Baseline progress report on soybean in Kenya

Jonas Chianu et al

Baseline progress report for Tropical Legumes-II

PROGRESS REPORT

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1. Background

Using a detailed and structured questionnaire, the Kenyan arm of the TL II Objective 7 (Soybean) baseline survey was carried out from 1 – 20 March 2008. Thirteen trained enumerators (five females and eight males) carried out actual data collection. Mr. Martin Odendo, an Agricultural Economist from the Kenya Agricultural Research Institute (KARI), *Kakamega* led the training of the enumerators, assisted by Ms. Immaculate Omondi of the Tropical Soil Biology and Fertility institute of the Centro Internacional Agricultura Tropical (TSBF–CIAT). Prior to actual data collection, the trained enumerators pre-tested the questionnaire. Thereafter, the outcome of the pre-testing exercise by each and every enumerator was discussed in group so that all enumerators would benefit from the discussions.

The topics covered in the questionnaire are summarized as follows: general information about the household (especially about the head of the household), household composition, household resources, institutional settings, and agricultural production (crop production and productivity, soybean production including soybean seed systems, and livestock production). The other topics are agricultural commodity marketing (decisions, commercial index, etc.), household income and expenditure profile, household welfare and livelihoods, processing and other forms of value-addition, food consumption and utilization, soybean utilization and perceptions related to it, income from processed soybean products, household and community-level seed systems, sale of crop seeds, household food consumption frequency, and capacity strengthening. The last but not the least set of topics covered is child welfare assessment targeted at a subset of the survey households with children aged two years and below. The specific topics covered are child feeding (weaning and complementary), assessment of child health and nutrition status, and anthropometric assessment.

In order to reach a sufficient number of soybean growing households, we sampled at sub-locational level instead of village level. A sub-location contains many villages. In total we visited three sub-locations (two soybean growing sub-locations and one non-soybean growing sub-location). While the two soybean growing sub-locations were *Khalaba* and *Musamba*, the non-soybean growing sub-location was *Kholera*. We sampled a total of 247 farm households, distributed by sub-locations as follows: 83 farm households (or 33.6%) from *Khalaba*, 76 farm households (or 30.8%) from *Kholera*, and 88 farm households (or 35.6%) from *Musamba* sub-location (**Table not shown**). However, the distribution of the actual sampled farm households show that 168 farm households (or 68%) were soybean growing; the balance of 79 farm households (or 32%) was non-soybean growing. Surprisingly, while four of the 83 households sampled from *Khalaba* sub-location turned out to be non-soybean growing, one of the 88 households sampled from *Musamba* sub-location turned out to also be non-soybean growing. With respect to *Kholera* sub-location, it turned out that of the 76 farm households samples initially as non-soybean growing, two turned out to be soybean growing. The authenticity of these switches would be varied as the analysis proceeds, especially since the results presented in this report are largely preliminary. The numbers of villages (usually small-sized)

involved were 22 for *Khalaba* sub-location, seven for *Kholera* sub-location, and 13 for *Musamba* sub-location. Our initial intention was to have equal numbers of male-headed and female-headed farm households included in the survey. However, final sample selection was highly skewed towards male-headed households for the main reason that it was not possible to see a sufficient number of female-headed households. However, post survey, we were able to use household headship and management to classify the survey farm households into three interesting classes for an improved understanding of the data. These classes are: male-headed male-managed households (where the head is a man and is actively living with the households), male-headed female-managed (where the man, though is taken as the head, but he is not always staying with the household), and female-headed female-managed (where the woman is fully incharge and control and a widow in all cases). We extended some aspects of the data analysis and the report following those classes.

Following survey data collection, we embarked on data entry, cleaning, validation and preliminary data analysis. The results presented in this report are based on a preliminary analysis of a part of the baseline data collected. More detailed analyses, informed by the results from exploratory or preliminary data analysis will follow.

2. Results of preliminary data analyses

2.1. General household information (especially about the head)

2.1.1. Household size

Household size in the survey area ranges from one to 12 persons (with a mean of 6.3 persons and a standard deviation of 2.22 persons). About 45.4% of the survey households had household sizes of seven to 12 persons. Distribution by sub-location shows that mean household size ranges from 5.9 persons (in *Kholera* sub-location) to 6.5 persons (in *Khalaba* and *Musamba* sub-locations) (see **Table 2.1).** There is no significant difference among mean household sizes across sub-location and even across the headship and management of households. However, at a mean household size of 6.5 (and standard deviation of 2.12 persons), the mean size of soybean growing households was significantly higher (at 10% probability level) than the mean size of non-soybean growing households (with mean household size of 5.9 persons (and standard deviation of 2.37 persons). **Figure 1.1** shows a more or less normal distribution in farm household sizes in the survey area (across sub-locations).

Table 1.1: Distribution of mean household size in Western Kenya by sub-location

Sub-location	n	Mean	Std. Deviation
Khalaba	83	6.5	2.29
Kholera	76	5.9	2.41
Musamba	88	6.5	2.05
Total	**247**	**6.3**	**2.22**
P		**0.170**	

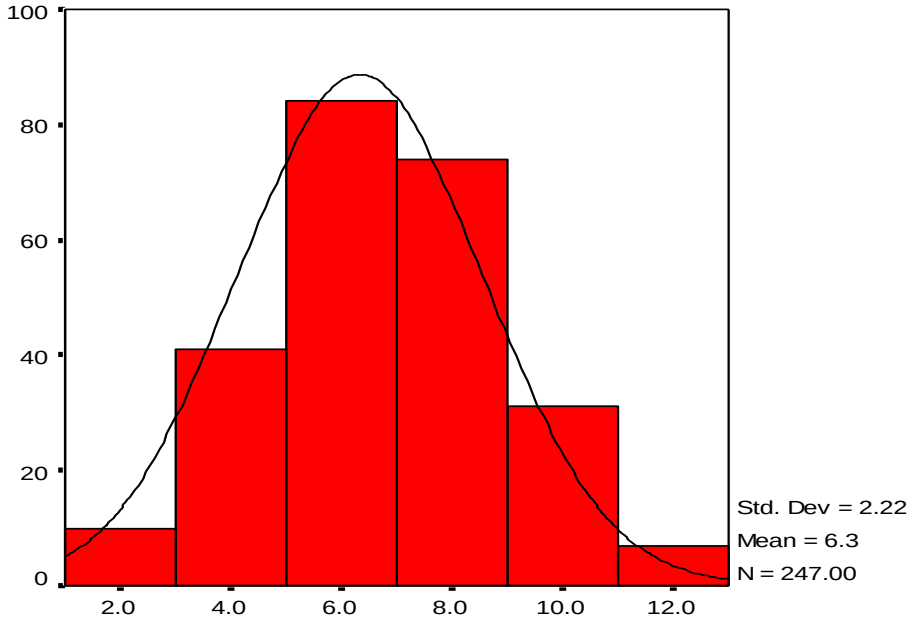

Figure 1.1: Distribution of farm household size in Western Kenya

2.1.2. Age and marital status distribution of heads of survey households

The age of the heads of the survey households ranges from 21 to 86 years (with a mean of 45.4 years and a standard deviation of 13.4 years). **Table 1.2** shows the age distribution of survey households by sub-location, soybean growing status, and headship and management of households. Most (231 out of 247 or 93.5%) of the household heads were married. However, 14 of them (or 5.7%) were widowed. The balance of two (0.8%) were either divorced or separated (**Table not shown**).

Table 1.2: Age distribution of heads of survey households in Western Kenya by household headship and management and sub-location

		Household headship and management			
Sub-location	**Soybean growing status**	**Male headed-male managed**	**Male headed-female managed**	**Female headed-female managed**	**Total**
	Yes	46.5	43.5	52.8	45.6
	No	38.0	49.3		46.5
Khalaba	Across	46.3	44.0	52.8	45.6
	Yes	50.0	55.0		52.5
	No	45.0	45.8	44.1	45.2
Kholera	Across	45.1	46.1	44.1	45.4
	Yes	45.1	44.4	52.0	45.1
	No	-	37.0	-	37.0
Musamba	Across	45.1	44.2	52.0	45.0
	Yes	**45.9**	**44.1**	**52.4**	**45.4**
	No	**44.8**	**45.8**	**44.1**	**45.2**
Total	**Total**	**45.6**	**44.7**	**48.3**	**45.4**

Source: Survey data, 2008

2.1.3. Decision making in the household

Decision making is critical for overall welfare of farm households. We investigated the persons involved in key decision making in the survey households. Results show that while most (62.8%) of the decisions were made by the household head, about 26.7% of them are jointly made by household head and the spouse. Spouses only make just about 8.5% of the decisions. Only 2% of the decisions are usually made by all members of the household together.

2.1.4. Educational level and religion of household heads

Most of the heads of the survey households were literate. Only 12 out of the 247 households surveyed had illiterate heads (and can neither read nor write). In decreasing order of educational level, while one out of the 247 households (0.4%) had a head that attained just adult education, 19 out of the 247 households (or 7.7%) had heads that attained post secondary education. About 88 of the 247 households (or 35.6%) had heads that attained secondary education. Majority of the households (127 out of 247 or 51.4%) had household heads that attained only primary education (**Table not shown**). This result generally shows that the educational level of most of the heads of the survey households is sufficient for carrying out good agricultural productivity practices. The distribution of household heads' education attainment by the headship and management of households shows that the heads of female-headed female-managed households were more educationally disadvantaged than the heads of the remaining two categories (i.e., male-headed male-managed and male-headed female-managed households) (see **Table 1.3**). Most (9 out of 19 or 47.4%) of the farm household heads that attained post secondary education were from *Kholera* sub-location. Ironically, however, of all the three sub-

locations, the same *Kholera* sub-location had the least number of household heads (21 out of 88 or 23.9% compared to 37.5 for *Musamba* sub-location and 38.6% for *Khalaba* sub-location) that had attained secondary education (see **Table 1.4**).

Most (193 out of 247 or 78.1%) of the heads of the survey households were Christians. However, one of the survey heads (from among the male-headed female-managed households in *Khalaba* sub-location) of households (0.4%) was an African traditional religious believer. The remaining 53 heads of households (or 21.5%) were Muslims (**Table not shown**).

Table 1.3: Distribution of household heads' education attainment in Western Kenya by headship and management of households

	Household headship and management			
Head's education level	**Male headed-male managed**	**Male headed-female managed**	**Female headed-female managed**	**Total**
Primary	53 (49.1)	61 (51.3)	13 (65.0)	127 (51.4)
Secondary	45 (41.7)	40 (33.6)	3 (15.0)	88 (35.6)
Post secondary	5 (04.6)	13 (10.9)	1 (05.0)	19 (07.7)
Illiterate	5 (04.6)	4 (03.4)	3 (15.0)	12 (04.9)
Adult education	0 (00.0)	1 (00.8)	0 (00.0)	1 (00.4)
Total	108 (100.0)	119 (100.0)	20 (100.0)	247 (100.0)

Values in parenthesis are percent figures

Source: Survey data, 2008

Table 1.4: Distribution of household heads' education attainment in Western Kenya by sub-location

	Sub-location			
Head's education level	**Khalaba**	**Kholera**	**Musamba**	**Total**
Primary	42 (50.6)	39 (51.3)	46 (52.3)	127 (51.4)
Secondary	34 (41.0)	21 (27.6)	33 (37.5)	88 (35.6)
Post secondary	5 (06.0)	9 (11.8)	5 (05.7)	19 (07.7)
Illiterate	2 (02.4)	7 (09.2)	3 (03.4)	12 (04.9)
Adult education	0 (00.0)	0 (00.0)	1 (01.1)	1 (00.4)
Total	**83 (100.0)**	**76 (100.0)**	**88 (100.0)**	**247 (100.0)**

Values in parenthesis are percent figures

Source: Survey data, 2008

2.2. Household composition

For each survey household, we also collected data on all the people living in the same compound, eating from the same "pot" and working on the family farm. Variables covered include gender (male or female), age (in years), relation to household head (head

himself or herself, parent, child/grand child, nephew/niece, son/daughter-in-law, brother/sister, other relative, etc.), marital status (single, married, widowed, separated, divorced), literacy status (minor, illiterate, primary, secondary, post secondary, adult education), type of off-farm income source (petty trading, teaching, masonry/carpentry, nursing, art and craft, driving, fitting mechanic, etc.), number of months lives at home in the last 12 months, and number of months (in a year) available for farm work. These data are still being processed.

2.3.1. Household resources

Through observation and special focus on each household's main house, we evaluated the type of dwelling survey households lived in. We classified responses into: block house with asbestos or iron roof, brick house with asbestos or iron roof, mud hut with asbestos or iron roof, block house with grass thatch roof, brick house with grass thatch roof, mud hut with grass thatch roof, in a decreasing order of quality and cost. Result shows that the most popular type of dwelling in the study area was **mud hut with asbestos or iron roof** (according to data from 165 out of the 247 survey households or 66.8%). It is distantly followed by mud hut with grass thatch roof (18.6%).

If we regard the first and second best quality type houses (block house with asbestos or iron roof and brick house with asbestos or iron roof) to be inhabited by the relatively well to do in the survey sub-locations, it implies that they were just about 32 out of the 247 survey households (or 13.0%) (see **Table 3.1**). The distributions by household headship and management and by sub-location are contained in **Table 3.2** and **Table 3.3**, respectively. **Table 3.2** shows that by sub-location, the distribution of households that lived in first and second best quality type houses were eight out of 83 households (or 9.6%) for *Khalaba*, 13 out of 76 households (or 17.1%) in *Kholera*, and 11 out of 88 households (or 12.5%) in *Musamba* sub-locations. By headship and management of households, **Table 3.3** shows that the distribution of households that lived in first and second best quality type houses were 13 out of 108 households (or 12.0%) for male-headed male-managed households, 16 out of 119 households (or 13.4%) for male-headed female-managed households, and three out of 20 households (or 15.0%) for female-headed female-managed households.

Table 3.1: Type of dwelling survey households lived in: Western Kenya

Dwelling quality rank	Exact type of dwelling	Frequency
3rd	Mud hut with asbestos or iron roof	165 (66.8)
6th	Mud hut with grass thatch roof	46 (18.6)
2nd	Brick house with asbestos or iron roof	19 (07.7)
1st	Block house with asbestos or iron roof	13 (05.3)
5th	Brick house with grass thatch roof	1 (00.4)
4th	Block house with grass thatch roof	0 (00.0)
	Other (specify)	3 (01.2)
Total		247 (100.0)

Values in parenthesis are percent figures

Source: Survey data, 2008

Table 3.2: Type of dwelling survey households lived in Western Kenya by household headship and management

Dwelling quality rank		Households headship and management			
	Type of dwelling	Male headed-male managed	Male headed-female managed	Female headed-female managed	Total
3rd	Mud hut with asbestos or iron roof	67 (62.0)	83 (69.7)	15 (75.0)	165 (66.8)
6th	Mud hut with grass thatch roof	25 (23.1)	19 (16.0)	2 (10.0)	46 (18.6)
2nd	Brick house with asbestos or iron roof	10 (09.3)	7 (05.9)	2 (10.0)	19 (07.7)
1st	Block house with asbestos or iron roof	3 (02.8)	9 (07.6)	1 (05.0)	13 (05.3)
5th	Brick house with grass thatch roof	0 (00.0)	1 (00.8)	0 (00.0)	1 (00.4)
4th	Block house with grass thatch roof				
	Other (specify)	3 (02.8)	0 (00.0)	0 (00.0)	3 (01.2)
Total		**108 (100.0)**	**119 (100.0)**	**20 (100.0)**	**247 (100.0)**

Values in parenthesis are percent figures

Source: Survey data, 2008

Table 3.3: Type of dwelling survey households lived in Western Kenya by sub-location

Dwelling quality rank	Type of dwelling	Sub-location			Total
		Khalaba	***Kholera***	***Musamba***	
3rd	Mud hut with asbestos or iron roof	51 (61.4)	51 (67.1)	63 (71.6)	165 (66.8)
6th	Mud hut with grass thatch roof	22 (26.5)	11 (14.5)	13 (14.8)	46 (18.6)
2nd	Brick house with asbestos or iron roof	6 (07.2)	6 (07.9)	7 (08.0)	19 (07.7)
1st	Block house with asbestos or iron roof	2 (02.4)	7 (09.2)	4 (04.5)	13 (05.3)
5th	Brick house with grass thatch roof	1 (01.2)	0 (00.0)	0 (00.0)	1 (00.4)
4th	Block house with grass thatch roof				
	Other (specify)	1 (01.2)	1 (01.3)	1 (01.1)	3 (01.2)
Total		**83 (100.0)**	**76 (100.0)**	**88 (100.0)**	**247 (100.0)**

Values in parenthesis are percent figures

Source: Survey data, 2008

2.3.2. Farm household asset ownership

We evaluated the ownership of different assets (motor vehicle, motorcycle, bicycle, tractor, tractor plough/harrow, draft animals, animal plough/harrow, animal cart, wheel barrow, television, radio, private water well, private borehole, water pump, diesel pumps, water tanks, generator, mobile phones, fixed phones, etc.) by the survey households. None of the households owned tractor, tractor plough/harrow, diesel pumps, or fixed phones. The four most commonly owned household asset items were radio (owned by 88.3% of the households), bicycle (82.3%), cultivation tools (hoes and cutlasses) (76.9%), and mobile phones (59.1%) in that order (see **Table 3.4**). It is rather surprising that about 23.1% of the farm households did not indicate that they possessed cultivation tools (hoes and cutlasses). Also surprising is the knowledge that only few farm households owned animal plough (9.7%), draft animals (7.7%), and animal cart (2.0%). The absence of these must have been contributing to farm drudgery that farmers in the study area often complain about (Chianu et al., 2008). In about 92% of the cases, it was the head of the household that bought the different household asset items (**Table not shown**). Considering that average household size in the study area is about seven (Chianu et al. 2008) or about 6.3 (based on data from this study), the mean number of units of different asset items owned by the households that own them is low in all cases (see **Table 3.5**).

Table 3.4: Farm household ownership of different assets in western Kenya

Asset owned	Frequency (% relative to n)	% (relative to total responses)
Radio	218 (88.3%)	20.7
Bicycle	204 (82.3%)	19.4
Cultivation tools (what items make up this)	190 (76.9%)	18.1
Mobile Phones	146 (59.1%)	13.9
Wheel barrow	84 (34.0%)	8.0
Television	60 (24.3%)	5.7
Private water well	49 (19.8%)	4.7
Animal plough or harrow	24 (9.7%)	2.3
Draft animals (Bullock/Oxen/Donkey)	19 (7.7%)	1.8
Water tanks	14 (5.7%)	1.3
Private borehole	11 (4.5%)	1.0
Generator	7 (2.8%)	.7
Motor cycle	5 (2.0%)	.5
Animal cart	5 (2.0%)	.5
Motor vehicle	2 (0.8%)	.2
Water pump	2 (0.8%)	.2
Other (Posho mill, Axe, Sawing machine, Battery, Wooden table, Zero-grazing unit)	11 (4.5%)	1.1
N	247 for each cell	1051 (100.0)

Values in parenthesis are percent figures

Source: Survey data, 2008

Table 3.5: Number of units of different asset items owned by households in Western Kenya

Item	n	Mean	Min.	Max.	Std. Deviation
Radio	218	1.35	1	6	0.685
Bicycle	199	1.31	1	3	0.561
Cultivation tools	190	3.08	1	10	1.837
Mobile Phones	146	1.42	1	5	0.713
Wheel barrow	84	1.10	1	3	0.334
Television	60	1.10	1	4	0.440
Private water well	48	1.08	1	2	0.279
Animal plough or harrow	24	1.08	1	2	0.282
Draft animals	19	2.37	1	6	1.499
Water tanks	14	1.29	1	2	0.469
Private borehole	11	1.00	1	1	0.000
Generator	7	1.14	1	2	0.378
Motor vehicle	2	1.00	1	1	0.000
Motor cycle	5	1.00	1	1	0.000
Animal cart	5	1.00	1	1	0.000
Posho mill	4	2.25	2	3	0.500
Water pump	2	1.00	1	1	0.000
Axe	2	1.00	1	1	0.000
Sawing machine	2	2.00	1	3	1.414
Battery charging	1	1.00	1	1	.
Wooden table	1	1.00	1	1	.
Zero-grazing unit	1	1.00	1	1	.
Total	**1045**	**1.62**	**1**	**10**	**1.191**

Values in parenthesis are percent figures

Source: Survey data, 2008

2.4. Institutional settings

2.4.1. Access to credit

We evaluated the different facilities at the disposal of survey farm households within the village. We started by asking if there were times survey households had critical shortages of available funds for agricultural activities. About 98% of the survey households indicated that they have faced shortage of funds for farm activities (**Table not shown**). While the highest number of the farm households (235 out of 247 or 95.1%) faced shortages of funds in the first quarter of the year (**January to March**), the least number (39 out of 247 or 15.8%) faced shortages of funds in the last quarter of the year (**October to December**) (see **Table 4.1**).

