

**INTRODUCING NEW BEAN VARIETIES WITH SMALL SEED PACKS:
EXPERIENCE FROM MALAWI**

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PREFACE

This paper is one of a series of studies that has been produced as part of the project, 'Linking Seed Producers and Consumers: Diagnosing Constraints in Institutional Performance'. The purpose of the project is to describe the current mechanisms for seed delivery to African farmers and to offer suggestions for improving seed access, particularly for seed of new crop varieties. The focus of the analysis is on the information, institutional and regulatory constraints that limit seed access. The project includes research and analysis in Kenya, Malawi, Zambia, and Zimbabwe.

The project is a joint effort between the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the Overseas Development Institute (ODI), and national researchers in the participating countries. The project was made possible by a grant from the UK Department for International Development (DFID) under the Competitive Research Facility (CRF), which supports collaborative work between international agricultural research centres and UK and national research organisations. The views expressed are not necessarily those of DFID, ICRISAT, or ODI.

This case study examines the implementation of a strategy planned by Malawi's Department of Agricultural Research in the Ministry of Agriculture with CIAT, with support from DFID. The strategy is described more fully by R.M. Chirwa and V.D. Aggarwal in "Bean Seed Dissemination Systems in Malawi: A Strategy" (Journal of Sustainable Agriculture, Vol. 15: 5-24, 2000 and distributed also in our Reprint Series No. 25). Several other publications in the CIAT Africa series report results from seed dissemination studies elsewhere.

CIAT appreciates the various kinds of inter-institutional collaboration that led to this report, and acknowledges the permission of ICRISAT to distribute the report more widely. Disseminating results from significant research is an activity of the Pan-African Bean Research Alliance (PABRA) that serves to stimulate, focus and coordinate research efforts on common bean, the systems within which it is produced and the people who consume it. PABRA is coordinated by CIAT in collaboration with two interdependent sub-regional networks of national programmes: the Eastern and Central Africa Bean Research Network (ECABREN) and the Southern Africa Bean Research Network (SABRN).

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Pan-Africa Coordinator, CIAT, P.O.Box 6247, Kampala, Uganda.

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1. Introduction

In many African countries the most serious bottleneck for the diffusion of new crop varieties is the absence of an adequate seed system. Until recently, many countries relied upon a single parastatal seed company. In most cases these companies were unable to operate efficiently. In addition, they concentrated on a few crops (such as hybrid maize) for which there was high seed demand. Liberalisation policies have led to the privatisation or closure of many of these companies and have stimulated the emergence of a number of private seed companies. But the private companies also focus on hybrids and often claim to see no market for seed of grains and grain legumes that farmers can save from one year to the next. A number of NGO and donor projects have attempted to stimulate small-scale commercial seed activity at the local level, but this strategy has so far had limited success.

These limitations in the formal seed system cause great problems for public sector plant breeding. When a new variety is released, there is no obvious way in which to distribute seed. Extension agents may help with demonstrations and they can distribute some seed if it is available. Adaptive research teams can also contribute, but funding limitations for research and extension mean that the ability to initiate seed diffusion activities is limited. NGO and church groups can also help in distributing seed of new varieties. But most of these strategies tend to be organised in an ad hoc manner; there is often no clear set of procedures for obtaining seed of new varieties or even for learning of its availability.

An innovative strategy for overcoming some of these difficulties involves the provision of small packs of seed of new varieties. The strategy attempts to bridge the gap between farmer interest in seed of new varieties and the commercial potential for seed production. The idea is to sell small quantities of seed through local shops, extension agencies, NGOs, or other local outlets. The quantities and prices are low enough that many farmers can afford to acquire the seed. On the other hand, the sale of the small packs aims at cost recovery, so the strategy is sustainable. If it is managed in an efficient manner, the small pack strategy can stimulate greater commercial interest in seed production.

The basic idea of providing small packs of seed to farmers in order to try new varieties is not new. In the nineteenth century the U.S. Patent Office distributed small packs of seed, free of charge, mostly of vegetable and flower varieties. The distribution was arranged by congressmen for their constituents; by 1861 nearly two and a half million packets had been distributed (Kloppenburg, 1988). Grisley and Shamambo (1993) report on the successful diffusion of a new bean variety in an area of Zambia where small packs of seed had been given to farmers.

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But the strategy described in this paper is based on the principle that farmers are willing to pay a reasonable price for the small packs. Several national bean research programmes, in collaboration with the International Centre for Tropical Agriculture (CIAT), have pioneered the use of small seed pack sale in Africa. One of the first experiences was in Rwanda, where in the early 1990s CIAT and an NGO experimented with several ways of selling small quantities of new bean varieties. The seed was sold by local merchants, government shops, and at open-air markets. In most cases the seed was sold very quickly (Sperling, Scheidegger and Buruchara, 1996). Small packs of bean seed have been sold through shops, rural clinics, women's groups and an NGO in Uganda (David, Kasozi and Wortmann, 1997).

