Improving Soybean Productivity through Participatory Action Research for increased Food Security and Incomes in West Nile Region

By

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A report of a baseline study submitted to Agency for Accelerated Regional Development (AFARD) for conducting a participatory action research on enhancing soybean productivity, consumption, marketing and seed systems in West Nile.

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1. Introduction

This is a report of a baseline study submitted to Agency for Accelerated Regional Development (AFARD) in preparation for undertaking a participatory action research on improving soybean productivity in West Nile conducted in July 2012. AFARD is a local Non Governmental Organization that has been operating in West Nile for over 11 years with a major focus on food security, community health, education and governance has partnered with the College of Agricultural and Environmental Sciences, Makerere University to undertake an action research for improving productivity and marketing of soybeans in West Nile.

To get the proposed participatory action research underway, the partnership agreed to first establish baseline information on current knowledge, attitudes and practices concerning soybean production in the region, and then, to identify and implement interventions aimed at improving soybean productivity, marketability, utilization, seed security and marketing. A baseline survey was necessary because West Nile region has been left out in all national studies on soybeans. As a result, there is scant information on all aspects of soybean production, utilization, seed systems and marketing in the region. Any meaningful intervention to increase soybean productivity and incomes from the crop has to begin by understanding the key contemporary issues in soybeans subsector in the region.

2. Objectives of the study

The main objective of the study was establish baseline information upon which a participatory action research agenda could be developed to enhance soybean productivity, consumption, marketing and seed systems for increased household incomes and food security in West Nile region.

Specifically, the study:

- Explored the current knowledge and practices of soybean production as is compared to best sub sector practices (noting the aspects of seed security).
- Developed farmer-cum-gender responsive interventions for increasing soybean productivity, marketability, utilization and seed security.

- Strengthened the capacity of AFARD staffs/WOSSUP stakeholders and farmers through feasible and cost-effective on-field strategies able to achieve.
- Documented and disseminated best practices.

4. Research Methods

4.1 Research design:

This was a participatory action research study. Both qualitative and quantitative information were gathered. Qualitative data came from focus group discussions with farmers' groups and interviews with households. Households were interviewed to gather in on production levels, incomes and gender issues and actions needed for maximum gendered farmer involvement and empowerment in production, marketing and utilization in the region. The main focus in the baseline was to obtain data on current knowledge levels and practices in soybean production, marketing and utilization. These issues then informed participatory identification and implementation of interventions for enhanced soybean productivity and marketing including on-farm variety trials.

4.2 Study area:

This study was carried out in two of the seven districts in West Nile, namely Zombo and Yumbe where AFARD is operating. Field work during the baseline survey took place between 24th and 30th June 2012. Discussions were held with a total of seven eight AFARD-supported groups preceded household interviews with 29 soybean growing households. Data analysis and report writing took place in Kampala. The training of trainers on soybean agronomy, on farm seed production practices, post-harvest handling, marketing and utilization and presentation of preliminary findings for discussions with AFARD team for derivation of realistic project took place at Centre for Continuing Agricultural Education (CAEC) located in Makerere University Agricultural Research Institute Kabanyolo (MUARIK) on 20th and 21st July 2012.

4.3 Sampling and data collection procedures:

Purposive and cluster sampling techniques were used to identify participants in the data collection process. Together with AFARD field staff, the research team identified research

participants based on the diversity in farming practices, soil types, rainfall patterns and group performance. In total, 29 households were interviewed, 11 and 18 in Yumbe and Zombo respectively. Up to seven group discussions with selected groups were held with two and five discussions in Yumbe and Zombo respectively. In terms of gender representation, 69% of the household interviewed had male heads. There were more male household heads in Yumbe (82%) than Zombo (61%).

In the household interviews, questions focused on current levels of knowledge, practices and production in the soybean subsector. Other questions explored selected household and demographic characteristics; access to land; soybean agronomy, production levels and associated problems, post-harvest handling and associated problems, marketing, utilization, income and food security. Special attention was paid to intra-household gender issues.

