Getting Back to basics: Creating Impact Oriented Bean Seed Delivery System for the Poor (and 0thers) in Malawi, Mozambique and Tanzania

Annual Report 2008

For
The McKnight Foundation's
Collaborative Crop Research Program

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Executive Summary

The common bean (*Phaseolus vulgaris*) is an important crop for food/nutrition security, cash income and agro ecosystem improvement in Malawi, Mozambique and Tanzania. The national bean research programs of the three countries along with the Southern Africa Bean Research Network (SABRN) and the International Centre for Tropical Agriculture (CIAT) have developed varieties in Tanzania, Malawi and Mozambique. These varieties have potential for wider adaptation and use across agro-ecological region, suitable for various market niches. One of the limiting factors to bean crop production and productivity in these countries is limited availability of seeds of suitable bean varieties. It is important to note that preferences for varieties vary among farmers, traders and consumers, and likewise varieties vary in their adaptation to diverse environments including biotic and abiotic stress factors. This project seeks to increase bean production and productivity in Malawi, Mozambique and southern highlands of Tanzania by identifying preferred bean types and developing efficient bean seed production and delivery systems.

In the second year, strategic extension partners and scientists (48) were identified and trained in PVS in Malawi and Mozambique so that the trials can easily be assessed and evaluated for reliable interpretation of results. Training of trainers (TOT) was conducted to enhance skills in NARS of participating countries. A total of 7 scientists were trained across the countries

The national bean research programs from the three participating countries (Malawi, Mozambique and Tanzania) continued to identify and assemble potential bean varieties/lines for on-station and on-farm evaluation. Malawi maintained the bean lines/ varieties identified in 2007, while Mozambique and Tanzania made a few changes. The bean trials and demos were conducted in 115 sites across the 3 countries. A diverse group of clients: farmers, traders, local hoteliers and other consumers were exposed to released bean varieties and promising lines for stakeholders input in selection based on pre- and post-harvest traits in all the three countries. Parallel to the on-farm evaluation through participatory variety selection (PVS) trials the three countries conducted multi-location yield trials for the purposes of gathering sufficient data which is required for official variety release of crop varieties. These data will be used to supplement information from PVS trials during release process.

The results of the PVS trials in the 3 countries showed that stakeholders (farmers, traders, and consumers) had selected varieties of their choice based on the criteria that they use in different sites. The varieties varied from one site to another, but some were cross cutting. In total there were: 10 varieties in Malawi, 10 in Mozambique and 6 in southern highlands of Tanzania, which were selected.

Breeders' and foundation seed production for existing bean varieties were initiated with various stakeholders in all the 3 countries in order to ensure that seeds are made available when demanded. The following quantities were produced: 5 tones (Malawi); 3 tones (Mozambique) and 89.6 tones (southern highlands of Tanzania, of which 75 tones was certified seed).

Capacities of partners was enhanced to ensure that they were better able to carry out PVS trials and were better organized to produce and disseminate seeds of selected bean varieties. This was done through planning meetings with partners involved in PVS and bean seed production, where roles and responsibilities of each partner were agreed upon. Resource manuals were translated to avail the information in a user friendly package for wider use among the clients.

Introduction

Studies throughout the Sub-Saharan Africa region show that the bulk of farmers' bean seed is supplied through local sources—farmer saved/traded seed and local seed markets (Sperling et al., 1996, David and Sperling, 1999). Unfortunately, these local sources are often disconnected from the innovations of new bean varieties (NARS): there are few established mechanisms for facilitating farmer exposure to new materials. Recently NARS working on beans in Africa, via Pan African Bean Research Alliance (PABRA) and CIAT as catalyst, have started to foster strategic alliances so as: a) to expose farmers to more germplasm, via PVS methods and b) develop more integrated seed supply systems. These client-oriented thrusts are being developed in partnership with various NGOs, community based organizations (CBOs) farmer organizations (FOs), government related organizations and the private sector. Though fragmented to date, these efforts are slowly having results as they are giving both decentralized/farm based (local) seed producers and large seed producers access to seeds of improved varieties of their choice. CIAT's experience from a parallel program started in Ethiopia in 2004, where there has been remarkable progress, and the project achieved unusual success (Assefa, *et al.*, 2005). The key to success in Ethiopia was the development of a range of partnerships which built on organizational complementarities.

The 3 NARS (Malawi, Mozambique and Tanzania), through the Southern Africa Bean Research Network (SABRN), which is part of PABRA, have already adopted the principles of innovative research and decentralized seed systems approach, which foster strategic alliances so as: to expose farmers to more bean germplasm, through PVS and develop more integrated seed supply systems in partnership with various NGOs, CBOs, FOs, government-related organizations and private sector seed actors. However, the implementation with SABRN resources was limited and thus additional resources through this project will make a difference, and produce similar achievements to those reported in Ethiopia.

In this Project we hope to capture and combine both, the seed acquisition systems which are routinely used by farmers, as well as those seed delivery channels designed for improved germplasm innovations. The aim here is to sharpen these incipient efforts (rigorously analyzing their varied strength/weaknesses) and to consolidate them to the extent that they become independent from an outside catalyst. Specifically we are addressing problems that are based on two major thrusts:

1. What are the clients' (farmers, traders and consumers) criteria for selecting and accepting varieties of *Phaseolus* bean? The preference criteria may embrace agro-ecological, agronomic, organoleptic, socio-economic and other dimensions.
2. What are the factors which contribute to the effective and efficient production and delivery of seed of new varieties to farmers? Under this thrust, we focus on the following questions: what are the most effective and efficient ways of producing bean seed – formal vs. non-formal seed system? Which are the most efficient bean seed delivery systems -small versus large package sizes – using formal agriculture input shops and others versus non traditional outlets; clinics, schools and maize mills etc?

Progress towards achieving objectives

General Objective: To enhance common bean productivity through user-oriented germplasm selection and enhanced bean seed production and delivery systems in select areas of Malawi, Mozambique and Tanzania

Objective 1*: To identify and verify farmers' bean variety preferences in relation to diverse agro-ecological (e.g. drought and non-drought areas, presence of pests and diseases, soil fertility gradients) and socio-economic criteria (market preferences, post-harvest qualities, gender/wealth)*

Result 1.1. Technical and social capacity of partners to carry out PVS, seed systems analysis and to integrate gender and equity issues bolstered.