This paper describes experience with a small pack programme in Malawi. It is based on the analysis of programme records as well as interviews with participating merchants and a survey of 150 farmers. The following section outlines the background for the Malawi case. The next section summarises the costs of the small pack programme. This is followed by a discussion of merchants' experience with small packs. The next section reports the results of a survey of farmers living in villages that have access to small packs. The final section presents some conclusions.

2. The Malawi Case

Malawi's formal seed system has not been able to support the distribution of new bean varieties. The National Seed Company of Malawi (NSCM) operated as a seed production arm of the national agricultural marketing corporation (ADMARC) until 1989, when Cargill obtained a controlling interest in the company. The bulk of its sales have always been hybrid maize seed. It has never been effective in producing or distributing bean seed, despite the fact that beans are an important crop for many Malawian farmers. In 1986 the Ministry of Agriculture (MOA), recognising the problems in seed supply for non-hybrid grains and legumes, initiated a Smallholder Seed Multiplication Scheme (SSMS). The aim was to decentralise seed production for these crops through the organisation of seed multiplication at the level of Agricultural Development Divisions (ADDs) and subsequent sale by ADMARC. However, the scheme was never able to function properly (Chirwa and Aggarwal, 2000).

In response to these difficulties, Malawi's Bean Improvement Programme (BIP) has participated in a number of alternative methods for bean seed provision. In 1996 the BIP began to contract large-scale and small farmers for the seed production of 6 newly-released varieties. A considerable amount of this seed has been sold to NGOs for their own local-level seed projects. The BIP also used some of this seed for small packs that were sold through grocery shops, as well as through extension agents and NGOs. This paper is concerned with the results of this small pack strategy, which is summarised in Table 1. This initiative was undertaken by the BIP with funding from the UK Department for International Development (DFID).

The 1998-99 agricultural season was the third year in which BIP organised the production and sale of small seed packs of six new bean varieties. Table 2 shows the quantities of seed managed by small shops in the 3 years.

Table 1. Merchants participating in bean sales in the years 1997/98 and 1998/99 and their locations

Types of the merchants and areas of the selling points	No. of merchants and extension agents		
	Year		Location
	1997/98	1998/99	
A. MZUZU ADD			
1. Agriculture stations	1	1	Mzuzu
	4	2	Rumphi
	4	0	Mzimba
TOTAL	9	3	
2. Grocery/shops	14	10	Rumphi
	0	1	Ekwendeni
	1	0	Mzuzu
TOTAL	15	11	
3. Primary health care	4	2	Rumphi
B. KASUNGU ADD			
1. Agriculture stations	2	2	Ntchisi
2. Grocery/shops	1	0	Ntchisi
3. School	1	1	Ntchisi
4. Maize mill	1	1	Dowa
5. Village	1	0	Dowa
C. LILONGWE ADD			
1. Agriculture stations	1	1	Dowa
	1	2	Dedza
	3	2	Lilongwe
TOTAL	5	5	
2. Grocery/shops	1	2	Dedza
	2	1	Lilongwe
TOTAL	3	3	
3. School	0	1	Dedza
4. Villages	1	1	Dedza
5. NGO	0	1	Dedza
D. BLANTYRE ADD			
1. Agriculture stations	3	2	Thyolo
2. Grocery/Shops	1	0	Thyolo
Grand Total	47	33	
Total Number of merchants	28	21	
Total number of extension agents	19	12	

Table 2. Seed sales of small packs by merchants

Variety	Quantity of seed, by season (kg)		
	1996/97	1997/98	1998/99
Kambidzi	163	1,772	334
Maluwa	129	2,157	581
Mkhalira	290	2,330	617
Nagaga	295	639	737
Napilira	210	3,343	659
Sapatsika	0	1,777	523
Total	1,088	11,009	3,451

Source: BIP annual reports 1996-97, 1997-98, 1998-99

All varieties used in the small packs were released by the Bean Improvement Programme in 1995. All of the varieties originated from CIAT in Colombia. The first four are from the Andean gene pool and the last two are from the Mesoamerican gene pool. Their characteristics are described:

CAL 143 (*Napilira*)

This variety originated from a cross between Bola x AND 277. It has red, speckled, medium-sized seeds (42 g per 100 seeds). It is determinate and suitable for the highlands with a long growing season (90 days). It performs well under low phosphorus conditions and shows good levels of resistance to Angular leaf Spot (ALS), Halo Blight (HB) and Powdery Mildew (PM). It has a yield potential of 2000 kg ha⁻¹.