***2.5 Data analysis*:**

After field work, the data was compiled, sorted, edited, classified, and finally analyzed. For quantitative information, Statistical Package for Social Sciences (SPSS) version 19 was used to generate descriptive statistics (frequencies, means and cross tabulations). Cross tabulations and chi-square statistics were used to explore gender- and location-based differences in variables for soybean production, marketing and utilization. Qualitative data were catalogued, rated in terms of relevance to the study to aid identification of emerging themes. Analysis of information from group discussions and open-ended questions involved examining the participants' views and using content analysis to summarize the discussions.

5. Training of AFARD staff and discussion of preliminary results:

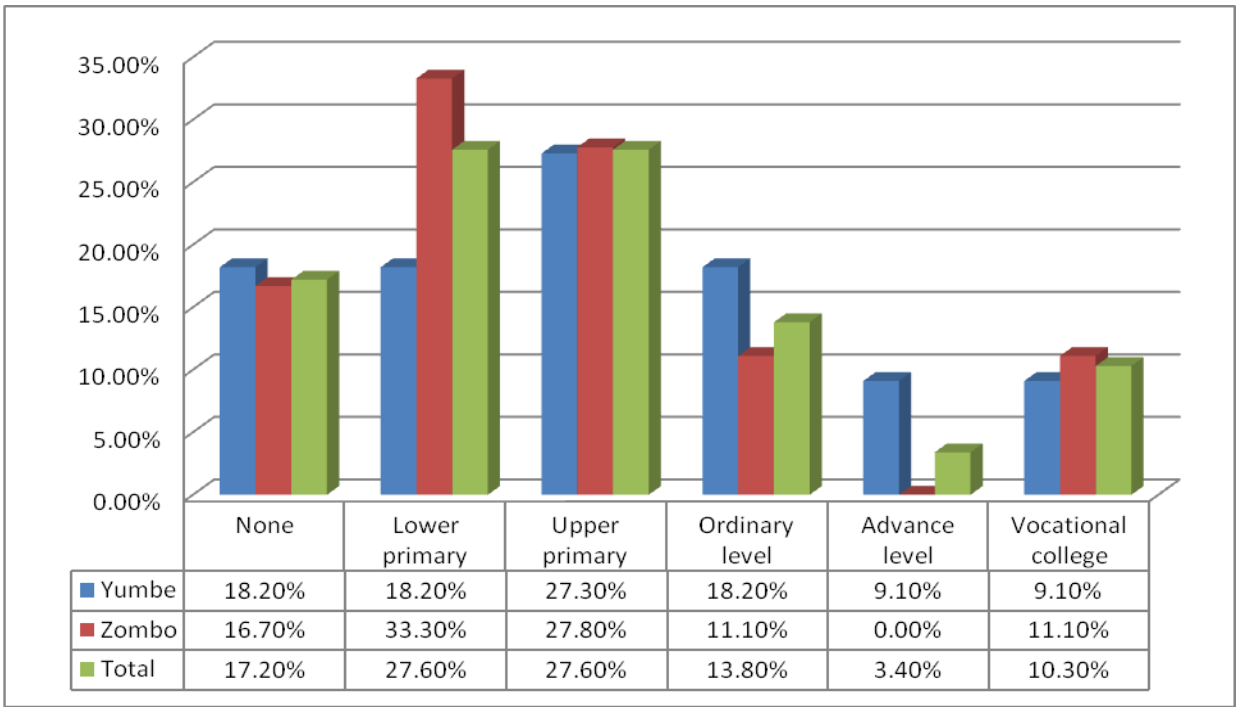
After producing a draft report, a two-day training of trainers' workshop was organized for AFARD staff on all aspects of soybean production and marketing at Center for Continuing Agricultural Education (CAEC) in Makerere Agricultural Research Institute Kabanyolo (MUARIK) on 20^{th}-21^{st} July 2012. The draft report was presented in this workshop and discussed to identify some realistic project interventions for enhancing soybean productivity and incomes in the region. The workshop participants proposed activities for the action research based on the preliminary results of the baseline and discussions their discussions in the workshop. Given the participatory nature of the proposed study, final decisions on interventions

will be taken jointly with the main project participants, the farmers, based on what is likely to make the greatest difference on improving their soybean productivity and incomes from the crop.

