LegumeSELECT: a baseline characterisation of four selected sites in Kisii and Migori counties of western Kenya

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Abbreviations and acronyms

HH   Household

MAE   Male adult equivalent (in terms of calorie demand)

TLU   Tropical livestock units

TVA   Total value of activities

USD   United States dollar

yr   year

Acknowledgements

Summary

In June 2019, a survey of 413 smallholder farmer households was carried out in western Kenya, Kisii County (Kitutu Chache North and Nyaribari Chache) and Migori County (South and East Kamagambo and Suna West). The purpose was to establish the baseline conditions and farm characteristics prior to the implementation of the LegumeSELECT project. More than 50% of the interviewees were females. The average family size was four persons per household across all sites. The sites were fairly similar in terms of types and composition of farm activities. The sites were characterized by small-scale landholdings, from 0.5 to 2 ha. The farms in Kisii were generally smaller than the farms in Migori. Livestock ownership was generally higher in Migori (1.8 tropical livestock units [TLU]) compared to Kisii (<1 TLU). Little off-farm income was reported in all sites. A big gender disparity was observed, with about 30% to 50% of households reporting zero female decision-making regarding the use of farm products and income.

All sites showed mixed farming systems in which the main food crop was maize and the minor crop was usually common beans (*Phaseolus vulgaris L.*). Suna West is located in an area of lower agricultural potential, where the drier climate means that drought-tolerant crops such as groundnuts, millet and sorghum are more suitable to the region's farming system, although maize and beans are still the most commonly grown. In all sites, it was common to grow maize as the main crop with common beans as an intercrop, or when common bean was grown as the main crop, maize was the priority intercrop. Common beans (semi-climbing and dwarf types) were by far the most commonly grown grain legume across the sites. Of the total households surveyed, 36% were growing common beans in Migori and 42% in Kisii. Common cash crops were groundnut, sugar cane, kales, banana, and in Kisii tea; although the majority of households were not able to break through into commercial production. *Sesbania* was the most commonly grown tree legume. In Nyaribari Chache it was grown by under 20% of the households and in Suna West by 10%, while in the other sites the reporting was negligible. This may indicate scope for the promotion of tree or shrub legumes. Legumes were mainly grown for household consumption, with a minority of respondents also growing legumes for sale. The use of legumes as animal feed or for environmental services was low. Fertilizer use was widely reported in all sites, and virtually all interviewed farmers applied it. The use of hybrid seeds, tick-spraying and veterinary services were reported by a low to moderate proportion of respondents. Nearly half of the respondents were not applying any soil or water conservation practices. About 20–30% of households reported problems with soil fertility and erosion, and this rose to about 40% in Suna West.

The extent of poverty was high with the overwhelming majority of the study respondents living below poverty line of USD1.90 per day. The poverty rate was highest in the Suna West site at 86% and lowest in Kitutu Chache North at 65%. Nyaribari Chache, and South and East Kamagambo had poverty rates of 73% and 71%, respectively. Under these circumstances, subsistence food production is inadequate to meet the basic calorific needs of the households. Requiring cash to meet other needs, farmers are often forced to sell at harvest time well aware that they will have to buy the same food from the market at exorbitant prices at a later date. There are two hunger periods per year across the sites, the major one being in January to February and a minor one in May to July. In Suna West, the major hunger peak was May to July, and the minor peak was longer, from October to February. During the lean season the main foods consumed include grains/roots/tubers, vegetables and milk. During the flush season, increased consumption was reported for eggs, meat, fruits, nuts and legumes.

Livestock ownership was associated with improved living standards, as consumption of livestock products and later sale became more pronounced as household income increased. In the two sites in Kisii, and in South and East Kamagambo (Migori), the foundation for commercial livestock production had been laid through increased use of planted forages, cutting and carrying feeds, mineral supplementation and use of crop residue for feed (although incorporation of residues into soil was more common). Suna West lagged behind in this regard, as reliance was still on open grazing in natural pasture.

Introduction and methods

Interviews were carried out at project locations in Kisii and Migori counties of western Kenya in late June 2019. Two sites were sampled per county: Kitutu Chache North and Nyaribari Chache in Kisii, and South and East (S&E) Kamagambo and Suna West in Migori (Figure 1). The interview questionnaire is presented in Annex 1.

Figure 1: Map showing location of project sites in Kisii and Migori counties

● Kitutu Cache North (Kisii)
● Nyaribari Cache (Kisii)
● South and East Kamagambo (Migori)
○ Suna West (Migori)
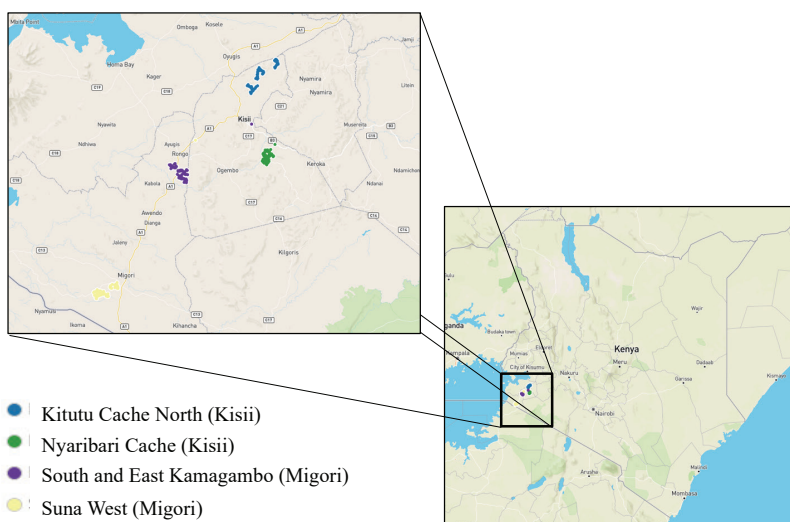
Table 1 shows that more farmers were interviewed in Kisii (over 100 per study site) than in Migori (below 100). There were generally more females (over 50%) than male respondents. The number of respondents of either gender who were head of their household (HH) was nearly two thirds. These respondents were most likely to be married (70–80%). The proportion of female HH heads that were single was higher (between 10% and 25%) than the single males (less than 5%) across all sites. More than half of the respondents were female and, according to the enumerator responses on survey implementation (reliability and rapport), the interviews seemed to have gone well.

