Supporting Communities to Increase Bean Productivity through Enhanced Accessibility to Seed of Preferred Bean Varieties in Malawi, Mozambique and Tanzania

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For

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Executive Summary

Common bean is an important crop for food/nutrition security, cash income and agro ecosystem improvement in Malawi, Mozambique and Tanzania. The national bean programs of the three countries (along with the Southern Africa Bean Research Network (SABRN) which operates under the International Centre for Tropical Agriculture (CIAT) have a long history of collaboration in developing improved bean varieties suitable for Tanzania, Malawi and Mozambique. In the first phase of the bean systems project, it was considered 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 a biotic stress factors. As a result over the four year period, the project identified some client preferred bean varieties and increased their availability of their seed in Malawi, Mozambique and Southern Highlands of Tanzania through participatory variety selection processes and it attempted to develop efficient bean seed production and delivery systems.

In the first year of the second phase, multiplication of promising bean lines was done on-stations to bulk up seed for participatory variety selection (PVS) in all three countries. Furthermore, multi location yield trials were conducted to act as a base of comparison to what will be obtained from on farm PVS trials for variety realise. In order to conduct a cost and social benefit analysis of seed production and delivery channels, an inventory of existing seed entrepreneurs has been planned. From the established inventory a sample of entrepreneurs will be drawn from who cost and social benefit analysis will be conducted. There is continual supply of foundation bean seed to seed entrepreneurs like Demeter seed in Malawi was supplied with bean seed plus other seed entrepreneurs.

A project inception meeting was held and participants from all three countries were present. Participants included bean seed multipliers and technical staff from research institutes from all three countries. Country work plans, Theory of Change and Integrated Monitoring and Evaluation Plan were developed so that the project activities are implemented according to a set guideline. During this meeting it was emphasised that all activities should have a protocol and these protocols must be properly documented and stored. The research team from McKnight regional team assured all project team members that they will offer statistical services if need be. It was further agreed that all data from first phase will be organised and reanalysed if need be before end of 2011.

Introduction

Common bean is an important crop for food/nutrition security, cash income and agro ecosystem improvement in Malawi, Mozambique and Tanzania. The national bean programs of the three countries (along with the Southern Africa Bean Research Network (SABRN) which operates under the International Centre for Tropical Agriculture (CIAT) have a long history of collaboration in developing improved bean varieties suitable for Tanzania, Malawi and Mozambique. In the first phase of the bean systems project, it was considered 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. As a result over the 3½-year period, this project has sought to identify some client preferred bean varieties and increase availability of their seed in Malawi, Mozambique and southern highlands of Tanzania through participatory variety selection (PSV) processes and attempting to develop efficient bean seed production and delivery systems.

By the third year of the project (2009), the national bean research programs in Malawi, Mozambique and Tanzania had conducted bean trials and demonstrations in 112 sites across the 3 countries, using participatory approaches to expose a diverse group of clients (farmers, traders, local hoteliers and other consumers) to released and promising bean varieties, for the clients to provide input in the selection processes. The number of people involved in the evaluation were about 1000 (Tanzania), 800 (Malawi), and 700 (Mozambique). The selected varieties varied from one site to another in each country, but some were cross-cutting, and in total the selected varieties were: 10 (Malawi), 6 (Mozambique) and 10 (Tanzania). Parallel to the on-farm evaluation with clients the National Agricultural Research Services (NARS) scientists conducted multi-location yield trials for the purposes of gathering sufficient data which is required for official variety release. In Malawi and Tanzania, these data were being used to supplement information from PVS trials during variety release process.

The capacity of partners was enhanced, to ensure that they were better able to carry out PVS trials and better organized to produce and disseminate seeds of selected bean varieties. The production of breeders' and foundation seed of released bean varieties were initiated with various stakeholders in all the 3 countries in order to ensure that seeds of client selected varieties were made available to farmers. The following bean seed quantities across varieties and grades (breeders', foundation were produced: 10 tons (Malawi); 6 tons (Mozambique) and 60 tons (Tanzania). Both large and small-scale farmers (individuals or groups) were supported to produce and widely supply seeds of client oriented varieties. However, the identified bean seed production and delivery systems need to be thoroughly analyzed to come up with concrete recommendations of which systems work best under what circumstances and for which category of clients and this is one of the agenda for the second phase of the project. In the first year of the second phase, the project set out to speed up the testing of any new promising varieties - as variety development is a continuous process. Project inception meeting was conducted in Malawi to introduce the project objectives and activities to all project team members from the three countries. This report presents progress that has been made in achieving all the set objectives for the first year of phase one. It further provides detailed work plan and budget for the year two activities.

Progress towards achieving objectives

The project aims at ensuring that farmers realize increased bean production, leading to improved household food and nutrition security and more income from bean sales at local as well as regional markets. This will be achieved through enhanced access to sufficient quantities of bean seed of preferred improved varieties, as well as to other eco-efficient non-variety bean production technologies.

