ANNUAL PROGRESS REPORT FROM JANUARY TO DECEMBER 2008

IMPROVING FOOD SECURITY AND NUTRITION THROUGH EDIBLE LEGUME RESEARCH IN MALAWI, MOZAMBIQUE AND TANZANIA

PROJECT TITLE: Improving Smallholder Food Security, Nutrition and Income Through Increased Production and Marketing of Climbing Beans

GRANT NO.: 06-744

1.0. AUTHORS

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2.0. INTRODUCTION

The common bean (*Phaseolus vulgaris*) plays a critical role in the nutrition of millions of people in southern Africa. Although meat is the main source of protein for the human health globally. access to, and consumption of, meat is very low in southern Africa due to declining animal numbers and high costs of production. While maize as a staple food provides most of the energy requirement, beans containing 22% protein complement maize and other starchy staples to form the basic diet in the SADC region. The common bean is also an important source of carbohydrate and, as such, the bean is the second most important food crop over much of the area. In the maize-based systems of mid-altitude areas of southern Africa, beans contribute up to 30% of dietary energy. Dry beans are particularly rich sources of iron and zinc, and provide vitamins when consumed in such forms as leaves (fresh or preserved) as a side dish or fresh green pods. Thus, beans are an important source of food at the household level for groups vulnerable to malnutrition, including children, pregnant mothers and the poor. Malawi, South Africa and Zambia are net importers of bean from other SADC countries.

Bean production in Malawi is constrained by low soil fertility, use of low yielding varieties, pests and diseases. Climbing beans grow vigorously, produce more biomass and are higher yielding than bush beans, and accordingly demand more nutrients from the soil for their growth. Use of inorganic fertilizer is the first option for ameliorating the soils to increase crop yield. However, the poor resource smallholder farmers hardly afford the inorganic fertilizer because of the prohibitive high prices. Agroforestry offers an alternative and cheap source of crop nutrients. Past research has shown that these agroforestry technologies can improve soil fertility through application of the leafy biomass (Ikerra *et al*., 1999; Makumba, 2003; Makumba *et al*., 2006). In Western Kenya research has shown that improving soil fertility with PREP-PAC increased bean yield by 250 kg ha^{-1} (Nekesa *et al*., 1999). *Gliricidia sepium* in simultaneous agroforestry systems can recycle through deep rooting up to 20 kg P ha^{-1} yr^{-1} through leaf biomass application, which is then available for the subsequent bean crop (Makumba, 2003). The simultaneous intercropping system can produce up to 5 t ha^{-1} of wood on dry matter (DM) basis, whereas a two-year *Tephrosia candida* improved fallow yields up to 10 t DM ha^{-1} wood. This wood biomass is partly used to stake the climbing beans hence maximizing their yield potential and the excess wood is used for firewood. Women travel long distances to fetch firewood, hence agroforestry provides a solution to this burden as women now source the firewood within the farmyard. The scarcity of suitable materials for staking which is a major impediment to adoption of climbing beans is resolved by the agroforestry systems. Agroforestry technologies, e.g. with *Gliricidia sepium, Acacia angustisma, Tephrosia candida* and *Sesbania sesban,* can improve soil fertility through nitrogen fixation, while at the same time providing staking material for climbing bean production.

This project aims at increasing bean production in Malawi and Mozambique through introduction of improved high yielding climbing bean varieties, soil fertility management practices and provision of staking materials for the climbing beans using agroforestry technologies in order to improve food security, nutrition and incomes of resource poor farmers.

This report covers activities done in the second year of the project that includes, finalizing initial soil characterization of the pilot sites; conducting participatory variety selection; bulk up seed of

selected bean varieties and agroforestry tree species for further evaluation with existing and new partners; finalizing baseline studies to provide references for measuring impact of the project.

3.0. NARRATIVE SUMMARY

The project's main objective is to improve food security, nutrition and incomes of resource poor farmers

Objective 1: Increase efficiencies of production through cultivation of high yielding climbing beans linked to agro-forestry technologies for soil fertility improvement and provide staking materials

1.1.1. Finalize initial soil characterization of the pilot sites

Soil samples have been collected from all the sites. The samples were augured from the following soil depths: 0-20; 20-40 and 40-60. We did not reach 100 cm deep because the land is hard since the sampling was done during the dry period. Photo 1 shows the soils team auguring soil samples in one of the farmers fields in Thyolo, Zomba – Gurue transect. The chemical analysis is still underway at Bvumbwe Agricultural Research Soil and Plant analytical laboratory. Once analysis of the soil samples is completed the data will be used to develop a soil map.