Table 4.1: Distribution of quarters of the year when farm households in Western Kenya face shortage of funds for agricultural activities

Quarter	Months	Frequency[$]	Frequency[&]
First	January – March	235 (95.1)	235 (52.7)
Second	April – June	97 (39.3)	97 (21.7)
Third	July – September	75 (30.4)	75 (16.8)
Fourth	October – December	39 (15.8)	39 (08.7)
N		247 in each case	446 (100.0)

[$] Values in parenthesis are percent figures; n was 247 in each case; [&] n was total responses (446) since responses were not mutually exclusive

Source: Survey data, 2008

We verified whether or not farm households received any cash and/or input (formal and informal) credit in the year 2007/08 cropping season for crop production, livestock production or for household consumption. Most of the farm households (164 out of 245 or 66.9%) did not receive any cash and/or input credit during the reference period or year (**Table not shown**). Out of the 164 farm households that did not receive credit, 34 households (or 20.7%) indicated that they did not look for credit. Of the remaining 130 households 75 households (or 57.7%) noted the lack of credit source in their vicinity. Lack of collateral for credit was the reason given by 28 farm households (or 21.5%). High interest rate was responsible for the non receipt of credit by 23 farm households (or 17.7%). The balance of four households gave other unspecified reasons for not receiving credit in 2007/08 (**Table not shown**). This result can be summarized to mean a gross absence of credit to the farmers in the survey sub-locations.

2.4.2. Farmers associations

Farmers' associations have become very strong means of reaching many farmers and farm households with new agricultural technologies, especially following the structural adjustment programs (SAP) of the 1980s and 1990s that brought about the downsizing of the staff of most ministries of agriculture in Africa, affecting agricultural extension staff disproportionately. Due to the increasing role of farmers' associations in the bid to close the gap created by limited agricultural extension services, we verified the extent to which the heads of survey farm households belonged to farmers' associations. Results show that not all household heads are yet members of farmers' associations. Of the 247 households, only the heads of 142 households (or 57.5%) belonged to farmers' associations. By sub-location, this is distributed as follows: heads of 60 households (or 42.3%) from *Khalaba*, 24 households (or 16.9%) from *Kholera*, and 58 households (or 40.8%) in *Musamba* sub-location. By headship and management of households, these are distributed as follows: heads of 71 male-headed male-managed households (or 50%), heads of 59 male-headed female-managed households (or 41.5%), and heads of 12 female-headed female-managed households (or 8.5%). The balance, of 105 out of 247 households (or 42.5%) did not yet belong to any farmers' association. By sub-location, these are distributed as follows:

heads of 23 households (or 21.9%) from *Khalaba*, heads of 52 households (or 49.5%) from *Kholera*, and heads of 30 households (or 28.6%) from *Musamba* sub-location. By headship and management of households, these are distributed as follows: heads of 37 male-headed male-managed households (or 35.2%), heads of 60 male-headed female-managed households (or 57.1%), and heads of eight female-headed female-managed households (or 7.6%) (**Table not shown**). For the heads of farm households that indicated that they belonged to farmers' associations, our result shows that on the average, the mean number of years they have been members of farmers' associations was 4 years with a standard deviation of 5.64 years (**Table not shown**). In view of the high standard deviation, the data need to be further validated. The number of farmers' associations/groups a household head belonged to ranges from one to six with a mean of 1.90 and standard deviation of 1.14.

Following the foregoing result, more effort needs to be directed towards encouraging the formation of more farmers' associations and to encouraging more farmers to joint in order to start partaking in the benefits, especially if increasing agricultural extension roles will continue to be expected from such associations.

2.4.3. Agricultural extension services

Using a non-mutually exclusive response approach, we evaluated farm households' frequent sources of agricultural extension messages. The options provided included agricultural extension staff, agricultural extension bulletins, news paper, radio, television, marketing institutions, and research institutions. What is spectacular here is the increasing importance of radio in the dissemination of agricultural extension messages in Western Kenya. With 39.9% of the responses, radio ranked a close overall second (and also in *Khalaba* and *Musamba* sub-locations) to agricultural extension staff that explained 42.9% of the responses. Jointly, agricultural extension staff and radio accounted for 276 of the 333 responses (or 82.9%) (**see Table 4.2**). In *Kholera* sub-location, radio actually overtook agricultural extension staff and accounted for 45 of the 75 responses (or 60%) (see **Table 4.3**). When data was analyzed by headship and management of households, the result indicates that radio is the most important source of agricultural extension message to male-headed male-managed households and female-headed female-managed households (**Table not shown**).

The increasing role of radio as a means of disseminating agricultural extension message needs to be properly re-assessed for effectiveness in delivering agricultural extension messages related to complex agricultural productivity improving technologies such as the integrated soil fertility management (ISFM) that involves a combination of improved germplasm, organic manure, inorganic fertilizers, and local adaptations for reasonable and optimal effect. The effectiveness of radio in carrying and delivering related extension messages must be re-examined.

Table 4.2: Frequent sources of agricultural extension messages by farm households in Western Kenya

Source of agricultural extension message	Frequency[$]
Agricultural extension staff	143 (42.9)
Radio	133 (39.9)
Television	20 (06.0)
Research institutions	14 (04.2)
Agricultural extension bulletins	14 (04.2)
News paper	5 (01.5)
Marketing institutions	4 (01.2)
N	333 (100.0)

[$] **Values in parenthesis are percent figures; Responses were not mutually exclusive**

Source: Survey data, 2008

Table 4.3: Frequent sources of agricultural extension messages by farm households in Western Kenya by sub-location

Source of agricultural extension message	Sub-location			Total
	Khalaba	***Kholera***	***Musamba***	
Agricultural extension staff	66 (48.5)	18 (24.0)	59 (48.4)	143 (42.9)
Radio	50 (36.8)	45 (60.0)	38 (31.1)	133 (39.9)
Television	8 (05.9)	8 (10.7)	4 (3.3)	20 (06.0)
Research institutions	7 (05.1)	2 (2.7)	5 (4.1)	14 (04.2)
Agricultural extension bulletins	2 (01.5)	2 (2.7)	10 (8.2)	14 (04.2)
News paper	2 (01.5)	0 (0)	3 (2.5)	5 (01.5)
Marketing institutions	1 (00.8)	0 (0)	3 (2.5)	4 (01.2)
N	136 (100.0)	75 (100.0)	122 (100.0)	333 (100.0)

[$] **Values in parenthesis are percent figures; Responses were not mutually exclusive**

Source: Survey data, 2008

Given the critical and traditional role of agricultural extension on the adoption of improved agricultural technologies, we also investigated the intensity of farm household and agricultural extension workers interaction on crop and livestock production issues in 2007/08. Result indicates that there was no interaction whatsoever between agricultural extension workers and 101 out of the 247 survey farm households (or 40.9%). For the farm households that interacted with agricultural extension workers in 2007/08, the number of such interaction ranges from once to eight times. However, the highest number of farm households interacted with agricultural extension either once (37 out of 146 households or 25.3%) or twice (33 out of 146 households or 22.6%) (see **Table 4.4**). Part of the result showing that about 32 farm households (or 21.9%) interacted with

agricultural workers eight times needs to be further verified, especially since it is out of the tune with the declining number of farm households as the intensity of interaction increases.

Table 4.4: Number of times farm households interacted with extension workers in western Kenya in 2007/08 cropping season

Number of interactions with extension in one years	Frequency[$]
Once	37 (25.3)
Two times	33 (22.6)
Three times	15 (10.27)
Four times	14 (09.6)
Five times	9 (06.2)
Six times	5 (03.4)
Seven times	1 (00.7)
Eight times	32 (21.9)
Effective n	146 (100.0)

[$] **Values in parenthesis are percent figures**

Source: Survey data, 2008

2.4.4. Farm household's access to cash/non-cash loans in Western Kenya

Table 4.5 and **Table 4.6** give the impression that 104 out of the 247 households surveyed (or 42.1%) received some kind of cash and/or input (formal and informal) credit in 2007/08 cropping season either for crop or livestock production or for household consumption. However, across credit types (cash, seed, and fertilizer) most for the respondents (57%) noted that the loans were received late (bringing to question their usefulness). The figures for the different types of credit are: 63.6% for cash credit, 61.5% for seed credit, and only 26.7% for fertilizer credit (implying that 73.3% of the households that received fertilizer credit did so in time) (**Table not shown**).

While financial institution accounted for just 16.3% of the sources of loan, money lender accounted for only one percent. Government program, NGO, Research institutions and agro-allied companied accounted for about 68.3% of the sources of loan, most of which were received by farmers as farm inputs, especially seeds, explaining why about 76% of the loans were repaid back in form of either seed or grains (see **Table 4.7**). The response as to the exact use of the credit contained in **Table 4.8** is a clear confirmation that 92 of the 104 households (or 88.5%) that received cash or non-cash loan actually received non-cash credit, especially seeds and fertilizers (for planting and top dressing).

Of the 104 farm households that received **credit**, 102 households (or 98.1%) indicated the type of credit. This is distributed as follows: 76 farm households (or 74.5%) received credit in form of seed, 15 households (or 14.7%) received credit in form of mineral fertilizer, and 11 households (10.8%) received credit in form of cash (**Table not shown**).

Table 4.5: Sources of cash and non-cash loans among farm households in Western Kenya

Loan sources (cash and non-cash)[$]	Frequency[&]
Government program (+KARI/KAPP)	31 (29.8)
NGO	27 (26.0)
Financial institution	17 (16.3)
TSBF-CIAT	13 (12.5)
Sugar company	8 (7.7)
Neighbor and relative	6 (5.8)
Money lenders	1 (1.0)
Farmers co-operative	1 (1.0)
Total	104 (100.0)

[$] **KARI = Kenya Agricultural Research Institute, KAPP = Kenya Agricultural Productivity Project;** [&] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 4.6: Sources of cash and non-cash loans among farm households in Western Kenya by type of credit

	Type of credit			
Source	**Cash**	**Seeds**	**Fertilizers**	**Total**
Government program (+KARI/KAPP)	-	31 (39.7)	-	31 (29.8)
NGO	1 (09.1)	26 (33.3)	-	27 (26.0)
Financial institution	6 (54.5)	1 (01.3)	10 (66.7)	17 (16.3)
TSBF	-	13 (16.7)	-	13 (12.5)
Sugar company	1 (09.1)	2 (02.6)	4 (26.7)	7 (06.7)
Neighbor and relative	2 (18.2)	5 (06.4)	-	7 (06.8)
Money lenders	1 (09.1)	-	-	1 (01.0)
Farmers co-operative	-	-	1 06.7)	1 (01.0)
Total	**11 (100)**	**78 (100)**	**15 (100)**	**104 (100)**

[&] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 4.7: Forms of loan repayment by farm households in Western Kenya

Form of repayment	Frequency
Seed	68 (65.4)
Grain	11 (10.6)
Cash	14 (13.5)
Other	11 (10.6)
Total	104 (100.0)

[&] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 4.8: Exact use of the credit received by farm households in 2007/8 cropping season in Western Kenya

Exact use of credit	Frequency
Planting	57 (54.8)
Seeds	32 (30.8)
Top dressing	3 (2.9)
Fees	6 (5.8)
Farm inputs	4 (3.8)
Livestock	1 (1.0)
Fertilizers	1 (1.0)
Total	104 (100.0)

[&] Values in parenthesis are percent figures

Source: Survey data, 2008

2.4.5. Benefits from governmental organizations and/or NGO

We evaluated whether or not farm household benefited from selected governmental and /or NGO programs (World Vision International, Sasakawa Global 2000, Catholic Relief Services, Care International, Africare, Ministry of Agriculture, etc.) over the last two years. Results show that these NGOs do not generally exist in the survey communities. Out of the 247 target households, 124 households (or 50.2%) responded. Of this 124, 70 households (or 56.5%) indicated that they benefited from just Ministry of Agriculture within the last two years. The number of times they benefited ranges from once to 24 times (with a mean of 2.7 times and a standard deviation of 4.1 times) (**Table not shown**). The most important benefit package that farm households get from the Ministry of Agriculture is seed relief (according to 37 out of 67 households or 55.2% that responded), followed by training (17.9%). The other minor benefits they derive include fertilizer relief, livestock breeding stock and animal husbandry assistance (3% each) (**Table not shown**).

2.4.6. Farm household participation in field days/demonstrations

These days, apart from the organizations that have the traditional mandate of working to ensure that agricultural development occurs (e.g., Agricultural extension services, Agricultural research institutes, etc.), many other different types of organizations (e.g., NGOs, Seed companies, Development projects, etc.) are more and more get involved in agricultural development activities in order to help accelerate rural development. These organizations often use demonstrations and field days to reach farmers with agricultural development messages. We evaluated the number of field days and field demonstrated organized by the staff of these different organizations that survey farm households attended during the 2007/08 cropping season. We also evaluated the number of times soybean crop production was discussed in such field days and field demonstrations. Collating responses from different sub-sample sizes, the mean number of times that soybean crop production was discussed ranges from 1.6 (for development projects) to 3.5 (other agricultural development agencies) with a mean across means of about 2.5 times (see **Table 4.9**). Although the different organizations seem to show some attention to the soybean crop, this result seems to portray an insufficient attention size of the sub-samples from which the averages were calculated.

Table 4.9: Number of times soybean crop production was discussed during field days and field demonstrations organized by different **organizations in Western Kenya**

Type of organization	n	Min.	Max.	Mean	Std. Deviation
Agricultural extension services	101	1	20	2.9	2.729
NGO	27	1	6	2.3	1.353
Agricultural Research Institute	16	1	6	2.4	1.586
Development projects	14	1	3	1.6	0.756
Other agricultural development agencies	11	1	25	3.5	7.160

Source: Survey data, 2008

2.5. Agricultural production

2.5.1. Farm size (acres) distribution and fallow period

Land is a key factor of production, especially agricultural production. We evaluated the total size of the farmland owned/managed by the different survey farm households. Results from exploratory analyses indicate that 28 of the 247 farm households (or 11.3%) owned/managed < 1 acre of farmland. While 82 of the 247 farm households (or 33.2%) owned/managed between 1 and 2 acres of farmland, 73 out of the 247 farm households (or 29.6%) owned/managed between 2 and 4 acres of farmland. The remaining 64 out of the 247 farm households (or 25.9%) owned/managed farmlands of above 4 acres in size (**Table not shown**). This result is a clear demonstration of the population pressure on farmland in the survey sub-locations. This situation will become much clearer with an analysis that would express the available land area on a per capita basis. In response to population pressure on land, about 224 out of the 247 survey farm households (90.7%)

noted that they do not leave any land they owned/managed on fallow, but instead cultivate them continuously. However, 23 out of 247 survey households (or 9.3%) noted that they still leave or put part of the farmland they owned/managed on fallow after cropping for a period ranging from one to 10 seasons (i.e., six months to five years). According to 22 out of the 23 farm households that observed some fallow, the length of fallow ranges from six months to four years, with 15 of them (or 68.2%) observing fallow lengths of just six months to one year (**Table not shown**). Although only 23 households noted that they observed some fallow periods in between cropping, it was rather surprising that about 42 farm households responded to the question trying to ascertain which crop(s) is/are normally grown following a fallow period. This lack of synchrony will be verified and necessary adjustments made in the report after re-analyzing the affected portion of the data. Preliminary results show that many types of crops (including maize, common beans, groundnut, soybean, millet, cassava, sorghum, Nappier grass, and sweet potatoes) featured as crops normally grown following a fallow period. However, while about 45.2% of the farm households grow maize following a follow period, 14.3% each would grow common beans or groundnut. About 9.5%would grow soybean and 4.8% each would grow millet or cassava (see **Table 5.1**). Again, this result depicts the overwhelming priority usually given to maize (a key staple crop in the survey region) in the farming systems of Western Kenya. This is again demonstrated by data on farm land allocation to various crops based on sub-samples of the respondents that answered related questions (see **Table 5.2**). **Table 5.3** contains the descriptive statistics of selected features of farm households in Western Kenya.

Table 5.1: Crops farm households in Western Kenya would grow following a fallow period

Crop	**Frequency[$]**
Maize	19 (45.2)
Common bean	6 (14.3)
Groundnut	6 (14.3)
Soybean	4 (09.5)
Millet	2 (04.8)
Cassava	2 (04.8)
Sorghum	1 (02.4)
Nappier grass	1 (02.4)
Sweet potatoes	1 (02.4)
Total	**42 (100.0)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 5.2: Land (acres) allocation to various crops by farm households in Western Kenya

Crops	n	Min.	Max.	Mean	Std. Deviation
Improved maize	55	0.04	1.62	0.5112	0.42828
Improved sorghum	5	0.20	0.30	0.2222	0.04517
Improved soybean	47	0.05	0.61	0.1968	0.13974
Improved beans	8	0.10	0.40	0.2020	0.13224
Improved groundnut	2	0.04	0.20	0.1212	0.11427
Improved cassava	6	0.05	0.81	0.2441	0.28283
Local Maize	21	0.05	0.81	0.3535	0.22809
Local sorghum	6	0.10	0.30	0.1515	0.08450
Local millet	3	0.05	0.20	0.1178	0.07714
Local soybean	7	0.05	0.20	0.1299	0.07056
Local beans	15	0.10	1.01	0.4121	0.21348
Local groundnut	15	0.05	0.40	0.1650	0.10876
Local cowpea	2	0.05	0.20	0.1263	0.10713
Local cassava	18	0.04	0.81	0.1874	0.17780

Source: Survey data, 2008

Table 5.3: Selected characteristics of farm households in Western Kenya

Parameter	n	Min.	Max.	Mean	Std. Deviation
Number of times farm household interacts with agricultural extension workers	146	1	8	3.71	2.65
Farm size (acres)	247	0.25	105	3.97	7.28
Number of seasons farm households crop before leaving their land on fallow	23	1.0	10	2.74	2.22
Number of years of fallowing	22	0.5	4.0	1.52	1.14

Source: Survey data, 2008

2.5.2. Land and cropping systems in Western Kenya

Agricultural production in sub-Saharan Africa (SSA) comprises mostly of crop (food crops, cash crops, tree crops, etc.) and livestock production. Land is a critical resource for agricultural production in SSA, especially in high population density areas such as Western Kenya (Chianu et al. 2008). We evaluated the land resources allocated to crops (food and cash), pasture (for livestock), and trees as well as land under fallow and land abandoned altogether by farm households for one reason or another. Across the 247 survey households, we evaluated how a total of 854 farm plots encountered were allocated. The result shows the dominance of crop farming in land allocation in Western Kenya, with 758 plots out of 854 plots (or 88.8%) allocated to crop farming in 2007/8 (see **Table 5.4**). The number of plots set aside for pasture followed with about 58 out of

the 854 plots (or 6.8%) allocated to it. The result also shows that leaving land on fallow is quite uncommon in Western Kenya, with just 20 out the 854 plots (or 2.3%) being under fallow in 2007/8 – a situation that again symbolizes population pressure on land. Tree crops are unfortunately not given priority with only 12 out of the 854 plots evaluated (or 1.4%) allocated to tree crops. Land abandonment by farmers was also not a common practice among farm households in survey sub-locations in Western Kenya. Only 0.7% of the 854 plots were noted to have been abandoned as at 2007/8.