In Kitutu Chache North, 117 respondents were surveyed of which 59% were females and 41% males. Of the total surveyed, 60% were HH heads. Of the HH heads interviewed, 80% of them were married while 17% were single females and 3% were single males.

In Nyaribari Chache, 102 respondents were surveyed of which 52% were females and 48% males. Of the total surveyed, 70% were HH heads. Of the HH heads interviewed 78% of them were married while 19% were single females and 1% were single males.

In South and East Kamagambo, 99 respondents were surveyed of which 49% were females and 51% males. Of the total surveyed 67% were HH heads. Of the HH heads interviewed 84% of them were married while 11% were single females and 4% were single males.

In Suna West, 99 respondents were surveyed of which 59% were females and 41% males. Of the total surveyed 73% were HH heads. Of the HH heads interviewed 71% of them were married while 24% were single females and 3% were single males

Table 1: Characteristics of the households in the four locations in the survey and the enumerator responses on the survey implementation Reliability and rapport were subjectively evaluated by enumerators. Avg=mean average, sd=standard deviation, mins =minutes

Location		No. interviews	% female respondents	% HH head respondents	% HH heads married	% single female heads	% single male heads	Interview duration (mins) (avg and sd)	% reliable	% good rapport
Kisii	Kitutu Chache North	117	59	60	80	17	3	34 (18)	63	99
	Nyaribari Chache	102	52	70	78	19	1	32 (14)	87	100
Migori	S&E Kamagambo	99	49	67	84	11	4	32 (16)	91	99
	Suna West	95	59	73	71	24	3	32 (17)	91	99

Statistical analyses

Survey responses were summarized according to the four study sites. Unless otherwise specified, averages presented are means, and an indication of variance is expressed as standard deviation (sd). For survey questions with categorical answers, percentages of the study population (per site) was used for the summary.

Key site characteristics

The average altitude for the Kitutu Chache North site is 1,544 metres above sea level (masl). It receives an annual precipitation of 1,424 mm with an average temperature of 13.1 °C. The Nyaribari Chache site is at an elevation of 1,700 m asl. It receives a total average rainfall of over 1,500 mm characterized by a bimodal distribution of February to June for the long rains and September to November for the short rains. The Kamagambo site is at an elevation of 1,530 m asl and receives a bimodal rainfall with an annual precipitation of 1,600 mm. Its long rains season falls between March and June and the short rains between November and January. Suna West is characterized by a bimodal rainfall model with 1,369 mm total annual precipitation and 21.2°C average temperature. It is on an elevation of 1,500 masl. It has two season peaks that are similar to those of Kamagambo.

Smallholder farmers in the project sites operate a highly mixed cropping system. Maize is the most dominant crop grown by farmers across all the project areas. Maize and common beans constitute the main food crops with kales, spider plant and black nightshade as the vegetable relishes. These are also sold for cash. In terms of frequency of reporting on the types of crops grown, Nyaribari Chache has more farmers reporting across a wider range of activities followed by Kitutu Chache North, S&E Kamagambo and Suna West in that order.

As the graphs below demonstrate (Figure 2–5), there is a striking similarity between the cropping systems of the different sites but with unique site specifications. The crops grown most often (maize, kales, common beans, etc.) and least often (watermelon, cassava, tomatoes, etc.) are comparable across the sites. The uniqueness of the Kitutu Chache site is its proximity to the huge food market of Kisii town. This has encouraged farmers to produce a variety of food crops all year round to feed the large and increasingly urban population. The Nyaribari Chache site is part of the greater Keumbu hinterland and is strategically situated to supply the Keumbu market from where a wide range of agricultural products are sold for onward transportation to both near and far-flung markets like Kericho, Nakuru and Nairobi. Chief among the products from Nyaribari Chache are bananas, kales, avocado and chewing sugar cane. The S&E Kamagambo site, which is dissected by the Rongo-Migori road, is strategically located to supply the increasing

food demands of Rongo town and the greater southwest Kenya region. Consequently, S&E Kamagambo farmers grow a wide range of food crops and fruits to supply to this market. Some farmers in this site also reported growing commercial cane for supply to the Sony Sugar factory. The Suna West site, in comparison, is located south of the Migori County headquarters near the Kenya-Tanzania border and suffers from poor road infrastructure making it hard for farmers to access the lucrative Migori market. Farmers participating in the survey in this site grow a wide range of food crops, though on a smaller scale compared to the other sites.

There have been past initiatives by both government and nongovernment actors to promote the growing of herbaceous and tree legumes (*calliandra*, *desmodium*, *leucaena* etc.) in the project sites. A forerunner project of the LegumeSELECT was implemented in the same sites between the years 2014 to 2017. The outcomes of these past efforts can still be seen on some farms where legumes are grown to fulfil a variety of functions including livestock feed, fuel, erosion control, shade, etc. The Suna West site has, however, been less affected by these past legume intervention initiatives.

Resource endowments

All the sites have comparable family sizes of nearly four members per household (Table 2). Two sites, one in each county, have similar farm sizes with Kitutu Chache North and Kamagambo having a mean of 0.8 ha and Nyaribari Chache and Suna West reporting a mean of 1.3 ha. Average TLU is one in the three sites of Kitutu Chache North, Nyaribari Chache and Suna West and nearly two in Kamagambo.

Total farm production is relatively high at all sites except in Suna West. The degree of market orientation at the three sites of Kitutu Chache, Kamagambo and Nyaribari Chache is high due to participation in diversified income generation enterprises such as milk, tea, coffee, vegetables and sugar cane production. Income levels follow the same pattern as production levels: Kitutu Chache North has the highest average off-farm income at USD143 followed by Kamagambo at USD77 with the other two sites reporting incomes of USD40. The reliability of these averages needs to be ascertained given the high variability in values reported.