6. Results and Discussions:

6.1 Selected household characteristics and assets:

Education: Educational levels are generally low in the two districts (Figure 1). Up to 17.2% of household heads never attended any school. More than half of the household heads attended primary education. Among those interviewed, people in Yumbe were slightly more educated than those in Zombo because the district had more household heads with ordinary level or higher levels of education.



	None	Lower primary	Upper primary	Ordinary level	Advance level	Vocational college
Yumbe	18.20%	18.20%	27.30%	18.20%	9.10%	9.10%
Zombo	16.70%	33.30%	27.80%	11.10%	0.00%	11.10%
Total	17.20%	27.60%	27.60%	13.80%	3.40%	10.30%

Figure 1. Education levels of household heads in Yumbe and Zombo districts

Ownership of household equipment: In terms of ownership of equipment that can facilitate the household's farming activities, most households were found to own bicycles (79%), radio (73%) and cell phones (62%) (Figure 2). More households in Yumbe than Zombo owned more bicycles (91% versus 72%), radios, cell phones (82% versus 50%) and motorcycles. There were no ox-ploughs, indicating that no ox-traction technology was being used in the two districts.

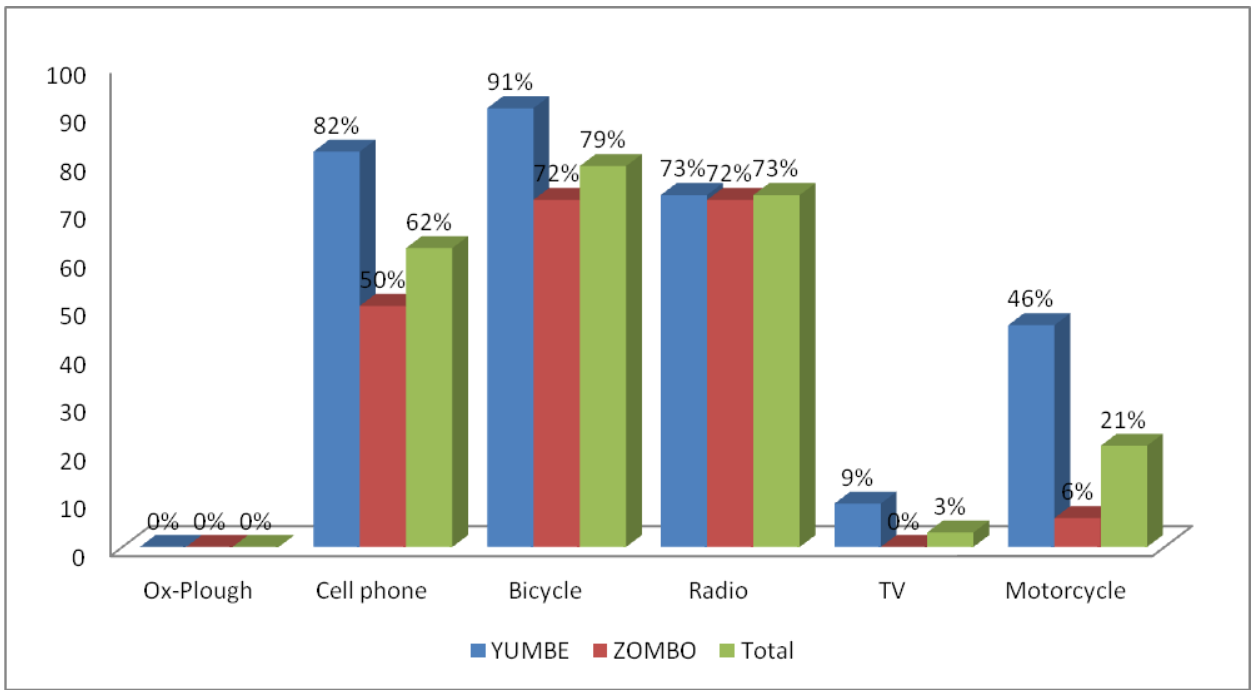


Figure 2. Ownership of household equipment

Land ownership and use: The two districts had relatively more access to land compared to the national average of about 2.5 acres (Table 1). On average, households in Yumbe had more access to land (15.5 acres) relative to Zombo (7.2 acres). Out of the total amount of land accessible, more was cultivated in Yumbe (4 acres) than Zombo (3 acres). The average size of land under soybeans in Yumbe was also found to be higher (1.7 acres) than in Zombo (0.82 acres) (Table 2). Generally, discussions with farmers indicated that land shortage was not yet a problem in the two districts.

Table 1a. Amount of accessible land and under crops

Statistics	Yumbe		Zombo	
	Total (acres)	Under crops (acres)	Total (acres)	Under crops (acres)
Mean	15.54	4.05	7.19	3.33
Median	15.00	3.50	4.00	2.50
Minimum	2.00	2.00	2.50	1.00
Maximum	30.00	10.00	30.00	10.00

Table 1b. Amount of land under soybeans

Statistics	Zombo	Yumbe	Total
Mean	0.82	1.71	1.16
Median	0.625	2.00	1.00
Minimum	0.25	0.30	0.25
Maximum	2.00	4.00	4.00

6.2 Soybean production, marketing and consumption:

Our findings indicate that AFARD did a lot work in promoting soybean production and marketing among participating farmers. Farmers were trained and provided soybean seeds. However, there were things which could have been done better. For instance, the seeds supplied to farmers were of poor quality containing mixed varieties. Also farmers were given too much seeds. The amounts of land farmers declared for planting soybeans were not verified and so many farmers over stated the size of their land earmarked for planting soybeans. Moreover, the farmers used less seed rate, since they were not trained in planting appropriate plant populations of soybeans. The result was that most farmers ended up with more seeds than they could plant. Some kept the remaining seeds for the following season while others just ate the remaining seeds soon after planting. In Zombo, each farmer was given 25kgs, regardless of the size of seedbed prepared for soybeans. In Yumbe, farmers were asked to declare the size of land prepared for soybeans. This figure was then used to estimate the amount seed needed. On average farmers in Yumbe received any where between 10kgs and 50kgs of soybean seeds.

6.21 Varieties grown: Most farmers could not name the varieties they grew. From their descriptions, Maksoy 1N was more prevalent with 82% and 18% of households in Yumbe and Zombo respectively growing the variety. Other varieties mentioned were Maksoy 2N and Namsoy 4M. Again the most preferred variety was Maksoy 1N (25% in Yumbe) and Namsoy 4M. The reasons for varietal preferences were high yields (21.4%), minimum shattering (10.7% in Yumbe) and drought tolerance (3.6% in Yumbe) and early maturity.

6.22 Source of labor and gender: Households used manual labor for all farming operations. For seedbed preparation, the source of labor included both household and hired labor (51.7%), household labor only (37.9%) and hired labor only (3.4%). In land preparation, in 90% of the

households, both men and women were involved. For planting, most households (75%) relied on household labor only. A few (20.7%) used both household and hired labor for planting. During weeding, in majority of the households (75.9%) both men and women were equally involved. There were those households (24.1%) where weeding soybeans was exclusively left to women. At harvest time, majority (82%) rely on household labor only. The rest of the households use both household and hired labor. In most (75%) households, harvesting is done by both men and women. There were households (25%) in which harvesting was left to women alone.

6.23 Planting and weeding: All the households interviewed planted soybeans in rows. Most households used spacing other than those recommended for appropriate plant population. The result was very low plant populations in most fields (Plate 1). And because soybeans like growing in competition, the low plant population significantly affected crop yields. Some households (27.6%) intercropped soybeans with other crops including cassava, beans, maize and groundnuts. Their reasons for intercropping centered on optimizing the use of labor and the need to use land more intensively.