Mean plot size ranged from 0.1 to 5.25 ha (with a mean of 0.465 ha) for cropped plots, from 0.04 to 1.62 ha (with a mean of 0.32 ha) for pasture lands, from 0.05 to 1.21 ha (with a mean of 0.37 ha) for fallow land, and from 0.1 to 0.81 ha (with a mean of 0.41 ha) for tree crops (see **Table 5.4**).

Table 5.4: Farm allocation (ha) to land use types, across crops by farmers in western Kenya

Land use type	n[$]	Min.	Max.	Mean	Std. Deviation
Cropped plots (all)	758	0.10	5.25	0.4650	0.53010
Pasture	58	0.04	1.62	0.3183	0.33818
Fallow	20	0.05	1.21	0.3661	0.30691
Tree crops	12	0.10	0.81	0.4124	0.28391
Abandoned	6	0.20	2.83	1.1447	1.04312
Total	854				

[$] n = number of plots

Source: Survey data, 2008

2.5.3. Land tenure systems in Western Kenya

Land tenure system is critical in determining the freedom people have in the use of land. For the different plots that the survey households had, owned or managed in 2007/8, we evaluated the land tenure system that applied. The result shows that for the total of 703 plots for which responses were provided, 609 plots (or 86.6%) were under individual land ownership system. Only about 6.1% of the plots were under family or communal land ownership (see **Table 5.5**). The fact that most of the plots are under individual ownership system is an indication that most farmers in the study area have sufficient liberty to use their land. However, we did not verify whether or not the individual land ownerships are also accompanied by title deeds. This will be verified in subsequent studies.

Table 5.5: Land tenure systems in Western Kenya by land use type

Land tenure system	Total No. of plots	Number of plots by land use type				
		Cropped plots	Pasture	Fallow	Tree crops	Abandoned
Individual ownership (own land)	609 (86.6)	522	49	17	15	6
Land rented in	45 (06.4)	45	0	0	0	0
Family land (Communal)	43 (06.1)	39	1	1	2	0
Land rented out	4 (00.6)	4	0	0	0	0
Share cropped	2 (00.3)	2	0	0	0	0
Total	**703 (100.0)**	**612**	**50**	**18**	**17**	**6**

Source: Survey data, 2008.

2.5.4. Distances of farm plots from homestead

Across the different plots of land owned and/or managed by the survey households, we evaluated how long it takes a farmer to get to his/her farm (various plots) from homestead on foot. Results indicate that survey farm households could get to about 96.2% of their farm plots in < 30 minutes. In fact about 35.8% percent of the farm plots were very close to the homestead, with farm households estimating that they could reach them in < 1 minute. Only about 1.2% of the farm plots could be regarded as far fields that would take over one hour (or > 60 minutes) to get to from the homestead (see **Table 5.6**). This result explains the limited access to land that is endemic in most parts of Western Kenya, also contributed to by the high population density in the area (Chianu et al., 2008). This creates a great opportunity for agricultural intensification, especially since the cost of transportation from homestead to the farm would be relatively low.

Table 5.6: Length of time (minutes, one way) it takes a farmer to get to his/her farm from homestead on foot in Western Kenya

Land use type	Time range (minutes)[$]			
	< 1	1 – 30	31 – 60	> 60
Cropped plots	230	389	19	8
Pasture land	18	34	0	0
Fallow land	6	11	0	0
Tree crops land	9	9	0	1
Abandoned land	2	4	0	0
Total	**265 (35.8)**	**447 (60.4)**	**19 (2.6)**	**9 (1.2)**

[$] **While values outside parenthesis are frequency figures, values in parenthesis are percent figures**

Source: Survey data, 2008

2.5.5. Sources of water for agricultural production

Water is crucial for crop and livestock production as well as for ensuring the provision of ecosystem services that support agriculture. Unfortunately, due to climate change, water as a resource in agricultural production is increasingly becoming scarce, negatively impacting on crop and livestock production. The incidence of dry spell and outright drought is on the increase. As a result, for all the different plots belonging to the survey households, we evaluated the main sources of water for the crops, in a bid to start positioning for sustainable agricultural water supply in the future. The options (rainfall, irrigation, water harvesting, and swamp agriculture) we evaluated enabled us to assess the prevalence of the much talked about technologies such as 'water harvesting'. The result, presented in **Table 5.7** clearly demonstrates the domineering importance of rainfall as a source of water in the agricultural systems of the survey sub-locations in Western Kenya, with about 99% of all the plots dependent on natural rainfall for water. This implies a huge risk, given the ongoing climate change that potentially increases the water stresses of crops that are solely rain-fed.

Table 5.7: Sources of water for agriculture in Western Kenya

	Water source				
Land use type	**Irrigation**	**Rainfall**	**Swamp**	**Water harvesting**	**Total**
Cropped plots	4	629	2	2	637
Pasture land	0	55	0	0	55
Fallow land	0	16	0	0	16
Tree crops land	0	20	0	0	20
Abandoned land	0	6	0	0	6
Total	**4 (0.5)**	**726 (98.9)**	**2 (0.3)**	**2 (0.3)**	**734 (100)**

Source: Survey data, 2008

2.5.6. Determinants of household's size of cultivated farm

Based on a set of factors, we used scoring (with 1 depicting least important and 10 depicting most important) method to assess the determinants of household's size of cultivated farmland. Result shows that the three most important factors determining the size of cultivated farmland by survey household were household's food needs (with a mean score of 8.2), cash availability to purchase other inputs (7.4), and availability of seed (7.3) (see **Table 5.8**). Both expected grain prices after harvest (with a mean score of 5.3) and current grain prices (with a mean score of 4.6), especially the latter scored relatively low among what farm households consider when deciding on how large their farms should be. With respect to the three most important factors determining the size of cultivated farmland by survey households, the trend is similar across the three survey sub-locations (see **Table 5.9**), across soybean growing status of households (see **Table 5.10**), and across the headship and management of households (see **Table 5.11**). However, among the other lowly scored factors, there were switches in *Kholera* sub-

location, with expected family labor availability now scoring fourth, displacing cash availability to hire labor, which now ranked fifth (see **Table 5.9**). Similar switches among lowly scored factors also occurred among non-soybean growing households (see **Table 5.10**), and female-headed female-managed households. These results speak loud that the farming objectives of most households in the study area is household food security. Most of the households are not into farming to make money and this explains why most households do not generally take farming as a business but rather as a way of life. This has great implications on the targeting of agricultural development interventions. Sites for such interventions must be chosen based on what each intervention aims to achieve (e.g., food security, cash income security, improved livelihoods, etc.).

Table 5.8: Relative importance of factors determining household's size of cultivated farmland in Western Kenya[$]

Factor	n	Min.	Max.	Mean	Std. Deviation
Household's food needs	243	1	10	8.16	2.319
Cash availability to purchase other inputs	243	1	10	7.40	2.393
Availability of seed	242	1	10	7.27	2.116
Cash availability to hire labor	240	1	10	5.79	2.818
Expected grain prices after harvest	231	1	10	5.34	2.528
Expected family labor availability	240	1	10	5.13	2.613
Current grain prices	232	1	10	4.56	2.366
Other factors	5	1	10	3.60	3.647

[$] 10 = Most important, 1 = Least important

Source: Survey data, 2008

Table 5.9: Relative importance of factors determining household's size of cultivated farmland in Western Kenya by sub-location[$]

	Sub-location		
Factor	Khalaba	Kholera	Musamba
Household's food needs	8.02	8.23	7.96
Cash availability to purchase other inputs	7.13	7.43	7.70
Availability of seed	7.04	7.43	7.75
Cash availability to hire labor	5.61	5.67	6.06
Expected grain prices after harvest	5.23	4.96	5.55
Expected family labor availability	4.90	5.73	4.94
Current grain prices	4.84	4.13	4.80
Other factors	3.60	-	-

[$] 10 = Most important, 1 = Least important

Source: Survey data, 2008

Table 5.10: Relative importance of factors determining household's size of cultivated farmland in Western Kenya by soybean growing status[$]

	Soybean growing status	
Factors	**Yes**	**No**
Household's food needs	8.03	8.03
Cash availability to purchase other inputs	7.40	7.36
Availability of seed	7.36	7.42
Cash availability to hire labor	5.77	5.85
Expected grain prices after harvest	5.43	4.74
Expected family labor availability	4.86	5.91
Current grain prices	4.80	4.27
Other factors	3.60	-

[$] 10 = Most important, 1 = Least important

Source: Survey data, 2008

Table 5.11: Relative importance of factors determining household's size of cultivated farmland in Western Kenya by household headship and management[$]

	Household headship and management		
Factors	**Male-headed male-managed**	**Male-headed female-managed**	**Female-headed female - managed**
Household's food needs	7.92	8.24	7.65
Cash availability to purchase other inputs	7.01	7.78	7.47
Availability of seed	7.47	7.30	7.18
Cash availability to hire labor	5.85	5.82	5.35
Expected grain prices after harvest	5.13	5.31	6.18
Expected family labor availability	4.99	5.32	4.13
Current grain prices	4.74	4.67	4.65
Other factors	4.33	2.00	3.00

[$] 10 = Most important, 1 = Least important

Source: Survey data, 2008

2.6. Crop production and productivity

2.6.1. Grains (legumes and cereals) production in Western Kenya

Prevalence

We audited the prevalence of soybean, other grain legumes (common bean, groundnut, cowpea, and pigeon pea), and selected cereals (maize, sorghum, and millet) in the farming systems of the survey sub-locations. Result shows that the most commonly cultivated grain in the area was maize (grown by about 90% of the households), followed by common bean (87%) (see **Table 6.1**). Soybean was grown by about 66% of the respondents. This value for soybean is perhaps not surprising since two-thirds of the

respondents were supposed to be soybean growing households. Pigeon pea, millet, cowpea, and sorghum, in that order, were not commonly grown by farmers in the study area. The land area allocated to these different grains by farm households during each cropping season also reflects their relative importance in both their farming systems and livelihoods, especially since farmers are usually rational in their resource allocation. In that respect, maize usually occupies the largest portion of the farm household's cropping land, followed by common bean.

Table 6.1: Whether or not survey farm households grow selected grains (legumes and cereals) in western Kenya

Crop group	Specific crop	Frequency (No. of farmers)[$]
Soybean:	Soybean	162 (65.6)
Other grain legumes:		
	Common bean	215 (87.0)
	Groundnut	134 (54.3)
	Cowpea	19 (07.7)
	Pigeon pea	1 (00.4)
Selected cereals:		
	Maize	222 (89.9)
	Sorghum	39 (15.9)
	Millet	15 (06.1)

[$] Values in parenthesis are percent figures; n is 247 in each case.

Source: Survey data, 2008

Quantity produced

In addition to the prevalence, we evaluated the average quantity (kg) produced by farm households of the selected grains (legumes and cereals) during the last cropping season (2007/8). The result, presented in **Table 6.2**, clearly shows the low level of production of most of the grains in the study area. It was only with maize that the average production was more than one bag (of 90 kg size). Even with maize if we consider an average household size of 6.3 or ~ 7 persons (say three adults and four children) and their annual maize needs of about 100 kg per adult and about 50 kg per non-adult on the average (Paul Woomer, personal communication July 2008), this result shows that there is hardly any surplus for sale for household cash needs. We tried to verify if the low level of grains production was peculiar to the last cropping season by asking the survey households about the highest quantity they have ever produced of the different grains. The result is contained in **Table 6.3**. It generally shows that grains production has been low in the survey area. In all cases, the last season's production was lower than the highest quantity ever produced in the survey area. The result of last season's production expressed as a proportion of the highest quantity ever produced ranges from a low value of 37.8% (for soybean) to a high value of 83% (for cowpea) with a mean of 56.6% across the seven grains (see **Table 6.4**). Similarly, the result of last season's production expressed as a

proportion of the lowest quantity ever produced ranges from 133.7% (for cowpea) to 240.6% (for millet) with a mean of 177.7% across the seven grains (see **Table 6.5**). **Table 6.5** clearly shows how bad it can get to and how very low production exposes farm households to food insecurity, famine, and the need for food aids and other emergencies.

Table 6.2: Average quantity (kg) produced by farm households of selected grains (legumes and cereals) during the last cropping season (2007/8) in western Kenya

Crop	n	Mean	Min.	Max.	Std. Deviation
Soybean	147	28.47	1	180	33.208
Common bean	199	79.90	2	1440	136.611
Cowpea	14	37.64	2	180	53.467
Groundnut	121	92.56	1	810	129.968
Maize	216	614.26	4	10800	961.530
Sorghum	34	63.06	10	360	71.528
Millet	11	61.55	1	240	69.993
Total	742	225.49	1	10800	582.366
Sig		0.000			

Source: Survey data, 2008

Table 6. 3: Highest quantity (kg) ever produced by farm households of selected grains (legumes and cereals) in one growing in western Kenya

Crop	n	Mean	Min.	Max.	Std. Deviation
Soybean	132	75.33	1	2400	260.501
Common bean	210	203.21	1	6400	511.092
Cowpea	14	45.36	2	180	62.324
Groundnut	129	208.35	2	1350	261.619
Maize	221	944.52	35	13400	1349.898
Sorghum	36	124.25	12	720	161.554
Millet	13	81.08	8	180	60.253
Total	755	389.93	1	13400	871.137
Sig		0.000			

Source: Survey data, 2008

Table 6.4: Last season's grains production compared to the highest quantity (kg) ever produced by farm households in one growing season in Western Kenya

Crop	Mean A (Last cropping season)	Mean B (Highest quantity ever)	Difference (B – A) (Kg)	A as % of B
Soybean	28.47	75.33	**46.86**	**37.8**
Common beans	79.90	203.21	**123.31**	**39.3**
Cowpea	37.64	45.36	**7.72**	**83.0**
Groundnut	92.56	208.35	**115.79**	**44.4**
Maize	614.26	944.52	**330.26**	**65.0**
Sorghum	63.06	124.25	**61.19**	**50.8**
Millet	61.55	81.08	**19.53**	**75.9**

Source: Survey data, 2008

Table 6.5: Last season's grains production compared to the lowest quantity (kg) ever produced by farm households in one growing season in Western Kenya

Crop	Mean A (Last cropping season)	Mean B (Lowest ever)	Difference (B–A) (Kg)	A as % of B
Soybean	28.47	20.85	–7.62	136.5
Common bean	79.90	46.61	–33.29	171.4
Cowpea	37.64	28.15	–9.49	133.7
Groundnut	92.56	52.94	–39.62	174.8
Maize	614.26	324.63	–289.63	189.2
Sorghum	63.06	31.94	–31.12	197.4
Millet	61.55	25.58	–35.97	240.6

Source: Survey data, 2008

2.6.2. Incentives to increase the production of specific crops

For nine crops (soybean, common bean, cowpea, groundnut, pigeon pea, maize, sorghum, millet, and sugarcane), we assessed whether or not survey farm households have ever received some incentives to increase their production. The result presented in **Table 6.6** show that the incentive to increase production is mostly developed for sugarcane production, followed by soybean, a grain legume currently being promoted in the survey area by the Tropical Soil Biology and Fertility institute of the Centro Internacional Agricultura Tropicale (TSBF-CIAT). . About 73.8% of the incentives are on farm input (especially seeds and fertilizers) supply. Training-related incentives (in various areas including crop processing, storage, and marketing) come next, accounting for 17.2% of the responses (**see Table 6.7**). The incentives related to increase in sugarcane production are constituted as follows: input supply (41.9%), seed (20.5%), fertilizer (19.4%), education (13.2%), money (3.1%), and marketing and ploughing (0.8% each) (**Table not shown**). On the other hand, the incentives related to increase in soybean production are constituted as follows: seed supply (76.1%), education (17.1%), food (5.1%), and fertilizer and processing (0.9% each (**Table not shown**). Across the nine crops, although there is evidence that this incentive system has a long history starting from 1967,

altogether about 78.3% of it occurred in between 2006 and 2007 alone (**Table not shown**) – about the time the first TSBF-CIAT soybean promotion project started in the study area. The soybean project actually gingered the sugar company to start giving real incentives to farmers because they have seen soybean as coming to discourage farmers from continuing to allocate a lion share of their land to sugarcane production in favor of soybean. With respect to the organizations the provided the incentives, the responses are distributed as follows: MOCO (62.4% of the responses), *Mumias* Sugar Company (36.8%), and Ministry of Agriculture (0.8%) for the sugarcane production incentives and TSBF-CIAT (51.3%), KAPP (22.6%), Ministry of Agriculture (21.7%), *Mumias* Sugar Company (3.5%), and NALEP (0.9%) for the soybean production incentives (**Table not shown**). Most of the survey farm households considered the incentives as good.

Table 6.6: Crops for which farmers have received some incentives to increase their production in Western Kenya

Crop group	Specific crop	Frequency[$]
***Cash crop*:**	Sugarcane	131 (41.1)
Grain legumes:	Soybean	117 (36.7)
	Common beans	12 (3.8)
	Groundnut	9 (2.8)
	Cowpea	4 (1.3)
	Pigeon pea	1 (0.3)
Cereals:	Maize	26 (8.2)
	Sorghum	16 (5.0)
	Millet	3 (0.9)
Total		319 (100.0)

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 6.7: Types of incentive received by farm households to increase crop production in Western Kenya

Incentive group	Specific incentive	Frequency[$]
Input supply-related:		
	Seed	149 (47.6)
	Input supply	55 (17.6)
	Fertilizer	26 (08.3)
	Ploughing/cutting	1 (00.3)
Training-related:		
	Education and training	51 (16.3)
	Processing	1 (00.3)
	Marketing	1 (00.3)
	Good storage	1 (00.3)
Other:		
	Food	24 (07.6)
	Money	4 (01.3)
Total		313 (100.0)

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

2.7. Soybean production

The essence of an additional separate look on soybean is to underscore the fact that Objective 7 of the TL II project focuses on soybean.

2.7.1. Soybean growing status of sampled farm households by sub-location

The distribution of the actual sampled farm households show that 168 farm households (or 68%) were soybean growing; the balance of 79 farm households (or 32%) was non-soybean growing (see **Table 7.1**). Having non-soybean growing households in *Khalaba* and *Musamba* sub-locations or soybean growing households in *Kholera*-sub-location were not initially intended. The authenticity of the entries must be further verified.