Table 2: Site resource endowment characteristics

	Kisii				Migori			
	Kitutu Chache North		Nyaribari Chache		S&E Kamagambo		Suna West	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
HH size (members)	4.0	1.8	3.9	1.7	4.1	1.7	4.4	1.8
Land owned (ha)	0.8	0.7	1.3	1.1	0.8	0.7	1.3	1.1
Land cultivated (ha)	0.7	0.8	1.1	1.0	0.7	0.8	1.1	1.0
Livestock holdings (TLU)	0.9	0.9	1.3	1.2	1.8	1.7	1.4	1.8
Total value of production (USD/MAE/day)	2.2	33.2	1.5	3.9	1.5	2.6	0.8	1.3
Cash income (USD/MAE/day)	1.3	4.4	0.9	3.3	0.8	2.1	0.4	1.0
Crop production value (USD/HH/year)	583	39,447	415	2,222	748	2,139	541	1,113
Livestock production value (USD/HH/year)	880	2,474	782	1,935	551	1,140	182	590
Market orientation (% produce sold)	40	37	44	37	37	34	36	33
Off-farm income (USD/HH/year)	143	1,320	41	1,660	77	810	38	503

Kitutu Chache North has an average family size of 4 persons and mean land holdings of 0.8 ha per household (Table 2). Generally, 0.7 ha is cultivated leaving only 0.1 ha for the homestead and the uncultivable portions. The high proportion of land under cultivation confirms the critical shortage of land at this site. Average TLU at the site is 0.9, which suggests huge potential to increase livestock productivity.

Nyaribari Chache North has an average family size of 3.9 persons and mean land holdings of 1.3 ha per household – 0.4 ha higher than in Kitutu Chache North. On average, 1.1 ha is cultivated leaving 0.2 ha for the homestead and the uncultivable portions. The high proportion of land under cultivation indicates a critical shortage of land at this site. Average TLU at the site is 1.3, which, though higher than Kitutu Chache North, is still very low considering the areas immense agricultural potential.

S&E Kamagambo has an average family size of 4.1 persons with an average land holding of 0.8 ha per household – similar to sites in Kitutu Chache North. On average, 0.7 ha is cultivated leaving 0.1 ha for the homestead and the uncultivable portions. Average TLU at the site is 1.8 ha, though higher than in Kisii, it is still low considering the areas immense agricultural potential.

Suna West has an average family size of 4.4 persons with an average land holding of 1.3 ha per household. On average, 1.1 ha is cultivated leaving 0.2 ha for the homestead and the uncultivable portions. Average TLU at the site is 1.4 ha, though higher than in Kisii it is still low considering the areas immense agricultural potential.

Livelihoods

Figures 2–5 give an indication of the size and make-up of the household economies. Each vertical bar represents one household, and the height of each bar represents the total annual value of all farm and non-farm produce and incomes, measured in USD and adjusted to 2015 purchasing power parity. The households have been ordered from poorest to richest, and the blue dashed line indicates the international poverty line of USD1.90 per person per day.

The colours of the bars represent different sources of value (for example green is the value of all crops grown and consumed by the household, and blue is the value of crops grown and sold). These charts show that in Kisii livestock sale and consumption are very important for households. A minority of wealthier households also engage in crop sales. There is little non-farm income.

Food crops represent the main source of food for domestic consumption across all sites. A sizeable proportion of these same households sold excess crops for cash. A major distinction between the Kisii and Migori sites is the degree to which respondents in the former are more dependent on cash sales from livestock than in the latter. The survey results revealed that the level of destitution is higher in Suna West (Migori County) where the percentage of households below the USD1.90 poverty line is higher than the other three sites. Even for those that live above the USD1.90 threshold, the majority are still poor.

Figure 2: Value of activities in Kitutu Chache North
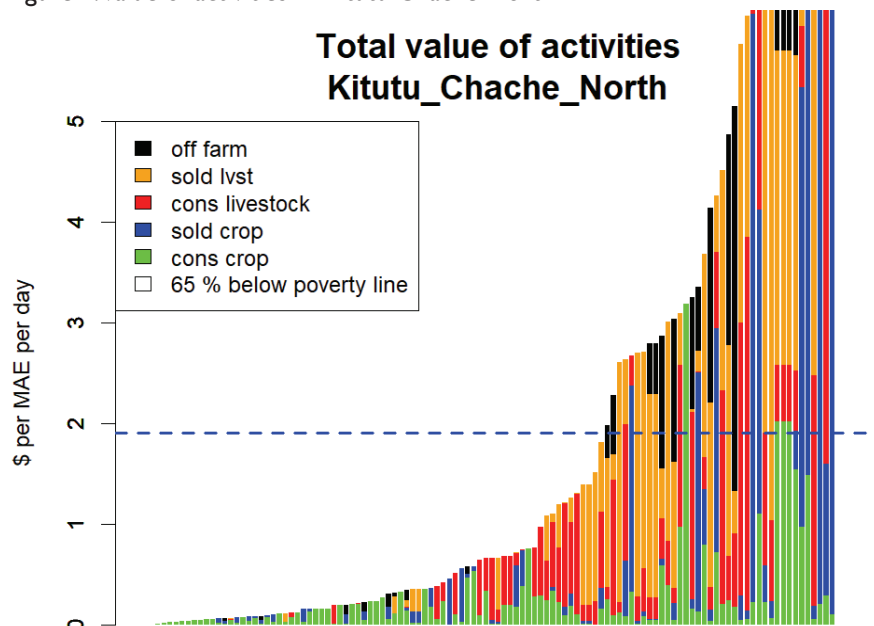
Figure 2 shows that more than 65% of the study sample live below or very close to the poverty line, which means that life is an everyday struggle to survive for most households. There is even a sizeable proportion (nearly half of those interviewed) whose production value is near zero. These households are engaged in subsistence production of crops and livestock but it is insufficient to satisfy their nutritional requirements. This situation is further exacerbated by the need to sell part of their inadequate food stocks out of desperation for cash. From Figure 2 it is evident that many households depend on a meagre harvest as their only source of food and income. This category does not have livestock or off-farm income sources to fall back on.