Objective 1: To speed the testing of any new promising varieties

Result 1.1. New acceptable client oriented bean varieties identified across the different agro-ecologies and users systems

Activity	**Progress**
1.1.1. Multiply the promising lines (candidates) for PVS	The national bean programs in the three participating countries (Malawi, Mozambique and Tanzania) assembled and increased seed of the identified potential bean varieties/lines. In Malawi the identified bean germplasm and some released bean varieties (Napilira) were multiplied both in dry season using irrigation facility and rain season at Chitedze Agricultural Research Station (Kandiyani irrigation site) and on station respectively. Similar activities were done in Tanzania where it multiplied seed of pre- released and released varieties which will be used in PVS and demonstration plots.

Table 1: Seed quantity (kg)of promising bean lines multiplied for PVS in Malawi

Irrigated			
Genotype	**Yield(kg)**	**Genotype**	**Yield(kg)**
SER45	5	RCB 237	5
MC 12832-129-1	5	SER 86	5
Napilira	5	CIM-KHAK 02-22-1-2	5
VTTT924/10-4	5	MR 13557-67-7	5
CIM-RM 00-67-2	5	VTTT924/10-7-1-1	5
GCI-CAL-172-AR	5	CIM-Nav02-11-1	5
CIM-D-C-30-1	5	VTTT923/10-3	5

Furthermore, in Malawi breeder's seed of pre-released bean varieties were multiplied during rain-fed so as to back up seed for seed multipliers. Results of yields obtained are presented in Table 2 below.

Table 2: Breeder's seed (kg) of released varieties multiplied in Malawi

Variety	**Breeder's seed produced (kg)**

VTT 924/4-4	80
NUA 45	150
NUA 35	80
NUA 59	100
Napilira	100
Kholophethe	60
Maluwa	150

Likewise in Mozambique seed multiplication was done of both released and promising lines in Gurue and Chokwe.

Table 3: Seed quantity (kg)of promising bean lines multiplied for PVS in Mozambique

Genotype	**Seed (kg)**	**Genotype**	**Seed (kg)**
SUGAR 131	40	PC 1459 BC2-RR9	4
CAL 143	20	PAN 148	2
A 222	30	PAN 116	2
AFR 703	40	Ica pijao	2
NUA 45	10	Magnu	2
VTT 923/10-3	10	Manteiga	2
VTT 924/4-4	10	MBC 39	1
VTT 925/9-1-2	10	MBC 10	1
PAN 148	20	12D/2	1
G 20939	4	MBC 41	1

Result 1.2. PVS sites identified and characterised	
Activity	Progress
1.1.2. a. Identify and characterize PVS	In all the three countries identification of PVS sites based on agro-ecological and user systems was done. In other countries like Mozambique characterisation of the sites started

sites based on agro-ecological and user systems

though not yet finished whilst in other countries it is yet to be done.

Table 4: PVS site identification and characterisation in Mozambique

Site	**Site Characterisation**		**Partner**
	Agro-ecology[a] rainfall , altitude, pest and diseases prevalence, crop systems	**Users' system[b] market and house hold food orientations, land holding**	
Canhanja	Rainfall > 1000 mm; altitude about 1300 m; ALS and CBB	Food and local Market	APLA
Ntengo Umodzi	Rainfall > 1000 mm; altitude about 1300 m; ALS and CBB	Maputo Market	APLA
Domue	Rainfall > 1000 mm; altitude about 1300 m; ALS and CBB	Maputo market	APLA/MLT
Chincumba	Rainfall > 900 mm; altitude about 1200 m; BSM, ALS and CBB.	Food and Malawi market	TLC
Namadende	Rainfall > 1000 mm; altitude about 1200 m; BSM, ALS and CBB.	Food and local market	TLC
Lizie	Rainfall: 600 - 800 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	APLA
Zobue	Rainfall: 600 - 800 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	APLA
Nkondezi	Rainfall: 600 - 800 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	APLA
Livranje	Rainfall > 1000 mm; altitude about 1200 m; BSM, ALS and CBB.	Local market	APLA/MLT
Mualijane	Rainfall: 900 mm; altitude about 600 m; BSM, ALS	Local market	World Vision

	and CBB.		
Murrimo	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local market	World Vision
Nawoworo	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local market	World Vision
Invinha	Rainfall: 900 mm; altitude about 750 m; BSM, ALS and CBB.	Maputo market	World Vision
Mutequelesse	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Maputo market	Extension
Niusse	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local market	Extension
Nintulo	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Nampula market	Extension
Ruace	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local market	World Vision
Brigada	Rainfall > 1000 mm; altitude about 600 m; BSM, ALS and CBB.	Local market	Extension
Simbe	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	Extension
Nhanombe	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	Extension
Matage	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	Extension
Mbose	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local and Malawi market	Extension

