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Using subsidised seed to catalyse demand-driven bean seed systems in Malawi

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Citation:

Rubyogo, Jean Claude; Magreta, Ruth; Kambewa, Dymon; Chirwa, Rowland; Mazuma, Elisa; Andrews, Martin. 2016. Using subsidised seed to catalyse demand-driven bean seed systems in Malawi. *Development in Practice*. Routledge Taylor & Francis Group, 26(1): 15-26.

Publisher's DOI:

<http://dx.doi.org/10.1080/09614524.2016.1117579>

Access through CIAT Research Online:

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Using subsidised seed to catalyse demand-driven bean seed systems in Malawi

Jean Claude Rubyogo, Ruth Magreta, Dymon Kambewa, Rowland Chirwa, Elisa Mazuma and Martin Andrews

ABSTRACT

Through an innovative public-private partnership, Demeter Agricultural Limited, along with the Malawi National Bean Programme and the International Centre for Tropical Agriculture, supplied 2559 tons of certified bean seed between 2009 and 2012 through the government's Targeted Farm Input Programme. Farmers were satisfied with the variety supplied, timeliness of the operation, pack size, and information provided. Growing numbers also accessed new improved varieties, from 264,661 households in 2009 to 344,200 in 2012. These emerging farmers' demands and the subsequent DAL responses suggest a base for building sustainable delivery systems. However, decentralised seed-based systems will be needed for promoting varieties suited to micro-ecological niches.

ARTICLE HISTORY

Received 9 June 2014
Accepted 23 September 2015


KEYWORDS

Civil society – Partnership;
Environment (built and natural) – Agriculture;
Aid – Capacity development;
Sub-Saharan Africa

Introduction

Beans (*Phaseolus vulgaris* L.) are the most important food legume in Malawi. The crop is predominantly produced by small-scale farmers, particularly women who use beans for both food and cash. Considering the dwindling fish production and consumption in Malawi (FAO 2013), beans could significantly contribute to addressing malnutrition problems if consumed in greater quantities. Unfortunately current bean consumption in Malawi is modest, estimated at 12kg per capita/year, and partially linked to unusually low yield of ≤ 500 kg/ha (Mwale et al. 2009). Despite these negative trends, Malawian farmers are showing increased interest in the bean crop: between 2002 and 2013, the land area under bean cultivation increased by 30.94% countrywide, and aggregate production rose 84.12% (MoAFS 2008). Even with such expansion, however, the production levels attained for beans cannot keep pace with rising demand. The Ministry of Agriculture attributes the stagnation largely to use of poor quality seed of old bean varieties and inadequate cultural management practices (MoAFS 2008). Evidence elsewhere suggests that quality seed, in particular, can be a key strategy for raising agricultural productivity (Bishaw and van Gastel 2008; Buruchara et al. 2011).

Several improved bean varieties have been released by the Malawi National Bean Programme (MNBP) of the Department of Agricultural Research Services (DARS). This breeding and selection work has been conducted in partnership with The International Centre for Tropical Agriculture (CIAT) through the Pan Africa Bean Research Alliance (PABRA). The released varieties have the potential for wider national agro-ecological adaptation, including resistance to some of the major bean diseases as well as traits that make them highly marketable nationally and internationally. Unfortunately, after market liberalisation and structural adjustments programmes, which brought in privatisation of many public seed enterprises, bean seed supply has been below expectations (Rubyogo et al. 2010). Therefore, the use of improved varieties by Malawian farmers has been impeded by lack of reliable and sustainable seed delivery systems that can operate at wider scales.

CONTACT Jean Claude Rubyogo  j.c.rubyogo@cgiar.org

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Over 95% of the bean seed planted by the smallholders in Malawi is farm-saved seed, obtained through social networks and/or from local seed sources such as grain markets or neighbours (DARS 2010). In recent years, farmers have also acquired seed of improved bean varieties from participatory variety selection (PVS) activities whereby farmers assess large numbers of test varieties and evaluate them in their location conditions using their usual management practices. It was from such activities that participating farmers were left with the novel bean seed after harvest, hence adding new varieties to their prior sets (Doward et al. 2006; Aw-Hassan, Mazid, and Salahieh 2008). Such a PVS approach has played an important role in linking poor farmers, especially women, to micro-ecological niche adapted bean varieties that are locally preferred by the farmers (Almekinders, Thiele, and Danial 2007). However, evidence suggests that such one-off introductions into local systems are insufficient for distributing the new varieties widely. Simply, informal seed systems, including farmer-to-farmer exchanges, can be slow, and the geographic and social diffusion reach are often limited (David and Sperling 1999). Seed delivery processes have to be catalysed specifically to achieve the speed and breadth needed to achieve higher-level impacts.