CAL 113 (*Maluwa*)

This originated from a cross between Limone # 0-1 x PVA 773. It has red, speckled, medium sized seeds (46 g per 100 seeds). It is determinate and matures in about 85 days and is suitable for short growing seasons in the mid-altitude plains where it copes well with drought. It grows well with modest levels of N and P (20 kg ha⁻¹) and has a yield potential of 2000 kg ha⁻¹.

A 197 (*Nagaga*)

This variety, is a cross between G 76 x G 21721. It has a determinate growth habit. It has large, tan seeds (52 g per 100 seeds) and matures in about 85 days. It shows a good level of resistance to Bean Common Mosaic Virus (BCMV) and is well adapted to a wide range of environments. Its yield potential is greater than 2000 kg ha⁻¹.

DRK 57 (*Sapatsika*)

This variety originated from a double cross between (PVA 142 x TIB 33341) x (PVA 1426 x A 197). It has large, red kidney seeds. It is erect but semi-determinate. It grows well in cool environments and shows good levels of resistance to the common diseases. It matures in 90 days, performs well when intercropped with maize and has a yield potential of 2000 kg ha⁻¹.

A 344 (*Mkhalira*)

A 344 originated from a cross between G 3807 x G 2618. It belongs to the Mesoamerican gene pool and has small, tan seeds (24 g per 100 seeds). It is semi-erect but determinate with small leaves. It matures in 90 days. It grows well in a wide range of environments and shows good levels of resistance to the common diseases. However, it has the "I gene" which produces a necrotic reaction in the presence of the necrotic strains of BCMV. It performs well

under drought conditions and when intercropped with maize. It has a yield potential of 2500 kg ha⁻¹.

A 286 (*Kambidzi*)

Originating from a cross between G 4017 x G 4830, this variety has small, tan seeds (22 g per 100 seeds) with brown stripes. It matures in 90 days and is determinate, semi-erect with small leaves. It does well in a wide range of environments and shows good levels of resistance to the common diseases. It has the "I gene" and performs well under drought and yields over 2500 kg ha⁻¹.

Table 3 summarises the characteristics.

Table 3. Characteristics of new bean varieties

Characteristics	Variety					
	Maluwa	Napilira	Nagaga	Sapatsika	Kambidzi	Mkhalira
Seed colour	Red, speckled	Red, speckled	Tan	Red	Tan, brown stripes	Tan
Seed size	Medium	Medium	Large	Medium	Small	Small
Growth habit	Determinate	Determinate	Determinate	Determinate	Determinate, semi-erect	Determinate, semi-erect
Days to maturity	85	90	80 - 90	85 - 90	85 - 90	85 - 90
General adaptability	Low fertility	Low soil P	Wide range of environments	Cool environments	Wide range of environments	Wide range of environments
Disease resistance/tolerance	Average to major diseases	ALS, HB and PM	BCMV	Average to major disease	Average to major disease	BCMV
Yield	2000 kg/ha	2000 kg/ha	2000 kg/ha	2000 kg/ha	2500 kg/ha	2500 kg/ha

The bean packs are of three sizes: 100 g, 250 g, and 500 g. The seed is packed in small polythene bags that contain a simple printed label with the name of the bean variety. The BIP contacts grocery shop owners who might be interested in selling the seed. The packs are delivered to the shop and a retail price is suggested. The shopkeeper may keep 20 percent of this sale price; the receipts and unsold seed are collected at the end of the season. The merchants decided the types of varieties to sell and the quantities to sell and the quantities they could handle based on their knowledge of their customers.

The BIP utilises several promotional strategies for the new varieties. Some of the posters are on A4 paper size, showing a colour photo of the variety and describing its basic characteristics. Other posters are on A3 paper size, showing colour photos of all the six varieties and their identities. Both posters are in two local languages, Chichewa and Chitumbuka.

Radio announcements also describe the new varieties and the availability of the small seed packs. There were two types of radio programmes. One was a commercial advert with jingles, which was aired three times a day, for four weeks, just before planting. The other was through the agricultural extension radio programmes. This covers a wide range of new agricultural technologies including bean varieties and their seeds. The programme runs throughout the year, featuring different technologies depending on the time of the year.

The seed for the small packs is mostly produced by smallholders in Salima Agricultural Development Division, along the lakeshore. The seed growers are contracted by the BIP. These farmers have access to low-lying land in the flood plains of the rivers draining into

Lake Malawi. These areas normally produce a crop of beans during the dry season, between May and October. They are able to produce a bean seed crop in time for sale for the major bean-growing season, beginning in November or December.

3. Costs of Production of Small Pack Seed

One of the principal challenges for a small seed pack strategy is to produce and deliver the seed at a reasonable cost. Because the BIP must finance the process, it wants to recover as many of the costs as possible. In addition, they want to be able to demonstrate that it is commercially feasible to produce and sell small seed packs of new varieties.