	Molumbo	Rainfall: 900 mm; altitude about 600 m; BSM, ALS and CBB.	Local market	Extension
	Ecole	Rainfall > 1000 mm; altitude about 800 m; BSM, ALS and CBB.	Maputo and Portuguese market	World Vision
	Mugema	Rainfall > 1000 mm; altitude about 800 m; BSM, ALS and CBB.	Maputo and Portuguese market	World Vision
	Namilepe	Rainfall > 1000 mm; altitude about 800 m; BSM, ALS and CBB.	Maputo market	CLUSA
	Mohiua	Rainfall > 1000 mm; altitude about 800 m; BSM, ALS and CBB.	Local and Maputo market	World Vision
	Nioce	Rainfall: 800 - 900 mm; altitude about 800 m; BSM, ALS and CBB.	Nampula market	Extension
	Mutuali	Rainfall: 800 - 900 mm; altitude about 700 m; BSM, ALS and CBB.	Nampula market	Extension
	[a] *rainfall range (actual figure), altitude (range) , pest and diseases prevalence e.g. root rot prone, BSM, crop systems (maize, cassava, dimba/irrigate/rainfed)* [b]*: market (proximity market areas and specific targeted market, and household food orientation, land holding, product uses e.g. leaves/pods*			
1.1.3 Conduct multi-location yield trials for variety release of farmer selected varieties	All national programs in the three countries continued the on-station bean evaluation trials of client oriented bean varieties from phase one. The main objective was to collect concise data that can be used to supplement information from PVS trials during the variety release processes. in Malawi yield trials were located in four agricultural research stations namely Chitedze, Bvumbwe, Bembeke and Nchenachena.			

Table 5: Multi-location evaluation of bean genotypes in the 2010-2011 cropping season in Malawi

Identity	Yield Kg/ha			
Bean Genotype	Bvumbwe	Chitedze	Bembeke	Mean
MC 12832-129-3	1082	1331	1087	1166.7
CIM-2-22-1-2	1489	880	1294	1221.0
SER 86	860	1406	1400	1222.0
MC 12832-129-1	1030	1035	1581	1215.3
RCB 237	1351	1414	1200	1321.7
CIM-KHAK02-24-1	1593	716	1610	1306.3
SER 45	1119	1057	1058	1078.0
CIM-KHAK02-30-1	1440	1312	1383	1378.3
CIM-NAV02-11-1	927	715	881	841.0
CAL 143	763	1433	325	840.3
CIM-RM02-67-2	545	967	685	732.3
GCI-CAL-172-AR	1761	986	1952	1566.3
CIM-DWRF-CLIMB01-56-10	770	694	462	642.0
VTTT 923/10-3	466	600	104	390.0
CIM-DWRF-CLIMB01-03-1	1662	1586	1833	1693.7
CIM-DWRF-CLIMB01-59-1	1978	480	1200	1219.3
CIM-DWRF-CLIMB01-119-1	689	1479	950	1039.3
LOCAL	425	554	133	370.7
CANNELIN (EGYPT)	677	946	1137	920.0
CIM-DWRF-CLIMB01-30-1	1048	389	246	561.0
Mean	**1084**	**999**	**1026**	1036.3
SE ±	**519.7**	**271.4**	**324.9**	
LSD $_{0.05}$	**735.9**	**384.3**	**460**	
f. Prob.	**<.001**	**<.001**	**<.001**	
cv%	**48**	**27.2**	**31.7**	

In Mozambique, promising varieties/lines from PVS and other trials were included in the national yield trial. This trial included 20 entries. The experimental design used was randomized complete block design with 4 replications. The plot size was 4 rows of 4 meters. The trial was conducted in Angonia, Gurue and Chokwe. In Gurue and Chokwe, the experiment was conducted under irrigation. In Angonia, the trial was conducted under rain-fed conditions. One week after emergency, plants were sprayed with a mixture of dimethoate and cypermethrin (1 ml + 1 ml)/L to avoid bean fly attack and later, at the flowering stage plants were sprayed with cypermethrin to control other pests of the vegetative phase. Yield results are summarized in Table 6.

Table 6: Multi-location yield trials of bean genotypes in the 2010-2011 cropping season in Mozambique

	Angonia	Gurue	Chokwe
Variety	**Yield (kg/ha)**		

CAL 143	855	1350	1586
SUGAR 131	1540	2318	1575
CIM-KHAK02-24-1	1103	2610	1013
SER 45	383	923	1260
CIM-DWRF-CLIMB01-59-1	1058	945	1856
A 222	1103	2655	2360
GCI-CAL-172-AR	608	1575	1193
CIM-RM02-67-2	878	1778	1451
VTT924/4-4	1490	2025	1911
CIM-DWRF-CLIMB01-03-1	720	1125	1485
VTTT924/15-24	540	2250	1215
VTTT1675918/15-1	698	1890	1395
VTTT1450925/9-1-2	1675	2093	1136
VTT1360T928/9-2	1360	1598	1181
AFR 703	1450	2003	1690
Magnu	540	1660	1450
NUA 45	1360	2835	1450
Encarnado	940	1553	1148
CIM-NAV02-11-1	585	1755	1733
VTTT923/10-3	1653	2880	2326
Mean	1027	1891	1521
CV (%)	21.4	15.2	16.5
LSD $_{(0.05)}$	512	336	412