This article describes the process of building a private-public partnership (PPP) to stimulate wider delivery of bean seed across regions of Malawi. The PPP aimed to leverage the Malawi government's bean seed subsidy programme as an opportunity to build a foundation for demand-driven and sustainable bean seed systems. The article also reports some significant institutional shifts on how the national bean research programmes such as the MNBP, catalysed private investment in the delivery of quality bean seed.

Background to bean seed initiatives in Malawi

Between 1994–2009 the MNBP developed and released 11 bean varieties. The breeding programme aimed at developing higher yielding varieties which could optimally perform under small-scale farmers' conditions, that is with minimal external input use. Simultaneously, the programme has focused on identifying varieties with targeted utilisation of traits such as marketability and, more recently, higher levels of micronutrients, especially increased iron and zinc. Table 1 details the characteristics of released varieties.

Through time, seed production and dissemination has also been supported, through multiple approaches that aimed for varied scales. Several donors had funded NGOs who then engaged

Table 1. Bean varieties released by MNBP.

Variety	Year of release	Preferred traits		On station yield (tons/ha)
		agronomic	Utilisation traits	
Napilira	1995	Disease resistance/higher yield	medium seeded, red mottled (good marketability)	2.5
Maluwa	1995	Disease resistance/higher yield	Large seed, red mottled (good marketability)	2.5
Khambizi	1995	Disease resistance/higher yield		3.0
Nagaga	1995	Disease resistance/higher yield		2.5
Mkhalira	1995	Disease resistance/higher yield		2.5
Sapatsika	1995	Disease resistance/higher yield	Large red kidney -	2.5
Kholopethe	2002	Disease resistance/higher yield	Large seeded/ sugar bean (good marketability)	2.5
Kabalabala	2002	Disease resistance/low soil fertility higher yield	Small navy	2.5
NUA 45	2009	Early maturity	Shorten hunger period, Iron- and zinc- rich	1.7
NUA 59	2009	Early maturity	Shorten hunger period, Iron- and zinc- rich	1.8
VTT924/4-4	2009	Disease resistance/higher yield	Large seeded- sugar bean (good marketability)	2.7

Source: Malawi National Bean Programme Report (2012).

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smallholder farmers in on-farm seed production. For instance, from 1995 and 1999, the UK Department for International Development (DFID) supported Action Aid to implement a smallholder seed multiplication project in which small groups of farmers were trained to produce good quality seed and sell to fellow farmers (Ng'ambi and Maliro 2004). Other NGOs, like Plan International, World Vision International, CARE, and Concern Universal have also been engaged in varied seed production programmes for smallholders, helping to disseminate improved bean varieties mainly in their impact zones and slightly beyond. As one example, Concern Universal widely disseminated two bean varieties called Napilira (CAL 143) and Maluwa (CAL113) in Dedza District (the NGO impact area); everywhere in the district the variety is known as "Concern".

Another thrust was that of the Ministry of Agriculture and Food Security (MoAFS), with the support from the seed certification institutions, which worked directly to support decentralised seed production by arranging official certification of seed produced locally by smallholder farmers. The approach helped farmers venture into bean seed multiplication of quite high quality seed as part of their larger development/business strategy. However, some observers suggest this type of initiative was localised, leaving out the wider population (Bezner et al. 2007). In the early 2000s, the MNBP, in collaboration with CIAT, introduced new bean varieties to smallholder farmers using a small pack delivery model (bags of 100g, 250g, and 500g), selling bean seed through rural outlets (agro-dealers, churches, grocery stores) across major bean growing areas in Malawi. This was one-off seasonal exercise but it increased access to bean seed by farmers. However, continuous delivery of seed of farmer-preferred bean varieties did not materialise through this work; possibly due to the limited involvement of private seed suppliers, for example, seed companies and individual entrepreneurs to sustain the supply (Phiri et al. 2000).

Other approaches used in Malawi to help farmers access improved bean varieties have been described by Phiri et al. (2000), Chirwa et al. (2006), and Scott et al. (2003). For instance, since 2000–01, the MoAFS and NGOs have facilitated supply of seed to beneficiaries through its Targeted Farm Inputs Programme (TFIP). The merits of this subsidy programme, which distributes vouchers to farmers to buy seed at reduced cost from agro-dealers, have long been debated (Xu et al. 2009). As punctual aid, farmers do get new varieties and good quality seed but the delivery mechanism is unsustainable. Constraints associated with distribution of seed through subsidy programmes are two-fold: the government assumes a strong financial burden and the private seed sector are simply crowded out from important business opportunities.