Activity	**Progress**
1.1.1. Identify strategic extension partners and scientists to be trained as trainers for PVS and conduct training in participatory variety selection approaches and methods to partners and NBRP scientists	Most strategic extension partners and scientists were identified in year 1 of the project and they were trained in PVS in Malawi, Mozambique and Tanzania so that the trials can easily be assessed and evaluated for reliable interpretation of results. However, Malawi and Mozambique added new partners in the second year, and these needed additional training in PVS. In each country, partner organizations (NARS, NGOs, CBOs, traders and Government Extension agents) nominated staff who participated in the training (Table1.). The topics covered included working with farmers/end users (groups); seed systems; critical features for meeting clients' needs and achieving impact; overview of PVS approaches; principles of trial design (location, layout, inputs used); management of trials; agronomic information to be collected from the trials (timing and number of evaluation within each season); formulating questions for an open-ended evaluation; participatory monitoring and evaluation procedures for community-based trials; and quantitative/qualitative data collection. **Table 1.** Number of partner organizations and trained participants in PVS, Malawi and Mozambique in 2008. **Country** | **No. Partner organisation** | **No. of participants** Malawi | 12 | 29 Mozambique | 10 | 19 a. In Malawi, the training targeted collaborating partners and scientists including farmers specifically those that did not participate in the previous training workshops. The training was facilitated by DARS and CIAT. The participating partner organizations included; World Vision CRS-CADECOM, CARE, SFLH Project of Ekwendeni Hospital, Action Aid, DAETS, DARS, SABRN, IRLADP, ILARD and Concern Universal (Figure 1).  Figure 1. Participants to PVS training course in Malawi b. In Mozambique the training for partners was conducted from November 4 - 6, 2008 in Gurue. Participants to the workshop were drawn from NGOs; government extension; and research institutions. It was a joint training workshop for partners implementing both McKnight seed delivery systems and climbing bean projects

Figure 2. Participants to PVS training course in Mozambique

Result 1.2. Preferred varieties which meet specific clients' needs identified for diverse zones

Activity	Progress
1.2.1 Implement PVS trials in multiple sites to identify/ verify potential bean lines/ varieties	National Bean Programs from the three participating countries (Malawi, Mozambique and Tanzania) assembled and increased seed of the identified potential bean varieties/lines and evaluated them both on-station and on-farm, during the rainy season as well as off-rainy season under irrigation. Malawi maintained the bean lines/varieties as identified in 2007, while Tanzania and Mozambique made a few changes. The trials were conducted at several sites in all 3 countries (Table 2).

Table 2. Number of bean lines/varieties, sites, districts and partners in the three countries, that implemented PVS in 2008

Country	varieties	No of sites	No of districts	Partners
Malawi	20	22	10	12
Mozambique	20	16	7	10
Tanzania	30*	77	14	31

*10 lines per site except Mbeya Rural which had 12 lines and the varieties varied from one site to another although some varieties were common across sites.

a. In Malawi, the identified bean germplasm were multiplied in dry season using irrigation facility at Kandiyani and Kasinthula sites. A total of 213 kg of seed for all the varieties was produced at Chitedze. The realised bean seed was used in PVS across the country. The PVS results are presented in Table 3. The results showed that there were some varieties (MC12832-8; VTTT 925/11-7; MR1358-8; VTTT 924/4-4; and VTTT 924/17-2) that yielded more than the released varieties (UBR 92-25 and Kholophethe). This suggested that there were some potential varieties that farmers could benefit from should they adopt these varieties.

b. However, farmers' choice of preferred varieties did not necessarily match the ranking based on the yield performance of the varieties. Farmers' choice was based on other criteria in addition to grain yield performance, and these included early maturity and other desirable characteristics. Varieties such as NUA 59 and NUA 45 were among the farmer selected bean varieties though they were not among the top 5 high yielding varieties (Table 3). Only 2 varieties, VTTT925/11-4 and VTTT924/4-4 among the farmers' selected varieties were also among the top 5 high yielding bean varieties.

Table 3. Average performance of bean genotypes across six on-farm sites in Malawi, 2008.

Variety	Grain Yield (kg ha^{-1})	Positive ribbons[†]	Negative ribbons[‡]
MC 12832-8	1100	5	3
VTTT925/11-7	1099	6	2
VTTT924/4-4	1053	6	3
MR 13508-8	980	0	5
VTTT924/17-2	976	5	3
UBR (92) 25	914	4	6
PAN 150	885	2	6
KHOLOPHETHE	807	4	2
NUA 59	772	10	1
CIM 9422-2	767	5	1
MC 12832-9	741	0	6
SSDT 55-C2	723	0	4
VTTT924/2-4-2-1	694	3	3
NUA 35	654	6	3
ECAB 07	637	0	6
NUA 45	601	7	1
BOA 5-8/13	532	1	2
VTTT926/9-4	472	0	6
LOCAL	457	4	1
NUA 56	375	6	4
Mean	762	3.5	3.4
CV %	51	85	70
SE +/-	216	1.5***	1.20**

c. In Mozambique, bean varieties of different market classes, including both released and promising ones, were tested in both old and new sites in Tete, Zambezia and Niassa provinces (Table 4).

Table 4: Bean varieties used in PVS trials in Mozambique, 2008

Bean varieties	Bean variety
VTTT 923/10-3	CIM-SUG02 21 LN 04
A 222	Sugar 131
BM 12722-126	AFR 703
PC 1459 BC2-RR9	G 20939
CAL 143	CIM-SUG02-12 LN 01
VTTT 925/9-1-2	ZEBRA
JESCA	CIM-SUG02 41 LN 02
Encarnado	CIM-SUG02 32 LN 02

The results showed that a few sites (Molumbo, Murrimo, Brigada, Ruace, Mualijane and Chinkumba) were affected by the early cessation of rains, resulting in drought stress, and reduced mean yields of the bean crop (site means of less than 1000 kg ha^{-1}). Only two sites (Mutequelesse and Niusse) had meaningful grain yields above 1000 kg ha^{-1}. The top 4 varieties which had grain yield above one of the control varieties CAL143 were: VTTT 923/10-3, A 222, BM 12722-126, PC 1459 BC2-RR9, with mean yields above 1000 kg ha^{-1}. However, farmers had their own selected varieties, not necessarily based on grain yield. These were: AFR 703, CAL 143, SUGAR 131, VTTT 925/9-1-2, VTTT 923/10-3, PC 1459 BC2-RR9, BM 12722-126 VEF 2000-300, G 20939. There were only 2 varieties which appeared among the list of top yielding varieties as well as on the farmers' selected varieties: VTTT 923/10-3, and BM 12722-126.

d. In Tanzania, different sets of bean varieties were planted in different districts although there were common check varieties in all sites (Table 6). Njano was one of the varieties that appeared in all the sites.