Table 7 below presents yield results from Tanzania

Table 7: Multi-location yield trials of bean genotypes in the 2010-2011 cropping season in Tanzania

Trial	**entries**	**Mean yield (kg/ha) per site**					
		Milundikwa	Mbimba	Ndengo	Mitalula	Seandale	Suluti

	Wanja CR F6	20	1008	1175	-	986	-	-
	High Min F6	10	-	1030	730	1060	1065	107
	PBUCT	16	-	1253	-	1153	-	680
	BIOFORT 2008	16	1185	923	-	988	-	-
	PBAYT DRK	16	-	1255	-	1040	2183	84

Objective 2: To mainstream the use of appropriate seed production and dissemination channels for wider uptake and utilization of released varieties

Result 2.1	Appropriate (cost effective, healthy seed, socially acceptable) seed production and dissemination models/channels selected and mainstreamed for wider uptake of client-oriented released bean varieties.
Activity	Progress
2.1.1. a. Supply seed to entrepreneurs (breeder, foundation, certified and other accepted seed grades)	In each country breeder seed was multiplied in various locations so as to avail enough seed to seed entrepreneurs. The following foundation seed was supplied to seed entrepreneurs in Malawi

Table 8: Breeders seed availed to bean seed producer (Demeter Agricultural Company) in Malawi

Name seed of producer	Variety	Amount supplied (kg)
Demeter seeds	Napilira	150
	Kholophethe	100
	Maluwa	50
	NUA 45	50

Furthermore, in Malawi bean seed were made available to bean seed growers who produced different classes of seed. Table 9 provides an inventory of the seed growers and the classes of seed produced. The seed produced was checked for quality and declared good seed by the Seed Services Unit in Malawi.

Table 9:Bean seed made available to bean seed growers by type of class produced in Malawi in the 2010-2011 season

Grower/producer	Bean variety supplied	Hectare planted	Seed produced (tonnes)	Seed supplied (tonnes)	Class produced
Seed Co	Kholophethe	29.0	43.50	2.3	Certified
	Napirila	40.0	60.00	3.2	Certified
Demeter Agriculture	Kholophethe	33.0	49.50	2.6	Basic
	Kholophethe	529.0	793.50	42.3	Certified
	Napilira	1.5	2.25	0.1	Basic
	Maluwa	1.0	1.50	0.1	Basic
	NUA 45	1.0	1.50	0.1	Basic
Individuals	Kholophethe	19.0	28.50	1.5	Certified
	Napilira	11.7	17.55	0.9	Certified
	NUA 59	1.0	1.50	0.1	Certified
ASSMAG	Napilira	27.0	40.50	2.2	Certified
PEACOCK	Kholophethe	45.0	67.50	3.6	Certified
Research Into Use	Kholophethe	12.5	18.75	1.0	Certified
	Napilira	25.0	37.50	2.0	Certified
GALA	Kholophethe		7.00	0.4	Certified
	Napilira		10.00	0.6	Certified
	Total	775.7	1180.55	63.1	

In Mozambique, 18 hectares were planted and about 18 tonnes were produced to supply to seed producers. The seed was produced at IIAM research stations. See Table 10 below

Table 10 : Breeders seed availed to bean seed producer in Mozambique

Name of seed producer	Variety	Amount produced (kg)
South Zone South	Sugar 131	60
	Cal 143	43
	Diacol calima	250
	Manteiga	180

Centre Zone Centre	Sugar 131	75
	Cal 143	41
	Diacol calima	120
	Manteiga	68
Northwest Zone Northwest	Sugar 131	54
	Cal 143	61
	Diacol calima	230
	Manteiga	150

Table 11 below presents an inventory of seed that was supplied to small and medium seed multipliers in Mozambvique per district.

Table 11: Amount of seed supplied to small and medium farmers in Mozambique

Variety	**Amount of seed distributed per district (kg)**				
	Gurue	**Milange**	**Moatize**	**Angonia**	**Malema**
Sugar 131	60	-	40	-	150
Cal 143	40	80	-	50	-
Diacol Calima	200	100	80	120	-
Bonus	-	150	-	-	50
Ica Pijao	100	-	-	30	-
VTT 925/9-1-2	-	30	-	-	-
VTT 923/10-3	-	-	60	-	40
A 222	40	-	-	-	-
Total	440	360	180	200	240

In Tanzania bean seed were multiplied at UYOLE farm as well as breeders seed were multiplied. Results of yields for the two multiplications are presented in Tables 12 and 13 below.

