1976 "Bean production in Kenya s Central and Eastern Provinces Occasional Paper no 23 Institute of Development Studies University of Nairobi

Sperling L 1994 Analysis of bean seed channels in the Great Lakes Region South Kivu, Zaire, Southern Rwanda, and select bean growing areas zones of Burundi CIAT African Occasional Publications Series no 13 CIAT/RESAPAC Butare Rwanda

Sperling L and Loevinsohn M 1993 The dynamics of adoption distribution and mortality of bean varieties among small farmers in Rwanda Agricultural Systems 41 441 453

Sperling L M Loevinsohn M and B Ntabomvura 1993 Rethinking the farmer s role in plant breeding local bean experts and on station selection in Rwanda Expl Agriculture Vol 29 509 519

Trutmann P and E Kayitare 1991 Disease control and small multiplication plots improve seed quality and small farm dry bean yields in Central Africa Journal of Applied Seed Production 9 36 40

Wortmann C and D Allen 1994 African bean production environments their definition, characteristics and constraints Network on Bean Research in Africa Occasional Paper Series no 11 Dar es Salaam Tanzania