Plate 1. Wider spacing used for soybeans in Zombo district leading to low plant populations and significantly reduced soybean yields

Majority (75.9%) of the households weeded soybeans twice. A few (20.7%) weeded thrice. None of the households used fertilizers and/or compost.

6.24 Field problems experienced in soybean growing: About 62% of the households reported too much rains as a major problem. There were also problems lack of hard surface for drying soybeans (9.8%) and theft (4.9%). Other problems observed were drought and poor soils both

more severe in Yumbe than Zombo (Plate 2). There were a few cases of pests and diseases noted, especially beetles in Terego (Plate 3). In some group discussions in Zombo, farmers identified the problem of birds destroying cotyledons at the time of germination and caterpillars. As mentioned earlier, poor quality seeds, especially mixing varieties was frequent.

Plate 2. Drooping soybeans as a result of poor soils and drought in Yumbe

Plate 3. Beetle attack in Terego

Plate 4. Mixed varieties as a result of poor seed quality observed in a soybean field in Terego

6.25 Harvesting: During household interviews, we asked the best time for harvesting soybeans. Their responses were: when pods turn brown (33.3%), when pods are dry (26.2%), when plant turns yellowish (21.4%), when leaves fall (14.3%) and when pods start shattering (4.8% in Yumbe). These responses indicated that most households had been harvesting soybeans just before the best time. In Yumbe, some households (35.7%) reported occurrence of pod shattering

in their gardens. The main cause was delayed harvesting (60%) and variety type (30%) 9Namsoy 4M variety). Other problems experienced in harvesting included: lack of labor (55% more severe in Zombo), too much rains (27%) and difficulties in transporting harvested soybeans home (4.5%).

Problems experienced in soybean harvesting: Majority of the farmers reported to have experienced problems during harvesting (78.6%). This problem was more reported in Yumbe (81.8%) as compared to Zombo (76.5%). In addition to above mentioned problems, farmers indicated lack labor (54.5%) and bad weather (27.3%) as key problem faced during the harvesting of soybeans. Lack of labor was more pronounced in Zombo (69.2%) and less reported in Yumbe (33.3%). Of all operations in producing soybeans from planting to harvesting, the most challenging/problematic were harvesting (57%) and weeding (50%). Planting (25%) and weeding (11%) were also said to be challenging.

6.27 Yield: The total yields of soybeans in Yumbe and Zombo in 2011 were generally very low compared possible yields in comparable situations (Table 2). There were also big inter-district yield differences. In Yumbe, the average yields in kilograms per acre were more than double (314) the average yield in Zombo (129). On how the produce was used, over 70% of the households sold the crop (Figure 3). A small portion (about 20%) of the harvest was consumed at home. Some kept very small amounts for seed. In general, the reported postharvest losses were negligible.

Table 2. Total yield of soybeans per acre in Yumbe and Zombo in second season 2011

Statistics	Yield in kilograms per acre	
	Yumbe	Zombo
Mean	313.95	128.71
Median	250	60
Minimum	31.5	7
Maximum	860	800