Table 7.1: Distribution of survey households in Western Kenya by soybean growing status and sub- location[$]

Soybean growing status	Sub-location			Total
	Khalaba	*Kholera*	*Musamba*	
Yes	79 (95.2)	2 (02.6)	87 (98.9)	168 (68.0)
No	4 (04.8)	74 (97.4)	1 (01.1)	79 (32.0)
Total	**83 (100.0)**	**76 (100.0)**	**88 (100.0)**	**247 (100.0)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

2.7.2. Headship and management of sampled farm households by soybean growing status

Table 7.2 shows the distribution of the 247 survey households by both the headship and management and soybean growing status. Across soybean growing status, while 108 of the sampled 247 survey farm households (or 43.7%) were male-headed male-managed, 119 farm households (or 48.2%) were male-headed female-managed. The balance of 20 survey farm households (or 8.1%) were female-headed female-managed.

Table 7.2: Distribution of survey households in Western Kenya by soybean growing status and headship and management of households[$]

Soybean growing status	Headship and management of household			
	Male headed-male managed	Male headed-female managed	Female headed-female managed	Total
Yes	76 (70.4)	82 (68.9)	10 (50)	168 (68)
No	32 (29.6)	37 (31.1)	10 (50)	79 (32)
Total	**108 (100)**	**119 (100)**	**20 (100)**	**247 (100)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

2.7.3. Soybean varieties most commonly grown in Western Kenya

Survey farm households were asked to mention the three most important soybean varieties (local and improved) that they grow. The result presented in **Table 7.3** shows that overall farmers were able to identify about 18 local and improved soybean varieties. Three soybean varieties were only identified as short, tall, and agriculture. Comparing farmers' ability to identify soybean varieties with their ability to identify the varieties of common bean, farmers seem to be better in the latter than in the former. They could identify a total of about 34 local and improved varieties of common bean (**Table not**

shown). The same applies to groundnut and maize (where the farmers could identify up to 70 local and improved varieties) (**Table not shown**). The three most popular varieties of soybean among the survey household are TGx 1835-10E or SB3 (according to 26.2% of the responses), TGx 1448-2E or SB20 (18.8%), and Namsoy 4m or SB25 (16.9%) (**Table 7.3**).

Table 7.3: Most important soybean varieties planted by farmers in Western Kenya

IITA Number or Name of Variety	TSBF Number (if any)	Frequency[$]
TGx 1835-10E	SB3	53 (26.2)
TGx 1448-2E	SB20	38 (18.8)
Namsoy 4m	SB25	34 (16.9)
J499	SB22	9 (04.5)
Maksoy	SB24	8 (04.0)
Nyala	SB23	7 (03.5)
TGx1893-10F	SB17	6 (03.0)
TGx 1871-12E	SB4	5 (02.5)
TGx 1895-33F	SB8	4 (02.0)
TGx 1878-7E	SB14	2 (01.0)
TGx 1740-2F	SB19	2 (01.0)
TGx 1889-12F	SB15	2 (01.0)
Xbaraton or Baraton	-	2 (01.0)
Ovakwawu	-	1 (00.5)
TGx 1869-31E	SB12	1 (00.5)
TCU	-	1 (00.5)
TGx 1894-3F	SB18	1 (00.5)
TGx 1831-32E	SB2	1 (00.5)
Short	-	13 (06.4)
Tall	-	9 (04.5)
Agriculture	-	3 (01.5)
Total		**202 (100.0)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

2.7.4. Trend in number of households cultivating soybean in Western Kenya

Results contained in **Table 7.4** indicate that in the study area, more farmers get involved in soybean production in the minor cropping season (short rainy season) compared to the major cropping season (long rainy season). This is probably to avoid soybean competing with maize (a major staple food crop) for the generally scarce farm land during the major cropping or long rainy season. Over the years, there has been a significant increase in the number of farm households that get involved in soybean production both during the major (long rainy season) and the minor (short rainy season) cropping seasons, especially

the latter. Moving from year to year, there was a big jump in the number of farm households growing soybean between 2006/07 and 2007/08 (**Table 7.4**).

Table 7.4: Trend in number of households planting soybean: 2004/05 – 2007/08

Season	Year	Sub-location			Total
		Khalaba	*Kholera*	*Musamba*	
Major cropping season	2007/ 08	31	1	40	**72**
	2006/ 07	7		11	**18**
	2005/ 06	1	1	6	**8**
	2004/ 05		1	4	**5**
	Total	**39**	**3**	**61**	**103**
Minor cropping season	2007/ 08	65	1	62	128
	2006/ 07	9	1	15	25
	2005/ 06	1	1	7	9
	2004/ 05	1	1	5	7
	Total	**76**	**4**	**89**	**169**
Across cropping seasons	2007/ 08	96	2	102	200
	2006/ 07	16	1	26	43
	2005/ 06	2	2	13	17
	2004/ 05	1	2	9	12
	Total	**115**	**7**	**150**	**272**

Source: Survey data, 2008

2.7.5. Comparing last season's soybean area (acres) with previous ones

We posed a question to solicit data on trends in soybean area expansion or reduction over the years. A subset of 113 farm households (58 farm households or 51.3% from *Musamba* sub-location, 53 households or 46.9% from *Khalaba* sub-location, and 2 households or 1.8% from *Kholera* sub-location) responded. Comparing last season's soybean area with the previous one, 39 farm households (or 34.5%) indicated that last season's soybean area was larger than the previous ones. However, 20 farm households (or 17.7%) noted that there was no change in last season's soybean area compared with the previous ones. According to the balance of 54 farm households (or 47.8%) their last season's soybean area was smaller than the previous ones. How this result that depicts a mixed reaction applies to the three study sub-locations and to the headship and management of household is contained in **Table 7.5** and **Table 7.6**, respectively.

Table 7.5: Comparing last season's soybean area with previous ones in western Kenya by sub-location[$]

	Sub-location			
Response	***Khalaba***	***Kholera***	***Musamba***	**Total**
Same	9 (45.0)	1 (5.0)	10 (50.0)	20 (100)
Larger	20 (51.3)	0 (0.0)	19 (48.7)	39 (100)
Smaller	24 (44.4)	1 (1.9)	29 (53.7)	54 (100)
Total	**53 (46.9)**	**2 (1.8)**	**58 (51.3)**	**113 (100)**

[$] Values in parentheses are percentages

Source: Survey data, 2008

Table 7.6: Comparing last season's soybean area with previous ones in western Kenya by household headship and management

	Headship and management of households			
Response	**Male headed-male managed**	**Male headed-female managed**	**Female headed-female managed**	**Total**
Same	7 (35.0)	10 (50.0)	3 (15.0)	20 (100)
Larger	21 (53.8)	17 (43.6)	1 (2.6)	39 (100)
Smaller	20 (37.0)	29 (53.7)	5 (9.3)	54 (100)
Total	**48 (42.5)**	**56 (49.6)**	**9 (8.0)**	**113 (100)**

[$] Values in parentheses are percentages

Source: Survey data, 2008

2.7.6. Planting of improved variety of soybean (in the last five years)

Survey farm households were asked if they have ever planted any improved variety of soybean during the last five years. Of the 170 farm households that responded, 137 farm households (or 80.6%) were affirmative. All of these were soybean growing farm households. By sub-location, these were distributed as follows: 71 farm households (or 51.8%) from *Khalaba* sub-location, 65 farm households (or 47.5%) from *Musamba* sub-location, and one farm household (or 0.7%) from *Kholera* sub-location. By headship and management of farm households, the 137 farm households are distributed as follows: 66 or 48.2% male-headed male-managed farm households, 62 or 45.2% male-headed female-managed farm households, and nine or 6.6% female-headed female-managed farm households.

Only 33 farm households (or 19.4%) indicated that they never planted any improved variety of soybean during the last five years. While 27 (or 81.8%) of these were soybean growing farm households (implying that these have been growing local varieties during the reference last five years), the remaining six (or 18.2%) were non-soybean growing farm households. By sub-location, these were distributed as follows: eight farm households (or 24.2%) from *Khalaba* sub-location, 21 farm households (or 63.7%) from

Musamba sub-location, and four farm households (or 12.1%) from *Kholera* sub-location. By headship and management of survey farm households, the 33 farm households are distributed as follows: 10 or 30.3% male-headed male-managed farm households, 22 or 66.7% male-headed female-managed farm households, and one or 3.0% female-headed female-managed farm households. Lack of information, none availability of improved soybean seeds, and complacence were the most important reasons why these farm households never planted improved variety of soybean during the last five years (see **Table 7.7**).

Table 7.7: Why farm households in Western Kenya never planted improved variety of soybean during the last five years

Reason	Frequency[$]
Lack of information (have not heard of any improved varieties; have not seen any demonstration to show superiority of improved varieties)	20 (41.7)
Seed of improved soybean varieties not available	12 (25.0)
Complacence (satisfied with the performance of local soybean varieties; Simply not interested in experimenting with new varieties	5 (10.5)
Does not have money to buy the seeds of improved soybean varieties	3 (6.3)
Other	8 (16.7)
Total	**48 (100.0)**

[$] Values in parenthesis are percent figures; Responses were not mutually exclusive

2.7.7. Farm households' first planting of improved variety of soybean

We evaluated how many years ago survey farm households first planted an improved variety of soybean. Out of the 142 households that responded, 112 of farm households (or 78.9%) indicated that they first planted an improved variety of soybean one year ago. While 25 farm households (or 17.6%) of the remaining first planted an improved variety of soybean two years ago, only 5 farm households (or 3.5%) first planted an improved variety of soybean about three or more years ago. None of the farm households that first planted improved variety of soybean two or more years ago came from *Kholera* sub-location (**Table not shown**). Of the 30 of such farm households, 24 (or 80%) were from *Musamba* sub-location while six (or 20%) were from *Khalaba* sub-location. By headship and management of households, of the 112 farm households that indicated that they first planted an improved variety of soybean one year ago, while 54 of farm households (or 48.2%) were male-headed male-managed, 51 farm households (or 45.5%) were male-headed female-managed. Only seven farm households (or 6.3%) were female-headed female managed. By sub-location, of the 112 farm households that noted that they first planted an improved variety of soybean one year ago, while 63 farm households (or 56.3%) were from *Khalaba* sub-location, 48 farm households (or 42.9%) were from *Musamba* sub-location. Only one farm household (or 0.9%) was from *Kholera* sub-

location. In summary, this result clearly shows how recent the spread of improved varieties of soybean was in the study area.

2.7.8. Farmers' choice of soybean varieties (improved and local)

Prior to an attempt to ask farmers to compare their best improved with their best local soybean varieties; we tried to determine what their best improved and their best locat soybean varieties were. Results presented in **Table 7.8** indicate the overwhelmingly high rating of TGx 1835-10E (SB3) (43.9% of the responses), followed by NAMSOY 4m (SB25) (17.8%) and TGx 1448-2E (SB20) (14.0%). The other varieties (including TGx 1740-2F that was a champion in previous farmer evaluations) trailed behind (Chianu et al., 2006). The rating of TGx 1740-2F (SB19) that appeared as a champion in Farmer evaluation in 2006 casts some shadows or doubts as to how much farmers knew the different varieties of soybean, especially that the earlier multi-location soybean varietal evaluation was carried out by farmers. This result, therefore, needs to be further verified.

Table 7.8: Farmers' best improved soybean variety in western Kenya[$]

Scientific name	Common name (or TSBF-CIAT given)	Frequency
TGx 1835-10E	SB3	47 (43.9)
NAMSOY 4m	SB25	19 (17.8)
TGx 1448-2E	SB20	15 (14.0)
Maksoy	SB24	5 (04.7)
TGx 1878-7E	SB14	3 (02.8)
TGx 1893-10F	SB17	3 (02.8)
TGx 1889-12E	SB15	2 (01.9)
TGx 1895-33F	SB8	2 (01.9)
TGx 1894-3F	SB 18	1 (00.9)
TGx 1869-31E	SB12	1 (00.9)
TGx 1740-2F	SB19	1 (00.9)
TGx 1871-12E	SB4	1 (00.9)
	Do not know (including 'Agriculture')	7 (06.5)
Total		**107 (100.0)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

With respect to farmers' best local soybean variety, the response obtained was rather scanty. Out of 16 farm households that gave soybean variety names while responding, while eight farm households (or 50%) indicated *Nyala* (a truly local variety), six farm households (37.5%) indicated J499 (also called SB22) (another truly local check) (**Table not shown**). However, the remaining two farm households (12.5%) indicated SB25 (also known as NAMSOY 4m), which incidentally is not a local soybean variety but an improved variety from *Namulonge* Research Station in Uganda. The fact that only 14 out of all the respondents (including the so called soybean growers) could give the correct

names of local varieties as their best local varieties has several implications. It underscores that fact that soybean is still new in the survey area (not really in Kenya where there is evidence that the crop has been introduced to since 1904). Besides, it shows the predominance of improved soybean varieties in the area. It also signals that a lot of work still needs to be done to promote soybean in the survey area since references are limited.

2.7.8. Important features that farmers desire in ideal soybean varieties

Sustainable adoption and retention of an improved variety of a crop is critical for improved welfare of farm families in sub-Saharan Africa. However, this can only happen if the varieties extended to farm households possess the attributes that they desire. In line with this thinking, we evaluated the most important characteristics that farmers desire in their ideal soybean variety. The responses articulated in five categories show that yield-related attributes (accounting for 35.3% of the responses) were the most important characteristic that farmers desire in their ideal soybean variety. Within the yield-related attribute category, yield potential was the single most important attribute (see **Table 7.9**). Adaptation-related attributes category was the second most important (29.4% of the responses) after the yield-related attribute category. The single most important feature within this category is **drought tolerance**. The other important attribute categories were early maturity (20.1%) and disease and pest resistance (10.9%). On the basis of specific attributes (different from attribute class), early maturity is the second most desired attribute after yield potential. In summary, these are key information that soybean breeders must take into account in their breeding work.

Table 7.9: Most important characteristics farm households' desire in their ideal soybean varieties in Western Kenya

Attribute category	Specific characteristic	Frequency
Yield-related:		***172 (35.3)***
	Yield potential	141 (29.0)
	Yield stability	12 (2.5)
	Large seed and grain size	19 (3.9)
Adaptation–related:		***143 (29.4)***
	Drought tolerance	79 (16.2)
	Performance under poor rainfall	17 (3.5)
	Performance under poor soils	42 (8.6)
	Resistance to lodging	5 (1.0)
Early maturity:		***98 (20.1)***
	Early maturity	98 (20.1)
Disease/pest resistance:		***53 (10.9)***
	Pest/disease resistance	49 (10.1)
	Superior storage pest resistance	4 (0.8)
Others:		***21 (4.3)***
	Husk cover, High oil + milk content, Intercropping advantages, Plant height	21 (4.3)
Total		**487 (100.0)**

[$] Values in parenthesis are percent figures; Responses were not mutually exclusive

Source: Survey data, 2008

2.8. Soybean seed systems (including variety description)

2.8.1. Varieties of soybean seeds purchased by farm households

We verified some of the attributes of soybean varieties purchased by farm households in 2007/2008. About 44 out of the 65 farm households (or 68%) that responded to the related question indicated that they purchased improved varieties of soybean. The balance of 21 farm households (or 32%) noted that they purchased local varieties of soybean (**Table not shown**). These purchased soybean seeds were bought from two main sources: fellow farmers and other local sources (66.7%) and traders and other market vendors (33.3%) (**Table not shown**). The quantity of soybean seed purchased was small in all cases, ranging from 0.5 kg to 25 kg (with a mean of 3.7 kg and a standard deviation of 4.65 kg). The price paid per kilogram of purchased soybean seed ranged from KShs 24 to KShs 100 (with a mean of KShs 54.2 and a standard deviation of KShs 14.24). The location of the soybean seed sellers ranges from 100 m to 18 km (with a mean of 3.5 km and a standard deviation of 3.98 km) (see **Table 8.1**). Result contained in **Table 8.1** clearly depicts the current small-sized nature of soybean enterprises in the study area. The seed of TGx 1835-10E (or SB3) was the most commonly purchased (according to 21 out of the 55 farm households that responded or 38.2%). This was followed at a distant by the seed of TGx 1448-2E (or SB20) (14.5%). Most the soybean seed purchases occurred in

August (38.2%) followed by July (15.8%) (**Table not shown**). This implies that most of the purchasing is in readiness for the second cropping season (short rainy season) that starts in August/September in the study area. This result shows the little attention given to soybean, unlike crops such as maize, in land resource allocation during the first cropping season (long rainy season) and again underscored the importance of allocating most land to the production of maize (a staple crop in the survey area) during the long rainy season.

It is important to note that **none of these purchasers of soybean seed did so from formal seed companies**. This has great implications on the type of seed system to emphasize and develop in order to usher in a sustainable development and promotion of soybean enterprises in the study area.

Table 8.1: Characteristics of soybean seed purchases in western Kenya

Parameter	n	Min.	Max.	Mean	Std. Deviation
Quantity of soybean seeds purchased (Kg)	62	0.5	25.0	3.7	4.6488
Amount paid per kilogram of seeds (KShs[$])	56	24.0	100.0	54.2	14.23709
Location of soybean seed sellers (Km)	51	0.1	18.0	3.5	3.9809

[$] KShs 65 = US$1.

Source: Survey data, 2008

2.8.2. Soybean varieties households planted over the years: 2004/05 – 2007/08

Between 2004/05 and 2007/08, the number of soybean varieties (local, improved, and improperly identified) ever planted by survey farm households increased from three to 20 (about 567% increases). However, across the subset of survey farm households that planted different varieties, the mean quantity of seeds planted during the main cropping season (long rainy season) ranged from 2 to 3.6 kg (with a mean of means of 2.5 kg) in 2004/05, 2 to 10 kg (with a mean of means of 6.2 kg) in 2005/06, 2 to 10.4 kg (with a mean of means of 4.5 kg) in 2006/07, and 0.5 to 10 kg (with a mean of means of 4.4 kg) in 2007/08. The corresponding figures for the quantity of seeds planted during the minor cropping season (short rainy season) were 3.5 to 4.0 kg (with a mean of means of 4.2 kg) in 2004/05, 3.7 to 15 kg (with a mean of means of 6.7 kg) in 2005/06, 4 to 8.1 kg (with a mean of means of 6.0 kg) in 2006/07, and 1.0 to 18 kg (with a mean of means of 5.4 kg) in 2007/08 (see **Table 8.2**).

With respect to the mean area (ha) allocated to the different soybean varieties, again by subsets of survey farm households that planted different varieties, the mean area allocated during the main cropping season (long rainy season) ranged from 0.1 to 0.5 ha (with a mean of means of 0.4 ha) in 2004/05, 0.3 to 1.5 ha (with a mean of means of 0.7 ha) in 2005/06, 0.2 to 0.6 ha (with a mean of means of 0.39 ha) in both 2006/07 and 2007/08. The corresponding figures for the minor cropping season ranged from 0.2 to 0.5 ha (with a mean of means of 0.4 ha) in 2004/05, 0.2 to 0.5 ha (with a mean of means of 0.4 ha) in

2005/06, 0.2 to 0.5 ha (with a mean of means of 0.4 ha) in 2006/07, and 0.2 to 0.7 (with a mean of means of 0.35 ha) ha in 2007/08 (see **Table 8.2**).