1.1.2. Participatory variety selection (PVS)

A group comprising of farmers (both participating and not participating in testing the climbing beans) and bean traders were invited to evaluate the climbing bean varieties using the PVS method. The PVS was conducted in all the sites both in Malawi and Mozambique. The PVS participants used pre and post harvest traits on beans to base their evaluation. At each site at least 40 participants were involved in the PVS of the climbing beans. The participatory evaluation was done using four different coloured ribbon, the men were given two sets of colour one representing the best liked varieties and the other representing the worst performing varieties the women were also given two sets of colours that were different from the men. Using the colour codes were able to distinguish the selections made by the male from those by female participants. The participants were trained at the field what to do before starting the selections. Photo 2 participants are making selections.

Table 1.0 gives the five best performing bean lines selected by farmers in a PVS in each altitude range. Farmers from the three altitude ranges preferred DC 86-215; this variety was liked because of its grain colour and size. The farmers liked the MBC 21 because of its high yielding potential. It was interesting to note that all men (100%) voted for DC 86-263 versus 17%, the variety has very good traits for the market. In general reasons given by farmers for selecting the bean varieties were common for both female and male participants and basically the participants were interested in the following traits: high yielding potential, bright colours and large seed size, easy to cook and marketability.

1.1.3. Identification of potential best bet combinations (agroforestry soil fertility technology x germplasm) on station

Twenty climbing bean varieties were evaluated in the farmers' fields in the three altitude ranges (<700, 700-1400, >1400 masl) and three rainfall regimes (<700, 700-1000, >1000 mm). The on-farm yield performance of the bean lines significantly varied across the three altitude ranges ($P<0.001$), it was apparent that high altitude range was the most suitable areas for the growing of the climbing beans on the other hand highest rainfall favoured the climbing bean production followed by the moderate rainfall. The interaction of altitude range and rainfall regime was significantly high ($P = 0.002$) with the combination of high altitude and high rainfall providing the best climatic condition for the climbing bean growing and the Low altitude and low rainfall as the unfavourable. The low rainfall reduced the yield of the climbing beans across all the altitude ranges. Although the Low altitude could be classified in general as unsuitable condition for growing of climbing beans the data shows that some varieties like MAC 49, MBC 21 and MAC 51 gave yields that were comparable to the yields of the local check Kanzama that were realized in high altitude. During the two years of experimentation we have observed that in the high altitude range and high rainfall regime the bean yield loss could be high if the crop is planted at rain onset due to high incidences of diseases, flower abortion and also the bean rotting common. Many beans rot under high rainfall in high altitude because the beans mature when there is still too much rainfall a condition not favourable for the bean production. In this altitude range farmers advised us to delay the planting by a month from the rain onset. When planting was delayed by a month we noted that the beans flowering stage coincided with low rainfall intensity and the physiological maturity of the crop coincided with the tailing off of the rain. Table 2 presents the climbing bean yield performance in the different three altitude ranges and rainfall regimes.

1.1.4. Promotion of agroforestry

Appropriate agroforestry tree seeds were sourced and distributed to farmers. A total of 48.8 kg of seed of four agroforestry species (*Gliricidia sepium, Sesbania sesban, Acacia anguistissima and Tephrosia candida*) were distributed to farmers (Table 3A). In addition, seedlings were distributed in some areas of Malawi where farmers did not sow the seed on time (Table 3A). This is expected to improve the tree survival.

***Objective 2**: Linking farmers to market to increase income through bean marketing*

2.1.1. Bulking seed of selected bean varieties and agroforestry tree species for further evaluation with existing and new partners

Climbing bean seed was bulked up, packaged in small plastic bags and properly labelled. During the summer, under rainfed we produced 106 kg of bean seed for the 20 promising varieties at Bembeke and Chitedze Research stations. Twenty kilos of breeder seed bulked in summer was distributed to farmers for further seed multiplication in dry season, under irrigation, in the farmers' fields. The seed produced on station and farmers' fields was then distributed to new farmers and some was distributed to the old sites where the summer crop had failed and lost the germplasm because of drought and pest infestation e.g. at Kalipale site in Mozambique and Makwasa in Malawi. Some seed was distributed to the farmers participating in the bean

evaluation to try on their own while maintaining our demonstration plot as a mother block. Table 4 gives the amount of seed produced for each of the 20 varieties. The seed bulking was done on small plots for instance at each site each variety was planted on 4 rows each 4 m long hence the amounts given seem to be very small. This amount of seed was enough for the next season's trials with the farmers since we only require about 200 g of each variety per site for example 6 kg of bean seed is enough to distribute to 30 sites.