In theory, the stimulation of the private sector, rather than continuous subsidised seed supply, could lay a foundation for more sustainable seed systems in Malawi and also help lessen the disadvantages associated with the input subsidy programmes, including the promoting of farmer dependency (Xu et al. 2009). One challenge has been to find an appropriate seed company that has a countrywide representation and in which the public sector has trust. Another challenge has revolved around defining the approach of collaboration: i.e. how to catalyse an ongoing process which allows public and private concerns and interests to be voiced and negotiated. In 2006, DARS in collaboration with the CIAT-PABRA conducted a bean variety exhibition and field day at Chitedze Research Station (CRS). Several robust local and multinational seed companies attended. However, only one of them, Demeter Agriculture Limited (DAL), was interested in producing bean seed. The company was mainly interested in the sugar bean type, targeting a variety known as Kholophethe (SUG 131) which is suitable for regional markets, specifically the South African market.

The potential private sector collaborator: Demeter Agriculture Limited (DAL) and steps in partnership building

DAL is a group of companies engaged in agro-input business, particularly fertilisers and maize seeds, as well as agricultural commodity trade including the export of sugar beans to South Africa. The company has an 800 ha farm with modern irrigation facilities in the southern part of Malawi along the Shire River. The company also has 120 rural-based shops operating across Malawian under the

two brands: Farmers' World in the central and northern regions of Malawi; and Agora in the southern region of Malawi. In addition to agro-inputs sale and farm produce purchase; these rural shops sell other household consumable items such as sugar, salt, cooking oil/fat, etc. Thus the shops are often visited by farmers buying both agro-inputs and household items as well as selling their farm produce. Shops are manned by managers and their assistants, the majority of whom do not have any agricultural professional background.

The actual partnership building between MNBP of the DARS and DAL did not happen naturally: the public-private collaboration was actively brokered through a six-step process (summarised in Figure 1).

The six-step process in catalysing and sustaining the public-private collaboration for producing and delivering improved bean seed is presented in greater detail below.

Step 1: Creating public awareness of released varieties. The first step involved informing the public about the existence of new improved bean varieties through open house events aiming at displaying and exposing the released varieties to interested (existing and potential) stakeholders. A field day and seed exhibition of released varieties were organised by DARS/MNBP and CIAT-PABRA who brought together different stakeholders, including agricultural research organisations, extension services and government departments, NGOs, the private sector involved in agricultural inputs and outputs (traders), and farmers. Based on seed producers' interests and their specific bean market targets, partners selected preferred varieties for multiplication.

Step 2: Building partnerships to scale up supply. This involved selecting, building, and sustaining partnerships for production of seed at a wider scale of supply. A key consideration was engaging partners with shared interests and commitments: information had to flow freely and seed had to be made readily available to many. In Malawi, DAL expressed an interest to partner with DARS/CIAT-PABRA in the seed multiplication and supply of bean seed countrywide.

Step 3: Making basic seed of preferred varieties available to DAL and support services. The focus in this step was around basic seed of improved bean varieties and rendering it available to identified seed suppliers. Private seed companies were supplied with basic seed for production of other seed grades. During the production period, there were frequent interactions, skills, and knowledge enhancement and sharing on bean seed production between researchers (DARS, CIAT/PABRA breeders and seed system specialists) and private seed company (DAL) staff and management. The interactions among bean value chain actors (seed suppliers, grain traders, extension, researchers, and policy-makers) were also enhanced through a national platform chaired by DAL. The platform provides an ongoing opportunity to exchange information and knowledge, with the interactions also helping seed entrepreneurs identify new seed business opportunities and broaden their client base.

Step 4: Scheduling activities around seed production, variety promotion and seed distribution to a larger community for planting. The widening supply of seed needed to be disseminated to end users in close proximity, on time, and in an appropriate seed pack sizes. This responsibility remained with the seed producer who, in collaboration with MNBP and CIAT-PABRA, organised half-day training sessions for shop managers and their assistants on improved bean production techniques (variety traits and production requirement) so as to be able to guide farmers when needed. At this stage, with advice from the MNBP and CIAT-PABRA, DAL also provided a production guide (on bean agronomy and post-harvest management) to farmers along with the seeds. Further, the company mounted a multimedia campaign to inform farmers and extension service providers about the bean seed availability in the local input shops and also about the characteristics of the bean varieties supplied. The original idea was to supply seeds through the DAL agro-input outlets across the country. However, since the bean seeds were highly demanded by the GoM Targeted Farm Input Programme (TFIP), most of the production (95%) was moved through the subsidy operation with the rest being sold for cash in 1.5kg packs. In addition, DAL put in place several support mechanisms to maximise their sales. For instance, a bean production guide in Chichewa was printed on the pack bag and also on a sheet inserted into the seed pack. Four weeks before the planting season commenced, farmers and extension staff were informed about the seed availability in DAL shops through radio messages.