The performance of these varieties varied from site to site. Yield data were analysed by district. This report discusses data from only 1 of the 14 districts, which serves as an example for the data from Tanzania. The results showed that the bean varieties were not significantly different from each other in terms of grain yield (Table 7). Eight varieties performed better than the released Uyole 04. CAL 05 E5 had the highest mean grain yield (2775 kg ha^{-1}). Uyole 04 and Njano Uyole were the most preferred varieties by farmers although they were not among the best in terms of grain yield. Nevertheless some of the new high yielding bean varieties were also among the list of farmers' preferred bean varieties, like CAL 05 E5, CAL 05 E3, and ROBA1. ROBA1 is already targeted for variety release in southern highlands of Tanzania, and Njano-Uyole is a released variety, so it can immediately go into wide dissemination of the bean varieties.

Table 5. Performance of bean varieties tested under PVS across locations in Mozambique, 2008

Variety	Grain yield (kg/ha)								
	Cincumba	Niusse	Ruace	Murrimo	Mualijane	Molumbo	Mutequelesse	Brigada	Mean
VTTT 923/10-3	1530	1470	1120	960	1230	630	1350	600	**1111**
A 222	750	1230	1300	990	1120	840	1650	690	**1071**
BM 12722-126	750	1440	1340	960	820	450	1720	690	**1021**
PC 1459 BC2-RR9	750	1560	1344	660	1140	540	1350	690	**1004**
CAL 143	1500	1230	1020	750	1060	540	1200	690	**999**
VTTT 925/9-1-2	830	1170	1080	820	990	720	1290	720	**953**
JESCA	960	870	1038	690	820	360	1720	990	**931**
Encarnado	1170	1050	504	720	960	540	1440	960	**918**
CIM-SUG02 21 LN 04	750	1080	762	450	720	660	1720	870	**877**

Sugar 131	1500	1480	700	390	840	390	1020	690	**876**
AFR 703	830	1050	894	660	700	960	960	820	**859**
G 20939	750	840	1488	840	1020	780	690	360	**846**
CIM-SUG02-12 LN 01	750	1350	714	440	720	520	1500	600	**824**
ZEBRA	1430	840	760	520	630	480	1050	540	**781**
CIM-SUG02 41 LN 02	744	750	840	540	960	460	1170	660	**766**
CIM-SUG02 32 LN 02	870	570	516	300	880	580	1420	750	**736**
Mean	**992**	**1124**	**964**	**668**	**913**	**591**	**1328**	**708**	
SE +/-	317	294	302	214	175	166	303	155	

The sites were significantly different from each other in the average grain yield performance. One site that did very well was Kasense and the relatively poor site was Malangano, which had an average grain yield that was below the site mean of 2000 kg ha^{-1} (Table 8).

Table 6. Distribution of PVS trials across the Southern Highlands of Tanzania, 2008.

Region	Districts	No of villages	Varieties introduced and evaluated through PVS
Mbeya	Mbarali	3	Njano; BILFA 4; EAI L 110; Roba 1; NRI Sel E9(E3 Prelim1); NRI Sel E 27; Wanja; PBAYT 07 E 15; Uyole 98; PBAYT 07 E 1; PBAYT 07 E 24 (P124) and Kablanketi (Local)
	Mbozi	13	Cal 05 P 213, Njano, NRI 05 E 13; LW RH E6 (07); Cal E 3 07; NRI Sel 06 E 9; Cal 05 E 9; Cal1 07 E21; LW 07 E 3; Roba1; Check (local)
	Mbeya Urban And Rural	9	Njano; BILFA 4; EAI L 110; Roba 1; NRI Sel E9(E3 Prelim1); NRI Sel E 27; Wanja; PBAYT 07 E 15; Uyole 98; PBAYT 07 E 1; PBAYT 07 E 24 (P124) and Kablanketi (Local)
	Chunya	7	Cal 05 E5; Njano; NRI Sel E9 (Red); Uyole 04; Cal 05 P213; NRI Or/BR; Cal 05 E 9; Cal 05 E 10; EAI L110; Roba 1 and check (L)
	Rungwe	10	Cal 05 E5; Njano; NRI Sel E9 (Red); Uyole 04; Cal 05 P213; NRI Or/BR; Cal 05 E 9; Cal 05 E 10; EAI L110; Roba 1 and check (L)
		12	On-farm seed multiplication under district council with technical back stopping from ARI Uyole Uyole 03, Wanja, Uyole 04 and Uyole 96
Iringa	Iringa Rural, Mufindi And Njombe	17	Cal 05 P 321; Njano; NRI 06 E13; OR/BR; Cal 05 E 3; Uyole 04; Cal 05 E 5; Cal 05 E 10; (EAI2525xChip)/ Sinon L 110; Roba 1
	Kilolo	10	NRI 05 E 27; Njano; Urafiki; BILFA 4; Wanja; Uyole 04; BILFA-Uyole; Cal 05 E 10; NRI 06 Prelim 1 (Red E 9); Roba 1
Ruvuma and Rukwa	Songea Sumbawanga Urban & Rural and Nkansi	26	Uyole 98; Njano; Uyole 04, Uyole 96; Wanja, Cal 05 E9; Uyole 94; Bilfa 4; Roba 1, Urafiki

Table 7: Average performance of bean varieties across 5 village in Rukwa district, Tanzania in 2008

Varieties	Grain yield kg ha^{-1}	Market	Preference	Maturity
		(1-5 scale)	(1-5 scale)	(1-5 scale)
CAL 05 E5	2775	1	1	2
CAL 05 E3	2292	1	1	2
ROBA1	**2292**	**2**	**3**	**3**
Njano-Uyole	**1924**	**2**	**1**	**1**
EAI L110	1850	2	2	1
CAL 05 P213	1833	1	1	2
CAL 05 E9	**1800**	**1**	**1**	**2**
Uyole 04	1716	2	1	1
NRI OR/BR	1667	2	3	2
NRI 07 E 13	1617	1	3	2
Means	2058	1.5	1.7	-
CV%	37.3	39.9	24.3	-
P (varieties)	NS	NS	***	-

Table 8. Average bean grain yield (kg ha^{-1}) at each test site in Rukwa region, Tanzania in 2008

Sites (Villages)	Grain yield kg ha^{-1}
Kasense	3150
Kitete (Laela)	1842
Ipanda Namanyele	1833
Mpembano	1833
Malangano	1583
Means	2058
P (sites)	***

1.2.2 Select bean varieties based on men and women farmers, traders and researchers' criteria

From the bean PVS trials described in the foregoing section above, diverse groups of clients: farmers, traders, local hoteliers and other consumers were involved in the selection of bean varieties based on their selection criteria for pre- and post-harvest traits. Table 9 summarises the number of varieties selected in the first and second year of the evaluations in the three countries.