3.1.1. Socio-economic characteristics in the pilot sites in Malawi and Mozambique

Socio- economic studies were carried out in all the pilot sites to understand the economic status of the participating farmers and also non participating farmers. Study population was dominated by poor households based on community defined indicators. This was reflected in the higher proportions 45% and 50.4% for Malawi and Mozambique respectively. The common indicators for categorizing wealth varied from community to community but other indicators were common to all groups. The most common indicators were possession of household assets (livestock; clothes; bicycles, radios); land; type of house (built with burnt bricks; with corrugated Iron roof or grass thatched); and food security status. Figure 2 gives the distribution of the farmers classified based on worth, the majority of the farmers we are working with are in the category of the poor whereas only a few are rich, hence this project has targeted the poor farmers.

Land is one of the most important and scarce resource in agricultural production. Land availability at household level may determine the types of crops grown a, the cropping system and level of production. In the study area, the land holding sizes of 0.8 and 1.02 ha were common for Malawi and Mozambique respectively.

The study also made an assessment on ease of acquisition of farm inputs that would help to identify potentials and opportunities for improving climbing bean production. The inputs considered were – land (hectares), fertilizer (kilograms), and farm credit (whether the farmers had access to credit). On average participating farmers allocated 0.2 ha to bean production and in most cases intercropped with maize. In the past two years the majority of farmers (85%) and 95.1 % in Malawi and Mozambique respectively did not use fertilizers in beans because of un affordable high prices and lack of knowledge that fertilizers can be applied to the bean crop. The majority incorporated residuals in the soil to improve soil fertility. Very few farmers 25% in Malawi and 10 % in Mozambique access credits for the farm inputs.

3.1.2 Conduct baseline studies to provide references for measuring impact of the project

Studies were initiated to collect baseline information on climbing bean production and marketing, and knowledge of agroforestry technologies for soil fertility improvement and also farmers' knowledge on establishment and management of Agroforestry technologies. The survey was conducted in all the project pilot sites in Malawi and Mozambique.

Malawi

A total of 200 households were sampled from all the pilot sites and interviewed. The study highlights are as follows:

- The composition of respondents in the study area ranged from poor; medium to rich; the majority (45%) were poor by community defined indicators. However, equally large proportion (43.0%) was within medium category. The medium were perceived to have the capacity to produce seed because they have land; assets and potential of adopting agricultural technologies. The study revealed that 60.3% of the respondents had their education only at primary. The low education of the farmers we are working with demands that we should be monitoring them very closely to make sure that things are done according to our proposed procedures since most of them can read and follow instructions.

- The ninety percent (90%) of respondents indicated that they produce the beans for household consumption and not for sale. However, when the production is in excess of the domestic requirement the excess is sold in the local markets. The study revealed that on average the farmer realised 1180 kg/ha from growing local varieties which is below potential yield of climbers of 4500 kg/ha. The largest proportion of the total harvest (73.1%) was used for consumption and the other was either sold or saved as seed for next season.

- About 70% of the households interviewed indicated that had difficulties in accessing seed of improved climbing bean varieties because of limited sources and lack of knowledge of these varieties. It was noted that there is no commercial seed company in Malawi that produces bean seed to sell to the farmers. Therefore, bean seed can only be found in local markets or smallholder seed producing farmers and the type of seed found is not certified seed. It was pleasing to learn that all the farmers interviewed had some experience in bean production, although 60% of the farmers were not exposed to improved climbing bean varieties. The climbing bean variety that was known by most farmers is called Kayera, many farmers grow. Kayera is a mild climber and is always intercropped with maize. First farmers plant maize and after a week they plant the beans in between the maize planting hills, the bean crop in this cropping system is not staked instead it is allowed to climb on the maize crop. The other varieties were perceived to be climbers but were dwarfs with climbing behaviour.