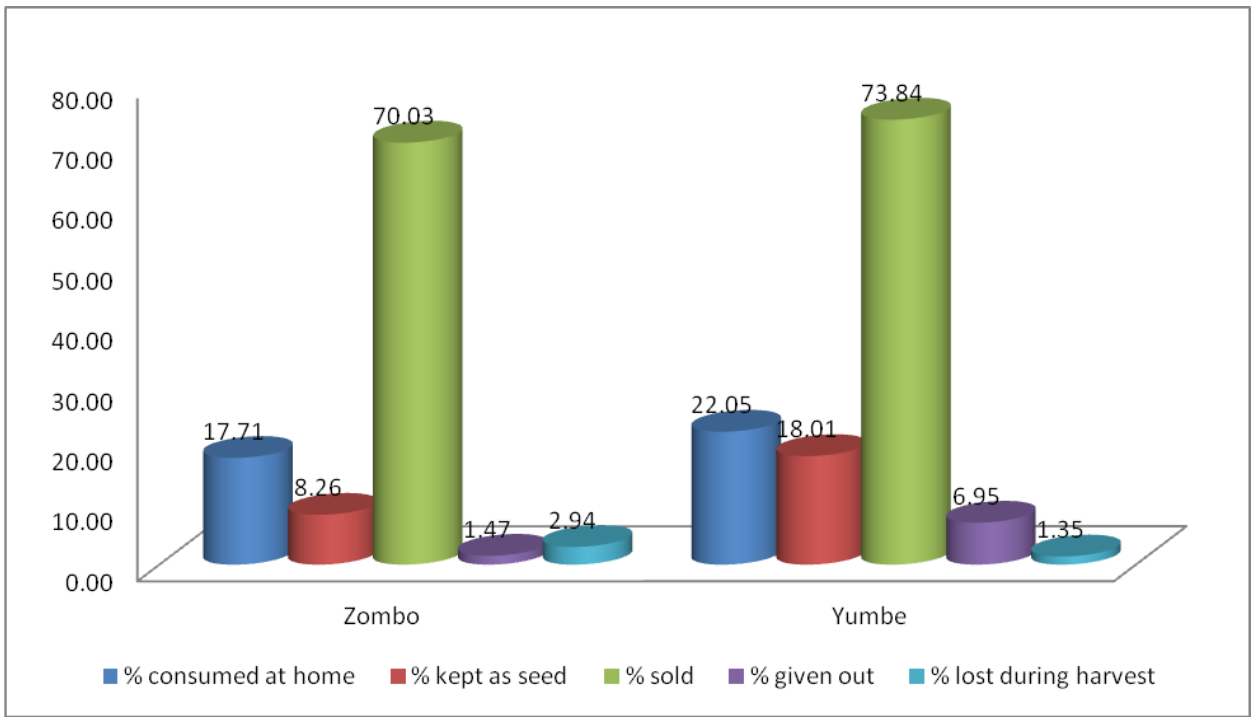


Figure 3. How soybean used in Yumbe and Zombo in 2011

6.28 Post harvest handling and Value addition: The reported length of time taken between harvesting and threshing was one to 10 days. Households threshed soybeans by beating the crop, spread on a hard surface, with a stick. The crop was often spread to dry on tarpaulin/tents (89.3%) and bare ground (10.7%). Some problems experienced in drying included too much rains (64.3% more of a problem in Zombo) and the lack of a good drying surface (17.8%). Some problems were identified during the group discussions such as crop losses in storage from rodents came up in the group discussions. After threshing, the produce is usually kept for one to two months before selling. For the produce consumed at home, there were mainly three ways of preparing before eating: roasting (93%), cooking as source (18% in Yumbe) and soy milk (11%). There were less prevalent incidences of using soybeans as paste, much like sesame and groundnuts and as porridge. In Zombo, it was noted that the farmers learnt of soybean utilization from Democratic Republic of Congo.

6.29 Marketing: Almost all households interviewed (93%) sold some soybeans in 2011. Again almost all sold AFARD at a group collecting center (48.1%), rural market (33.3%) or in their homes (18.5%). Most households (82%) experienced some problems in marketing soybeans. The biggest problem was perceived low price. AFARD bought soybeans at one thousand shillings per

kilogram. There was widespread outcry among farmers that this price was too low. The complaint was loudest in Yumbe where some local politicians told farmers to sell a kilogram of their produce for 5,000 shillings. Some households reported the problem of low demand (29%) and lack of market (25% in Zombo). They said apart from AFARD, there were no other interested parties in buying soybeans, emphasizing that the local market for soybeans was still very low. In Zombo, the problem of poor transport due to bad roads featured strongly. There were also problems associated with poor storage facilities.

6.3 Production of other crops:

Households were asked to name in order of importance the top five crops that they grew in 2011. The most important crop for both food and cash was beans, grown by all households interviewed. The second most important crop for both food and cash was cassava, followed by groundnuts. About 90% and 69% grew cassava and groundnuts respectively. Soybeans ranked as the fourth most important crop. More households (24.1%) grew soybeans for cash than any other crop in the list.