As the economic level of the households improves, livestock consumption and sales begin to take hold and complement or even surpass crops as a source of sustenance. Except for a few households, however, the majority are not able to increase their crop farming beyond subsistence level and incomes from crops are generally very limited. As the economic level of households improve, it is livestock that play a greater role as sources of food and income. For households above the poverty line there is also a slight increase in proceeds from off-farm activities, which complement income mainly from livestock. Kitutu Chache North is the least poor of the four sites.

Figure 3: Value of activities in Nyaribari Chache
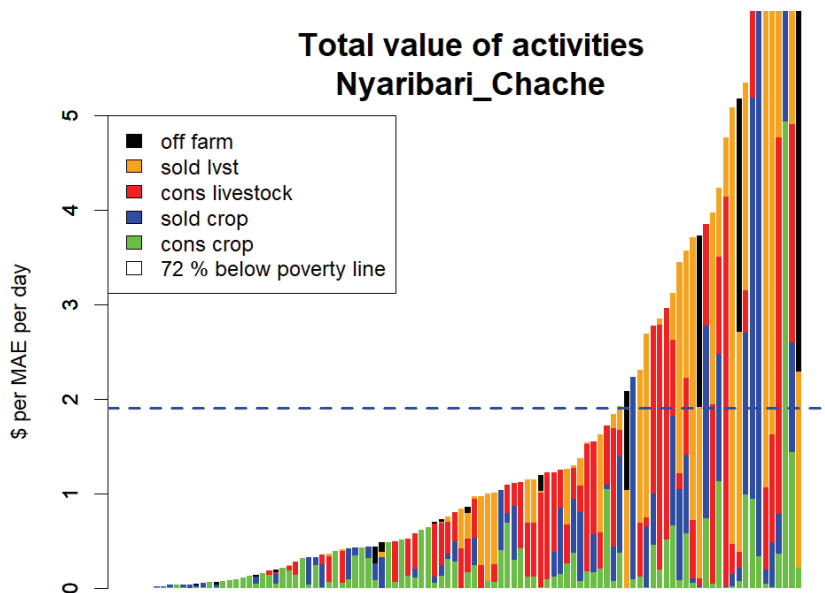
Figure 3 shows that in Nyaribari Chache nearly 73% of the study sample live below or very close to the poverty line of USD1.90 per day meaning that nearly 75% of the population live a life of struggle in search of livelihood necessities. More than half of the study sample live below USD1 a day with the bulk of respondents barely surviving and generating close to nil quantifiable income. There are households that reported consuming and also selling part of their meagre food stocks for cash in order to meet domestic necessities. They sell cheaply when the market prices are depressed after harvest and find it hard to buy at exorbitant prices several months later when supplies are low and food prices high.

Results from the study suggest income from crops is generally very limited. As in Kitutu Chache North, the crop component remains at subsistent level across the different economic strata. As the economic level of households improves, livestock begins to play a greater role in the food and income provision. The proportion of households reporting proceeds from off-farm sources is considerably lower than in Kitutu Chache North, even for households above the poverty line.

Livestock plays a greater role in the source of food and income as a household's economic level rises. Livestock ownership is thus an indicator of a change in the economic condition of a household.

In Migori, crop sales play a greater role in household economies compared to Kisii. In S&E Kamagambo livestock sales also make up a major proportion of the household economy for moderate and less poor households. There is little non-farm income reported. Suna West appears to be markedly less productive (poorer) than the other three locations.

Figure 4: Value of activities in S&E Kamagambo
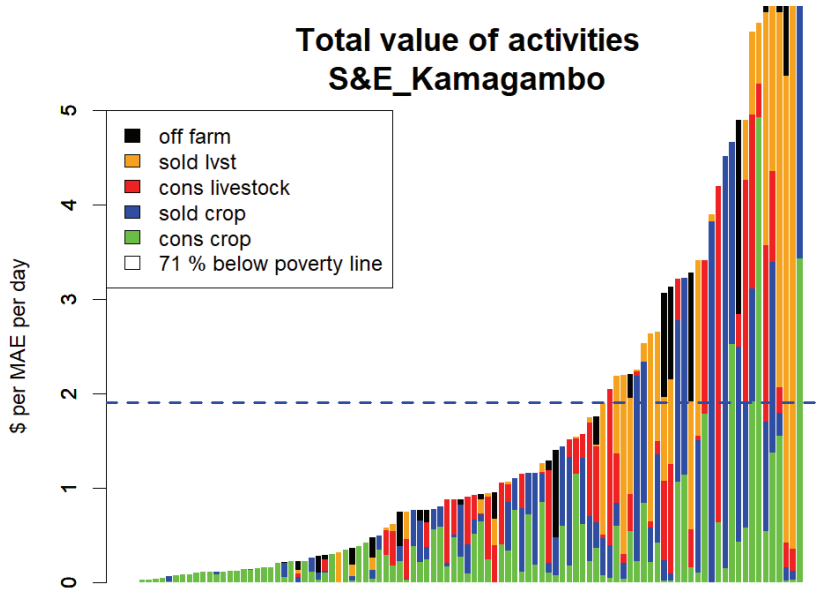
Figure 4 shows that more than 71% of the study sample live below or very close to the poverty line of USD1.90 per day, which means that for them everyday life is a struggle. For the majority who are below the poverty line, the value of their production activities is nil or negligible. For households below the poverty line in S&E Kamagambo, the proportion (by value) of crops used for consumption is higher than for the two sites in Kisii. This may mean that although they are yet to attain self-sufficiency in their domestic food requirement, the value of what they consume is higher than in Kisii. The value of food sold is also higher. Considered together this may be a pointer for the households to shift away from subsistence and towards food commercialization, though they have a long way to go to achieve this.

What is of critical importance now is for households to endeavour to cross the poverty line after which the elements of food self-sufficiency and commercialization can begin to crystallize. For households below the poverty line, the role of livestock in both consumption and sold value is much less pronounced than for crops. For households above the poverty line the value of food and livestock consumed and sold increases, which indicates the desire by households to sell food surpluses after attaining food self-sufficiency. Livestock contribution in this category is higher than the category of those below the poverty line, which makes it an indicator of wealth, as had been previously discussed. While the majority of households are not yet at the desired level, the hallmarks of gradually realizing it in the long run are evident from these results.