With respect to mean production (kg) of the different soybean varieties, again by subsets of survey households that planted different varieties, during the main cropping season it ranged from 5 to 89.5 kg (with a mean of means of 52.8 kg) in 2004/05, 10 to 60 kg (with a mean of means of 27.4 kg) in 2005/06, 10 to 72 kg (with a mean of means of 31.74 kg) in 2006/07, and 8 to 70 kg (with a mean of means of 35.8 kg) in 2007/08. The corresponding mean soybean production figures for the minor cropping season ranged from 12 to 55.5 kg (with a mean of means of 35.8 kg) in 2004/05, 7 to 64 kg (with a mean of means of 33.2 kg) in 2005/06, 17.2 to 54 kg (with a mean of means of 35.5 kg) in 2006/07, and 4 to 120 kg (with a mean of means of 29.8 kg) in 2007/08 (see **Table 8.2**).

In summary, **Table 8.2** shows that although some traces of soybean have been in the survey communities since 2004/05, all indications point to the fact that it is still a minor crop in the farming systems. This is clear from the mean quantities of seeds of the different varieties of soybean planted, the size of land allocated to soybean in the farming systems, as well as the level of production attained over the years.

Table 8.2: Trend in soybean varieties, quantity of seeds, area planted and production in western Kenya by season: 2004/05 – 2007/08

Year	Soybean varieties	Seed quantity (kg)		Area (ha)		Production (kg)	
		Major season	Minor season	Major season	Minor season	Major season	Minor season
2007/ 08	TGx 1831-32E (SB2)	2.0	18.0	0.2	0.3	40.0	80.0
	TGx 1835-10E (SB3)	5.9	4.5	0.5	0.4	47.7	28.0
	TGx 1871-12E (SB4)	10.0	6.0	0.5	0.3	70.0	24.0
	TGx 1895-33F (SB8)		8.5		0.4		27.6
	TGx 1869-31E (SB12)		4.0		0.3		14.0
	TGx 1878-7E (SB14)	3.0	3.0	0.2	0.2	12.0	6.3
	TGx 1889-12F (SB15)	3.0		0.3		35.0	
	TGx 1893-10F (SB17)	5.0	4.1	0.3	0.3	24.0	23.2
	TGx 1894-3F (SB18)	3.0		0.5		12.0	
	TGx 1740-2F (SB19)		1.0		0.3		8.0
	TGx 1448-2E (SB20)	7.0	6.0	0.6	0.4	23.0	23.3
	J499 (SB22)		2.5		0.2		5.0
	Maksoy (SB24)		4.0		0.2		7.0
	Namsoy (SB25)	3.9	5.7	0.3	0.4	22.8	23.0
	TGx 1910-11F (SB33)		4.0		0.5		4.0
	TGx 1903-2F (SB38)		4.0		0.3		120.0
	TGx 1903-13F (SB40)	6.7	8.7	0.5	0.5	59.4	37.3
	Agriculture	0.5	2.0	0.3	0.3	8.0	16.0
	Bukas	2.0	4.0	0.5	0.5	70.0	70.0
	Unknown varieties	3.1	3.2	0.3	0.3	18.5	12.3
2006/ 07	TGx 1835-10E (SB3)	4.0	6.0	0.5	0.5	45.0	38.7
	TGx 1871-12E (SB4)	6.0		0.5		32.0	
	TGx 1878-7E (SB14)	2.0		0.3		20.0	
	TGx 1893-10F (SB17)		7.0		0.4		54.0
	TGx 1448-2E (SB20)	10.4	8.1	0.6	0.5	43.1	33.1
	Maksoy (SB24)	4.0		0.2		10.0	
	Namsoy (SB25)	5.3	6.0	0.4	0.2	20.0	20.0
	Agriculture	3.0		0.3		24.0	
	Bukas	2.0	4.0	0.5	0.5	72.0	50.0
	Unknown varieties	4.3	4.7	0.3	0.3	35.3	17.2
	TGx 1903-3F (SB39)	4.0		0.3		16.0	
2005/ 06	TGx 1448-2E (SB20)	10.0	15.0	0.3	0.4	10.0	16.5
	Bukas	2.0	4.0	0.5	0.5	60.0	64.0
	Unknown varieties	2.8	3.7	0.4	0.4	27.7	45.3
	TGx 1903-3F (SB39)	10.0	4.0	1.5	0.2	12.0	7.0
2004/ 05	*Bukas*	2.0	4.0	0.5	0.5	64.0	40.0
	Unknown varieties	3.6	3.5	0.5	0.5	89.5	55.5
	TGx 1903-3F (SB39)	2.0	4.0	0.1	0.2	5.0	12.0

Source: Survey data, 2008

2.8.3. Farmers' ability to compare local and improved varieties of soybean

For farmers to make informed decisions on whether to adopt improved varieties of soybean or not to adopt them, they must be able to compare these "improved" varieties with the local varieties that they are used to. As a prelude to commencing the assessment, each survey farm household (although most applicable to households that grow soybeans) was asked to choose its best improved soybean variety as well as its best local soybean variety upon which to base to evaluation and comparison. So the varieties at the back of the mind of each farm household may differ from farm household to farm household. Over all, 68 farm households participated in the comparison that was based on 18 different criteria, some of which are related. These criteria were *seed price, seed availability, market price for grain, disease tolerance, field pests resistance, storage pests resistance, early maturity, yield potential, performance under low soil fertility* and *performance under low soil moisture*. Others were *seed size, seed eye color, seed color, pods characteristics* (length, texture), *taste, food quality, quantity of biomass,* and *soil fertility improvement*.

Among all the 18 criteria, farm households were most conversant in comparing the varieties using ***seed size*** with all households giving their felt opinion on this criterion. This was followed by ***seed availability*** (with only two out of 68 households unable to decide based on this criterion) and ***seed price*** (with only three out of 68 households unable to decide based on this criterion). On the other hand, certain criteria were particularly hard for many farm households to use in comparing local and improved soybean varieties. These include ***storage pest resistance*** (22 out of 68 farm households or 32.3% were unable to decide based on this criterion), ***pod characteristics*** (21 out of 68 farm households or 30.9% were unable to decide based on this criterion), ***performance under low soil fertility*** and ***soil fertility improvement*** (18 out of 68 farm households or 26.5% each were unable to decide based on these criteria), ***disease resistance*** (15 out of 68 farm households or 22.1% were unable to decide based on this criterion), and ***field pests resistance***, ***performance under low soil moisture***, and ***seed eye color*** (14 out of 68 farm households or 20.6% each were unable to decide based on there criteria), in that order.

Going by the order in which the farm households could effectively use the set criteria to compare local and improved varieties of soybean, the results are as follows: Compared with 30.9% of the farm households who felt that the seed size of local soybean varieties were the same as those of improved soybean varieties, 38.2% were of the opinion that local soybean varieties have larger seed sizes (see **Table 8.3**). With respect to seed availability while 39.7% of the survey farm households felt that seed availability of both local and improved soybean varieties were the same, 32.4% felt that the seeds of local soybean varieties were more readily available than that of improved soybean varieties. For market price for grains and seed color, about 66.2% each of the respondents were of the opinion that they were the same. About 82.4% felt that the seed price of both local and improved varieties of soybean is the same. For early maturity, 61.8% of the survey farm households or respondents felt that local soybean varieties mature earlier than improved soybean varieties. Also, about 57.4% of the respondents felt that local soybean

varieties have higher yield potential than improved soybean varieties. However, about 70.6% of the farm households were of the view that the taste of local soybean varieties was the same as that of improved soybean varieties. Similarly, about 69.1% of the respondents opined that their food quality is the same. Finally, about 39.7% of the assessors noted that local soybean varieties produce larger quantities of biomass than improved varieties – an assessment that is doubtful and must have been due to the huge proportion of the respondents that could not indicate any opinion with respect to soil fertility improvement, performance under low soil fertility, performance, and similar criteria. This result must be rechecked and validated.

It is important to note that there was no instance where farm households rated improved soybean varieties superior to the local varieties. At best, both improved and local varieties of soybean were rated equal or similar using certain criteria. This must have been contributing to the presently perceived widespread low adoption of improved soybean varieties in many parts of Western Kenya. This possesses a great challenge to soybean breeders to actually come up with champion improved soybean varieties, a pre-requisite to widespread soybean cultivation in Western Kenya and similar environments.

Table 8.3: Farmers' comparison of local and improved varieties of soybean in Western Kenya

Crop attributes	Comparison[$]				Total
	Same	**Cheaper**	**More expensive**	**Don't know**	
Seed price	**56 (82.4)**	7 (10.3)	2 (2.9)	3 (4.4)	68 (100)
	Same	**Readily**	**Not readily**	**Don't know**	
Seed availability	**27 (39.7)**	22 (32.4)	17 (25)	2 (2.9)	68 (100)
	Same	**More**	**Less**	**Don't know**	
Disease tolerance	11 (16.2)	**24 (35.3)**	18 (26.5)	15 (22.1)	68 (100)
Field pests resistance	20 (29.4)	**22 (32.4)**	12 (17.6)	14 (20.6)	68 (100)
Storage pest resistance	**32 (47.1)**	10 (14.7)	4 (5.9)	22 (32.4)	68 (100)
	Same	**Earlier**	**Later**	**Don't know**	
Early maturity	3 (4.4)	**42 (61.8)**	17 (25)	6 (8.8)	68 (100)
	Same	**Higher**	**Lower**	**Don't know**	
Yield potential	6 (8.8)	**39 (57.4)**	17 (25)	6 (8.8)	68 (100)
Market price for grain	**45 (66.2)**	7 (10.3)	12 (17.6)	4 (5.9)	68 (100)
	Same	**Higher**	**Worse**	**Don't know**	
Performance under low soil fertility	9 (13.2)	**27 (39.7)**	14 (20.6)	18 (26.5)	68 (100)
	Same	**Larger**	**Smaller**	**Don't know**	
Seed size	21 (30.9)	**26 (38.2)**	21 (30.9)	0 (0)	68 (100)
Seed eye color	**38 (55.9)**	10 (14.7)	6 (8.8)	14 (20.6)	68 (100)
	Same	**Better**	**Worse**	**Don't know**	
Performance under low soil moisture	8 (11.8)	**33 (48.5)**	13 (19.1)	14 (20.6)	68 (100)
Seed color	**45 (66.2)**	13 (19.1)	4 (5.9)	6 (8.8)	68 (100)
Pod characteristics (length, texture**)**	**26 (38.2)**	19 (27.9)	2 (2.9)	21 (30.9)	68 (100)
Taste	**48 (70.6)**	13 (19.1)	0 (0)	7 (10.3)	68 (100)
Food quality	**47 (69.1)**	11 (16.2)	1 (1.5)	9 (13.2)	68 (100)
	Same	**Larger**	**Lower**	**Don't know**	
Quantity of biomass	12 (17.6)	**27 (39.7)**	22 (32.4)	7 (10.3)	68 (100)
	Same	**Higher**	**Lower**	**Don't know**	
Soil fertility improvement	**19 (27.9)**	18 (26.5)	13 (19.1)	18 (26.5)	68 (100)
Total	**473 (38.6)**	375 (30.6)	190 (15.5)	186 (15.2)	1224 (100)

[$] **Set of comparison heading continues to apply until another set is seen.**

Source: Survey data, 2008

2.8.4. Farm households' knowledge of different <u>improved</u> soybean varieties

Survey farm households were asked whether or not they knew different types of soybean known as improved varieties. Of the 170 households that responded, 105 (or 61.8%) indicated that they knew the different types of soybean known as improved varieties. As expected, all of these 105 farm households were soybean growing farm households. By sub-location, these were distributed as follows: 57 farm households or 54.3% from *Khalaba* sub-location, 48 farm households or 45.7% from *Musamba* sub-location, and zero farm household from *Kholera* sub-location. By headship and management of households, they were distributed as follows: 51 or 48.6% male-headed male-managed

farm households, 45 or 42.9% male-headed female-managed farm households, and 9 or 8.5% female-headed female-managed farm households.

The balance of 65 households (or 38.2%) did, however, not know the different types of soybean known as improved varieties. While 59 of the 65 households (or 90.8%) were soybean growing farm households, 6 households (or 9.2%) were non-soybean growing farm households (based on pre-sampling classification). By sub-location, the 65 farm households were distributed as follows: 38 farm households or 58.5% from *Musamba* sub-location, 22 farm households or 33.8% from *Khalaba* sub-location, and 5 farm households or 7.7% from *Kholera* sub-location. By headship and management of the farm households, the 65 farm households were distributed as follows: 25 or 38.5% male-headed male-managed farm households, 39 or 60.0% male-headed female-managed farm households, and one or 1.5% female-headed female-managed farm household.

2.8.5. Farm households' sources of information about the seeds of improved soybean variety

We evaluated the sources through which survey farm households obtained information about the seeds of improved soybean varieties. Of a total 307 non-mutually exclusive responses [162 (or 52.7%) from *Musamba* sub-location, 142 (or 46.3%) from *Khalaba* sub-location, and 3 (or 1.0%) from *Kholera* sub-location], the two outstanding sources of information were the ***extension staff of the Ministry of Agriculture*** (which accounted for 31.9% of the responses) and ***fellow farmers*** (28.7%). These were distantly followed by two other sources, ***staff of agricultural research institutions*** (10.4%) and ***radio*** (9.8%). It is worthy of note that both **local retail shops and seed companies accounted for only 1.3% each** (see **Table 8.4**). The rating of radio here is not in synchrony with its second agricultural extension radio in the dissemination of agricultural extension messages earlier noted in the study area (see **Table 4.2**). By headship and management of survey farm households, the 307 mutually exclusive responses were distributed as follows: 152 (or 49.5%) from male-headed male-managed farm households, 134 (or 43.6%) from male-headed female-managed farm households, and 21 (or 6.9%) female-headed female-managed farm households.

Table 8.4: Farm households' sources of information about the improved variety in western Kenya[$]

Sources of information	Frequency
Ministry of Agriculture Extension	98 (31.9)
Fellow farmer	88 (28.7)
Staff of a research institute	32 (10.4)
Radio	30 (09.8)
NGO	19 (06.2)
Community based seed provider	8 (02.6)
Local retail shop	4 (01.3)
Seed company	4 (01.3)
Television	3 (01.0)
Other	21 (06.8)
Total	**307 (100.0)**

[$] Values in parenthesis are percent figures; Responses were not mutually exclusive

Source: Survey data, 2008

2.9. Livestock production

Livestock is an important component of the farming systems of sub-Saharan Africa as the other regions of the world. The baseline survey covered livestock production and marketing covering cattle, small ruminants (sheep and goats), and poultry (chicken and non-chicken categories) among others. For each of these livestock, we ascertained the number presently owned by the survey farm households and the total value (articulated in local currency). This aspect of the baseline data is yet to be analyzed and is not, therefore, included in this report.

2.10. Agricultural commodity marketing (decisions, commercial index, crop gift, etc.)

A bulk of the data were in the areas of the quantities (in kg) harvested, consumed, sold, given out as gift, reserved as seed for next season, lost due to handling, etc. in the 2007/08 season of soybean (local variety and improved variety), common beans, cowpea, groundnut, pigeon/chickpea, maize, sorghum, and millet. Related to this we also collected data specifically on soybean and with respect to when (soon after harvest, six months after harvest, just before planting) survey households sold their soybean grains and the proportion sold during each period. We also collected data on the place of sale, the average price per unit, and the buyer (if the survey farm households could recall). Most of the data related to this section of the baseline survey are yet to be analyzed and will be included in subsequent reports. A few other market-related items are reported here.

2.10.1. Market access

We evaluated the access to market by the respondents and in terms of how far both their nearest and their main market is. Results show that across the 247 farm households that provided data, the distance from farm household to the nearest market ranged from 0.1 km to 20 km (with a mean of 1.6 km and a standard deviation of ~ 1.7 km). The distance from farm household to the main market ranges from 0.5 km to 30 km (with a mean of 6.2 km and a standard deviation of ~ 4.0 km). Across the survey sub-locations, while the difference in the distance from household to the nearest market is not statistical significant, that between the farm household and the main market is significant at 1% level (see **Table 10.1**).

Table 10: Distance (km) to nearest and main markets in Western Kenya

Sub-location	Distance to nearest market (km)	Distance to main market (km)
Khalaba	1.5 ±1.2 (83)	7.3 ±3 (83)
Kholera	1.4 ±0.8 (76)	4 ±3.5 (76)
Musamba	1.9 ±2.4 (88)	7.2 ±4.6 (88)
Total	**1.6 ±1.7 (247)**	**6.2 ±4 (247)**
Sig	**0.142**	**0.000**

[$] Values are means, standard deviations, and number of cases (or effective sample size)

Source: Survey data, 2008

2.11. Household income and expenditure profile

2.11.1. Farm households' cash income profile

Adequate household cash income is a necessary but not sufficient requirement for improved or better household welfare. We used several methods to try to estimate household cash income in the study sub-locations. In the simplest of the methods, we asked survey households about their annual cash income range (in Kenya Shillings KShs). Average household size in the study area was about 6.3 or ~ 7 persons which more or less synchronize with about seven persons based on an earlier estimate (Chianu et al., 2008). The result presented in **Table 11.1** indicates that ***at least 80.2% of the people live on less than 1 US$ a day***. This is because, a household of seven persons requires at least US$ 2555 (or KShs 166075) to live on 1 US$ a day. However, Table 11.1 indicates that household income range was from less than KShs 40000 (or US$ 615) to KShs 120000 (or US$ 1846) for at least 80.2% of the survey farm households. Low agricultural productivity is a precursor to this widespread low income. This result supports a recent finding by Chianu et al. (2008) on high level of poverty in various parts of Western Kenya. It is in line with this type of situation that WDR2008 noted that the overall priorities are: (i) to increase the assets of poor farmers (particularly access to land, water, education, and health care), (ii) to raise the productivity of smallholders, and (iii) to generate opportunities in the rural non-farm economy (Perez et al. 2008). The report recognizes: (a) that the state must be actively involved, (b) that the sector is plagued with

multiple market failures, and (c) that assistance must go beyond safety-net social programs to focus on raising smallholder productivity and stimulating broad-based rural development of both the farm and non-farm sectors (Perez et al. 2008).

Table 11.1: Farm households' cash income range in Western Kenya

Income level class (KShs)	Income level class (US$ equivalent)[$]	Frequency[&]
Less than 40000	Less than 615	76 (30.8)
Between 40000 and 80000	Between 615 and 1230	87 (35.2)
Between 80001 and 120000	Between 1231 and 1846	35 (14.2)
Greater than 120000	Greater than 1846	49 (19.8)
Total		**247 (100.0)**

[$] At US$ 1 = KShs 65; [&] Values in parenthesis are percent figures

2.11.2. Household spending and expenditure items

We audited household food and beverage expenditure items in 2007/08 (i.e., between February 2007 and March 2008 since the survey was carried out in March 2008), first irrespective of the amount and then with respect to the amount spent on each item. Result shows that although the survey targeted farm households, ***almost all of them (98.8%) indicated that they expended money purchasing staple foods***. This clearly brings to light the low productivity and production of the farming systems in the survey sub-locations of Western Kenya, ***despite the widely talked about high agricultural potential of the region***. In addition, a little above half (or 53.4%) of the survey farm households spent money over the reference period, purchasing snacks. It is, however, encouraging to note that only about 6.9% of the survey farm households spent money on tobacco and cigarettes (see **Table 11.2**). Apart from food and beverages, most of the farm households spent money on other items including fuelwood and paraffin (95.5% of the farm households), medicals (87.4%), education (86.2%), clothing (83.4%), social contributions (57.9%), remittances to relatives (54.3%), and miscellaneous items (47.8%) (see **Table 11.3**). With respect to selected agricultural inputs (seeds, mineral fertilizers, organic fertilizers, and hired labor), results indicate that while 91.9% of survey farm households spent some money buying seeds in 2007/08, the corresponding proportions of the survey farm households that spent money purchasing the other agricultural inputs were 66.8% for mineral fertilizers, 34.8% for hired labor, and only 3.6% for organic fertilizers (**Table not shown**).