- The majority of farmers, 92%, recycle seed from previous harvest. The other off- farm sources included researchers and extension staff (small quantities through on-farm trials); other farmers and local traders.

- There is a great potential for adoption and wide utilisation of the newly introduced climbing beans in the study areas since the farmers are looking for high yielding varieties and are desperate to go into commercial production. Thirty-two percent of the farmers prefer varieties that are high yielding and large seeded. The other major attributes liked by the farmers include; early maturity; short cooking time; disease resistance; good taste and potential marketability.

- The majority of farmers (73.1%) indicated that they knew agroforestry technologies through participation in either government or non governmental organisation projects. However, 53.3 % have problems in accessing seed of agroforestry tree species because of

lack of exposure and limited sources; they do not know where they can get the seed, and unaffordable prices of seed in commercial seed companies.

- The common existing agroforestry species include; Acacia, Tephrosia vogelii, Sesbania sesban, Gliricidia, Acacia. polycantha and alteleria herbertsmth. These species were used in various technologies of which the majority (73.7%) were used in contour strips (Fig. 2). The project promotes these species in all project sites.

- 58.6% of the farmers acquired seed of agroforestry species from government extension staff (limited in terms of coverage and quantities provided). The other sources were non governmental organisations; researchers and other farmers.

- Incorporating residues in the soil was the most common soil fertility improvement measures followed by 62.2% of the farmers. The other measures used were farm yard manure; soil conservation and use of agroforestry species. It was revealed that farmers in the study area rarely practice crop rotation and land fallowing because small landholding.

Mozambique

Similar study was conducted in Mozambique, a total of 116 farmers were sampled from six pilot sites. Baseline information on production; seed access; soil fertility improvement measures; food security and socio economic factors was collected and analysed. The highlights of the study were as follows:

- The poor (based on community indicators) formed a large fraction (50.4%) of the participating farmers. These were perceived to have the capacity to produce seed just enough for themselves and hardly in excess to distribute to other farmers because their productions are rarely enough to satisfy their household demand. The medium and rich farmers have the potential to produce more than they require hence could be used to produce seed for scaling up of the project.

- The existing varieties were Cabunguire; Katarina; Nanyati; Thyolo; F. Manteiga and Chiata. The yield from these varieties were low (915kg/ha) compared to the potential yield from improved climbing beans (4500kg/ha) growing in the ideal conditions. About 95% of farmers indicated that they intercrop beans with maize so that the beans climb onto the maize stalks.

- Seed of bean varieties was diffused to other farmers largely (72.7%) freely to neighbours and relatives. The other means were cash (sales at local markets); credit (both cash and in kind); and seed exchange in kind (with seed of other crops)

- The largest fraction of farmers (90.1%) interviewed find it difficult to access seed of climbing bean varieties because of lack of knowledge of existing sources; distance to seed sources; lack of awareness of existing varieties; and are cash constrained to buy from the market.

- Sixty percent of the farmers used recycled bean seed from previous harvest. The other sources were fellow farmers (free or cash), bought from local traders; received from non governmental organisations and research.

- The existing agroforestry species grown by farmers in the study area were *Sesbania sesban; Gliricidia sepium*; and *Fidherbia arbida*. These Agroforestry trees are planted in an alley cropping system, where the trees are planted in rows of 4 m apart and the crops are planted in the alley between the trees. Some farmers used hedge-row cropping system i.e the trees were planted in the boundaries of the field.

- Sixty-six percent of the farmers indicated that they acquired the Seed of agroforestry species free from NGOs who were promoting Agroforestry in their areas. The other sources were recycled seed; other farmers and government extension.

- The study revealed that 54.0% of the farmers incorporate crop residues in the soil to improve soil fertility. Very few farmers regularly use green manure from agroforestry trees; farm yard manure; animal manure; chemical fertilizers; and soil conservation measures.

- The majority of farmers (66.2%) sell their beans to local traders in the local markets though the prices offered were low. Low prices were the major marketing problem among the farmers. The other problems were lack of good markets and poor quality bean grain resulting in low prices.