From Table 9 it is clear that stakeholders in Malawi and Mozambique had added more varieties in year 2 to the selected list of varieties they had in year 1, making a total of 10 varieties in Malawi and 7 in Mozambique. On the other hand, in Tanzania, the numbers were reduced from 10 varieties in year 1 to 6 in year 2, dropping out some varieties

which did not meet some of the selection criteria. Some of the selection criteria are described in detail below:

Table 9 Varieties selected across the sites in Malawi, Mozambique and Tanzania in 2007 and 2008

Country	Varieties tested	Varieties selected across all sites	
		2007	2008
Malawi	20	5	10
Mozambique	16	5	7
Tanzania	30	10	6

a. In Malawi the client's selection criteria included: disease resistance, resistance to drought, tolerance to low soil fertility, early maturing, good leaf texture for vegetable, good grain colour, large seed size, high yield, and marketability. Based on these criteria, 10 varieties were selected. Table 10 below, shows the list of the most frequent selected bean varieties from a sample of 6 sites. NUA35 was the most frequent selected variety, in 5 out of 6 sites, while PAN150 and MC12832-8 were selected in 2 out of 6 sites.

Table 10. Frequently selected bean varieties across selected sites in Malawi, 2008

Variety	Sites preferring the variety
NUA 35	5
NUA 56	4
NUA 45	4
NUA 59	4
CIM 9422-2	4
VTTT 924/17-2	4
VTTT 925/11-7	3
VTTT 924/4-4	3
PAN 150	2
MC 12832-8	2

b. In Mozambique the clients had a shorter list of selection criteria compared to Malawi. These included grain size (large seeded is preferred), marketability, high yielding and earliness. Almost all these selection criteria were covered in Malawi.

c. In Tanzania the clients had the following selection criteria: plant population per unit area, germination percentage, period to flowering, quantity of leaves, disease resistance, tolerance insect pest damage, pod load, grain yield, grain colour, seed size, market preference, fast to cook, palatability and broth quality

Linking PVS and on-farm seed production

In Malawi farmers in all sites have been bulking seed of preferred varieties, for example, Kaluluma in Kasungu a farmer group under the supervision of a government extension agent, were increasing the selected varieties since 2007. They started with 20 varieties, each with 82 seeds but by 2008 they had produced 120 kg of assorted varieties, and started to share seed to 4 other communities in the same quantities (82 seeds of each

	variety) as they had received. In Mozambique, foundation seed is being produced in Mutequelesse and Nintulo, in Gurue, under irrigation. Farmers' Associations and individual farmers of Gurue, Angonia and Tsangano are involved in the production of certified and quality declared seed. A total of 4 associations with 93 members and 13 individual farmers were involved as follows: • Alto Molocue: 20 kg of Sugar 131; • Gurue: 55 kg of Sugar 131 (Nintulo – 30 kg and Ewarelo – 25 kg); • Malema: 10 kg of PAN 148; • Gurue (Nintulo): 26 kg of PAN 148; • Gurue (Nintulo): 40 kg of VTTT 925/9-1-2; • Angonia (Kanhanja): 60 kg of Sugar 131; • Milange (Sede): 40 kg of PC 1459 BC2-RR9 In Tanzania, every site (village) was given 2 kg, in addition some selected farmer groups and individuals had planted larger plots: a) Ilembo Peasant Group in Mbozi district planted Uyole 04 and Njano on 4.5 ha, b) J Mwampashi's Ivwanga Group, in Mbozi district planted Uyole 96 on 2.5 ha; and c) a farmer in Kilolo district produced seeds on 2 ha.  **Figure 3**. On-farm seed multiplication by a group of farmers in Tanzania
1.2.3 Conduct multi location yield trials for variety release of client oriented bean lines/ varieties	All national programs in the three countries embarked on on-station bean evaluation trials of client oriented bean genotypes. The main objective was to collect concise data that can be used to supplement information from PVS trials during the variety release procedures. a. In Malawi the trails were located at 3 agricultural research stations namely Chitedze, Bvumbwe and Nchenachena. The trial at Bvumbwe Research Station was damaged by bean stem maggot. These trials were similar to the PVS trials sited across the country. The results are presented in Table 11 for Chitedze and Nchenachena. The results at Chitedze show that the bean varieties did not significantly differ (P>0.05) from each other in term of mean grain yield per hectare. However, there were some varieties (7

varieties) that out yielded the recommended varieties (Kholophethe and UBR (92) 25). At Nchenachena bean varieties performed differently (P<0.001) with 4 varieties out yielding the released variety UBR (92) 25. The bean yields at Nchenachena are very low because the trial was planted late.

These results do not reflect the preference made by farmers in participatory variety selection. The performance of the varieties at each site was different. One variety could do well at Chitedze and not at Nchenachena. This suggests that varieties could do well at a specific site.

Table 11. Performance of bean varieties on mean grain yield evaluated at Chitedze and Nchenachena research stations in the 2007/08 season

Chitedze	
Variety	Mean yield (Kg ha^{-1})
MC 12832-129-8	959.7
PAN 150	937.5
MR13508-6	780.1
VTTT924/4-4	752.3
VTTT925/11-7	705.5
CIM 9422-2	700.9
VTTT 924/17-2	653.7
UBR (92) 25	648.1
NUA 59	571.8
NUA 35	547.7
SDDT 55-C2	544.0
ECAB 07	544.0
MC 12832-129-9	514.4
VTTT 924/2-4-2-1	509.3
NUA 45	506.9
KHOLOPHETHE	497.7
LOCAL	463.0
BOA 5-8/13	405.1
NUA 56	333.3
VTTT924/9-4	319.4
Mean	594.7
CV%	38.8
SE $\pm$	133.1
Sign.	NS