For the food and beverages, the actual household annual expenditure (KShs) ranges from 500 to 200000 (with a mean and standard deviation of 26417.3 and 27789.6, respectively) for staple foods, from 200 to 72000 (with a mean and standard deviation of 7430.2 and 11030.0, respectively) for snacks, from 300 to 30000 (with a mean and standard deviation of 7718.6 and 7368.4, respectively) for alcohol and soft drinks, and from 200 to 19200 (with a mean and standard deviation of 3063.5 and 4624.2, respectively) for tobacco and cigarettes (see **Table 11.4**). Mean household annual expenditure (KShs) on other items was 3930.95 for fuelwood and paraffin, 5577.31 for medicals, 23048.73 for education,

4544.15 for clothing, 4460.84 for social contributions, 4661.94 for remittances to relatives, and 3467.28 for miscellaneous items (see **Table 11.5**). With respect to selected agricultural inputs (seeds, mineral fertilizers, organic fertilizers, and hired labor), mean farm household annual expenditure (KShs) was 1860.22 (with a standard deviation of 1965.653) for seeds, 3617.84 (with a standard deviation of 5251.620) for mineral fertilizers, 6900.35 (with a standard deviation of 9594.841) for hired labor, and 1358.89 (with a standard deviation of 1000.206) for organic fertilizers (**Table not shown**). Due to the associated high standard deviations, the mean expenditures data need to be further validated and the associated results re-computed. This result should, therefore, be regarded as just preliminary.

Table 11.2: Whether or not farm households spent money on different food and beverages in 2007/08

Food and beverage expenditure item	**Frequency[$]**
Staple foods	244 (98.8)
Snacks	132 (53.4)
Alcohol and soft drinks	29 (11.7)
Tobacco and cigarettes	17 (06.9)
N	**247**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 11.3: Whether or not households spent money on other items in 2007/08

Other household expenses	**Frequency[$]**
Fuelwood, paraffin, etc	236 (95.5)
Medical expenses	216 (87.4)
Educational expenses	213 (86.2)
Clothing	206 (83.4)
Social contributions	143 (57.9)
Remittances to relatives	134 (54.3)
Miscellaneous	118 (47.8)

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 11.4: Mean farm household annual expenditure (KShs[&]) on different Food and beverages in Western Kenya

Food and beverage expenditure item	n	Mean	Min.	Max.	Std. Deviation
Staple foods	244	26417.3	500	200000	27789.602
Snacks	132	7430.2	200	72000	11030.020
Alcohol and soft drinks	29	7718.6	300	30000	7368.440
Tobacco and cigarettes	17	3063.5	200	19200	4624.193

[&] KShs. 65 = US$ 1

Source: Survey data, 2008

Table 11.5: Mean farm household annual expenditure (KShs[&]) on other items in Western Kenya

Other household expenses	Mean	n	Min.	Max.	Std. Deviation
Fuelwood, paraffin, etc	3930.95	236	50	36000	4137.936
Medical expenses	5577.31	216	50	80000	9137.795
Educational expenses	23048.73	213	200	448000	47775.785
Clothing	4544.15	206	300	40000	5128.983
Social contributions	4460.84	143	50	80000	8189.412
Remittances to relatives	4661.94	134	200	70000	9154.043
Miscellaneous (repairs, gifts, etc)	3467.29	118	50	25000	4685.382
Total	**7622.13**	**1266**	**50**	**448000**	**21704.111**

[&] KShs. 65 = US$ 1

Source: Survey data, 2008

2.12. Household welfare and livelihoods

2.12.1. Livelihood goals of farm households in Western Kenya

We evaluated the relative importance of various livelihood goals in contributing to shaping improvements in the livelihoods of farm households in the survey sub-locations. The livelihood goals included in the assessment were *increase in agricultural production, reduction in agricultural production risk, reduction in marketing risk, increase in food security*, and *improvement in health status of household members*. Others were *increase in volume of household assets, increase in the education level of household members, increase in land ownership, improvement in household's social status*, and *increase in household income/reduction in household income risks*. Also included were *increase in job opportunities/earn wages*, and *go out of agriculture/more off-farm activities*.

Popularity results (based on number of respondents that gave their opinion) collated under four main household livelihood goal categories (agriculture and food-related, farm household welfare-related, asset-related, and other) show the overwhelming popularity of

agriculture and food-related goal among farm households in the survey sub-locations. Both within this category and across the four categories of livelihood goals, increase in agricultural production and increase in food security were the most popular specific livelihood goals (see **Table 12.1**). Acquisition of asset and income do not seem to be of high popularity among the survey farm households. Clearly, **Table 12.1** also shows how unpopular the idea of survey households stepping out of agriculture to embrace more off-farm activities is. So, the challenge to research and development agencies is to find effective ways of improving their livelihoods within farming enterprises.

Individually, the specific livelihood goals were ranked in order of their importance in improving the livelihoods of the survey farm households. Results indicate that increase in food security followed by increase in agricultural production were the two most important livelihood pursuits of the survey farm households (see **Table 12.2**).

Table 12.1: Typical livelihood outcomes of farm households in Western Kenya[$]

Outcome category	Specific livelihood outcome	Frequency[&]
Agriculture and food-related:		***496 (50.3)***
	Increase agricultural production	215 (21.8)
	Increase food security	195 (19.8)
	Reduce agricultural production risk	86 (08.7)
Welfare-related:		***289 (29.3)***
	Increase education level of household members	111 (11.3)
	Improve health status of household members	105 (10.6)
	Increase job opportunities / earn wages	60 (06.1)
	Improve household's social status	13 (01.3)
Asset-related:		***194 (19.7)***
	Increase land ownership	76 (07.7)
	Increase household's income / Reduce income risk	55 (05.6)
	Reduce marketing risk	37 (03.8)
	Increase volume of household's assets	26 (02.6)
Other:		***7 (00.7)***
	Get out of agriculture (More off-farm activities)	7 (06.1)
Total		**986 (100.0)**

[$] Responses are not mutually exclusive; [&] Values in parenthesis are percent figures

Source: Survey data, 2008

Table 12.2: Mean rank of livelihood outcomes by households in Western Kenya

Specific livelihood outcome	Mean	n	Std. Deviation
Increase agricultural production	2.05	214	1.133
Increase food security	1.91	195	0.996
Reduce agricultural production risk	2.98	86	0.854
Increase education level of household members	2.78	111	0.957
Improve health status of household members	2.81	105	0.931
Increase job opportunities / earn wages	3.07	60	1.071
Improve household's social status	3.38	13	0.768
Increase land ownership	2.66	76	1.114
Increase household's income / Reduce income risk	2.60	55	1.148
Reduce marketing risk	3.19	37	0.877
Increase volume of household's assets	2.88	26	1.033
Get out of agriculture (More off-farm activities)	3.29	7	0.951

Source: Survey data, 2008

2.12.2. Household food, nutrition, and income security

Using a self assessment method, we evaluated food, nutrition, and income security among the survey farm households. Result shows widespread farm household insecurity arising from various realms (food, nutrition, and income) in the study area (see **Table 12.3**). The incidence of insecurity was highest for income with 205 out of the 247 farm households (or 83%) indicating that they have been income insecure. Food insecurity comes next (70.4% of survey farm households), and then nutrition insecurity (67.2% farm households). That nutrition insecurity has the lowest frequency of the three types of farm household security assessed may be due to widespread lack of nutritional education in Africa, making it difficult for many Africans to be in a position to correctly assess their nutritional status. Such knowledge is sometimes availed to those who visit hospitals for nutrition-related ailments, especially when specifically requested for.

Table 12.3: Household food, nutrition and income security in Western Kenya

Type of security	Status	Frequency[$]
Food:		
	Secure	73 (29.6)
	Insecure	174 (70.4)
Nutrition:		
	Secure	81 (32.8)
	Insecure	166 (67.2)
Income:		
	Secure	42 (17.0)
	Insecure	205 (83.0)

[$] Values in parenthesis are percent figures. Effective sample size (n) is 247 in each case.

Source: Survey data, 2008

By sub-location, the prevalence of food insecurity ranged from 67.1% in *Kholera* sub-location to 72.3% in *Khalaba* sub-location. *Musamba* sub-location was in the middle with 71.6% of survey farm households from it being food insecure (**Table not shown**). While 71.4% of the soybean growing farm households noted that they were food insecure, the corresponding figure for non-soybean growing farm households was 68.4%. By household headship and management, the proportion was as follows: 65.5% food insecurity level among male-headed female-managed farm households, 74.1% among male-headed male-managed farm households, and 80.0% among female-headed female-managed farm households. With respect to nutrition insecurity, the prevalence ranges from 64.5% (in *Kholera* sub-location) to 69.3% in *Musamba* sub-location. *Khalaba* sub-location was in the middle with 67.5% of the survey farm households from it being nutrition insecure (**Table not shown**). While 68.5% of the soybean growing farm households noted that they were nutrition insecure, the corresponding figure for the non-soybean growing farm households was 64.6%. By household headship and management, the proportion was as follows: 71.3% nutrition insecurity level among male-headed female-managed farm households, 63.0% among male-headed male-managed farm households, and 70.0% among female-headed female-managed farm households. With respect to income insecurity, the prevalence ranged from 80.7% in *Musamba* sub-location to 86.7% in *Khalaba* sub-location. *Kholera* sub-location was in the middle with 81.6.5% of survey farm households from it being income insecure (**Table not shown**). While 83.3% of the soybean growing farm households noted that they were income insecure, the corresponding figure for non-soybean growing farm households was 82.3%. By household headship and management, the proportion was as follows: 82.4% income insecurity level each for both male-headed male-managed farm households and male-headed female-managed farm households, and 90.0% among female-headed female-managed farm households.

2.12.3. Threats to livelihoods in Western Kenya

From own perspectives, we evaluated the threats to the livelihoods of the survey farm households. Six threat groups (climate-related, food scarcity-related, health-related,

poverty-related, pest and disease-related, and deviance-related) were identified from a total of 726 non-mutually exclusive responses (see **Table 12.4**). Climate-related threats (comprising of drought, flood, hailstones, and fire) posed the most serious threat to the livelihoods of the people (according to about 52% of the responses) in the study area. This was followed by food scarcity-related threats (15.8%), health-related threats (11.2%), and poverty-related threats (7.9%) in that order.

Table 12.4: Threats to livelihoods of farm household in Western Kenya[$]

Livelihood threats	**Frequency[&]**
Climate-related (drought, flood, hailstones, fire)	378 (52.1)
Food scarcity-related (famine and food insecurity)	115 (15.8)
Health-related (poor health status)	81 (11.2)
Poverty-related (lack of finance)	57 (07.9)
Pest and disease-related (crop/livestock diseases and pests)	47 (06.5)
Deviance-related (Theft)	32 (04.4)
Others (poor soil, lack of employment, lack of market for produce, lack of education/training, insufficient farmland, limited farm labor)	16 (02.2)
Total	**726 (100.0)**

[$] Responses are not mutually exclusive; [&] **Values in parenthesis are percent figures.**

Source: Survey data, 2008

2.12.4. Constraints to improved livelihoods in Western Kenya

The deepening poverty among rural households in sub-Saharan Africa (SSA) is a major source of concern to the development community. If the different targets of the Millennium Development Goal must be met in various SSA countries, the factors that have continued to fuel rural poverty in the sub-region must be isolated and decisively dealt with. In order to contribute to the isolation of the factors accelerating poverty in SSA, we assessed the most serious factors that constrain improvements in the livelihoods of the survey farm households. Each farm household's own assessment method was used. In a decreasing order of importance, these factors that constrain improvements in the livelihoods of the survey farm households were grouped into *farming systems-related* (according to 46.9% of the mutually non-responsive responses), *credit and market-related* (28.0%), *human health-related* (11.9%), *infrastructure-related* (6.2%), *farm labor-related* (4.8%), and *natural disaster-related* (1.3%) factors or constraints (see **Table 12.5**). Across the constraints groups, the four most important specific constraints to improvements in the livelihoods of survey households were: low soil fertility (19.6%), lack of finance (13.4%), poor input/output markets (12.5%), and poor health status (11.8%) (see **Table 12.5**).

Table 12.5: Most serious constraints to improving farm households' livelihoods in western Kenya

Constraints group	Specific constraints	Frequency[$]
Farming systems-related:		***335 (46.9)***
	Low soil fertility	140 (19.6)
	Low crop yields	79 (11.1)
	Lack of farm inputs (fertilizers)	41 (5.7)
	Crop and livestock diseases and pests	36 (5.0)
	Seed (quality, viability and availability)	8 (1.1)
	Late planting	1 (0.1)
	Food shortage	1 (0.1)
	Lack of land	29 (4.1)
Credit and market-related:		***200 (28.0)***
	Lack of finance	96 (13.4)
	Lack of credit facilities	15 (2.1)
	Poor markets (input/output)	89 (12.5)
Human health-related:		***85 (11.9)***
	Poor health status	84 (11.8)
	Lack medical facilities	1 (0.1)
Infrastructure-related:		***44 (6.2)***
	High transport cost	30 (4.2)
	Poor roads	14 (2.0)
Farm labor-related:		***34 (4.8)***
	Lack of knowledge	19 (2.7)
	Lack of labor/time	14 (2.0)
	Drunkenness	1 (0.1)
Natural disaster-related:		***9 (1.3)***
	Poor weather, rainfall, hailstones	6 (0.8)
	Perishable crops	2 (0.3)
	Cattle feeding on crops	1 (0.1)
Others:		***7 (1.0)***
	Insecurity, quarrels, dependency on other family members, competition	7 (1.0)
Total		**714 (100.0)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

2.12.5. Household members' access to enough food

The result of our assessment of household members' access to food indicates that 168 of the 247 households (or 68%) noted that its members did not have enough and adequate food in 2007. This ranged from 64.5% in *Kholera* sub-location to 72.3% in *Khalaba* sub-location. The corresponding figure was 69% for soybean growing farm households and 65.8% for non-soybean growing farm households. With respect to the headship and

management of the survey farm households, the proportion of farm households that indicated that its members did not have enough and adequate food in 2007 was as follows: 64.7% for male-headed female-managed farm households, 70.4% for male-headed male-managed farm households, and 75% for female-headed female-managed farm households. In all cases, the balance was where farm households indicated that its members had enough and adequate food in 2007 and was 32% across the respondents (ranging from 27.7% for *Khalaba* sub-location to 35.5% for *Kholera* sub-location) (**Table not shown**). This result is clear micro-level demonstration of the inability of Africa (including African farm families) to feed itself. There is little or no doubt that these farm households (68% of total respondents) whose members did not have enough and adequate food do not usually produce surpluses for the market and do not really participate in agricultural commodity markets. For such farm households, one cannot talk of earning profit from farming or reinvestment in the farm (as expected in the market-led hypothesis) because there is clearly nothing to reinvest. Such farm households are actually best described as net buyers of food. It is possible that some of them would have sold part of their produce even cheaper and soon after harvest so that they do not have to store the produce and worry about pests. These need to be verified during detailed data analysis.

In its recent update, AGRA (Alliance for a Green Revolution in Africa) noted that three-quarters of the world's poorest – the 1.1 billion people who live on less than US$ 1 a day – live in rural areas, and mostly rely on agriculture to feed themselves and their families, yet many cannot grow enough to eat or sell (AGRA, 2008). Over the years, such farm households have been suffering from what was described as a silent food crisis (AGRA, 2008).

The number of months in the year when the affected farm household members did not have enough and adequate food were ascertained from the 168 households that indicated that its members did not have enough and adequate food in 2007. Results show that the of months ranged from one month to 12 months with a mean and standard deviation of 5.29 months and 2.137 months, respectively (see **Table 12.6**). By sub-location, the mean number of months the affected farm households did not have enough and adequate food was 5.02 (with standard deviation of 1.925) for *Musamba* sub-location, 5.38 (with standard deviation of 2.148) for *Khalaba* sub-location, and 5.51 (with standard deviation of 2.364) for *Kholera* sub-location (see **Table 12.7**). Of the 168 survey farm households that its members did not have enough and adequate food in 2007, 116 farm households (or 69.0%) were soybean growing households while 52 (or 31%) were non-soybean growing households. While the mean number of months household did not have enough and adequate food was 5.20 (with a standard deviation of 2.040 months) among the affected soybean growing farm households, it was 5.5 months (with a standard deviation of 2.347 months) among the affected non-soybean growing farm households (**Table not shown**). By headship and management of the survey farm households, the mean number of months households did not have enough and adequate food was 4.99 (with standard deviation of 1.970) for male-headed female-managed farm households, 5.51 (with standard deviation of 2.283) for male-headed male-managed farm households, and 5.73

(with standard deviation of 2.120) for female-headed female-managed farm households (see **Table 12.8**).

Table 12.6: Number of months households did not have enough and adequate food in Western Kenya

Parameter	n	Min.	Max.	Mean	Std. Deviation
Months of insufficient food	168	1	12	5.29	2.137

Source: Survey data, 2008

Table 12.7: Mean number of months households did not have enough and adequate food in Western Kenya by sub-location

Sub-location	n	Mean number of months of insufficient food	Std. Deviation
Khalaba	60	5.38	2.148
Kholera	49	5.51	2.364
Musamba	59	5.02	1.925
Total	**168**	**5.29**	**2.137**

Source: Survey data, 2008

Table 12.8: Mean number of months households did not have enough and adequate food in Western Kenya by household headship and management

Household headship and management	n	Mean	Std. Deviation
Male headed-male managed	76	5.51	2.283
Male headed-female managed	77	4.99	1.970
Female headed-female managed	15	5.73	2.120
Total	**168**	**5.29**	**2.137**

Source: Survey data, 2008

For the farm households that hadn't enough and adequate in 2007, we followed up to find out the months of the year during which months they hadn't enough and adequate food. Result shows that the most critical month of insufficient food in was June (according to about 27% of the respondents). This is expected since June precedes July when most of the harvests from the first season (or long rainy season) cropping take place. The fact that a similar trend was not observed for the second season (or short rainy season) cropping shows the overwhelming importance of the first cropping season (or long rainy season) compared with the second cropping season (or short rainy season) in the farming systems of the survey sub-locations. More or less, the results contained in **Table 12.9** seem to confirm the 5.29 average numbers of months of insufficient food in the study area

(especially if the frequencies for February and July are combined). After June, the next critical months of household food insecurity in the survey sub-locations were March (15.5% of the respondents), April (14.9%), and May (13.7%) in that order. This again brings to question the real food security value of the second season (or short rainy season) cropping since these months (March, April, May, and even June) are post January/February when most of the second cropping season (or short rainy season) crops would have been harvested.

Table 12.9: Months of the year (2007) during which survey in Western Kenya hadn't enough and adequate food

Months households did not have enough and adequate food	Frequency[$]
January	1 (0.6)
February	12 (7.1)
March	26 (15.5)
April	25 (14.9)
May	23 (13.7)
June	45 (26.8)
July	14 (8.3)
August	8 (4.8)
September	5 (3.0)
October	6 (3.6)
November	2 (1.2)
December	1 (0.6)
Total	**168 (100.0)**

[$] **Values in parenthesis are percent figures**

Source: Survey data, 2008

In summary, these results reinforce the continued importance of various rural interventions to increase income, improve food security, and reduce poverty in an efficient, equitable, and sustainable manner.