Table 3. Other crops grown in Yumbe and Zombo districts

Crop	Main reason for growing the crop (%)				Total	
	Food	Cash	Both food and cash	Others	N	(%)
Beans	44.8	0	55.2	0	29	100
Cassava	37.9	3.4	48.2	0	26	89.5
Groundnuts	6.9	6.9	55.2	0	20	69.0
Soybeans	0	24.1	37.9	3.4	19	65.4
Maize	13.8	6.9	41.4	0	18	62.1
Millet	13.8	0	0	0	4	13.8
Sesame	0	6.9	6.9	0	4	13.8
Sun flower	3.4	3.4	3.4	0	3	10.2
Sorghum	6.9	0	0	0	2	6.9
Sweet potatoes	6.9	0	0	0	2	6.9
Cow peas	3.4	0	0	0	1	3.4
Rice	3.4	0	0	0	1	3.4

6.4 Household income and food security:

The main sources of income to the households were crop sales, livestock sales, casual employment and running own businesses as shown in the Table 4. The estimated average

proportion of household income from soybeans was computed to be 27% with the maximum reported value of 80% and a minimum of 0.5%.

Table 4. Sources of household income

Source	Households earning from source (%)		Total	
	Yumbe	Zombo	(N)	(%)
Crop sales	27.6	34.5	18	62.1
Livestock sales	20.7	30.0	15	51.7
Casual employment (agric)	34.5	10.3	13	44.8
Own business	17.2	13.8	9.0	31.0
Others	6.9	6.9	4.0	13.8
Poles/firewood/charcoal	3.4	6.9	3.0	10.3
Casual employment (non-agric)	0.0	10.3	3.0	10.3

6.42 Household food security: Most of the farmers acknowledged having experienced lack of food in the last twelve month (71.4%). On whether household considered themselves food secure, sometimes food insecure or food insecure, the majority (75%) reported being sometimes food insecure with only 25% saying they were food secure. The months of March to June were mentioned as period of most food insecurity. Farmers reported that they experienced most of the famine in June, May and April and was more reported in Zombo as compared to Yumbe. On what households thought of their relative poverty status in their village, 47% thought they were the same as others in the village, 32% rated themselves richer than others and 21% felt they were poorer.

7. Summary of the main issues emerging from the study

a) There was generally very little knowledge on all aspects of soybeans in the region. The lack knowledge however does not mean lack support for soybean production. There was a genuine interest among farmers in producing soybeans.

b) Farmers were given seeds without adequate training on what to do with the seeds. Some of the seeds supplied by AFARD were of relatively poor quality. For instance, some had mixed varieties. There was also inadequate follow-up of those who received seeds.

c) The yields were too low. This was mostly attributed to poor agronomic practices, extreme drought, poor soils and poor seed quality. Some of the seeds supplied by AFARD had poor germination.

d) Widespread concern among farmers that the price for soybeans in 2011 was too low.

8. Proposed interventions for further engagement by workshop participants:

1. *Training farmers on agronomy, marketing and consumption of soybeans:*

    - Establishing demos at group level. The demos should be set up before famers start field operations Increase extension worker-farmer ratio to ensure close monitoring by field officers.
    - Technical backstopping by Makerere University's College of Agricultural and Environmental Sciences (Mak-CAES).

2. *Establishing a sustainable community seed systems:*

    - Identify two committed farmers in each group, train and contract them to produce seed.
    - AFARD should establish better seed storage.
    - Access to breeder seeds from Mak-CAES
    - Routine M&E by AFARD
    - Mak-CAES to link AFARD to the seed market in Uganda.

3. *Establishing a sustainable partnership between Makerere University and AFARD:*

    - AFARD to draft an MOU for establishing a partnership with Mak-CAES.
    - Establish field trials in West Nile in collaboration with Abi-ZARDI.
    - Mak-CAES to jointly develop and disseminate technologies with AFARD.