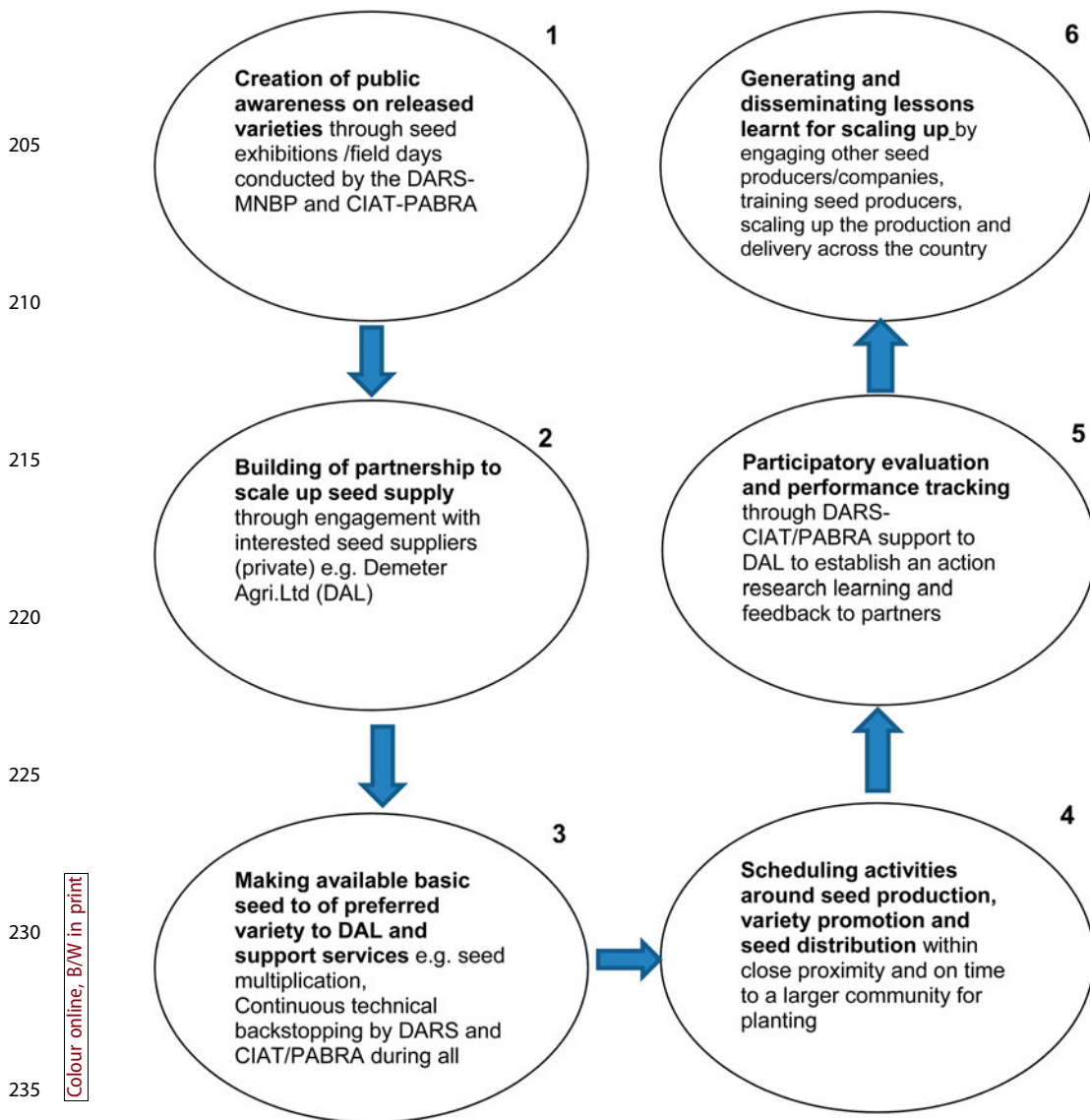


Figure 1. The key steps in developing and sustaining a public-private partnership of bean seed production and dissemination in Malawi.