2.12.6. Household coping mechanisms against food shortage

We evaluated the strategies which survey farm households in the study area used to cope with food shortages, especially since this occurs frequently. The results organized into six coping strategy classes (*self control-related*, *self help-related*, *asset disposal-related*, *borrowing-related*, *food aid*, and *others*) show that self control-related strategies were the most important, accounting for 48.6% of the responses (see **Table 12.10**). The most important specific coping mechanisms in this class were *reduction of the frequency of food intake* and *reduction of non-school fee expenditure*. Next to the self control-related coping strategy was self help-related strategy that accounted for 24.5% of the responses. *More work off-farm* was dominating in this category. Asset disposal-related coping strategy (accounting for 15.3% of the responses) came next, with the *sale of small*

animals dominating. Borrowing-related coping strategy, comprising of borrowing and leasing, came next, with 7.6% of the respondents alluding to it. Resort to food aid was important to only about 2% of the respondents (see **Table 12.10**).

Table 12.10: Strategies used by farm households to cope with food shortage in Western Kenya

Coping strategy and actual coping mechanism	Frequency[$]
Self control-related:	***312 (48.6)***
Reduced frequency of food intake	169 (26.3)
Reducing non-school fee expenditure	140 (21.8)
Withdrawing children from school	3 (00.5)
Self-help-related:	***157 (24.5)***
More work off-farm	136 (21.2)
Working at Food-for-work	21 (03.3)
Asset disposal-related:	***98 (15.3)***
Selling small animals	76 (11.8)
Selling cattle	10 (01.6)
Selling other (none animal or farm equipment) assets	7 (01.1)
Selling farm equipments	5 (00.8)
Borrowing-related:	***49 (7.6)***
Loans and borrowing	41 (06.4)
Leasing (land, cash crops)	8 (01.2)
Food aid:	***13 (2.0)***
Receiving food aid	13 (02.0)
Others:	***13 (2.0)***
Diet diversification (supplementation, substitution)	10 (01.6)
Improved farming	2 (00.3)
Buying food from the market	1 (00.2)
Total	**642 (100.0)**

Source: Survey data, 2008

2.13. Processing and other forms of value-addition

2.13.1. Grains and processed products sold by farm households

Maize was the dominant cereal crop sold by farmers in the survey area (see **Table 13.1**). Among the grain legumes, the dominantly sold were soybean and common beans. Across both cereals and grain legumes, while maize accounted for about 28% of the grain sales, soybean and common beans accounted for about 27% each of the grain sales. Groundnut accounted for about 14% of the grain sales. The other grains (sorghum and millet among cereals and cowpea among the grain legumes) were more or less insignificant sales items

in the survey sub-locations. However, it is important to note that the annual income from the sales of grains ranged from a very low value of KShs 60 (< US$ 1) to about KShs 60000 (about US$923). The sale of processed forms of various grains was not common. Of the 183 survey farm households that responded, only 24 farm households (or 13%) sold processed grains. The balance only sold primary produce of raw grains. This shows the dearth of processing and value addition activities in the survey sub-locations – a situation that must have been contributing to widespread poverty and income and nutrition insecurity in the area. However, it is important to note that 18 farm households out of the 24 farm households (or 75%) that sold processed forms of grains sold processed forms of soybean (see **Table 13.2**). About 13 of these 18 farm households (about 72%) were from *Musamba* sub-location while the rest were from *Khalaba* sub-location (see **Table 13.3**). As expected, none of these came from the control sub-location (*Kholera*). The annual household income from the sale of processed forms of soybean by the few households that did so ranged from a low value of KShs 200 (or US$ 3.1) to KShs 25000 (or US$ 385) with a mean of KShs 7746.7 (or US$ 119.2) (see **Table 13.4**).

Table 13.5 shows that among the cereals, maize was outstanding as a source of household cash income. About 87.5% of the survey farm households that got income from the sales of cereals did so from maize. While about 8.9% of the balance got income from the sale of sorghum, the rest (3.6%) obtained income from the sale of millet. Annual household income from maize ranged from a low value of KShs 100 (about US$ 1.5) to a relatively high value of US$ 60000 (about US$ 923) with a mean of about KShs 6199.9 (or US$ 95.4). With respect to the grain legumes, the dominantly sold among the survey households were common bean (sold by 46.6% of the subset of respondents that sold grain legumes), soybean (28.2%), and groundnut (23.3%), in that order. Cowpea was sold by only about 1.9% of the subset of respondents. The annual household income from the sale of important grain legumes ranged from KShs 70 (about US$1.1) to KShs 30000 (or US$ 462) with a mean of about KShs 3558.5 (or US$ 55) for common bean. The corresponding values were KShs 150 (about US$2.3) to KShs 9600 (or US$ 147.7) with a mean of about KShs 2184.8 (or US$ 33.6) for soybean. Across the grains (cereals and legumes) the dominant crops in terms of the number of survey farm households that derived annual income from them were maize (30.8% of respondents), common beans (30.2%), soybean (18.2%), and groundnut (15.1%) in that order. The other grains (sorghum, millet, and cowpea) were insignificant in this respect (**Table 13.5**).

We evaluated the extent to which survey households took advantage of belonging to collective action outfits to enhance their income and commercial activities based on different grains (legumes and cereals). Across a subset of 180 respondents, only 30 (16.7%) attempted to tap the benefits of collective action to enhance their income and commercial activities based on the different grains (see **Table 13.6**). Collective action for enhanced income and commercial activities (among the 30 farm households that indicated this) were mostly (about 86.7%) formed around soybean and virtually non-existent with the other grains.

Table 13.1: Grains and processed products sold by farmers in Western Kenya

Crop	Frequency[$]
Soybean	48 (26.7)
Common beans	48 (26.7)
Groundnuts	25 (13.9)
Cowpea	2 (01.1)
Maize	50 (27.8)
Sorghum	5 (02.8)
Millet	2 (01.1)
Total	**180 (100.0)**

$ Values in parenthesis are percent figures

Source: Survey data, 2008

Table 13.2: Household's annual income from grains and processed products in Western Kenya

Income	n	Min.	Max.	Mean	Std. Deviation
Average annual income from grains (KShs)	159	60	60000	4211.8	6640.1
Average annual income from processed products (KShs.)	24	1	25000	7395.5	8501.7

Source: Survey data, 2008

Table 13.3: Mean annual income from processed products (KShs) among farmers in Western Kenya by sub-location

Grains and processed products sold	Sub-location	Mean	n	Min.	Max.	Std. Deviation
Soybean	Khalaba	5834.3	7	340	25000	8737.8
	Musamba	8963.6	11	200	24000	9083.9
Beans	Musamba	20000.0	1	20000	20000	.
Ground nuts	Khalaba	1933.7	3	1	5000	2685.4
Maize	Khalaba	250.0	1	250	250	.
	Musamba	12000.0	1	12000	12000	.
Total	**Khalaba**	4262.8	11	1	25000	7226.2
	Musamba	10046.2	13	200	24000	8855.1
	Total	7395.5	24	1	25000	8501.7

Source: Survey data, 2008

Table 13.4: Average annual income from processed products (KShs) among farmers in Western Kenya

Processed products	n	Mean	Min.	Max.	Std. Deviation
Soybean	18	7746.7	200.0	25000.0	8828.9
Common bean	1	20000.0	20000.0	20000.0	.
Groundnuts	3	1933.7	1.0	5000.0	2685.4
Maize	2	6125.0	250.0	12000.0	8308.5
Total	**24**	**7395.5**	**1.0**	**25000.0**	**8501.7**
Sig		**NS**			

Source: Survey data, 2008

Table 13.5: Average annual income (KShs) from grains in Western Kenya

Grains	n	Mean	Min.	Max.	Std. Deviation
Soybean	29	2184.8	150	9600	2094.18518
Common beans	48	3558.5	70	30000	5322.12923
Cowpea	2	4000.0	4000	4000	.00000
Groundnuts	24	3581.3	60	10000	2955.93480
Maize	49	6199.9	100	60000	9874.35074
Sorghum	5	6260.0	1200	20000	7904.30263
Millet	2	3230.0	460	6000	3917.37157
Total	**159**	**4211.8**	**60**	**60000**	**6640.05596**
Sig		**NS**			

Source: Survey data, 2008

Table 13.6: Whether or not any farm household member belongs to collective action for enhanced income and commercial activities based on different grains, western Kenya[&]

Grain	Yes	No	Total
Soybean	26 (86.7)	22 (14.7)	48 (26.7)
Common beans	2 (6.7)	46 (30.7)	48 (26.7)
Cowpea	1 (3.3)	1 (0.7)	2 (1.1)
Ground nuts	0 (0)	25 (16.7)	25 (13.9)
Maize	1 (3.3)	49 (32.7)	50 (27.8)
Sorghum	0 (0)	5 (3.3)	5 (2.8)
Millet	0 (0)	2 (1.3)	2 (1.1)
Total	**30 (100)**	**150 (100)**	**180 (100)**

[&] Values in parenthesis are percent figures

Source: Survey data, 2008

2.13.2. Household knowledge on soybean processing

We evaluated the knowledge base of the survey farm households on soybean processing. Result shows that although survey households indicated that they could process several products from soybean, the six products they were most comfortable with were soymilk and yoghurt; soy beverages; soynuts, fried soybeans, and soy crunches; soft bread (*mandazi* and doughnuts); soy porridge (*uji*); and soy flour in a decreasing order of popularity. Put together, these six products accounted for 78.5% of the responses given by the survey farm households (see **Table 13.7**).

Table 13.7: Soybean processed products households in Western Kenya can make

Products	Frequency[$]
Soymilk and yoghurt	61 (17.0)
Soy beverages	60 (16.7)
Soynuts, fried soybeans and soy crunches	57 (15.9)
Soft bread (*Mandazi* and Doughnuts)	49 (13.6)
Soy porridge and *uji*	34 (09.5)
Soy flour	21 (05.8)
Soy biscuit (*Chin Chin*) and cake	17 (04.7)
Soy meat	16 (04.5)
Soy chapatti	13 (03.6)
Soy vegetables	8 (02.2)
Soy ugali	7 (01.9)
Soy githeri	6 (01.7)
Livestock feeds	3 (00.8)
Others (*bhajia*, soyoil, boiled soybeans, soy egg, soy soup)	7 (01.9)
Total	**359 (100.0)**

[$] Values in parenthesis are percent figures; Responses were not mutually exclusive.

Source: Survey data, 2008

2.13.3. Collective action in soybean processing

Farmers are often encouraged to pool their resources together and embrace collective action so as to enjoy the benefits of economies of large scale. In line with this, we evaluated the existence of collective action outfits in soybean processing in the survey sub-locations. About 142 out of the 247 farm households (or 57.5%) that responded indicated that they did not know of any soybean processing group in their area. However, the balance of 105 households (or 42.5%) claimed that they knew some soybean processing groups (i.e., soybean-based collective action outfits) in their area. By sub-location, the 105 households were accounted for as follows: 51 farm households (or 48.6%) from *Musamba* sub-location, 50 farm households (or 47.6%) from *Khalaba* sub-location, and four farm households (or 3.8%) from *Kholera* sub-location. As expected, most of these 105 households (102 households or 97.1%) were soybean growing farm households. By headship and management of survey farm households, the 105 farm households were accounted for as follows: 48 (or 45.7%) male-headed male-managed farm households, 49 (or 46.7%) male-headed female-managed farm households, and 8 (or 7.6%) female-headed female-managed farm households.

Most (61.9%) of those farm households that indicated knowledge of some soybean processing groups in their area knew only of one such groups. About 21 of the 105 households (or 20%) knew about two such soybean processing groups. Collectively, the balance of 19 households (or 18.1%) knew three to five such soybean processing groups (**Table not shown**). In summary, there is the need for increased effort at collective action

in the survey area. Its limited presence must have been contributing to the observed widespread poverty in the survey sub-locations and many other parts of Western Kenya (Chianu et al., 2008).

2.13.4. Cottage-level soybean processing

Among the survey households, we evaluated those where at least someone from was involved in group or cottage-level processing of soybean into various products. Of the 232 households that responded 157 (or 67.7%) had no one involved in group or cottage-level processing of soybean into various products. The balance of 75 households (or 32.3%) was affirmative, implying a little less than half of the soybean growing farm households surveyed. By sub-location, these 75 farm households were distributed as follows: 38 farm households (or 50.7%) from *Khalaba* sub-location, 36 farm households (or 48.0%) from *Musamba* sub-location, and one unexpected farm household (or 1.3%) from *Kholera* sub-location. All of the 75 farm households were soybean growing farm households. While 34 of the 75 households (or 45.3%) were male-headed male-managed, 35 of them (or 46.7%) were male-headed female-managed. The balance of six farm households (or 8.0%) were female-headed female-managed.

2.14. General household food consumption frequency

For good health and wellness, all households (farm or non-farm) must regularly consume different types of food (carbohydrates, protein, vitamins, etc.) that supply the body with its different needs (energy, amino acids, etc.). As a way of further understanding the status of the welfare of the survey farm households, we evaluated the frequency of consumption of various types of food items (grain legumes, cereals, and vegetables) and for each food item, articulated this under: never, daily, once a week, two times a week, and more than three times a week. We also assessed the sources (own produce, food assistance, purchase, own farm and purchase, own farm and assistance, assistance and purchase, and others) of these different food items consumed by the survey farm households. Lastly we verified the perception of the survey farm households with respect to the adequacy of their frequency of consuming the different food items. The data from this section of the baseline questionnaire has not yet been analyzed and will, therefore, be contained in future project reports.

2.14.1. Food consumption and utilization: Soybean

2.14.1.1 Soybean utilization

Survey farm households were asked whether or not they used soybeans as food. Result indicated that 174 out of 246 survey farm households (or 70.7%) that responded were affirmative. Among the three survey sub-locations, these 174 farm households were distributed as follows: 82 (47.1%) for *Musamba* sub-location, 70 (or 40.2%) for *Khalaba* sub-location, and 22 (or 12.6%) for *Kholera* sub-location (surprising because this sub-location was sampled as a control site). While 152 of the 174 survey farm households (or 87.4%) that indicated that they used soybeans as food were soybean growing farm

households, the balance of 22 farm households (or 12.6%) were non-soybean growing farm households that might have been getting the soybeans they used as food from the other sources such as purchase from the market. This is definitely a good development that signifies the domestic market opportunity associated with soybean which is also one of the most tradable of all the known grain legumes. Of the 174 farm households that indicated that they used soybeans as food, 87 (or 50.0%) of them were male-headed female-managed farm households; 76 (or 43.7%) of them were male-headed male-managed farm households; and 11 (or 6.3%) of them were female-headed female managed farm households.

2.14.1.2. Household purchase of soybean for use

Since some household bought soybeans for use (consumption, processing, etc.), we evaluated the price per kg of the soybean purchased, the frequency of such purchase in three months. Results from a subset (112 for frequency of purchase and 117 for soybean price per kg) of the respondents indicated that while farm household's frequency of purchase (in three months) of soybean for family use ranged from once to 24 times (with a mean of 3.8 times) (see **Table 14.1**). **Table 14.1** also shows that the price per kg ranged from KShs 40 to KShs 160 (with a mean of KShs 56). Across the three survey sub-locations, the differences in both the mean soybean purchase price and the frequency of purchase were not statistically significant (see **Table 14.2**). However, as expected the numbers of respondents in both cases were higher in *Musamba* and *Khalaba* sub-locations than in *Kholera* sub-location. Similarly, across the survey farm households and headship and management categories (male-headed male-managed, male-headed female-managed, and female-headed female-managed), the differences in both the mean soybean purchase price and the frequency of purchase were again not statistically significant (see **Table 14.3**).

Table 14.1: Frequency of household purchase of soybean (for household use) and purchase price in Western Kenya

Parameter	n	Min.	Max.	Mean	Std. Deviation
No. of times (in 3 months) that household buys soybean	112	1	24	3.77	3.637
Price (KShs/kg) at which households purchased soybean	117	40.00	160.00	56.1966	14.04503

Source: Survey data, 2008

Table 14.2: Frequency of household purchase of soybean (for household use) and purchase price in Western Kenya by sub-location[$]

Sub-location	Price (KShs/kg) at which households purchased soybean	No. of times (in 3 months) that household buys soybean
Khalaba	56.8 ±17.7 (49)	3.5 ±3.0 (45)
Kholera	54.0 ±07.4 (21)	3.3 ±2.2 (20)
Musamba	56.5 ±12.1 (47)	4.2 ±4.6 (47)
Total	**56.2 ±14 (117)**	**3.8 ±3.6 (112)**
Sig	**0.739**	**0.5**

[$] Values are means, standard deviations, and number of cases (or effective sample size)

Source: Survey data, 2008

Table 14.3: Frequency of household purchase of soybean (for household use) and purchase price in Western Kenya by headship and management of household[$]

Household headship & management	Price (KShs/kg) at which households purchased soybean	No. of times (in 3 months) that household buys soybean
Male-headed male-managed	54.3 ±08.1 (56)	3.7 ±4 (53)
Male-headed female-managed	58.3 ±18.6 (55)	3.8 ±3.4 (53)
Female-headed female-managed	55.0 ±05.5 (06)	3.7 ±2.9 (06)
Total	**56.2 ±14 (117)**	**3.8 ±3.6 (112)**
Sig	**0.322**	**0.975**

[$] Values are means, standard deviations, and number of cases (or effective sample size)

Source: Survey data, 2008

Decision-making about the purchase of soybean for family use was made as follows: by the spouse in ~ 39% of the cases, by household head in ~ 36% of the cases, and jointly by household head and the spouse in ~ 24% of the cases (**Table not shown**). Overall, the spouse dominates in the decision making about the purchase of soybean for family use especially in *Kholera* sub-location (where they accounted for 64% of the 22 survey households that responded to this question) followed by *Musamba* sub-location (where they accounted for 43.4% of the 53 that responded). However, the household head dominates in *Khalaba* sub-location (where they accounted for 40.8% of the 49 that responded) (**Table not shown**).

2.15. Soybean utilization and perceptions related to it

2.15.1. Problems in preparing or cooking soybeans

One of the common reasons for the limited utilization of soybean in many parts of sub-Saharan Africa is the myth associated with preparing or cooking soybean. As a result, we verified if farm households had problems preparing or cooking soybean. Out of the 199 farm households (86 farm households or 43.2% from *Musamba* sub-location, 81 farm households or 40.7% from *Khalaba* sub-location, and 32 farm households or 16.1% from *Kholera* sub-location) that responded to this question, 119 (or 59.8%) farm households indicated that they had no problems preparing or cooking soybean. These were composed of 60 farm households (or 50.4%) from *Musamba* sub-location, 51 farm households (or 42.9%) from *Khalaba* sub-location and 8 farm households (or 6.7%) from *Kholera* sub-location. By soybean growing status, the 119 farm households that indicated that they had no problems preparing or cooking soybean were composed of 112 (94.1%) soybean growing farm households and seven (or 5.9%) non-soybean growing farm households. By headship and management of the survey farm households, the 119 farm households that had no problems preparing or cooking soybean were comprised of 52 (or 43.7%) male-headed male-managed farm households, 58 (or 48.7%) male-headed female-managed farm households, and 9 (or 7.6%) female-headed female-managed farm households.