Figure 5: Value of activities in Suna West
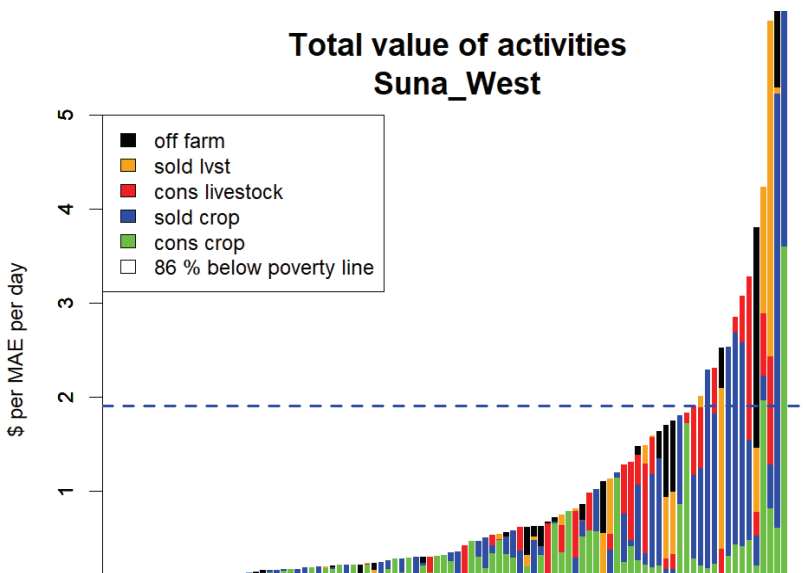
Figure 5 shows that more than 86% of the study sample live below or very close to the poverty line of USD1.90 per day which means that majority struggle every day to eke a living. In fact, three quarters of the households live on less than USD1 a day with the majority in this category not producing food of any quantifiable value. For these subsistence households the value of the food produced is insufficient to provide both the quantity and quality of nourishment that ensures a healthy and vibrant life.

These households are for the most part dependent on a hostile market economy in which they buy food at exorbitant prices due to the inadequacies of their own farms to provide more than a few months food. The poorest households reported very little cash income from farm products, consuming the majority of their production. Slightly wealthier households (but still below the poverty line) showed more sales of farm produce, mostly crops. A few households are engaged in off-farm activities to complement their meagre on-farm incomes. The selling of food seems to increase with the level of economic well-being. Of the 20% of households living above the poverty line there is a marked increase in sold crops and livestock. The overall picture, however, remains one of extreme poverty for the majority of households. Suna West is the poorest of the four project sites.

Cropping systems

Banana and tea farming are major cash earning enterprises for farming households across all four sites but it is in the two Kisii sites, and to a limited extent in the S&E Kamagambo, where they are commercially grown. Less prominent cash enterprises include pawpaw, guava, loquat, mango and avocado tree crops. In this highly mixed farming system, other crops being grown at subsistence levels are amaranth, pumpkin leaves, onion, sorghum, millet and cowpea. In the Nyaribari Chache site farmers also grow sugar cane for cash.

Other crops grown, though by fewer farmers, in all the sites include tomatoes, cassava, sweet potatoes, pineapples, spinach, Irish potatoes, plantain, *desmodium*, cabbage, grapes, passion fruits, green gram, groundnut, jute mallow, lemon, *Leucaena leucocephala,* oranges, pigeon pea, plum, soya bean, tree lucerne, tree tomato, vetch grass and watermelon.

Figure 6: Crops grown in Nyaribari Chache
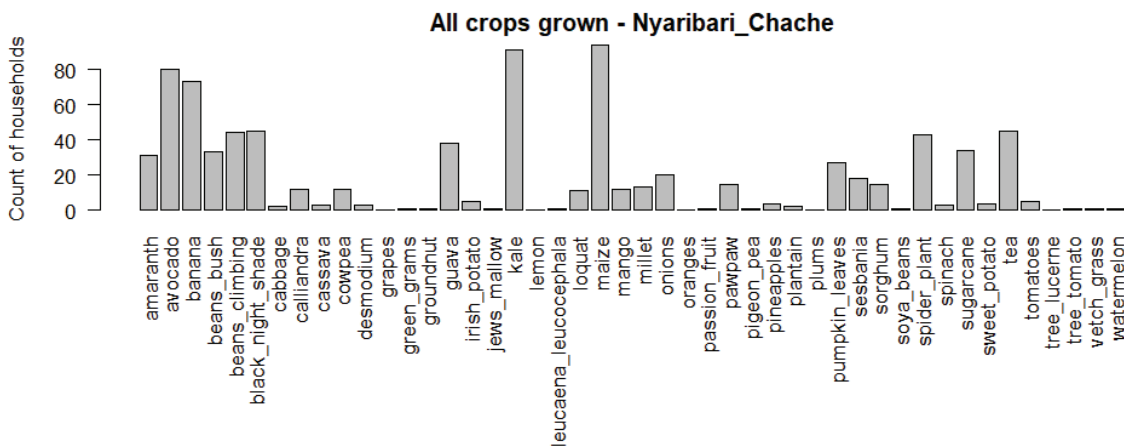
In Nyaribari Chache (Figure 6), the growing of maize and the vegetable, kales ('sukuma wiki'), were reported by 100% of respondents in the study. These were closely followed by avocado and banana, grown by 80% and 70% of respondents, respectively. Another diverse category of crops that were reported by 30–50% of the farmers include, at the lower range, amaranth, bush bean, guava, sugar cane and at the upper range, semi-climbing bean, black nightshade vegetable, spider plant and tea. A further wide range of crops reported by between 10% and less than 30% of the respondents include sorghum, *sesbania*, pumpkin, onions, millet, mango, cowpea and *calliandra*. Some respondents (<10%) also reported growing cabbages, cassava, *desmodium,* pineapples, plantain, spinach, sweetpotato and tomatoes.