Objective 3: Building capacity of farmers, NARES and other partners

3.1.1 Training of Farmers, Research and Development/Extension Staff to conduct PVS

Training in participatory variety selection (PVS) was conducted for staff from partner organizations (NGOs, CBOs, traders, research institutions and government extension agents) in the two countries. These training workshops were conducted in collaboration with the Bean seed Systems and Delivery project; the new partners were specifically targeted. Table 5 presents the numbers of partners trained segregated into gender.

Participants were equipped with knowledge and skills in PVS approaches; principles of trial design (location, layout, inputs used); Management of trials; agronomic information to be collected from 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; quantitative and qualitative data to be collected.

3.1.2 Training of Farmers and Partners on Agroforestry Establishment

On site training was conducted in Agroforestry tree nursery establishment and management. Farmers were also trained in establishment of AF plots and management of Agroforestry fertilizer trees. A total of 150 farmers have been trained during the season. The Photo 3 shows the scientists demonstrating establishment of Agroforestry trees in the field.

A two day training workshop was conducted in November 2008 at Makoka Agricultural Research Station in Southern, Malawi. The training was conducted in collaboration with Agroforestry Food Security Programme to train Development and Extension staff. This involved both theory and hands-on practical training focused on agroforestry technologies, tree nursery establishment, tree planting in the field and management. A total of 15 participants six of whom were women, these were mostly partners from new pilot sites (Table 5).

3.0. CORE TEAM'S REPORT

3.1. Management meetings

The team held a core management meeting at the beginning of the season; the meeting included the core team and key partners from both countries Malawi and Mozambique (Photo 4). The members reviewed the achievements, failures and other experiences from last year, reviewed and redefined responsibilities of all the members and partners in the project. At the end of the to day meeting the members visited two days meeting they visited bean crop grown under irrigation in two sites (Photo 5).

3.2. Lessons learned and challenges

1. The team learned that the high altitude and moderate rainfall is the best condition for the growing of high yielding climbing beans. Beans do not perform very well in high altitude and high rainfall if the beans are planted at the rain onset, however, the farmers advised us that the bean yields can be optimized if the crop is planted a month or two after the rain onset. The team implemented the trials in the high altude and high following the recommendations by the farmers in order to prove the farmers' experiences.

2. The climbing beans do not perform well in low altitude and low rainfall this is also true for the bush beans (non climbers).

3. The team also learned that the farmers' preferences were mostly based on a combination of taste, market characteristics and high yielding potentials

4. The team also learned that farmers may fail to plant agroforestry trees even after receiving training and seeds. This was a major challenge. Trees were not planted either because the beneficiary farmers did not receive the seeds from their respective extension staff or because seed was delivered late. In some cases management guidelines were not followed. Late planting and poor management lade to poor survival.

The lessons learned from these results, observations and experiences with the farmers will help the climbing bean team to redesign next years' trials to suit different agro ecological zones and satisfy different farmer group's preferences.

4.0. The 2008-09 Annual work and action plan for the climbing bean team and the collaborating partners is appended Appendix IV (a separate Microsoft Word file)

5.0. Budget for the 2009 (third year) is in appendix V (a separate Microsoft Excel file)

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APPENDIX I: TABLES

Table 1: Five most preferred bean varieties from each altitude range selected by farmers during PVS

Attitude	Variety	Scores (% Men)	Scores (% Women)	Reasons
High >1400	MBC 21	67	62	High yielding, good pod filling, good taste, good colour, high marketable
	DC 86 – 215	56	54	High yielding, cooks fast, good taste, very marketable
	MAC 38	67	46	Very marketable, good taste
	DC 86 – 263	89	30	Good taste, highly marketable,
	MAC 12	22	53	High yielding, marketable
Moderate 100 - 1400	MAC 3	67	50	Good taste, good seed quality, thick soup, high marketable, cooks fast
	MBC 35	83	33	Large seed size; good taste, high yielding, cooks fast, good market
	MAC 12	100	17	Cooks fast, good colour, high yielding, withstand excess rainfall
	MAC 51	33	50	Good taste, cooks fast, marketable
	DC 86-215	50	31	Good colour, liked by bean seller, good market, good taste
Low 700 - 1000	MAC 51	57	75	High yielding tolerant to diseases, cooks fast, good taste
	DC 86-215	71	50	High yielding, long pod with good grain filling, good market, tolerant to diseases withstands high rainfall
	MBC 21	54	50	Yields high
	MAC 38	57	53	Yields high
	MAC 49	42	62	Yields high