Nchenachena	
Variety	Mean yield (Kg ha^{-1})
SDDT 55-C2	593.8
ECAB 07	479.2
MC12832-129-9	366.7
MR13508-6	341.0
UBR(92)25	309.0
VTTT924/17-2	273.6
BOA 5-8/13	265.3
PAN 150	260.4
VTTT924/4-4	218.8
NUA 45	215.3
NUA 59	187.5
KHOLOPHETHE	176.4
CIM 9422-2	171.5
NUA 35	163.2
MC 12832-129-8	162.1
VTTT925/11-7	143.1
LOCAL	111.1
VTTT924/2-4-2-1	28.5
NUA 56	24.3
PAN 116	0.0
Mean	224.5
CV%	42.79
SE +	67.9
Sign	***

b. In Mozambique, promising lines from different trials were assembled into one set and conducted at Umbeluzi, Chokwe, Gurue and Lichinga research stations. At Umbeluzi, Chokwe and Gurue, the trial was conducted under irrigation and at Lichinga under rainfed. The experimental design was randomized complete block design with four replications. The plot size was four rows of 5 m long. In all plots, 200 kg/ha of the compound 12 24 12 was applied as a basal fertilizer, plus 30 kg/ha of N as side dressing, 22 days after emergence. Before planting, the seed was treated with endosulfun, to protect against bean-fly. The harvest was done in the two central rows of 5 meters long. The results are presented in Table 12. VTTT 923/10-3 performed very well in all locations.

Table 12. Performance of varieties in different ago-ecologies of Mozambique. Cropping season 2007/8.

Variety	Umbeluzi	Chokwe	Gurue	Lichinga
AFR 703	3240	3025	2125	1540
A 222	3130	2320	2540	1870
CAL 143	3120	3540	2520	1960
PC 1459 BC2-RR9	3750	3950	2210	980
Sugar 131	2970	3210	2430	1490
VTTT 925/9-1-2	2505	3850	2490	1150
VTTT 923/10-3	3120	4020	3000	1540
Zebra	1540	2430	1390	850
PAN 148	2850	3055	2090	1300
Magnu	2320	2530	1980	1100
G 20939	3020	3350	2480	990
Encarnado	2380	2130	1860	870
NUA 45	3210	3325	2450	1750
Ayenew	2125	2845	1860	1320
K 131	2545	3010	1210	1170
NUA 43	3030	2530	1760	1430
BM 12722-126-VEF-	3760	3520	2420	1745
PAN 116	2980	3350	2055	985
PAN 118	3045	3450	1980	1650
Manteiga	2450	2630	1550	1090
Media	2855	3104	2120	1339
LSD0.05	324	293	395	425
C.V. (%)	16.2	15.2	18.1	21.3

c. In Tanzania, multi-location evaluations of 16 bean genotypes were conducted at Uyole (Uyo), Mbimba (Mba), Mitalula (Mita), Nkundi (Nku), Ismani (Ism) and Seatodale (Seat) research stations. At all sites there were significant differences among the bean genotypes on bean seed yield.

Table 13. Performance (Mean yield (kg ha^{-1}) of 16 bean genotypes evaluated in preliminary bean uniformity cultivar trials (PBUCT) at 6 sites research stations in southern highlands of Tanzania in the 2008 season

Variety	Uyo	Mba	Mita	Nku	Ism	Seato	Mean
E6PBUCT 05	**3828**	**1580**	**2625**	**1020**	**1528**	**3079**	**2277**
NRI sel P220	**3550**	**1943**	**2320**	**1090**	**1603**	**2867**	**2229**
E1 CAL 05	**3653**	**1560**	**2608**	**1298**	**1728**	**2475**	**2220**
PRELII 05 E1	3768	1508	2313	790	1755	2973	2185
E 10 CAL 05	**3470**	**1690**	**2405**	**880**	**1788**	**2872**	**2184**
E9 CAL 05	**3640**	**1578**	**2433**	**1075**	**1428**	**2624**	**2130**
E4 CAL 05	**3508**	**1628**	**2335**	**1318**	**1158**	**2769**	**2119**

Njano-Uyole	**3473**	**1690**	**2493**	**898**	**1503**	**2463**	**2087**
NUA 45	3555	1478	2665	1163	1158	2228	2041
Roba 1	**2950**	**1278**	**2360**	**825**	**1713**	**2593**	**1953**
NRI Sel No12	3140	1220	2453	835	1458	1907	1836
VTTT924/2-4-2-1	3132	1143	2045	758	1415	2378	1812
NRI cr No 19	3173	1115	2255	1055	1258	1825	1780
NRI sel No 25	2750	1228	2228	950	1078	1948	1754
NRI cr No 15	2890	1033	1710	905	1643	2062	1707
NRI Sel No 22	2368	1530	2023	950	1375	1539	1627
Means	3290	1460	2330	990	1475	2413	1993
CV%	8.3	9.3	15.3	27.8	28.2	13.3	
P	***	***	*	*	*	***	

1.2.4 Analyze results to highlight bean variety preferences and selection criteria by stakeholders

The clients' (farmers, traders and consumers) criteria for selecting and accepting bean varieties were established in all countries. The preferred criteria included agronomic, organoleptic and socio-economic. There were variations in selection criteria based on gender. Figure 4 presents women selection criteria in Malawi across the sites where PVS was conducted. The majority (42.9%) selected bean varieties based on market potential followed by short cooking time. The other most important criteria were high yielding, early maturing and taste.

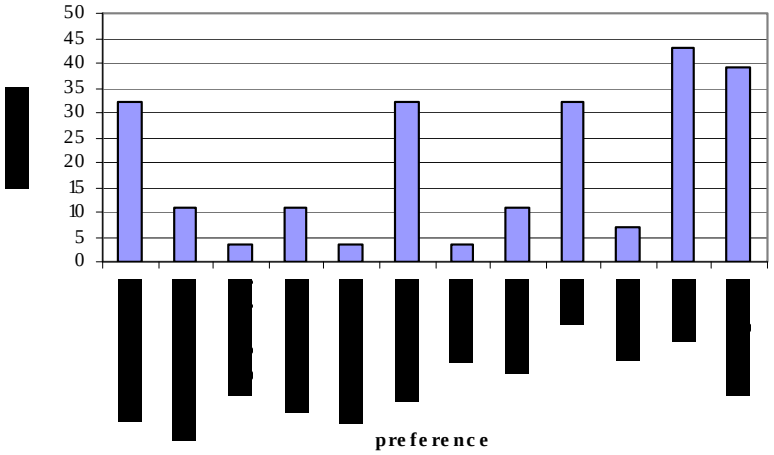

Figure 4. Commonly used criteria for selecting most preferred bean varieties by women