Like in Nyaribari Chache (Figure 7), growing maize in Kitutu Chache North was reported by 100% of the farmers surveyed but the growing of the vegetable, kales ('sukuma wiki'), was only reported by 80%. These were closely followed by avocado and banana, grown by 70% of respondents, and common bean, grown by 60% of respondents. Between 20% and 40% of farmers also reported growing amaranth, guava, mango, millet, tea, onions, pawpaw and spider plant. A few respondents (<10%) reported growing *calliandra*, cowpea, groundnut, loquat, pumpkins, *sesbania* and spinach.

Figure 7: Crops grown in Kitutu Chache North
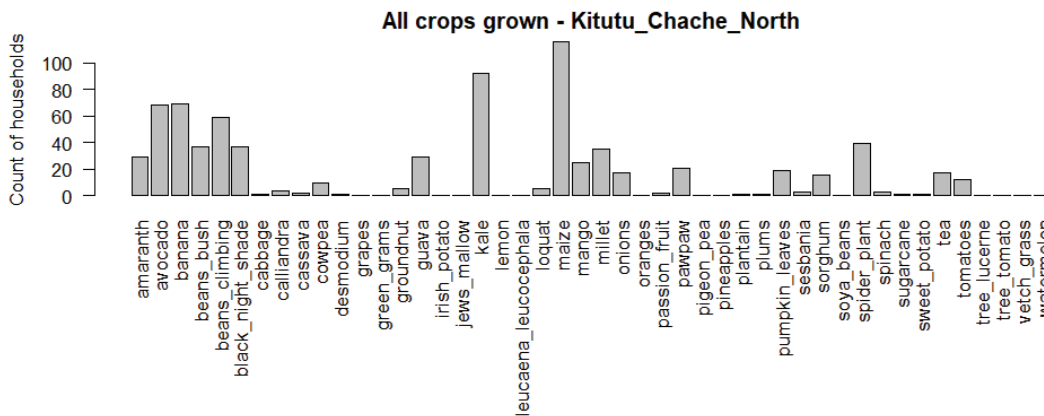
In S&E Kamagambo (Figure 8), maize farming was reported by 100% of the farmers included in the study and 80% reported that they were growing vegetables and fruits such as kales ('sukuma wiki') and avocado. Sixty per cent (60%) reported that they were growing mango and banana. Another diverse category of crops that between 30% and 50% of the farmers reported growing include amaranth, bush bean and semi-climbing bean (both common beans), pumpkins, spider plant, sugar cane, sweetpotato, guava, cassava and cowpea. A few respondents (<10%) also reported that they were growing Irish potato, loquat, onions, oranges, *sesbania*, spinach and tomatoes.

Figure 8: Crops grown in S&E Kamagambo
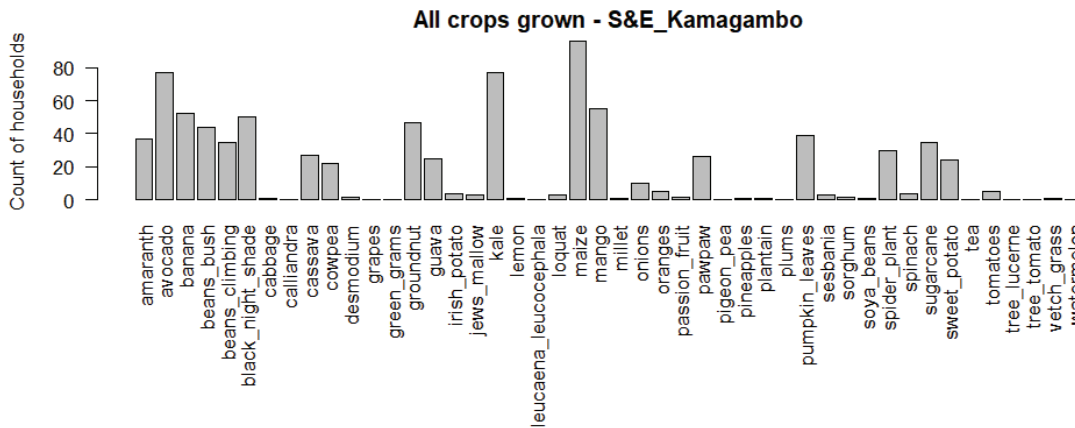
Figure 9: Crops grown in Suna West
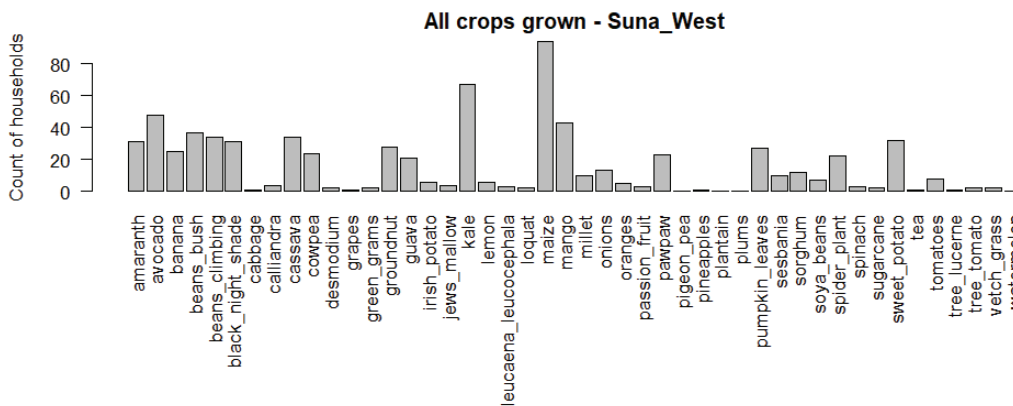
In Suna West (Figure 9), the growing of maize was reported by 100% of farmers surveyed and the vegetable, kales ('sukuma wiki'), was reported by 60%. These were closely followed by avocado, mango, bush and climbing beans, pumpkin, sweetpotato, amaranth, banana, cassava, cowpea, black nightshade which were grown by between 20% and 60% of households. A further wide range of crops grown by 20% or less of the respondents include sorghum, *sesbania*, soya bean, tomato, onions, millet, mango, cow pea and *calliandra*, lemon and Irish potato.