We have attempted to calculate the real costs of producing and distributing the seed. Table 4 uses data on current costs and procedures to estimate the unsubsidised cost of the small pack seed. This table was developed using the records kept by the BIP and estimates of other costs.

Table 4. Estimated Costs of Small Pack Bean Seed

Item	MK per ton of seed
<i>Cost of seed (47.0%)</i>	
Direct payment to farmers for seed	MK28,600
Interest on loans of chemicals, foundation seed	472
Organising and contracting	81
<i>Conditioning and storage (13.5%)</i>	
Bagging and transport to research station	895
Labour, chemicals, polythene bags, labels	645
Interest charges	6,864
<i>Quality control (0.2%)</i>	
Seed 'certification'	117
Seed testing	6
<i>Delivery to shops (11.1%)</i>	
<i>Promotion (0.9%)</i>	
<i>Unsold stocks and losses (7.3%)</i>	
<i>Merchant's margin (20%)</i>	
<i>UNSUBSIDISED SELLING PRICE (100%)</i>	MK62,064

(Costs are MK/ton in July 1998. Us\$1=MK26)

The first item in Table 4 is the cost of the seed. Most of this cost is the price paid to the growers for their product. (It includes a small percentage loss for rejected seed.) The BIP agrees to pay the growers 10 percent above the market price for grain. This formula represents a reasonable premium for seed growers (Chopra and Reusche, 1994). The farmers are provided with foundation seed on loan, as well as chemicals and sprayers. They must repay the cost of the foundation seed and chemicals when the seed is purchased. We have estimated an interest charge on these loans, using a rate of 4 percent per month, which approximates Malawi's commercial interest rates. We have also included a small charge for contracting farmers. Local extension agents manage the initial organisation, and we have

tried to cost their time. The BIP is fortunate that their seed production is done in a concentrated area where extension agents are available and supervision costs are low.

The second item is the conditioning and storage of the seed. After harvest, the seed is purchased, bagged, and transported back to Chitedze Research Station, near Lilongwe, a journey of about 200 km. Research station labour is used to clean and grade the seed, apply storage chemicals, and pack the seed in the polythene bags. The seed is then stored at the station until distribution to the merchants. We have not attempted to cost the storage facilities at the station, because their current opportunity cost is very low.

But storage facilities are often a problem for seed programmes, and their costs should be considered when planning a small pack strategy. However, because the BIP pays its seed producers immediately, but does not recover the sales receipts from the merchants until the end of the season, we include an interest charge for six months. Such gaps between the payment of growers and the recovery of funds from retailers, because of storage before sale (and in this case a delayed payment arrangement with merchants), are common in commercial seed enterprises.

In our example the costs of seed quality control are minimal. Seed of most crops can be sold in Malawi without certification, although it must be tested for germination and purity. In the small pack programme, certification agents make a single brief visit to the seed production area, but only visit a few randomly selected fields. BIP staff at Chitedze conduct germination tests on the seed, and this cost is minimal.

Delivery of the seed to shops accounts for more than 11 percent of the unsubsidised costs of the seed. This is not surprising because delivery entails several long trips by a BIP staff member and driver in a pick-up truck to visit many remote towns and villages.

Promotional costs were estimated using the costs of production of posters and the charges for radio announcements.

More than half of the seed left with the merchants is sold. The unsold packs are collected and tested for germination. Those lots with acceptable germination rates are offered for sale the following season or are often utilised in other ways. Nevertheless, we must assume some stock loss, especially under the current arrangements in which the merchant can return unsold seed with no penalty.

The final item in the table is the merchant's margin. Merchants are currently advised to keep 20 percent of the sales price. This is a fairly high mark-up, but it may be necessary in order to attract a large number of merchants. The figure in Table 4 represents a 20 percent margin on the unsubsidised sales price, rather than on the current subsidised price.

The figures in Table 4 indicate that in order for the BIP to recover all the costs of the small packs it should charge a retail price of about MK62 per kg. The actual retail price (in 1998) was MK40 per kg. Bean prices (at harvest time) were about MK25 per kg, although they rise at the time of planting. The bean packs are thus being sold at a price that is not sufficient to recover all of the costs. But the current pricing strategy seems a reasonable way of introducing the small seed packs to merchants and farmers. The exceptional volatility in bean prices makes it difficult to set bean seed prices. The price of beans at planting time may in fact be as high as MK 40 per kg. But bean prices may drop to one-third this level during the major harvest.

The value of the estimates in Table 4 is to allow a consideration of the constraints and possibilities for reducing costs in such a programme. The table suggests that the real costs of bean seed delivered in this way is about two and a half times the price of grain. This is well within the range of prices expected for commercial seed operations for a crop such as beans. It would be most unlikely that seed could be delivered for less than twice the price of grain.