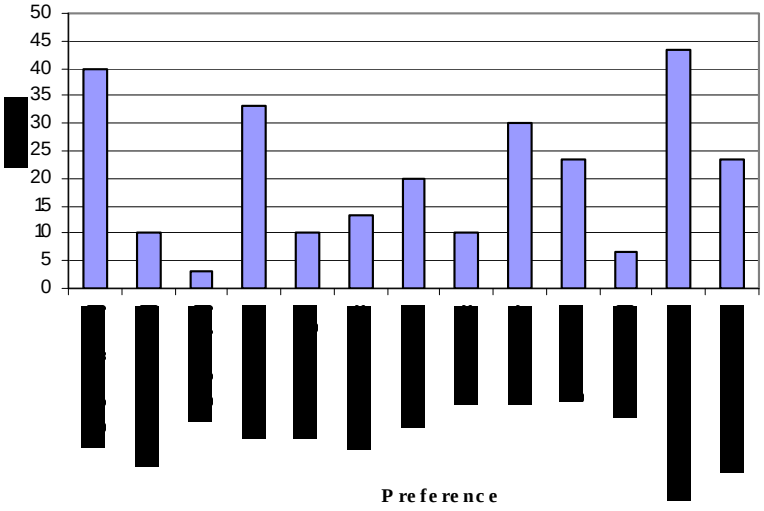

Figure 5. Commonly used criteria for selecting most preferred bean varieties by men

In Mozambique the selection criteria is presented in Table 14, as an example for clients'remarks for selecting one of the new bean varieties, VTTT925/10-3. Men and women had different selection criteria, although both groups had high grain yield as one on the criterion. Men wanted bean genotypes that had acceptable colour for markets and resistant to drought. While women liked those varieties that were early maturing – for food security (Table 14).

Table 14 Gender based genotype selection criteria in Mozambique

Variety	Male	Female:	Selection criteria
VTTT925/10-3	15	10	Male • High yielding – lots of pods • Acceptable color – linked to markets • Resistance to drought
			Female • High yield – well filled pods • Early maturing (shorten hunger periods

In Tanzania, the criteria used were linked to market suitability and acceptability. Taste and cooking time was also considered as one of the most important criteria for the bean genotype to be selected (Table 15). Farmers were among other criteria interested in early maturity, drought tolerance, diseases and insect pest tolerance. Cooking ability, palatability, grain yield and palatable leaves were important factors.

Table 15 Selection criteria of preferred genotypes during second year of PVS in Tanzania

Varieties	Selection criteria
Cal 05 P213, Cal 07 E 2, Cal 05 E 9, NRI Sel 06 E9 (Red), EAI Cross L110	• Market classes
Roba 1, Uyole 04 and BILFA 4	• Good for consumption

Objective 2*: To develop impact-oriented bean seed production and delivery systems geared to delivering a range of products to a range of users. Ability to scale 'up', to scale out geographically, and to reach marginal user groups will be particularly a key*

Result 2.1	Foundation seed of preferred bean varieties availed in increased amounts
Activity	Progress
2.1.1 Bulk up foundation seeds of client oriented bean varieties for decentralized seed systems	All national programs in the three countries embarked on seed increase of client oriented genotypes. This was done both on station and on farm (Table 16). These included released varieties and promising ones.

Table 16. Number of varieties and amount produced in each country

Country	No of varieties	Amount produced
Malawi	13	5 tones
Mozambique	8	3 tones
Tanzania	12	13.6 tones

		14 promising lines	1.0 tones
		7 varieties certified seed ARI - Uyole	75 tones

Result 2.2	Impact oriented and sustainable bean seed production and delivery systems developed
Activity	Progress
2.2.1 Assess seed quality from varied production options	Studies to assess bean seed quality from varied production options were initiated in Malawi and Mozambique In Malawi, bean seed quality survey was conducted targeting bean seed producers, farmers bean producers, extension personnel, NGOs involved in bean production and markets where beans are sold. Questionnaires and check lists were developed and administered to bean traders, farmers, extension personnel, and research. Bean seed samples were collected from various categories; markets, farmers' own seed and seed banks. Seed purity, seed health and germination standards are yet to be established from the seed samples collected. In Mozambique, the assessment of seed quality was initiated looking at the following parameters: seed production models (Individual seed producers, Farmers' group and Seed companies) and the risks involved in terms of seed quality.
2.2.2 a Compare different seed production options and delivery systems	This activity has been carried forward to third year when more farmers will start to produce seed using various options
2.2.2 b complete inventory of existing seed systems, diffusion channels and acquisition means in Mozambique	Baseline survey was conducted to take an inventory and analyse the existing seed systems in project areas in Mozambique. A total of 150 farmers and 8 partner organisations were sampled and data was collected. The highlights from the study were revealed as follows: a) The middle class farmers were ranked the best to multiply and disseminate seeds because they had adequate resources (capital, labor, land) and the majority (61%) had the capacity to supply seed to other farmers using affordable means. b) The poor'- had limited capacity to produce and disseminate seed because of poor crop management practices; they traded labor for cash; and often consumed seed. c) The rich - had the capacity to produce seed but dissemination to the poor was limited because they were out of reach as they preferred distant markets which fetched higher prices. Free farmer –to farmer seed distribution, in small quantities, accounted for the largest proportion (72.7%) in dissemination of improved bean varieties The other means were cash (sales at local markets); credit (both cash and in kind); and seed exchange in kind (Fig 6).

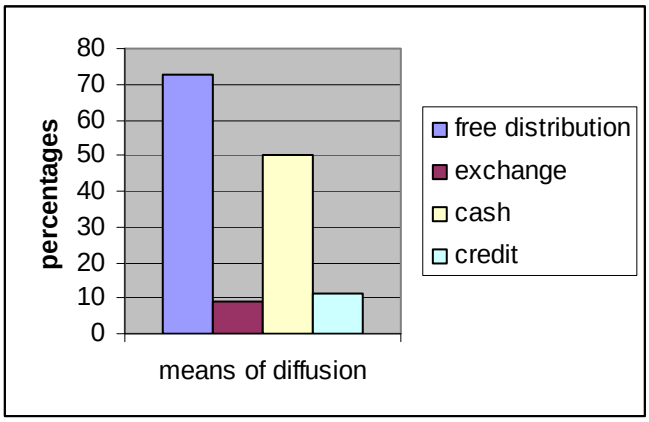

Figure 6. Means of diffusion of improved seed

It was revealed that the majority of farmers (70.2%) find it difficult to access seed of improved varieties not only because the majority are cash constrained to buy from the market but also distant; and limited sources; and lack of knowledge about improved varieties . These are critical features which the project is making efforts to address by exposing promising and released bean lines in multiple sites and to a wide range of clients.