Intercropping

Intercropping maize and common bean is the most common combination in the study sample (Tables 3–6). Intercropping is a strategy that farmers operating small and declining landholdings can use to increase land productivity. On a small piece of land, farmers are able to realize an early bean harvest from the intercrop. Maize and common beans complement each other through the distinct nutrients they mine and their contrasting root structures, which explore different depths in the soil and facilitate intensification. The semi-climbing bean crop uses the maize as an anchor as it explores the space above ground, it also competes with the maize for soil nutrients and sunlight both of which are critical for the eventual grain filling in the pods. Other intercropping practices reported in the study sites are maize/groundnuts, maize/*calliandra* and sugar cane/bush bean. In all cases of intercropping, which crop is main or minor depends on several factors chief of which are the farmers' production goals (e.g. domestic food production, market orientation, etc.).

Table 3: Percentage of households reporting intercropping practices – Kitutu Chache North

Main crop	Companion crop		
	Maize	Climbing beans	Bush beans
Maize	-	36	31
Climbing bean	27	-	0
Bush bean	21	0	-

In Kitutu Chache North (Table 3) maize is the main crop and common beans (semi-climbing and bush) are the intercrop for 67% of the farmers interviewed. Conversely, 48% of farmers planted bean as the main crop and maize as the companion crop in that system.

Table 4: Percentage of households reporting intercropping practices – Nyaribari Chache

Main crop	Companion crop				
	Maize	Climbing beans	Bush beans	Calliandra	Sugar cane
Maize	-	8	23	4	1
Climbing bean	16	-	1	0	0
Bush bean	10	1	-	0	4

In Nyaribari Chache (Table 4), 31% of the farmers interviewed grew maize as the main crop and used one of the two common bean types as intercrops. Conversely, 26% of those growing beans as the main crop were using maize as the intercrop. Other minority crops reported are *calliandra* as an intercrop for the maize crop and sugar cane intercropped with a common bean main crop.

Table 5: Percentage of households reporting intercropping practices – S&E Kamagambo

Main crop	Companion crop			
	Maize	Climbing beans	Bush beans	Groundnut
Maize	-	27	35	20
Climbing bean	25	-	0	0
Bush bean	14	1	-	0

In S&E Kamagambo (Table 5), 62% of the study sample reported growing maize as the main crop intercropped with common beans and 20% intercropped maize with groundnut. Forty-two per cent of interviewees reported growing common beans as the main crop, which was intercropped with maize.

Table 6: Percentage of households reporting intercropping practices – Suna West

| Main crop | Companion crop | | | |
	Maize	Climbing beans	Bush beans	Groundnut
Maize	-	22	34	12
Climbing bean	22	-	0	0
Bush bean	16	2	-	0

In Suna West (Table 6), 56% of the study sample reported growing maize as the main crop with common beans (climbing or bush beans) as the intercrop and in 12% of the cases, maize was intercropped with groundnut. For 38% of interviewees, common bean was the main crop, and it was intercropped with maize.

Crop production

Maize is grown on a fairly small acreage in Kisii and relatively large acreage in Migori, where landholdings tend to be bigger (Table 7). The maize yield, which is the main staple food in western Kenya, across all sites in this study sample was between one and almost two tonnes per ha. Kamagambo has the highest yield of the four sites. There is therefore tremendous potential for increasing cereal production given the proven higher yield potential of up to 10 tonnes per ha. Farmers tend to intercrop maize with a diverse range of leguminous crops like common beans, soya bean, cowpea and groundnut, among others. Maize is generally grown for household consumption though a few households are able to produce surplus for market.

Banana is a major cash earner in Kisii where it is grown on small plots as shown in Table 7. There is also banana growing in Kamagambo, which in many respects is a spill over practice from the neighbouring Kisii County, which is the main banana-producing county in Kenya. Here the banana acreage is relatively bigger (0.5 ha) due to the larger landholdings there. Banana growing was not identified in Nyaribari Chache or Suna West sites. The natural conditions in Suna West are not conducive for banana production. As shown in Table 7, farmers in Kitutu Chache North generate considerable income from the sale of bananas. Vegetable production is another source of income as represented by the 'sukuma wiki' (kales). Vegetables are grown on small plots and are judiciously harvested over the season(s) and sold in both local and far-flung markets including Nairobi. Other vegetables include spider plant and *amaranthus*.

Table 7: Comparative crop production and income across Kisii and Migori sites

| | | Kisii | | | | Migori | | | |
| | | Kitutu Chache North | | Nyaribari Chache | | Kamagambo | | Suna West | |
		Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Maize	Harvest (kg)	655	670	673	971	655	670	673	971
	Land area (ha)	0.6	0.6	0.8	0.9	0.6	0.6	0.8	0.9
	Yield (kg/ha)	1,766	2,866	1,334	1,813	1,766	2866	1,334	1,813
	Consumed (%)	59	32	54	32	59	32	54	32
	Sold (%)	41	20	46	23	41	20	46	23
	Sale income (USD/yr)	367	469	502	737	367	469	502	737
Banana	Harvest (kg)	560	567	-	-	560	567	-	-
	Land area (ha)	0.5	0.5	-	-	0.5	0.5	-	-
	Yield (kg/ha)	1150	377	-	-	1,150	377	-	-
	Consumed (%)	26	20	-	-	26	20	-	-
	Sold (%)	74	11	-	-	74	11	-	-
	Sale income (USD/year)	448	452	-	-	448	452	-	-

Maize, bananas, tea and kale were major crops for consumption and sale in Kitutu Chache North and Nyaribari Chache sites. Production was fairly similar in the two sites. The average maize acreage was 0.6 ha in Kitutu Chache North and 0.8 ha in Nyaribari Chache with an estimated yield of over 1,766 kg/ha and 1,336 kg/ha, respectively. By all standards, this is a low yield given that on-farm yields of 7.1 t/ha have been realized in this region under research conditions (Okoko et al. 2003). The gap between actual and potential maize yield highlights the immense potential that still exists for raising on-farm productivity, which will be critical for averting a food crisis in the face of high and increasing food demand. As noted earlier, the majority of study sample households are food deficient for most of the year and have to depend on buying food from the market at exorbitant prices. Strategies to support farmers to gradually increase on-farm productivity and attain both food self-sufficiency and market surplus are therefore required. Despite the low on-farm maize productivity, the results show that nearly 60% of the yield is actually consumed domestically while the balance is sold for the much-needed cash. Note that tea was a major cash crop in Kitutu Chache North but not in other locations.