How might the Malawi operation (or other similar programmes) cut costs? Its seed multiplication operation is admirably efficient. It uses farmers in a concentrated area whose resources allow them a good chance of producing an acceptable yield. The premium paid to the growers is reasonable. The operation is able to take advantage of collaboration from extension agents to manage much of the supervision. Other programmes might not be so fortunate, and supervision may imply additional costs.

Seed conditioning is also managed in an efficient manner and is carried out under close supervision at the research station. All of the cleaning and bagging is done by hand. The interest charges are considerable (although they admittedly reflect currently high interest rates in Malawi). One way of reducing these charges is to require the merchants to pay for the seed at the beginning of the season. It would not be possible to reduce quality control costs any further, and in other projects these costs might be higher, either because of mandatory certification or because of higher internal quality control costs.

The cost of delivering the seed is relatively high, but it is not reasonable to expect that this could be lowered. This is one of the costs that will likely be higher than what is expected in a conventional commercial seed operation. The purpose of the small pack strategy, after all, is to deliver relatively small quantities of seed to dispersed and isolated communities.

Some savings might be realised by lowering the amount of unsold seed. This could be partly accomplished by establishing a policy of no returned seed from the merchants. But care must be taken to maintain sufficient merchant interest in the programme. The merchants' margin could also be lower. Merchants currently keep 20 percent of the subsidised price, i.e., MK8 per kg. It may be that merchants would accept this absolute margin on seed that was sold at a higher retail price.

A few other estimates of the costs of small pack bean seed have been made. Sperling, Scheidegger and Buruchara (1996) examine a case in Rwanda, but only include packaging and retailing costs. The analysis of a project that sold small packs of bean seed through extension agents in Uganda showed that the cost of producing the seed on the experiment station was US\$1 per kg. The costs of packaging, transport and seller's margin amounted to an additional \$1.14 per kg (David, Kasozi and Wortmann, 1997). The authors indicate that it might be possible to lower the costs of seed production in this example (it is certified seed), but that delivery costs might well be higher in many other cases. Once again, we see that the unsubsidised retail price of the seed is likely to be above twice the price of grain (at harvest).

The seed pack pricing strategy must strike a fine balance. On the one hand, the price of the packs must be low enough so that farmers are interested in buying them, and so that merchants feel they can sell them. On the other hand, the price must be high enough to at least approach cost recovery, and hopefully to attract commercial enterprises that could eventually assume many of the production and distribution responsibilities.

Our study asked both merchants and farmers about acceptable prices for seed in small packs. Merchants were asked if farmers would be willing to buy bean seed if it was priced at 2, 3 or 4 times grain price. Similarly, farmers were asked about their willingness to buy small packs at these price ratios. Table 5 summarises the results.

Table 5. Seed price and willingness to buy small packs

Ratio of seed price to grain price	Proportion of farmers willing to buy	
	Farmer's opinion (N=150)	Merchants opinion (N=13)
1	96%	92%
2	69%	62%
3	43%	23%
4	35%	0%

The merchants and the farmers are in close agreement when seed price is twice grain price; both estimates indicate that about two-thirds of farmers would be willing to buy the packs. The merchants are more cautious than the farmers as the price rises, however. In farmers' opinions, there would be significant interest even if the seed price were 3 or 4 times grain price. It is interesting to note that there was no difference in these estimates between farmers who had experience with small packs and those who had never purchased them.

4. Merchants' Experience with Bean Seed Packs

A study was conducted in Rumphi District, Northern Region. This was the area of major concentration of seed sales. The study interviewed 11 grocery shops and 2 input shops that had experience selling the small seed packs.

Five of the 11 merchants in the sample sold other types of seed (mostly hybrid maize), four sold pesticides, and two sold fertiliser. Only four of the shops had been in business since at least 1990, and most had opened in the past 2 or 3 years.

We asked the merchants for their observations about the customers who purchased the small packs. The following is a rough summary of the estimates given by the various merchants. They believe that slightly more than half of their customers knew the small packs were available at the shop before they entered. The merchants believe that the efforts of the extension service and the availability of the posters are the two major factors that helped farmers learn about the seed. Roughly half of the farmers knew the name of the variety they wished to buy, and they believe this is largely because of extension messages. The merchants estimated that about a third of the small pack purchasers were women. The most common questions that farmers asked about the seed related to its agronomic characteristics (yield and disease resistance). Some farmers also asked about cooking qualities and the growth habit of the variety. Only three of the merchants recall farmers asking about seed quality (i.e., germination).