Table 12: Bean seed made available to bean seed growers in the 2010-2011 season in Tanzania

S/No	Variety	Production (bags)	Production (kg)
1	Uyole 96	550	55000
2	Uyole 94	60	6000
3	Uyole 03	80	8000
4	Uyole 04	50	5000
5	Wanja	45	4500
6	Njano-Uyole	90	9000
Total	6	900	90000

Below are the quantities of breeder seed multiplied

Table 13: Breeders seed availed to bean seed producer in Tanzania

S/No	Variety	Production (bags)	Production (kg)
1	Njano-Uyole	23	2300
2	Uyole 96	21	2100
3	CAL 06P213	8	800
4	Uyole04	6	600
5	Wanja	6	600
6	Uyole 98	5	500
7	Kabanima	3	300
8	Uyole 03	4.5	450
9	Urafiki	2	200
10	Uyole 84	2	200
11	NRI cr 05 E27	0.8	80
Total	11	81.3	8130

2.1.1c Carry out seed	Seed quality analysis involves different activities and varies by country. Some of the

quality analyses of different grades produced/disseminated by various entrepreneurs

common factors considered are; Physical quality (foreign materials, weevils, broken, non seeds etc.), Physiological quality (germination days and percentage, vigor) and Phytosanitary quality (seed born diseases) Anthracnose, CBB, ALS, HB, BCMV etc. In Malawi bean seed crop was inspected by the Seed Services Department and results are presented in Table 13 below.

Table 14: Bead seed crop inspected and class of bean seed certified in the 2010-2011 season

Company/organisation	variety	class	Hecterage inspected	Ha passed	Ha failed	remarks
Seed Co	Kholophethe	Certified	25.9	25.9	0.0	Followed standards
	Napilira	Certified	40.0	40.0	0.0	Followed standards
Demeter Agriculture	Kholophethe	Basic	33.0	33.0	0.0	Followed standards
	Kholophethe	Certified	529.0	529.0	0.0	Followed standards
	Napilira	Basic	1.5	1.5	0.0	Followed standards
	Maluwa	Basic	1.0	1.0	0.0	Followed standards
	NUA 45	Basic	1.0	1.0	0.0	Followed standards
Individuals	Kholophethe	Certified	19.0	19.0	0.0	Followed standards
	Napilira	Certified	11.7	11.7	0.0	Followed standards
	NUA 59	Certified	1.0	1.0	0.0	Followed standards
ASSMAG	Napilira	Certified	27.0	27.0	0.0	Followed standards
PEACOCK	Kholophethe	Certified	45.0	45.0	0.0	Followed standards
Research Into Use	Kholophethe	Certified	12.5	12.5	0.0	Followed standards
	Napilira	Certified	25.0	25.0	0.0	Followed standards
Fumwe farm	Kholophethe	Certified	1.8	1.8	0.0	Followed standards
	Napilira	Certified	1.5	1.5	0.0	Followed standards

	Similar activity was done in Tanzania where quality data for physical qualities was taken (broken, damage, insect holes and shrivelled seeds, trash, stones and seed coat discolouration). Samples for disease assessment are being collected from farmers for this planting season.
2.1.1d Carry out the economic and social benefit analysis of different seed production enterprises and dissemination channels	This activity will involve carrying out an inventory of seed producers from which a sample will be drawn and their economic and social benefit analysed. Tools for both studies have been developed and data collection will commence as soon as possible in all countries.

Objective 3: To widely test and fast track use of best non-variety bean-based technologies to increase production, reduce post-harvest loss and enhance utilization/market of beans to increase farmers' well being (nutrition and economic returns) at farm level and along the supply chains.

<table>
<tr><td>Result 3.1</td><td>Appropriate ISFM or IPDM bean production or protection management options identified and fast tracked for increased bean seed and food production</td></tr>
<tr><td>Activity</td><td>Progress</td></tr>
<tr><td>3.1.1.a. Carry out participatory evaluation of the identified management options (old varieties x new varieties from PVS; soil fertility management; and IPDM technologies) with seed entrepreneurs and neighbouring communities linking with ISFM in Malawi, P Efficient in Mozambique, Botanicals in Malawi and Tanzania, with SABRN activities in all the countries and other projects</td><td>Plans to conduct an inventory of IPDM and ISFM are underway in all three countries and this will be conducted as soon as possible. In Malawi an inventory of IPDM and ISFM was carried out and results are presented in Table 14 below.

Table 15: IPDM and ISFM options recorded in Malawi to be used in participatory evaluation with seed entrepreneurs

<table>
<tr><th>IPDM</th><th>ISFM</th></tr>
<tr><td>Legume-cereal intercrop**</td><td>Cereal/legume intercrops with inorganic fertiliser application**</td></tr>
<tr><td>Rotation/resistance/chemical</td><td>Green manure/inorganic fertiliser/early maturity of varieties</td></tr>
<tr><td>Timely planting/resistant variety</td><td>Integrated use of compost/ khola/ farmyard manure and fertilisers</td></tr>
<tr><td>Resistant variety/chemical/mulching</td><td>Conservation/ minimum tillage agriculture</td></tr>
<tr><td>Early planting/fertiliser/chemical</td><td>Use of bio-inorganic foliar fertilisers</td></tr>
<tr><td>field hygiene/fertiliser/residue management</td><td>Liming/tolerant variety/mulching</td></tr>
<tr><td>Field hygiene/weed management/genotype resistance</td><td>Green manure</td></tr>
<tr><td>Early planting/fertiliser/mixed crop</td><td>Rotation/mixed crop/mulching</td></tr>
</table>
** This may not be feasible in seed production due to difficulties in implementation of inspection services.