However, it is important to note that 80 out of the 199 survey farm households (or 40.2%) that responded to the question on whether or not they had problems preparing or cooking soybeans were affirmative. These were distributed as follows: 30 farm households (or 37.5%) from *Khalaba* sub-location, 26 farm households (or 32.5%) from *Musamba* sub-location, and 24 farm households (or 30%) from *Kholera* sub-location. By soybean growing status, while 53 (or 66.3%) of these farm households were soybean growing, 27 (or 33.7%) of them were non-soybean growing farm households. By headship and management of households, the 80 farm households that had problems preparing or cooking soybeans included 34 (or 42.5%) male-headed male-managed farm households, 40 (or 50%) male-headed female-managed farm households, and 6 (or 7.5%) female-headed female-managed farm households.

2.15.2. Constraints to soybean food preparation

We evaluated the constraints to widespread soybean food preparation. *Lack of knowledge on soybean food processing* and *lack of training* were the dominant constraints (95.3 of those who responded). The other minor constraints were *lack of necessary tools and equipment for soybean food preparation* and *lack of fund to use in procuring necessary equipment and tools for soybean food preparation* (see **Table 15.1**).

Table 15.1: Constraints to soybean food preparation in western Kenya

Constraint	Frequency[$]
Lack of training	41 (64.0)
Lack of knowledge on processing	20 (31.3)
Lack of necessary tools and equipment	2 (3.1)
Lack of fund	1 (1.6)
Total	64 (100.0)

[$] **Values in parenthesis are percent figures**

Source: Survey data, 2008

2.16. Income from processed soybean products

Apart from processing for family consumption, household cash income is another key reason why farm households embark on soybean processing into various products. Our earlier analysis (unpublished) in Kenya showed how it was possible to increase net returns from soybean by four to 14 times through processing. In this section we report on the cash income values of soybean processing.

2.16.1. Cash income from sale of processed products from soybean

Household cash income earnings from the sale of processed products from soybean were not yet common among the survey farm households in the study area. Out of the 242 households that responded to related question, only 27 households (or 11.2%) indicated that they earned cash income from the sale of processed products from soybean. While 18 of these 27 farm households (or 66.7%) were from *Musamba* sub-location, seven (or 25.9%) were from *Khalaba* sub-location. The remaining two farm households (or 7.4%) were from *Kholera* sub-location. The balance (215 or 88.8%) did not yet earn any cash income from the sale of processed products from soybean (**Table not shown**). As expected, most of the households (26 out of 27 or 96.3%) that indicated that they earn cash income from processed products from soybean are households that grow soybean. It was only one out of the 27 households (or 3.7%) that indicated that they earn cash income from processed products from soybean that is not a soybean growing household. Of the 27 households that earn cash from processed products from soybean, 14 (or 51.9%) were male-headed male-managed, 8 (or 29.6%) were male-headed female managed, and 5 (or 18.5%) were female-headed female managed (**Table not shown**).

2.17. Household and community-level seed systems

2.17.1. Sources of seeds (not specific to soybean) for planting

We evaluated farm households' sources of seed for planting in the survey sub-locations. Results show the existence of three important seed source classes (*seed purchases* 48.5%, *seed savings* 31.4%, and *seed gift* 17.5% in a decreasing order of importance) (see **Table**

17.1). The single most important actual source was *seed savings from previous harvest* that alone accounts for 31.4% of the responses. Within the seed purchases class, *seed purchase from the market* was the most important followed by *seed purchase from agro-input dealer*. It is worthy of note that ***seed purchases from seed company ranks fifth within this class*** (see **Table 17.1**). Although **Table 8.4** indicated that about 10.4% of the responses on sources of information about improved crop varieties in the study sub-locations were from the staff of research institutions, the result contained in **Table 17.1** does not show research institutions as important sources of seed. It is interesting to note that ***seed purchases from agro-input dealers are getting to a position of prominence***. This was in line with the thinking of the Alliance for a Green Revolution in Africa (AGRA) that has invested heavily on agro-input dealer development. According to AGRA, a network of rural agro-input dealers would be the backbone of a concerted effort to get farmers seeds and fertilizers to improve their crop yields (AGRA, 2008). AGRA-supported programs have offered these agro-input dealers business management training and is now also offering them access to affordable credit to help them grow their agro-input business. For instance, PASS (a program of AGRA)-funded activities have produced over 400 MT of improved seed and trained over 400 village-level distributors of seed in professional business practices (AGRA, 2008). PASS works along a value chain that *begins with newly-trained African crop scientists, continues with funds for breeding new crop varieties, and achieves impact in the lives of farmers through a vigorous campaign of seed production and supply of agricultural inputs at village level* (AGRA, 2008).

However, it is important to note that PASS is funding the development of new varieties of **common beans**, **cowpea**, **maize**, **rice**, **sorghum**, **cassava** and **sweet potato** in 12 countries. So, like many other grain legumes, soybean is not one of the crops that PASS is funding the new varieties of.

Table 17.1: Most important sources of seed for farm households in Western Kenya

Seed source class	Actual seed sources	Frequency[$]
Seed purchases:		***188 (48.5)***
	Purchased from market	57 (14.7)
	Purchased from agro-dealer	49 (12.6)
	Purchased from another farmer	44 (11.3)
	Purchased from Ministry of Agriculture	15 (03.9)
	Purchased from Seed company	14 (03.6)
	Purchased from NGO	6 (01.5)
	Purchased at a seed fair	3 (00.8)
Seed savings:		***122 (31.4)***
	Saved from previous harvest (i.e., own see)	122 (31.4)
Seed gift:		***68 (17.5)***
	Free seed from NGO	29 (07.5)
	Free seed from neighbor	21 (05.4)
	Free seed from government	18 (04.6)
Other:		***10 (2.6)***
	Other (including 'do not know')	10 (02.3)
Total		**388 (100.0)**

[$] Values in parenthesis are percent figures; Responses were not mutually exclusive

Source: Survey data, 2008

2.18. Sale of crop seeds

A section of the questionnaire was devoted to the assessment of survey farm households' sale of the seeds of selected crops (soybean, common beans, cowpea, groundnut, pigeon/chick pea, maize, sorghum, and millet). Apart from ascertaining whether or not survey farm households sell the seeds of these different crops, we specifically verified if they sold during the last cropping season (referring to the short rainy season of 2007). For each of the crops, we also tried to find out what proportion of the seeds sold was of improved varieties. For the survey farm households that did not sell the seeds of particular crops during the short rainy season of 2007, we sought to find out when last they sold the seeds of particular crops. We also verified who the normal customers were for the seeds of different crops and the quantities sold during the last year each survey farm household sold seeds and the total amount of money realized. Data from this section of the baseline survey have not yet been analyzed and will, therefore, be included in future reports.

2.19. Soybean grains selling price determination

Using 2007/2008 as reference year, we verified how the prices of soybean grains were fixed in the survey sub-locations. Unfortunately, only 44 responses were received (24 responses from *Musamba* sub-location, 20 responses from *Khalaba* sub-location, and as expected zero response from *Kholera* sub-location) and from soybean growing survey households alone. By household headship and management, the 44 responses were distributed as follows: 21 responses (or 47.7%) from male-headed male-managed survey farm households, 18 responses (or 40.9%) from male-headed female-managed survey farm households, and five responses (or 11.4%) from female-headed female-managed survey farm households.

Out of the 44 responses, 35 responses (or 79.5%) indicated that survey farm households fixed the prices at which they sold their soybean grains in 2007/2008. Buyers of soybean grains fixed the prices at which survey farm households sold their soybean grains to them in only 15.9% of the cases (seven of 44 responses). It was only in two out of the 44 cases (or 4.5%) that the prices were fixed by market processes (the forces of demand and supply). *This result is contrary to conventional wisdom that often claims that African farmers are price takers and hardly contribute in the determination of the prices at which agricultural commodities are sold in Africa*. The same conventional wisdom heaps the responsibility of agricultural commodity price fixing on the middlemen (or the buyer in this case), using this to support their argument that middlemen often exploit the farmers. Those who belong to this school of thought use this argument to push for and support farmers' active participation in the marketing of their agricultural produce. A possible explanation for farmers' dominance in the determination of soybean price in the study area could be the yet very low volume of production, sales and competition in the soybean sub-sector in the study area. It is important to keep track of how this evolves over the years.

Survey farm households who indicated that they were the ones that fixed the prices at which they sold their soybean grains were further requested to indicate how they determined those prices. Out of the 37 farm households in this category, 34 (or 91.9%) responded to this request. Of the 34 survey farm households that responded, 23 farm households (or 67.6%) used ***prices in neighboring markets*** to fix the price at which they sold the soybean grains. Ten survey farm households (or 29.4%) used ***cost of production*** as the basis for determining the price at which to sell their soybean grains. Only one survey farm household (or 2.9%) noted the use of ***prices published in news papers*** in determining the price at it sold its soybean grains in 2007/2008 (**Table not shown**). As expected, none of these households was from *Kholera* sub-location. While 18 households (or 52.9%) was from *Musamba* sub-location, 16 (or 47.1%) of them were from *Khalaba* sub-location. By household headship and management, the 34 respondents were distributed as follows: 17 male-headed male-managed farm households (or 50%), 13 male-headed female-managed farm households (or 38.2%), and four female-headed female-managed farm households (or 11.8%).

2.20. Capacity strengthening on soybean enterprises

A section of the questionnaire was devoted to issues related to building the capacity of survey farm households on soybean enterprises. The training areas audited include: seed production technology (methods, practices, etc.), basic business management and income generation, ways and methods to increase commercial index, agricultural marketing, nutrition and health, soybean value-addition/processing methods, production and productivity increase, soybean value chains and the benefits thereof, and soybean FPVS (Farmer Participatory Varietal Selection). Survey farm households were asked whether or not any of its members had received each of these trainings, the year training was received, which organization gave the training, and their assessment of the training in terms or whether relevant or not relevant. Data from this section of the baseline survey have not yet been analyzed and will, therefore, be included in future reports.

2.21. Child welfare assessment

In order to get some baseline information about children aged two years and below, a section of the questionnaire was targeted at households with children that fell under that category. Either the mothers or the caretakers of such children responded to the questions posed.

2.21.1. Characterization of households with children aged 2 years and below

***General*:** Out of the sample size of 247 farm households, 75 of them (or 30.4%) had at least one child within the age bracket of 6 to 24 months. While 30 (or 40%) of such survey households were from *Musamba* sub-location, 24 (or 32%), and 21 (or 28%) were from *Khalaba* and *Kholera* sub-locations, respectively. With respect to soybean growing status, while 54 (or 72%) of the 75 survey farm households with children aged 6 – 24 months grow soybean, the balance (21 households or 28%) do not grow soybean. With respect to the headship and management of the 75 survey farm households with children aged 6 – 24 months, while 39 of them (or 52.0%) were male-headed female-managed farm households, 35 (or 46.7%) were male-headed male-managed farm households. The balance of one farm household (or 1.3%) was a female-headed female-managed farm household. In all cases, both the mothers and the fathers of the children were alive and lived with the children.

***Child breastfeeding-related*:** About 76 farm households responded to the questions related to breastfeeding of children aged 6 – 24 months. In 59 (or 77.6%) of cases (21 in *Khalaba* sub-location, 20 in *Musamba* sub-location, and 18 in *Kholera* sub-location; 41 cases among soybean growing farm households, 18 cases among non-soybean growing farm households; 25 cases among male-headed male-managed farm households, 34 cases among male-headed female-managed farm households, and none among female-headed female-managed farm households), the child was breast-feeding. Sixteen out of the 17 cases (constituted by 10 farm households or 62.5% from male-headed male-managed farm households, five households or 31.3% from male-headed female-managed farm households, and one household or 6.2% from female-headed female-managed farm

households; 13 households or 81.2% from soybean growing farm households and three households or 18.8% from non-soybean growing farm households; 10 farm households or 62.4% from *Musamba* sub-location, three farm households or 18.8% each from *Khalaba* and *Kholera* sub-locations) where the child was no longer breast-feeding responded to some follow-up questions on how long (months) they breast-fed the child and on what other food the child was being fed. With respect to how long the children that had stopped breast-feeding were breast-fed, the response ranged from five months to 21 months (with a mean and standard deviation of 13.4 and 5.16 months, respectively). These children were now being fed with four main classes of food: starchy food (porridge, *ugali*, potatoes, plantain, rice, and maize in a decreasing order of popularity and probably importance), fruits and vegetables (banana, avocado, orange, pawpaw, pumpkin, etc.), beverages (milk and tea), and grain legumes (soybean, common beans, and groundnut) (see **Table 21.1**). **Table 21.1** shows the outstanding dominance of starchy food (occurring in about 60% of the cases) in the feeding of children being weaned in the study area.

Table 21.1: Feeds given to children who are not breast feeding by farmers in Western Kenya

Food	**Frequency[$]**
Starchy food:	***58 (59.8)***
Porridge	31 (32.0)
Ugali	16 (16.5)
Potatoes (Sweet and Irish)	6 (6.2)
Plantain	2 (2.1)
Rice	2 (2.1)
Maize	1 (1.0)
Fruits & vegetables:	***20 (20.6)***
Banana	8 (8.2)
Avocado	5 (5.2)
Other fruits (orange Juice, pawpaw, pumpkin)	3 (3.0)
Fruits & vegetables (unclassified)	4 (4.1)
Beverages:	***16 (16.5)***
Milk	10 (10.3)
Tea	6 (6.2)
Protein food:	***3 (3.1)***
Soybean	1 (1.0)
Common bean	1 (1.0)
Groundnut	1 (1.0)
Total	**97 (100.0)**

[$] Values in parenthesis are percent figures; Responses were not mutually exclusive.

Source: Survey data, 2008

Across 75 households with children aged 6 – 24 months, we evaluated whether or not they sifted the flour (from maize, sorghum, millet, cassava, or a mixture) before using it to make porridge fed to the children (especially when being first introduced to liquid and semi-solid foods). Results indicate that most of the respondents (61 out of 75 or 81.3%) did not sift the flour before using it to make porridge.

For the respondents that used mixed flour in preparing food (porridge) for the children, we evaluated what constitutes the common ingredients in the mixture. The results presented in Table 2 indicate that the common ingredients fall into two major groups, carbohydrate sources (maize, millet, and sorghum in that order being the most important) and protein sources (soybean, groundnut, and common bean in that order being the most important). Mineral sources are almost absent. Milk, sugar, and glucose in a decreasing order of importance constitute the most important items the respondents (about 65% of them) add to the porridge given to young children.

Table 21.2: Ingredients often incorporated in mixed flour used in making children's food (e.g., porridge) in Western Kenya

Common ingredients in mixed flour	Frequency[$]
Protein sources:	***61 (49.2)***
Soybeans	26 (21.0)
Groundnuts	16 (12.9)
Common bean	11 (8.9)
Sim Sim	1 (0.8)
Milk	2 (1.6)
Fish	5 (4.0)
Carbohydrate sources:	***62 (50.0)***
Maize	28 (22.6)
Millet	25 (20.2)
Sorghum	4 (3.2)
Rice	2 (1.6)
Finger Millet	1 (0.8)
Cassava	2 (1.6)
Mineral sources:	***1 (0.8)***
Amaranthus flour	1 (0.8)
	124 (100.0)

[$] Values in parenthesis are percent figures; Responses are not mutually exclusive

2.21.2. Caring for children aged two years and below

The result of responses to the question as to whether or not the mothers or the caretakers of such children ever left them behind indicates that leaving children of this age bracket was commonly practiced among farm households in the survey sub-locations. Of the 75 farm households (representing 75 mothers/caretakers) that responded, 63 of them (or 84%) had sometimes left the children behind (see **Table 21.3**). These were fairly equally

distributed among the survey sub-locations (*Musamba* 25 respondents, *Khalaba* 20, and *Kholera* 18).

Table 21.3: Whether or not households with children aged 2 years and below ever leaves them behind in Western Kenya

Response	Frequency[$]
Yes	63 (84)
No	12 (16)
Total	**75 (100)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

Most of the survey farm households (55 out of 75 or 73%) with children aged two years and below noted that they usually prepare their food separately (see **Table 21.4**). This was also fairly distributed among the survey sub-locations (*Musamba* 20 or 36.4% of the respondents, *Khalaba* 18 or 32.7%, and *Kholera* 17 or 30.9%). The balance (20 out of 75 or 27%) of the farm households (mostly from *Musamba* sub-location) prepares the food of children aged two years and below with that of the rest of the family. Of the 55 survey farm households that prepared their children's food separately, 38 (or 69%) was soybean growing farm households. While 28 of them (or 51%) were male-headed female-managed farm households, 27 (or 49%) were male-headed male-managed farm households. None of them was strictly female-headed female-managed farm households.

Table 21.4: Whether the child's food is prepared separately in Western Kenya

Response	Frequency[$]
Yes	55 (73)
No	20 (27)
Total	**75 (100)**

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

Adequate and balanced food consumption is critical for proper child physical and mental (brain) development. We evaluated what the mothers or caretakers of children aged two years and below do to make the tender children eat more and enough food. Result presented in **Table 21.5** indicates that stimulation by coaxing (persuasion by talking to them in a kind and gentle way) and encouragement were the most important ways (according to over 70% of the respondents) of ensuring that children aged two years and below ate more or enough food. Scaring, threatening, and beating were not generally used by mothers or caretakers to make the children aged two years and below ate more and enough food.

Table 21.5: What mothers or caretakers of children aged 2 years and below do to make them eat more/enough food in Western Kenya

Response	Frequency[$]
Stimulated by coaxing	27 (36.0)
Encouragement	26 (34.7)
Force	11 (14.7)
Scar or threaten or beat them	0 (0.0)
Other	11 (14.7)
Total	75 (100.0)

[$] Values in parenthesis are percent figures

Source: Survey data, 2008

The result of an assessment of the frequency (number of times) children aged two years and below fed in a day indicates that the mode was three times (**Table not shown**). However, in 46 out of the 75 (or 61%) households interviewed, children aged two years and below fed more than three times in a day. Only a very small proportion (2.7%) of the survey farm households indicated that children aged two years and below fed two times in a day.

2.21.3. Anthropometric assessment

We also collected the baseline anthropometric data of children aged 6–24 months. Among others, we measured their weight, lengths (as opposed to heights), and MUAC (Mid Upper Arm Circumference). Of the 75 children (30 from *Musamba* sub-location, 24 from *Khalaba* sub-location, and 21 from *Kholera* sub-location) within this age bracket from 75 survey farm households, while 32 (or 43%) of them were male children, the balance 43 (or 57%) were female children. With the exception of one survey farm household (from *Kholera* sub-location and belonging to a female-headed female-managed farm household), the remaining 74 farm households (or 99%) with children age 6 – 24 months had child health card (CHC) for the selected children. These data are yet to be fully analyzed, hence not fully reported here.

References

AGRA (Alliance for a Green Revolution in Africa). 2008. AGRA update, Volume 1, No. 1.

Chianu, J.N., Vanlauwe, B., Mukalama, J., Adesina, A., and N. Sanginga. 2006. Farmer evaluation of improved soybean varieties being screened in five locations in Kenya: Implications for research and development. African Journal of Agricultural Research Vol. 1 (5), pp. 143–150.

Chianu, Justina N., Ajani, O.I.Y., **Chianu, Jonas N**. 2008. Livelihoods and rural wealth distribution among farm households in western Kenya: Implications for rural development, poverty alleviation interventions and peace. African Journal of Agricultural Research 3 (7): XX–XX (***in press***: *accepted July 2008*).

Perez, M., Schlesinger, S., Wise, T.A. 2008. The promise and perils of agricultural trade liberalization: Lessons from Latin America. Washington office on Latin America (WOLA), Washington, DC 20009, 202-797-2171, www.wola.org and the Global Development and Environment Institute (GDAE) at Tufts University, 44 Teele Ave., Medfor, MA 02155, 617-627-3530, www.gdae.org.