The majority of farmers (61.0%) acquired seed of improved varieties from recycled seed from previous harvest and (60.0%) cash (local traders). The other sources were other farmers (free or cash), non governmental organisations, and research. The contribution of seed companies to the supply of improved seed was very minimal because of limited coverage.

To improve dissemination of improved bean varieties, the majority of farmers (32.4%) suggested establishment of decentralized demonstration plots (high yielding improved varieties) in the groups. The other means to fast track the dissemination of improved varieties included; provision of seed on credit to their groups/clubs for multiplication (increased amount of initial seed provided); establishment of seed banks in the communities; and training in seed production.

The project builds on these critical issues and combine both, the seed acquisition systems which are routinely used by farmers, as well as those seed delivery channels designed for improved germplasm innovations to enhanced impact oriented bean seed production and delivery systems in Mozambique

Objective 3*: To enhance skills and knowledge of partners*

Result 3.1	Project experiences (failures and success) in PVS and seed systems documented for wider use and replication
Activity	Progress
3.1.1 Project review and planning meetings to reflect on activities with partners/ their representatives	Planning and review meetings to reflect on activities were done both in country (involving the national bean programs with partners/ their representatives) and across countries (involving national bean program coordinators and CIAT). Across the countries, national bean program coordinators; Malawi, Mozambique, Tanzania; and CIAT-SABRN convened in Malawi (May 2008), to review project objectives, outcome, outputs and milestones; brainstorm and agree on research

	questions; have updates on progress reports towards activities – outputs and outcomes, (Fig 7).  **Figure 7.** Participants to the planning meeting In Malawi, a planning meeting was conducted with partners to review progress of the PVS and draw plans of action for the 2008/09 summer season for seed multiplication of the selected varieties. Partner organisations preferred to develop own nurseries for seed increase of the preferred varieties. In Mozambique. One-day meeting was organized in Gurue with partners to evaluate the progress of the project and discuss ways forward. 10 participants of (IIAM, IKURO, World Vision, Agroquimicos, SDAE-Gurue, SDAE-Alto Molocue, and One Individual farmer from Malema attended the meeting. The major topics included variety development and release, seed production, marketing and information system. Emerging issues included, making available a range of varieties for farmers and the seed for their production. Market information on the varieties and opportunities about bean need to be improved. The meeting recommended IKURO to lead the bean market and work closely with World Vision. IIAM was requested to create and make available the data base for the bean sub-sector.
Result 3.2	PVS and seed production resource manuals made available fro wide use in the communities.
Activity	Progress
3.2.1 Translate some selected resource manuals to local languages.	Resource manuals were translated to avail the information in a user friendly package for wider use among the clients. Partners were encouraged to embark on complimentary translate and publish the materials. In Malawi, one resource manual on bean pest and diseases is being translated into local languages (Tumbuka) and multiplied (Chewa/Nyanja) for use both in all the 3 regions. In Tanzania, manuals were translated and published in local languages (Swahili).
3.2.2. Capacity building for national programs to train others in PVS	A short training course was organized in Ethiopia by CIAT to build national capacity of bean research program across Africa. The course aimed at equipping NARS some responsibilities to train (TOT) other partners in PVS. All the 3 countries were represented alongside other countries from Africa who are part of the Pan Africa Bean

Research Alliances (PABRA) (Fig 8).

Figure 8. Participants to the training course in Ethiopia

In Tanzania female farmers and extension staff from Coffee Growers International were trained by Uyole bean scientists on planting, pest control and general bean management practices. The women were from ten groups where on-farm variety trials were conducted for the last two seasons.

Training of Trainers (TOT) for extension staff from DED Rungwe was conducted by Uyole scientists. The trained extensionists were to train other extension staff and farmers on production of Quality Declared Seed (QDS). The program plans to involved farmer groups and individual farmers who planted on farm trials for the last two seasons. During the training sessions, the bean program at Uyole committed itself to provide the groups and individual farmers with breeder seeds.

Appendix 1: The 2009 Annual work and action plan

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
1. To identify and verify farmers' bean variety preferences in relation to diverse agro-ecological and socio-economic criteria	Preferred varieties which meet clients needs identified for diverse zones	1.1.1 Implement PVS trials in multiple sites to identify/ verify potential bean lines/ varieties 1.1.1a Multiply bean lines	Amount of seed for released and new varieties to be evaluated (estimated at 50 kg per variety by SABRN and NBRP in each country	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata)
		1.1.1b Package and transport to local sites	# of sites and partner organizations participating in PVS	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata SABRN (R. Chirwa))
		1.1.1c Select bean varieties based on men and women farmers, traders (local and regional) and researchers' criteria	# of bean lines /varieties and their types selected based on farmers, traders and consumer's criteria in each country	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata SABRN (R. Chirwa)
		1.1.2 conduct multi location yield trials a. On station multiplication led by breeders b. Package/ label and distribute to trial sites	# of sites for multi-location variety trials # of client oriented bean lines/varieties tested in multi-location yield trials	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata SABRN (R. Chirwa)
		1.1.3 Analyze results to highlight bean variety preferences and selection criteria by stakeholders PVS scoring and qualitative data Preferable both pre and post harvest	Preferences (criteria) described by specific user group (women/men, farmers/traders	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata CIAT (L. Sperling) CIAT (J.C Rubyogo)

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
2. To develop impact-oriented bean seed production and delivery systems geared to delivering a range of products to a range of users.	2.1 Foundation seed of preferred bean varieties availed in increased amounts	2.1.1 Bulk up foundation seeds of client oriented bean varieties for decentralized seed systems	Atleast 500 kg per released variety of most preferred genotypes per site bulked and packaged. # of farmers and partners and (disaggregated by gender and wealth) involved in multiplication by site and country	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata SABRN (R. Chirwa)
		2.1.1 Planning meetings with partners involved in seed	Joint plan of action with partners in seed dissemination	CIAT (J.C Rubyogo) NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
	2.2. Partnerships for seed production and diffusion forged and strengthened	2.2.1 Assess seed quality from varied production options	1. work programs 2. seed quality assessment reports	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata SABRN (R. Chirwa
	2.3 Partnerships for scaling up production of Foundation seeds reinforced/or established	2.3.1 Assess cost effectiveness of seed production option a. Compare different options of seed production and delivery systems	1. work programs 2. economic assessment report	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata SABRN (R. Chirwa