In Tanzania part of these technologies were included in PVS, seed multiplication and promotion activities. Preliminary results recently collected from 20 villages in Iringa and Ruvuma regions showed that farmers have knowledge on none variety production problems. Example farmers in high altitude of Iringa region spray</td></tr>
</table>

	fungicides to control diseases and have adopted var BILFA-Uyole (torelant to acidic soils), farmers understand BSM problem in ares covered in PVS.
3.2.1. Develop bean based food baskets for targeted nutrition deficient areas	Currently the National Bean Programs in all countries are multiplying beans that will be used in the development of the food baskets. In Malawi mivro-nutrient rich beans (NUA 45 and NUA 59) were supplied to CRS-CADECOM for seed multiplication and a total of 500kg of basic seed were realised from the harvests. It was further planned that some of the seed be multiplied with irrigation so that enough grain can be obtained for development of food baskets with CRS-CADECOM farming communities in Kasungu district. Bunda College is facilitating nutrition studies targeting the high micronutrient rich bean varieties. Planning meetings were jointly (DARS, SABRN/CIAT, and Bunda College) conducted in order to strategise the implementation process. In Tanzania, a micro-rich variety Roba 1 is promoted in all the PVS sites and on-farm seed production in all the 4 regions of the SH. Farmers are producing the variety for home consumption of both grains and leaves. The variety is used as relish in school lunch in 2 Secondary Schools in Songea district. During the First Year period, 244 farmers including Extension, hospital staff and school teachers were trained on processing and use of Soyabean in relish including beans and other foods to improve nutrition. 244 (102 male and 142 females) from 11 villages of 3 districts in Ruvuma region were trained. The target nutrient deficient areas including schools, orphanage and hospitals will be established. Bean and soyabean seeds will be distributed to these areas. Training on nutrition and food preparations will be done by nutritionists; health officers, extension and other stakeholders will be involved.

Objective 4: To develop bean commodity functional platforms in the three countries.

Result 4.1	Vibrant/functional bean value chain platforms established in each country, bringing together various actors to support bean commodity development
Activity	Progress
4.1.1.Analyze /update bean value chains (Building on PABRA effort)	In Malawi bean value chain analysis was done by the PABRA project. Farm level impacts of the adoption of improved bean technologies were conducted (Kalyebara et., al., 2007) in order to understand the impacts of new and improved bean varieties on farmers' livelihood at farm level. Results of the survey of bean farmers indicate that 93% of surveyed households had adopted at least one new variety, with close to 100% adoption in the Central region. The results reflect a very effective variety dissemination programme. In terms of the share of seed planted in 2005, improved varieties accounted for 68% of total seed. Both male and female heads of households played major roles in decisions to adopt new varieties and there were no interregional differences reported. There is also a reported increase in both household income and consumption across all the regions. Annual bean income increased more than two-fold for all the wealth categories with the poor earning the highest income form beans in 2005. The most commonly reported intra household impacts that resulted from the introduction of new bean technologies were increase in amount of food and disposable income available to the household especially during periods of food shortage, improvement in health of the family, enhancement of social capital through improved relations with other farmers, and reduction in amount of fuel wood used. In terms of food security, the benefits appear to have been realized equally by most farmers with no significant variations between the poor and better off households.
4.1.2.Establish platform steering committee and hold seasonal meetings for the representatives of the value chain	In Malawi there is already a platform (Legumes Platform) whose activities are facilitated by RIU project. The platform is geared to promotion of the production of legume seed crops including beans, groundnuts, soybean, cowpea and pigeon peas. It is hoped that in one of the forum a deliberate inclusion of value chain initiatives/activities.

Objective 5: Enhance skills and knowledge of partners.

Result 5.1	knowledge (PVS, seed systems and bean management options) of NARS scientists and partner organizations including farmers enhanced

<table>
<tr><td>Activity</td><td>Progress</td></tr>
<tr><td>5.1.1 Make available manuals on PVS, seed production and crop management in user friendly languages, etc</td><td>This is an on-going work from first phase; in all countries manuals are available in user languages for clients. In Malawi brochures, booklets, and fliers for the new varieties were prepared and made available to bean growers

Table 16: Promotional materials developed and made available to bean producers

<table>
<tr><th>Resource Manual</th><th>Type</th><th>Mode of access</th><th>Number supplied</th></tr>
<tr><td>Flier</td><td>New Bean varieties</td><td>Field Day, Trade Fair, Agriculture show, Training session</td><td>1000</td></tr>
<tr><td>Booklet</td><td>NUA 59, NUA 45 and VTTT924/4-4</td><td>Field Day</td><td>260</td></tr>
<tr><td>Brochure</td><td>Kholophethe and KAbalabala</td><td>Field Day, Trade Fair</td><td>1000</td></tr>
<tr><td>Brochure</td><td>NUA 45, NUA 59, VTTT924/4-4</td><td>Training, Field Day</td><td>500</td></tr>
</table></td></tr>
<tr><td>5.1.2. Enhance the skills and knowledge of seed entrepreneurs in seed production, business and dissemination channels (linked to 2.1.1 b)</td><td>.