Table 2: Bean performance in different altitude ranges and rainfall regimes averaged across the sites in Malawi and Mozambique

ALTITUDE	**HIGH**			**MEDIUM**			**LOW**			**VARIETY**
RAINFALL	**High**	**Moderate**	**Low**	**High**	**Moderate**	**Low**	**High**	**Moderate**	**Low**	**MEAN**
12D-2	3231	3180	1339	1673	3011	1200	1934	2916	171	***2073***
DC86-215	4970	4125	1088	1958	4056	1580	2263	3034	348	***2602***
DC86-263	6170	3450	1254	2552	4025	1546	2951	1767	257	***2664***
MAC-3	4564	2916	1873	1982	3811	1744	2290	1414	458	***2339***
MAC-12	6527	4895	1349	5392	4665	4374	741	640	394	***3220***
MAC-23	3239	5757	1293	3308	1577	858	1733	992	678	***2159***
MAC-26	3795	3467	1386	2562	3003	1331	2961	1123	185	***2201***
MAC-38	4774	3833	1289	2946	1914	1315	2212	2753	807	***2427***
MAC-49	5451	5110	905	3505	3310	1303	4053	1926	576	***2904***
MAC-51	6008	1478	1661	3556	4140	1507	4111	1375	773	***2734***
MAC-53	6301	3098	1341	3324	2687	1148	3106	1549	733	***2587***
MAC-82	4081	4098	1623	4511	1995	1734	2306	817	839	***2445***
MBC-10	4503	3833	1810	3686	2108	1983	2437	1656	103	***2458***
MBC-21	7060	7124	1348	4025	3832	1180	4430	1426	630	***3451***
MBC-34	4338	4040	1084	3972	2279	1782	2679	1479	612	***2474***
MBC-35	6038	5010	4410	5351	4629	1913	1009	1604	693	***3406***
MBC-39	4556	3660	3047	2480	2146	2131	1761	1502	164	***2383***
MBC-41	5365	3545	3084	4092	3565	1793	863	656	572	***2615***
MBC-7	4456	3370	2225	3467	2914	1545	1424	664	445	***2279***
Kanzama	2939	3282	857	1806	1054	1661	2088	1031	231	***1661***
MEAN	***4918***	***3964***	***1713***	***3307***	***3036***	***1681***	***2368***	***1516***	***483***	2554
L.S.D. (5%)										
	Variety				*340.9*					
	Altitude				*132*					
	Rainfall				*132*					
	Variety x Altitude				*590.5*					
	Variety x Rainfall				*590.5*					
	Altitude x Rainfall				*228.7*					
	Variety x Altitude x Rainfall				*1022.8*					
CV%					*20.3*					

Table 3A. Amount of agroforestry tree seeds (grams) distributed

Country	District	Site	*Gliricidia sepium*	*Sesbania sesban*	*Acacia anguistissima*	*Tephrosia candida*
Malawi	Ntcheu	Njolomole	140	80	62	80
	Ntcheu	Kandeu	140	80	62	80
	Zomba	Thondwe	140	80	62	80
	Chiradzulu	Mombezi	140	80	62	80
	Thyolo	Nagwengwere	140	80	62	80
	Thyolo	Matapwata	140	80	62	80
	Thyolo	Masambanjati	140	80	62	80
Mozambique	Tete	LWF	9,800	3,200	1,240	32,000
Total			**10,780**	**3,760**	**1,674**	**32,560**

Table 3B. Number of agroforestry tree seedlings distributed in Malawi

Country	District	Site	*Gliricidia sepium*	*Sesbania sesban*
Malawi	Ntcheu	Kandeu	140	140
	Zomba	Thondwe	140	140
	Chiradzulu	Mombezi	150	0
	Thyolo	Nagwengwere	140	140
	Thyolo	Matapwata	0	140
Total			**570**	**560**

Table 4. Bean seed of promising varieties multiplied by selected few farmers on-farm using irrigation

Bean Variety	Quantity Of Seed Produced –Kg.
DC 86 – 263	7.46
MBC 34	9.94
MBC 35	10.02
MAC 49	9.51
MAC 51	6.20
DC 86 – 215	8.29
MAC 82	10.04
MBC 10	9.23
MBC 21	11.62
MBC 39	8.44
MBC 7	6.10
MAC 23	11.91
MBC 41	8.53
12 D/2	6.76
MAC 53	7.38
MAC 12	10.14
MAC 3	7.08
MAC 26	7.06
MAC 38	8.56
KANZAMA	6.28

Table 5: Number of partner organizations and participants identified and trained in Malawi and Mozambique.