All the merchants expressed an interest in continuing with the sale of small packs of bean seed. All but one of the merchants also expressed interest in the possibility of selling small seed packs of other crops. The greatest amount of interest was shown in maize and groundnut seed.

Most (69%) of the merchants said that they would be willing to pay for the small packs at the beginning of the season, rather than waiting until BIP staff returned to the shop at the end of the season. This could simplify the administration of the small pack programme (especially if a 'no return' policy could be implemented). It would also be an additional step in moving small packs toward commercial viability.

The majority of the merchants believed that the current retail price of the seed packs is acceptable, but three (23%) said the price was too high. Some merchants suggested that the price could be lowered, to make the packs accessible to more farmers. On the other hand, a few farmers complained that they had paid above the suggested retail price for their seed packs, but this could not be confirmed. Most of the merchants in the sample sold all of their stocks in 1998/99. In some cases (such as at Nchenachena), where many farmers plant beans in March or April, the small packs had all been sold by January and many farmers were unable to obtain them.

A number of merchants suggested that more emphasis should be placed on the smaller pack sizes, especially 100 g, so that farmers with little cash can at least afford to test the new varieties.

Both the campaign of radio announcements and the posters received the merchants' full support. They were particularly appreciative of the posters, which were useful for drawing customers' attention to the seed packs. In some instances merchants gave copies of the small posters to their customers, and they would like to do this more often. This is an indication of farmers' demand for simple printed information about varieties. More attention might be given to the wider distribution of small pamphlets that describe all of the varieties that are available.

5. Farmers' Experience with Small Seed Packs

A farmer survey was conducted in Rumph District in early 1999. Because many of the merchants maintained records of their customers it was possible to direct the survey towards farmers who had purchased the seed packs. A list of seed buyers was obtained from the merchants and this acted as a sampling frame from which to select a random sample. The goal was to interview 100 farmers who had purchased the seed packs. Because there seemed to be a high concentration of buyers in the Mpompha area, 40 buyers were selected from there and 20 farmers each from areas of Mhuj, Nchenachena, and Bolero. Farmer selection was done with the assistance of the extension agents and merchants who had been involved in the seed programme.

A total of 50 farmers who had not purchased bean seed were also interviewed. As with the buyer sample, relatively more were chosen from Mpompha. About one quarter of the supposed 'non-purchasers' also turned out to have purchased small seed packs in the past. Some farmers had first bought small packs before 1998. It was observed that Livingstonia Synod Primary Health Care Unit had been distributing bean seed packs in the past two years, so that farmers already knew the characteristics of many of the bean varieties.

The area in which the seed sales had concentrated is relatively prosperous. The areas are close to trading centres and have access to better facilities than the average for Malawi. The average level of education of farmers in the area is also quite high. Of the 150 households interviewed, 19 (13%) were female headed.

The major crop in the area is maize. Most beans are planted as an intercrop. Planting is generally carried out between November and January, with harvest in March or April.

About half of the households interviewed had at least 10 years of experience planting beans, but a significant minority (31%) had been growing beans for 3 years or less. In about half of the male-headed households the respondent said that both husband and wife participated in choosing which bean varieties would be planted, while in 28 percent of the cases they said that the woman chose the bean varieties.

Farmers in the sample planted a total of 20 different bean varieties (Table 6). The area planted with the 6 new varieties accounts for about 58 percent of total bean area for bean seed purchases. This represents a very significant diffusion of these varieties in a short time. Farmers were asked to describe the varieties (but not areas) of beans they grew the previous year as well. The 6 new varieties were mentioned almost as frequently, indicating that the small pack programme had been effective during the previous year as well.

Table 6. Bean varieties grown by sample farmers (Purchasers and non-purchasers)

Variety	Purchasers (N=100) Acres	Non-purchasers (N=50) Acres
<i>New Varieties</i>		
Sapatsika	9.2	0.6
Napilira	30.9	3.0
Maluwa	15.3	-
Nagaga	4.8	-
Mkhalira	10.8	-
Kambidzi	1.2	-
Total	72.2 (58.5%)	3.6 (5.7%)
<i>Other varieties</i>		
Selenje	29.8	30.1
Nyauzembe	7.6	8.4
Saba	5.3	8.3
Others	8.5	12.5
Total	51.2 (41.5%)	59.3 (94.3%)

Table 7 presents the number of varieties grown by farmers, most of whom plant two or more varieties. The average number of varieties per farmer is reported in this survey as 2.05. This is likely to be an underestimate, as farmers often plant variety mixtures, but may not know names for all of the components.