Bean seed producers in Malawi were trained in seed production. Farmer were introduced to better crop management, disease and pest control, seed crop quality standards adherence and many more.

The picture shows one of the farmer groups (facilitated by ASSMAG) that were trained in seed production.

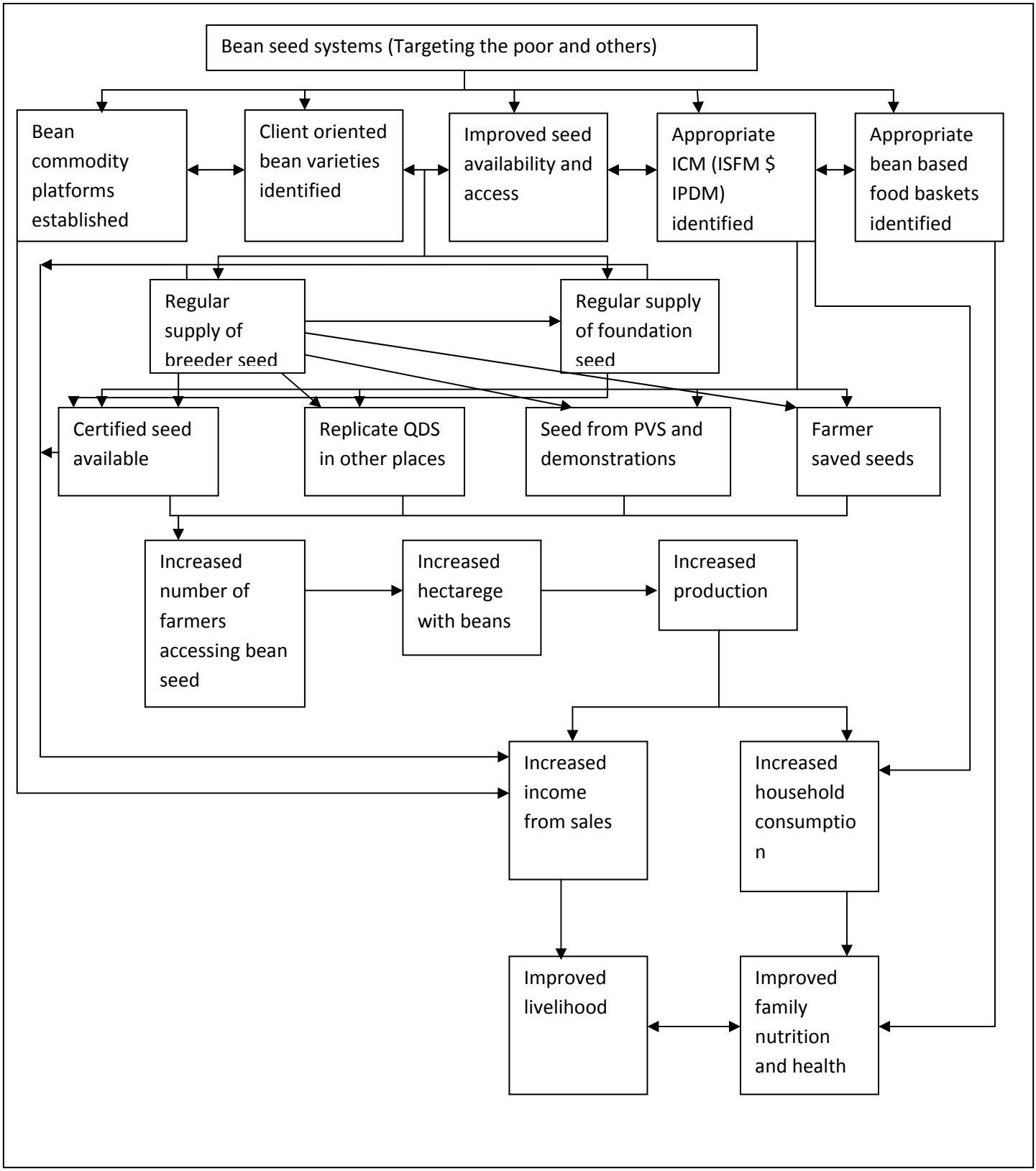
Figure 1: picture of seed growers from farmers groups (ASSMAG, GALA) trained in bean seed production</td></tr>
<tr><td>5.1.3. Implement outreach for non-literate</td><td>In Mozambique, mass media presentations were done though radio interviews (for about 20 minutes), direct TV interviews (for 45 minutes) and TV flash presentation during lunch and evening news bulletin. Through this it is assumed that a lot of farmers, seed entrepreneurs and</td></tr>
</table>