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Step 5: Participatory evaluation and performance tracking. Availing seeds of released varieties in different locations across the country was a huge task, especially at the initial stage. However, the work proved to be an important opportunity to create demand for seed of improved varieties. Ex-

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post (qualitative and quantitative) evaluations to assess the effects of the seed distributions were jointly carried by DAL, MNBP, staff of the MoAFS (both local extension and national policymakers), and CIAT-PABRA. These assessments gave insights for improving subsequent operations as well as for meeting emerging demands. The evaluations were achieved through multiple interactions with stakeholders, seed suppliers, farmers, extension staff and policymakers. For instance, farmers' satisfaction was assessed based on a range of criteria, including farmers' preference for pack size, time of seed delivery, distance to seed source, overall germination, yield levels, and type and source of information, especially on markets and extension advice. The evaluations were also extended to extension

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staff at the local Extension Planning Areas (EPA) and DAL personnel, including shop and production managers. These follow-up operations helped to identify gaps and develop corrective measures where necessary.

255 *Step 6: Generating and disseminating lessons learned for scaling up.* During this last step, the experiences and lessons learnt from DAL were extended to other companies and producers. This process saw the increase in the number of bean seed producers in both Malawi and other countries. Regular interactions with seed companies were organised and feedback mechanisms were established around selected themes. The feedback mechanisms established included sharing of lessons and knowledge gained through verbal (face-to-face as well as media) and written processes. Some of
260 the key issues raised included increasing the role of private seed producers in multiplying basic seed, and expanding access to certified bean seed to more farmers (i.e. more geographic coverage in Malawi).

265 **Creation of an enabling environment for stimulating bean demand**

In 2009/10, the GoM, through donor support and encouragement, included legume seeds in their large-scale subsidy programme, the TFIP. This was a large advance as the programme previously had been focused on maize seed. The inclusion of legumes in TFIP presented an opportunity for DAL to meet two major objectives:

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- (1) Increase business opportunity by expanding to bean seed.
 - (2) Disseminate bean seed of the Kholophethe (SUG 131) for subsequent large-scale grain purchase in the future.

275 As result of regular interactions with the officials in charge of TFIP in the Ministry of Agriculture, the MNBP and CIAT became members of the National Seed Coordination Group. The group's tasks included the identification and estimation of seed demand (variety and quantity) in areas where beans were a major crop. The information was then passed on to seed suppliers.

280 Since this was the first undertaking on a wider scale, demand for beans per se (versus other legumes) was not guaranteed. Therefore, DAL had to establish information systems to inform farmers and extension service providers. For instance, four weeks prior to seed distribution to the shops, DAL broadcast radio messages about the availability of bean seeds via the two most popular stations with countrywide coverage. In addition, with help from the MNBP, DAL designed and printed posters with variety information and had these placed on shop doors and walls; or
285 posters were left with influential local leaders to prominently display within their communities. Posters which had variety photos were especially appreciated by grain traders as well as farmers. Extension staff from the local Extension Planning Area (EPA) further served as direct information conduits, alerting farmers about the seed availability and specific variety characteristics, for example, production and marketability parameters. Information about the improved bean production management such as advice on plant spacing, seed rate, land preparation, weed control, and soil fertility requirement were also included on the back of seed packs. All these measures served to stimulate demand and helped farmers make informed choices about whether the bean seed on offer
290 would meet their needs.

295 **Results**

DAL seed production and business orientation

300 From the 200kg of breeder seed which the company received from CIAT in 2006, DAL produced 394.86 and 325 tons of bean seeds in the 2009/2010 and 2010/2011 cropping seasons respectively. As business continued, the company purchased fresh breeder seed from the DARS based on variety

demand. Several interactions and backstopping visits by the MNBP took place to enhance DAL seed production and supply capacities. Subsequently, the company became a member of the Malawi bean platform, which brings together actors interested in bean value-chain activities.