Table 7. Number of bean varieties grown by farmers

Number of varieties	Number of farmers
1	50 (33%)
2	52 (35%)
3	38 (25%)
4 or more	10 (7%)

For seed other than that of the 6 new varieties, 54 percent of the seed that was planted in 1998/99 was saved from a previous harvest. In 36 percent of these cases, the seed had been saved for 5 or more years. For the new varieties, however, only 11 percent had been saved. Table 8 shows the original source of the seed planted in 1998/99. For the new varieties, the majority is from small packs purchased at shops, while most of the rest comes from extension. For the other varieties, the majority of seed is obtained from other farmers. Some seed is also obtained (as grain) from markets or shops. A very small amount of grain to be used as seed is obtained from the state marketing organisation (ADMARC).

Table 8. Original source of bean seed planted in 1998/99

Source	Type of variety	
	New varieties (N = 134)	Other varieties (N = 162)
Another farmer	2%	68%
Small pack in shop	64%	2%
Extension	29%	0%
Grain market	2%	26%
ADMARC	2%	4%

The bean seed obtained from other farmers is purchased in 64 percent of the cases, while the rest is described as gifts. More than half (56%) of the seed obtained from other farmers is from relatives. Other farmers are not a significant source of seed of the new varieties (nor were they in the previous year). This indicates that the farmer-to-farmer diffusion of new varieties is quite limited in the early years of the small pack programme. This is similar to results of a study of bean variety diffusion in Rwanda (Sperling and Loevinsohn, 1993).

Tables 9 and 10 summarise information about sources of information for bean varieties. Although most farmers first saw their current bean varieties in other farmers' fields, this is not nearly so important in the case of the new varieties. Indeed, the majority (69%) of farmers planted the new varieties without first having seen them growing. Similarly, although farmers are the main source of information about bean varieties, less than 20 percent learned about the new varieties in this way. Instead, extension campaigns and shopkeepers' displays are the principal sources of information for these varieties.

Table 9. Where did you first see the variety?

Where seen	Type of variety	
	New varieties (N = 133)	Other varieties (N = 162)
Another farmers' field	29%	84%
Demonstration	2%	1%
Did not see the variety before planting it	69%	15%

Table 10. How did you hear about the variety?

Source of information	Type of variety	
	New varieties (N = 134)	Other varieties (N =162)
Another farmer	19%	78%
Extension	30%	6%
Shopkeeper	29%	1%
Radio	16%	5%
Poster	4%	2%
Other	2%	8%

Of the farmers in the sample, 75 percent had experience buying small packs of bean seed in the past. Of the 113 farmers who had purchased small packs, 48 had purchased two and 18 had purchased 3. Three-quarters of the purchases had been from shops, while most of the rest had been from extension. Of the total small pack purchases recorded in the survey, 31 percent were made the previous year.

Only 6 percent of the farmers had complaints about the germination of the seed they purchased in the packs. Further analysis revealed no obvious pattern of seed source or seed type for these complaints. Farmers were generally pleased with the performance of the varieties they purchased. The small packs give them an opportunity to test the new varieties and to see which perform best under their conditions and which ones meet their consumption or marketing requirements (Table 11).

Table 11. Farmer Opinions of Varieties in Small Packs

Variety	Very good	Acceptable	Unacceptable
Kambidzi (N=8)	63%	25%	13%
Maluwa (N=28)	50%	32%	18%
Mkhalira (N=12)	50%	42%	8%
Nagaga (N=11)	73%	18%	9%
Napilira (N=36)	56%	22%	22%
Sapatsika (N=17)	76%	12%	12%

In the majority (62%) of the cases it was the man who purchased the seed. This was even true in a number of instances where it was claimed that the woman chooses the bean variety within the household.

Only 14 (9%) of the farmers interviewed had never seen the small packs, and only 7 (5%) had never heard of them. Of the 37 households who have not purchased, many had seen the packs with extension (13) or at the shop (8).

Table 12 shows where farmers (purchasers and non-purchasers) first learned of small packs. Again, it is extension and shopkeepers who were the major sources of information.

Table 12. Where farmers (purchasers and non-purchasers) first learned of small packs

When they went to the shop	40 (28%)
From another farmer	32 (22%)
From extension	53 (37%)
From the radio	15 (10%)
Other	3 (2%)
Total	143 (99%)

Seventy-four percent of the farmers have heard radio announcements about the bean varieties. (This is very high coverage.) But a much lower proportion say that the radio was the primary way they learned about the varieties. 79% of households have radio. 38 % do not remember any names they heard on radio, but 26 % remember 5-6 names. 104 of the farmers claim to have seen the posters. About 70% saw them at the shop and most of the rest at extension.

Table 13 demonstrates that the vast majority of purchasers would be interested in purchasing further small packs, and those who have no experience would be interested in purchasing. With the exception of one purchaser who was not satisfied with the performance of the variety, all of the other farmers who indicated they would not purchase small packs said this was because the price was too high.