Country	Partner Organisation	No. of Research and Extension staff	No. of Farmers
Malawi	WVI, DAES, DARS	10	80
Mozambique	WVI, TLC, IIAM, Government Extension APLA	11	60

WVI: World Vision International
DAES: Department of Agricultural Extension Services
DARS: Department of Agricultural Research Services
TLC: Total Land Care
IIAM:

APLA:

APPENDIX II. FIGURES

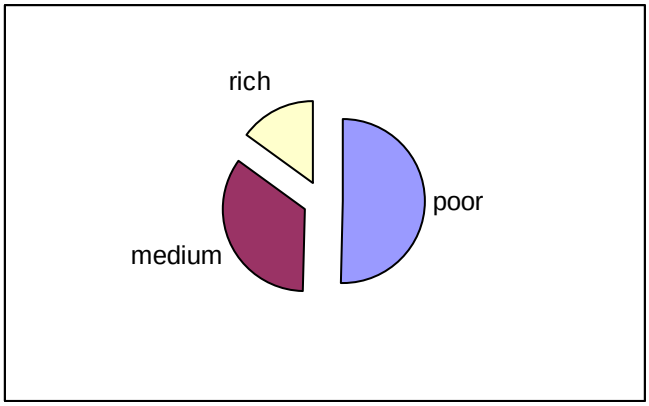

Fig. 1: Distribution of farmers participating in the project grouped by worth a case study of the bean pilot sites in Mozambique

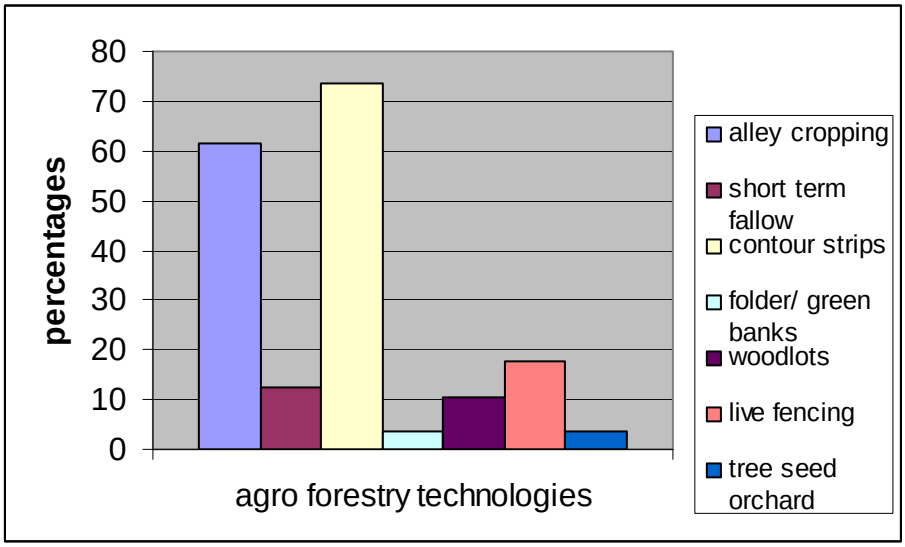

Fig. 2: Agroforestry technologies practiced by farmers in the pilot sites, the technologies were introduced by ICRAF, Government or non governmental organisations

APPENDIX III. PHOTOS

Photo 1: Laboratory technicians from the Department of Agricultural Research Services collecting soil samples from the farmer's field

Photo 2: Farmers posing for a photo in front of the bean field before evaluating the bean varieties (PVS) photo taken at Herman Village in Malawi – Zomba Gurue transect. Behind the farmers is a stand of climbing beans.

Photo 4: Training farmers in the field on proper ridge spacing, alignment and establishment of the Agroforestry fields. Dr. W. Makumba (wearing a red cap) and extension staff (standing, holding a hoe handle) are demonstrating to the farmers.

Photo 4: Planning meeting by the core team with key partners

Photo 5: The core team visited a winter bean crop after the management meeting.