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Progression in bean seed production and number of seed growers

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Though the initiative started with DAL, the quantity of bean seed produced overall steadily increased and more interestingly, the number of actors entering the bean seed production and marketing business increased. Table 2 documents the growing number of bean seed growers and their increased volumes of seed over a four-year period, 2009/10–2012/13. For seed companies, farmers' associations, individual entrepreneurs, and research entities alike, the trend has been dramatically positive. To get a clear idea of scale of the impact of the operations, Table 2 reports the amounts of bean seed supplied and sold between the 2009/10 and 2012/13 cropping seasons, and number of seed entrepreneurs who emerged. During the four-year period, seed supplied increased by 73%. Based on seed access data collected from agro-dealers (rural input shops) in four years, about 1.25 million small-scale farmers in Malawi accessed seeds of new bean varieties (1.5–2.0kg per household) representing 30% of farm households in Malawi. Moreover, as indicated in Table 2, seed companies consistently supplied the largest amount of bean seed during this period, accounting for 89.5% of the total seed supply for all varieties. This private sector engagement confirms a growing interest in bean seed commercialisation. Kholopethe (a preferred sugar bean variety) accounted for the largest proportion (84%) of seed supply, attributable to its demand at both national and export bean market.

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Seed system evaluation

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Farmers' viewpoints on some of the new delivery options were evaluated in 2010. Specifically, the farmers' views were sought on the innovation regarding the size of the seed packs. The results in Table 3 show that the majority of farmers (76.4%) were satisfied with the 1.5kg pack size. Farmers indicated that the seed was of high quality; accessed from trusted sources; packed in "risk free" sizes with agronomic advice enclosed; and that packs were made available at the nearest input outlets. Table 4 shows that the performance of Kholopethe was exceptionally good, especially in pure crop. In predominantly pure stand-dominated areas of Mzuzu and Karonga Areas Development Divisions (ADDs), it had a seed multiplication factor of 1 to 12, while it performed moderately in intercropped systems particularly with maize in Lilongwe and Kasungu ADDs. Farmers expressed their desire to have more varieties, including ones which might be adapted to intercropping systems. Farmers indicated that more varieties might also respond to their market needs and provide food at different time periods if variety maturity cycles were staggered. The desire to acquire new improved varieties was very high considering that farmers had to walk on average 7.4km to get

Table 2. Supply capacity of bean seed over four years stratified by seed producers.

Category of seed producers	2009/10		2010/11		2011/12		2012/13		Total amount of seed (tons)
	No. of growers	Tons	No. of growers	Tons	No. of growers	Tons	No. of growers	Tons	
Seed companies	1	344.8	1	450.6	9	864.2	9	632.8	2292.4
Farmers' association	2	30.0	3	25.0	5	91.6	5	79.98	146.6
Individual entrepreneurs	6	22.2	105	42.6	7	7.7	7	21.7	64.8
Research	0	0.0	0	0	0	0	4	55.6	55.6
Total	9	397.0	109	518.2	14	963.5	525	688.4	2559.4

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Sources: MNBP Annual Reports (2010, 2011, 2012).

Table 3. Farmers' satisfaction with bean seed pack across the country.

Extension Planning Area	Farmers' satisfaction with pack size (n=215)	
	No. of farmers interviewed	% of satisfied farmers
Bolero	14	100.0
355 Malomo	16	81.1
Mtunthama	6	83.3
Nasenga	20	60.0
Nsipe	16	68.8
Dwale	13	61.5
Thondwe	13	69.2
Bvumbwe	2	50.0
360 Linthipe 1	2	71.4
Mlonyeni	28	67.8
Kaluluma	17	41.1
Mayani	15	100
Linthipe	9	44.4
Lufita	7	100.0
365 Mwamkumba	12	100.0
Mhujū	6	100.0
Mbawa	19	100.0
Total (all sampled areas)	215	76.4

Source: field evaluation study 2011.

Table 4. Performance of the local varieties compared to Kholopethe (improved variety) in farmers' fields.

Amount of seed and yield (kg)	Agricultural Development Divisions (ADD)			
	Lilongwe	Kasungu	Mzuzu	Karonga
Average quantity of seed of Kholopethe planted per farmer	1.42	1.70	1.47	1.50
Quantity of grain harvested of improved bean variety	7.37	8.71	17.37*	18.00*
375 Average quantity of seed of local bean variety planted per farmer	4.77	2.94	2.62	7.04
Quantity of grain harvested of local bean variety	26.06	10.71	28.49	43.42
Multiplication ratio for Kholopethe	1:5.2	1:5.1	1:11.8	1:12
Multiplication ratio for local variety	1:5.5	1:3.6	1:10.9	6:2

Source: field evaluation study 2011.

* $p < 0.05$.

the seed of improved varieties from the DAL shop, as oppose to their average travel of only 3.2km to obtain their normal seed at local markets. The statistical difference between the distances of the two seed sources (shop and local seed/grain market) was significant ($p < 0.05$). Moving away from the TFIP, 385 60.5% of farmers interviewed indicated that they would be willing to pay for one kg of bean seed at \$US0.6 per kg (slightly above grain farm gate price at harvest time).