Table 13. Interest in buying small packs

Farmers' experience	Would you buy a small pack (again)	
	Yes	No
Previously purchased small pack	102	11
Never purchased small pack	35	2

Table 14 presents data that compares farmers who purchased the small packs with those who did not. If we use maize area as an indication of wealth, there is no indication that wealthier farmers are more likely to buy the small packs. In female-headed households there is a tendency for the women who purchase the packs to be somewhat younger and better educated than those who do not, but the difference is not statistically significant. In male-headed households there is no significant difference in the man's age or education between purchasing and non-purchasing households. The wives in the purchasing households appear to be somewhat younger, and to have slightly less education, but in those male-headed households where the woman chooses the bean variety, the wives education in purchasing households is significantly higher than in non-purchasing households. In summary, there may be a slight tendency for the small packs to be purchased by somewhat better educated farmers, but it would not appear that this is a serious bias.

Table 14. Crop areas, age, and education related to purchase of small packs

Factor	Experience with small packs		
	Used small packs	Never used small packs	Significance
Maize area (acres)	1.8	2.0	NS
Female-headed households:			
Age of woman	39.4	47.8	NS
Years of school of woman	8.4	5.0	NS
Male headed households:			
Age of man	42.3	40.5	NS
Years of school of man	9.1	7.1	NS
Age of woman	32.1	39.3	0.001
Years of school of woman	7.5	9.5	0.01
Male headed households where woman chooses bean variety:			
Age of woman	36.9	41.8	NS
Years of school of woman	7.4	4.5	0.1

6. Conclusions

The strategy of producing and selling small seed packs of new bean varieties in Malawi has been quite successful. In areas where the packs are available, many farmers have purchased the seed. The majority of these farmers are satisfied with the new varieties that they acquired and they are interested in purchasing other small seed packs. The merchants who have participated in the scheme are enthusiastic and wish to continue to sell the packs.

We should emphasise that many of these conclusions are drawn from a field study that covered only one small part of the country. We chose the area for the study specifically because it had good experience with the small seed pack strategy. There may be other areas with less positive experience, but our analysis of the sales of small packs, and the interest of merchants from various parts of the country to participate, indicates that this is not an unusual example.

This strategy was an activity of the BIP project and was to be limited to the project impact areas. However, its coverage has already spread beyond the project areas. Based on the positive experience from this strategy, a second phase of the project is planned to cover other parts of the country. The second phase will also include various other legumes like groundnut, soybean and pigeon-pea.

Part of the success of the programme is due to a well-organised promotion campaign. Extension agents helped inform farmers about the availability of the small packs and in some cases sold the packs at their offices. Announcements on the radio also helped raise awareness. Perhaps the most effective element in the promotion campaign was the colour posters that described the new varieties. These were widely distributed. Merchants speak very positively of these posters and would like access to additional material of a similar nature. Farmers' limited awareness of new crop varieties is one of the principal problems limiting variety diffusion. The interest in the posters points to the possibility of producing additional descriptive material that could be distributed directly to farmers for their reference.

Our analysis shows that the current retail price charged for the small packs is not sufficient to recover all of the costs. Farmers currently pay a seed price of about 160 percent of grain price at harvest. We estimate that this would have to rise to between 200 and 250 percent of grain price to make the activity financially viable. Charging full price might not be advisable in the early years of a small pack programme, if funds are available to help initiate the activity. If the programme is successful in contributing to the widespread diffusion of new varieties, then a small subsidy on the initial cost of the small packs may be a worthwhile investment. However, the price for small pack seed should always be significantly higher than grain price to prevent diversion of the seed and to emphasise the seed's value.

As the small pack programme matures, it should be possible to move towards a more commercial footing. This includes looking for possibilities to contract the seed production and conditioning to a commercial seed enterprise. It should also be possible to explore the use of existing wholesale channels for other agricultural inputs in order to distribute the seed to a wider range of retail outlets. However, if commercial distribution mechanisms are used, caution must be exercised regarding quality control. The sale of old or inappropriate small packs by uninformed or unscrupulous merchants would seriously jeopardise the goals of the programme. Including the date of production on the seed label in the pack would be one step towards ensuring appropriate marketing procedures.

Even if widespread commercial uptake of the small pack strategy is not immediately feasible, small packs can be used in the interface between agricultural research and NGO or donor seed projects. There are many projects that either distribute seed to client farmers or that try to organise local-level seed multiplication. There is often no standard procedure for these projects to acquire the seed that they use. It would be useful if such projects became accustomed to buying small packs (or, where appropriate, larger bags) of seed for their activities. This would help to organise and rationalise what is often a last-minute rush for seed. It would also establish the tradition of paying a fair price for seed and would help build the critical mass of seed demand that is required for a more sustainable system of seed provision.

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