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
	2.4 Ability to control seed borne diseases enhanced at multiple levels (farmer, CBO, NGO).	2.4.1 Train producers to manage seed quality	# and profile of partners trained	CIAT (J.C. Rubyogo)
	2.5 More targeted options for seed production identified	2.5.1 Package/distribute seed to assess diffusion options	# packets distributed to different diffusers	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
	Efficacy of varied seed diffusion channels established so as to link often neglected' end-users).	2.5.2 Assess efficiency of various seed diffusion channels	evaluation results of at least 4 diffusion channels	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
	Viable alliances for scaling up identified	2.6.1 Analyze organizational structures for scaling up/out	# and description of viable alliances by region. At least 300,000 farmers reached	CIAT (L. Sperling
SPECIFIC OBJECTIVES	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
3. To enhance skills and knowledge of partners	3.1 Adapted training manuals and variety	3.1.1 Translate select resource manuals (Tumbuka etc).	# of translations and	NBRP Team Leaders:

	promotional material availed on large scale and in multiple (local) languages		languages	DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
	3.2 Partner technical and social capacity to use PVS, seed system analysis and to integrate gender and equity issues bolstered.	3.2.1 Train partners in equity/gender (linked to 1.3)	# and profile of partners trained	CIAT (L. Sperling) with support of NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
	3.3 Project experiences (failures/success) in PVS and seed systems documented for wider use and replication.	3.3.1 Project review and planning meetings to reflect activities with partners	1. Meeting program 2. List of participants 3. Agreed upon project planning documents and workshop reports	Rowland Chirwa (SABRN) Louise Sperling (CIAT) Jean Claude Rubyogo (CIAT)
		3.3.2 Document project experiences (strengths/weaknesses	annual project reports seminar presentations	CIAT (L. Sperling)
		3.3.3 Implement outreach for non-literate clients	types of media outreach utilized (with indication of frequency)	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata

Four Year Project Planning Matrix

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES **(Intermediate Goal)**	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
1. Identify farmers' bean variety preferences .	Preferred varieties which meet specific clients' needs identified for diverse zones and exposed to large numbers of farmers	1.1.1 Identify potential germplasm for on-farm testing	Exact # of germplasm entries and types, by NBRP	SABRN (R. Chirwa)
		1.1.2 Multiply germplasm to be used in PVS trials	Volume of seed multiplied, by NBRP	SABRN (R. Chirwa)
	New Partnerships for PVS forged and strengthened	1.1.3 Train partners and scientists in PVS (3 countries)	# and profile of partners trained	CIAT (L. Sperling)
		1.1.4 Implement PVS trials (multiple sites per country)	# and location of sites, by NBRP #, gender and other qualitative variables of farmers involved	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
	Partner technical and social capacity to use PVS, seed system analysis and to integrate gender and equity issues bolstered. (also objective 3)	1.1.5 Analyze results to highlight varietal preferences	preferences (criteria) described by specific user group (women/men, farmers/traders)	CIAT (L. Sperling)

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES **(Intermediate Goal)**	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
2. Develop bean seed production and delivery systems	Existing (baseline) channels for seed production and delivery rigorously characterized Foundation seeds of preferred bean varieties availed in increased amounts, incl. for decentralized female/male producers Partnerships for scaling up production of Foundation seeds reinforced/or established Partnerships for seed production and diffusion forged and strengthened Ability to control seed borne diseases enhanced at multiple levels (farmer, CBO, NGO). More targeted options for seed production identified Efficacy of varied seed diffusion channels established so as to link often neglected' end-users).	2.1.1. Inventory existing seed systems diffusion channels and acquisition means	Profile baseline of production and diffusion channels	CIAT (J.C. Rubyogo)
		2.1.2 Bulk up foundation seed, package, label	Volume bulked + packaged, by provider and country/region	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		2.1.3 Assess cost-effectiveness of seed production options	Evaluation results of at least 3 production modes	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		2.1.4 Assess the seed quality from varied production options	Laboratory results of seed from at least 3 production options	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata)
		2.1.5 Train producers to manage seed quality	# and profile of partners trained	CIAT (J.C. Rubyogo)
		2.1.6 Package/distribute seed to assess diffusion options	# packets distributed to different diffusers	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		2.1.7 Assess efficiency of various seed diffusion channels	evaluation results of at least 4 diffusion channels	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES **(Intermediate Goal)**	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
	Viable alliances for scaling up identified Increased access to preferred bean varieties by a broad range of farmers (rich, poor, men and women	2.1.8 Analyze organizational structures for scaling up/out	# and description of viable alliances by region. At least 300,000 farmers reached	CIAT (L. Sperling)
3: Enhance skills and knowledge of partners	Adapted training manuals and variety promotional material availed on large scale and in multiple (local) languages. Partner technical and social capacity to use PVS, seed system analysis and to integrate gender and equity issues bolstered. (also objective 3) Project experiences (failures/success) in PVS and seed systems documented for wider use and replication.	3.1.1 Make available manuals on PVS, seed production, etc	# and type of manuals	CIAT (J. C. Rubyogo)
		3.1.2 Translate select resource manuals (Tumbuka etc).	# of translations and languages	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		3.1.3 Train partners in equity/gender (linked to 1.3)	# and profile of partners trained	CIAT (L. Sperling)
		3.1.4 Document project experiences (strengths/weaknesses)	annual project reports seminar presentations	CIAT (L. Sperling)
		3.1.5 Implement outreach for non-literate clients	types of media outreach utilized (with indication of frequency)	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		3.1.6 Project initiation meeting	meeting program	SABRN (R. Chirwa)

GENERAL OBJECTIVE (Goal):				
SPECIFIC OBJECTIVES **(Intermediate Goal)**	**OUTPUTS (Result)**	**ACTIVITIES**	**INDICATORS**	**RESPONSIBLE ORGANIZATION AND INDIVIDUAL**
		3.1.7 Project closure meeting	meeting program	SABRN (R. Chirwa)
4: Explore the adaptation/acceptability of Lima/tepary	Possibility to introduce and integrate novel crop options for very difficult environments closely assessed from scientist and farmer perspectives.	4.1.1 Multiply base stocks of tepary/lima germplasm	volume of seed multiplied	SABRN (R. Chirwa)
		4.1.2 Conduct on-station test for adaptation of tepary/lima	location and # of sites. reports of results	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		4.1.3 Conduct on-farm testing, intensive farmer feedback	# and location of sites farmer feedback disaggregated by user group (women/men, farmer, trader)	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata
		4.1.4 Carry out focused organoleptic tests for both	test results of acceptance on both types	NBRP Team Leaders: DAR (MW) – E. Mazuma IIAM (MZ) - M. Amane ARI-Uyole (TZ) – C. Madata