Discussion

390 In many African countries, the private sector involvement in seed supply has been largely limited to maize and vegetable seed (Langyintuo 2004). In Malawi, also, seed companies routinely showed little interest in commercial bean production owing to fragmented one-off demand: farmers re-sow their seeds once they get initial access to the germplasm. Across countries, diffusion of new bean varieties and bean seed multiplication have generally been left in the hands of NGOs, farmers' organisations, 395 or governmental operations (Teshale et al. 2006). Similarly, in Malawi, the MNBP has been supporting a couple of NGOs to disseminate seed of new improved bean varieties.

The uses of subsidised approaches like the TFIP have had encouraging results but such approaches have sometimes been shown to crowd out the private seed sector, for example, in Zambia (Gilbert et al. 2013). The promotion of such non-sustainable channels leaves non-targeted 400 farmers (willing buyers) with little access to seed (Mason and Ricker-Gilbert 2012). The case of Malawi might be regarded as a transitional one toward building a base for more efficient and

sustainable seed systems. Bean seed operations were subsidised but were systematically oriented toward building a foundation for the longer term, engaging a range of formal private seed multipliers (seed companies, individual seed entrepreneurs, and farmers' organisations). The step-by-step partnership building approach first helped the commercial sector to realise the good existing potential bean seed demand. The subsequent engagement of the private sector then confirmed commercial interest in bean seed production and allowed some of the key marketing functions to be carried out by the private sector, such as more systematic promotion of improved bean varieties through varied means, including radio advertisement and inclusion of agronomic information in the seed packs. The private sector's scaling up of the small packs approach has also ensured wider reach, greater access, and more proximity of supply to farming families. Experiences from Uganda showed that it took many years for bean varieties to reach a significant number of farmers diffusing through the grain markets alone (David and Sperling 1999). In contrast, the TFIP through a PPP arrangement in Malawi popularised the varieties and stimulated private sector involvement relatively quickly.

Looking to the future, there are some PPP areas which merit further attention, especially if investments in bean seed production are to be expanded. These areas include the need to: (1) foster open and transparent engagement with private sector, including providing it with information on new varieties so as to aid the sector in selecting varieties for specific grain markets; (2) diversify sources of basic bean seed for increased seed supply to seed companies and decentralised seed producers; (3) recognise the increasing demand by farmers and seed companies for new bean varieties and, therefore, intensify research leading to new varieties. It is worth noting that some seed companies have been triggered by this need to start their own breeding programmes; and (4) ensure continued maintenance, facilitation, and sustaining public-private relationships. This implies programmed interactions and backstopping to provide the guidance, required skills and knowledge of seed systems, and innovation process management. Also, although NGOs and local extension staff have had limited roles in producing and disseminating seed supplies, these actors are crucial in facilitating information flow on variety characteristics and use, popularising new varieties, and training farmers in bean agronomy. Engaging NGOs and extension in PPP processes is key to overall partnership success.

In all of the above, we particularly highlight access to basic seed of self-pollinated crops to private companies as one of the more challenging issues for wider seed multiplication (L. Sperling, personal communication, 2013; Tripp 2006; Tripp and Rohrbach 2001). As the seed demand increases, seed companies are seeking licence agreements for owning public bred varieties or access to breeder/foundation seed to multiply large quantities. Currently, in Malawi, the production of breeder seed is still in the hands of MNBP and it is proving to be an enormous task to satisfy the demand of breeder seed of all the varieties needed by farmers. For instance, to produce 700 tons of commercial bean seed, one requires about 50 tons of basic seed and before that, four tons of breeder seed. It is challenging for a national bean research programme to supply that amount. Therefore, it seems imperative to facilitate private companies to produce breeder seed under the supervision of the breeder and to allow such companies to multiply basic seed with support from DARS Seed Service Unit. These two initiatives have been tried with DAL in Malawi on a pilot basis with positive results. The call for access to breeder seed of public varieties by seed producers was reported in India (Tripp and Pal 2001) as a strategy to improve access to commercial maize seed.

Conclusion

In Malawi, the novel public-private partnership bean seed systems aligned to the TFIP has been crucial for building the capacity of the seed multipliers. The seed distribution by private companies through agro-inputs shops has also proved critical for countrywide rather than the localised seed dissemination. Supporting the private sector to produce and supply seed has opened opportunities for sustainable seed business; for instance, in 2011–12, DAL supplied more than 750

tonnes of bean seed through its inputs shops. Currently, more farmers are requesting bean seed than ever before.