clients	consumers both literate and illiterate received the message.
5.2.1. Project initiation meeting including sharing and adopting IMEP tools	The national bean programs organized a planning and review workshops with support from the McKnight funded bean seed delivery project. The meeting was organised and conducted in Malawi see appendix 1 for the lists of participants. Participants included a team from the McKnight region office, a team from CIAT Malawi, a team from all NARES from Malawi, Tanzania and Mozambique. It is from this meeting that the Theory of Change (ToC) and Integrated Monitoring and Evaluation Plan (IMEP) were modified see appendix 2 and 3 for the ToC and IMEP respectively. All project members clearly understood what the project is all about and what is expected from each participant. it was further agreed that each activity should have a written protocol and this must be well written and stored. During this meeting data storage and analysis was explained to each member and two participants (Ruth Magreta and Ben Chisama) were chosen to manage all data and reports for the project. These are to work with the research team at Reading University in the UK. It was further agreed that all data that was collected in phase one will be properly managed and stored. Each country team developed a work plan for the year on times suitable for them.  **Figure 2: Picture of participants who attended seed systems phase two inception meeting in Malawi**

Challenges

Erratic rains in Malawi which may have contributed to yield levels obtained in rain fed seed multiplication. Some activities are yet to be implemented as the project funds were received in December 2010 hence the results from such activities are not available for reporting.

Appendix 2: THEORY OF CHANGE-BEAN SEED SYSTEMS



Appendix 3: IMEP Plan for the Seed Systems Project

Outcome 1: Use of appropriate seed production and dissemination channels for wider uptake and utilisation of released varieties mainstreamed

Output: An efficient bean seed production and delivery system which target the poor and others developed

Evaluation question	**Evaluation indicator/measure**	**Evaluation methods (How)**	**Evaluation & Implementation plan (who, what and when)**	**Existing data**	**Use of information and who needs it**
Which seed production and dissemination channel is efficient, effective and sustainable	Efficiency indicators • Amount of seed produced per variety • Number of farmers/client reached • Quality of seed produced	• Each country team through use of questionnaires/check list given to seed producers at the beginning of each season collecting data on (amount of seed planted and produced) • mapping seed distribution and seed supply combined with producer records • lab test, visual assessment and client satisfaction	• Each countries social scientist. To be conducted each cropping season within the second phase • Each country team in collaboration with partners • Each countries seed services	• Baseline	• Information to be used by farmers, COP and other collaborators • Information to assist in identifying knowledge gaps of farmers, scientists and other stakeholders

	• Timeliness Sustainability indicators • Ownership • Involvement of stakeholders • Continuous supply of seed and regularity • Further investments specifically looking at: o Production trends o Variety diversify o Clients	• client satisfaction surveys • Each country team through use of questionnaires/check list (how they produce their seed, what external support do they get) • Checklist to capture production and supply of seed over seasons per variety • Check lists as above	unit • Each countries social scientists		

	involved o Supply o Number of seed enterprises involved				

Outcome 2: Best non-variety bean based technologies widely tested and their use fast tracked

Output: Non-variety bean based technologies identified and promoted for increasing bean production

Evaluation question	**Evaluation indicator/measure**	**Evaluation methods (How)**	**Evaluation & Implementation plan (who, what and when)**	**Existing data**	**Use of information and who needs it**
Are the adopted non variety bean based technologies assisting in increasing bean production?	• Productivity trend at seed producer level (per unit area etc.) • Quality of seed produced	• Checklist as above (information on area, amount planted/variety, cropping pattern and non-variety (ICM) cropping system used) • Lab test, visual	• Agronomists (track production for the past 3 years plus the current year of production) • Agronomists plus scientists from seed services unit	• Baseline, phase one annual reports, Indigenous knowledge and farmer practice methods	• Information to be used by farmers, COP and other collaborators • Information to assist in identifying knowledge gaps of farmers, scientists and other stakeholders

	• Cost effectiveness of farmer	observation, certification and client satisfaction surveys • Cost and benefit analysis (to be included in the check list)	• Social scientists (data to collected when collecting the above stated socio-economic data)		

Outcome 3: Improved bean seed widely adopted

Output: Increase in farmers using growing improved bean seed in bean production

Evaluation question	**Evaluation indicator/measure**	**Evaluation methods (How)**	**Evaluation & Implementation plan (who, what and when)**	**Existing data**	**Use of information and who needs it**
Is there early adoption of improved bean seed varieties by the larger community?	• Number of service providers demanding seed • Farmer variety assessment (targeting both seed producers and the larger community)	• Use of checklist (targeting seed producers) • Use of questionnaire / checklist (targeting PVS sites, seed producer catchment area and people who accessed seed from the producer)	• Social scientists, adoption surveys and data to be collected in the last year of phase two. (NB: baseline surveys to be used as a benchmark) (these will verify if farmers of stakeholders are using improved bean seed varieties as well as the identified seed production and dissemination channels)	• Baseline • Secondary information from governments reports and other published papers	• Information to be used by farmers, COP and other collaborators • Information to assist both stakeholders and scientists in identifying knowledge and gaps generated along side the implementation of the project