455 In terms of tailoring delivery strategy further, several possible refinements are suggested. The pack size could be reduced further to 0.5kg, especially for newly released varieties and geared to lower income farmers and those who are interested in testing new varieties. This innovation will encourage a move away from the subsidised seed and toward a marketing strategy based on farmers' willingness to pay. Multiple market outlets for bean seed might be explored, for example, supermarkets and small groceries, as is currently done for maize seed. Radio and newspapers advertisements can further help create awareness among farmers on the availability of seed in the shops. Beyond
460 seed, information on agronomic practices might be expanded through locally-managed and partner-based demonstrations combining insight on improved varieties and complementary improved crop management (timely planting, adequate density population, and cropping systems among others). This novel programme involving PPP has shown that smallholder farmers' demand for new bean varieties is an important one. The PPP now needs to respond to that demand in increasingly impact-oriented and effective ways.

465 Finally, this PPP process has been methodical and transparent and could be repeated for other crops, particularly other legumes. The advances, however, need to be evaluated in the light of continuing challenges, especially as linked to the Malawi context. The subsidy programme has fostered some level of dependency syndrome among some farmers and this might impede the willingness of
470 some farmers to purchase bean seed outright, if not subsidised. In addition, some emerging private companies have developed their market share directly relying on subsidy programme contracts and may not welcome any reduction in bulk purchase orders. However, considering the DAL medium to long-term approach of linking the seed supply to the grain commercialisation of Kholopethe, this value chain approach will create incentives for farmers to invest in certified seed and sustain the
475 bean seed demand leading to market-led bean seed systems. Another step taken to increase the sustainability of bean supply is through farmers' sensitisation on the advantages of using certified/quality bean seed. For instance, a good number of farmers moved from growing local maize varieties and started buying certified maize every year which was initially supplied only through subsidised input programmes. Very recently, CIAT-PABRA, in partnership with seed companies, introduced the
480 use of small/affordable packs to facilitate wide market penetration and more enduring business opportunities. Further, much as PPP has increased the overall bean seed supply, complementary decentralised seed systems (owned by local seed entrepreneurs) can extend work for the micro-niche varieties that are productive but adapted to more location specific markets and regions.

485 **Acknowledgments**

The authors appreciate the productive partnerships within the Pan African Bean Research Alliance (PABRA) alliance and the Southern African Bean Research (SABRN) networks. We also express gratitude to our donors: the Government of Malawi; the Swiss Development Cooperation; the Canadian International Development Agency, the McKnight Foundation, and Bill and Melinda Gates Foundation through Tropical Legume II Project. Finally, profound thanks to all partners
490 who continue to work towards the success of a programme that can benefit all Malawian farmers: among others: The Department of Agricultural Research Services (DARS) particularly the Malawi National Bean Programme; the Demeter Agricultural Ltd; the International Centre for Tropical Agriculture (CIAT)/PABRA; and the Malawian Ministry of Agriculture and Food Security (MoAFS).

495 **Disclosure statement**

No potential conflict of interest was reported by the authors.

Notes on contributors

500 **Jean Claude Rubyogo** is a Seed System Researcher and Advisor for the Pan Africa Bean Research Alliance/International Centre for Tropical Agriculture (PABRA/CIAT), Selian Agricultural Research Institute, Arusha, Tanzania.

Ruth Magreta is an Agricultural Economist for the Pan Africa Bean Research Alliance/International Centre for Tropical Agriculture, Chitedze Research Station, Lilongwe, Malawi. <r.magreta@cgiar.org>

Dymon Kambewa is an Associate Professor of Extension Studies and Head of Extension Department for Lilongwe University of Agriculture and Natural Resources, Lilongwe, Malawi. <dkambewa@hotmail.com>

505 **Elisa Mazuma** is a Plant Pathologist and Head of Malawi National Bean Programme/Deputy Director of Agricultural Research Services, Department of Agricultural Research Services, Chitedze Agricultural Research Station, Lilongwe, Malawi. <elisamazuma@gmail.com>

Rowland M. Chirwa is a Plant Breeder and South Africa Bean Research Network (SABRN) Coordinator/International Centre for Tropical Agriculture, Chitedze Agricultural Research Station, Lilongwe, Malawi. <r.chirwa@cgiar.org>

510 **Martin Andrews** is General Manager for Demeter Agriculture Limited, Lilongwe, Malawi. <maandrews@aointl.com>

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