Bananas were grown on smaller plots (0.5 ha) in Kitutu Chache North. The average reported yield of 1,150 kg/ha in Kitutu Chache is low given that banana yields under research conditions in the region were 60 t/ha (Kwach et al. 2000). In Kitutu Chache an average of 26% of the produced banana is consumed at home while 74% is sold, making it a major income earner in the region. Bananas were not grown in Nyaribari Chache.

Maize and bananas were major crops in S&E Kamagambo, and maize was the primary crop in the Suna West site. The average maize acreage for S&E Kamagambo and Suna West site are 0.6 and 0.8 ha, respectively. Their corresponding yields are 1,766 and 1,334 kg/ha. In both sites, nearly 60% of the harvested grains are consumed at home with the balance being sold to meet the much-needed cash for other basic household necessities. Banana cultivation acreage averages 0.5 ha in S&E Kamagambo achieving average yields of 1,150 kg/ha. Twenty-six per cent of the harvest is consumed at home and 74% is sold for cash.

Handling and use of crop residues

The maize crop is the main source of crop residues among respondents who reported recycling the residues back into the soil.

Table 8: Percentage of households reporting uses of crop residues – Kitutu Chache North

	Feed	Soil	Burn	Fuel	Manure	Compost	Sell
Maize	34	50	9	7	3	3	0
Bush bean	11	12	0	1	0	1	0
Climbing bean	9	26	0	0	3	1	0
Kale	7	15	0	0	2	2	0
Banana	13	3	0	0	0	1	3
Tea	0	7	0	0	0	0	0
Sugar cane	0	1	1	0	0	0	0
Groundnut	0	2	0	0	0	0	0

Maize stover returned to the soil in Kitutu Chache North was reported by 50% of households, whilst its use as animal feed was reported by 34% of households (Table 8). Other uses were reported but by less than 10% of respondents (burn 9%, fuel 7%, manure 3% and compost 3%) (Table 8). Stover from both bush beans and semi-climbing beans is predominately returned to the soil by 37% of the survey respondents. Using bean stover for livestock feed is also practiced by 20% of respondents. The use of bean stover for other uses such as fuel, manure, composting and cash was nil to negligible. Thirteen per cent (13%) of survey respondents also reported using banana stover for livestock feed. Tea stover was returned to the soil by 7% of respondents.

Table 9: Proportion of households reporting each use of crop residues – Nyaribari Chache

	Feed	Soil	Burn	Fuel	Manure	Compost	Sell
Maize	39	52	13	3	0	0	0
Bush bean	15	16	0	0	0	0	0
Climbing bean	3	15	0	0	0	0	0
Kale	10	11	1	0	0	0	0
Banana	14	10	1	0	0	0	0
Tea	0	25	1	0	0	0	1
Sugar cane	3	13	1	0	1	0	1
Groundnut	0	0	0	0	0	0	0

'Soil' refers to direct return to soil – residues are left in field and ploughed back in. Other uses of crop residues (e.g. composting, mixing with animal manure) may later also be returned to the soil.

Maize stover is mainly used for improving soil fertility (52% of respondents) and as livestock feed (39% of respondents – Table 9). Burning was reported by 13% and fuel by 3%. Using beans stover for improving soil fertility was reported by 31% respondents and 18% used it as livestock feed. Stover from kales was returned to the soil by 15% of respondents and used as animal feed by 3%. Farmers reported using of banana stover for feed (14%) and fertilizing the soil (10%).

Table 10: Proportion of households reporting each use of crop residues – S&E Kamagambo

	Feed	Soil	Burn	Fuel	Manure	Compost	Sell
Maize	45	76	4	8	3	1	0
Bush bean	6	18	1	0	0	0	0
Climbing bean	3	19	0	0	2	1	0
Kale	3	6	0	0	0	0	0
Banana	0	0	0	0	0	0	0
Tea	0	0	0	0	0	0	0
Sugar cane	0	0	0	0	0	0	0
Groundnut	1	6	0	0	2	2	0

'Soil' refers to direct return to soil – residues are left in field and ploughed back in. Other uses of crop residues (e.g. composting, mixing with animal manure) may later also be returned to soil.

Returning stover to the soil is common in S&E Kamagambo and was reported by 76% of farmers (Table 10). Maize residue was used as livestock feed by 45% of respondents. Less than 10% of farmers used maize stover for fuel, 4% burnt it as part of land preparation whilst 3% used it as manure and 1% as compost. The use of maize stover for fuel is an indication of a shortage of fuelwood due to deforestation caused by population pressure on the limited available land. Burning of crop stover though discouraged as a farming practice is nevertheless still being carried out, though the practice is gradually declining. Combined, stover from bush beans and semi-climbing beans was returned to the soil by 37% of the survey respondents. Bean stover use for livestock feed was also practiced by 9% of farmers. The use of beans for manure is negligible. Groundnut stover was returned to the soil by 6% of farmers and used as feed, manure or compost by a few respondents.

Table 11: % households reporting each use of crop residues – Suna West

	Feed	Soil	Burn	Fuel	Manure	Compost	Sell
Maize	39	81	4	9	10	8	0
Bush bean	8	19	2	3	2	1	0
Climbing bean	2	15	0	0	1	1	0
Kale	1	1	0	0	1	1	0
Banana	3	3	0	0	1	1	0
Tea	0	0	0	0	0	0	0
Sugar cane	5	17	0	1	2	2	0
Groundnut	3	13	0	0	4	2	0

'Soil' refers to direct return to soil – residues are left in field and ploughed back in. Other uses of crop residues (e.g. composting, mixing with animal manure) may later also be returned to soil.

In the Suna West (Table 11) site the use of maize stover for soil incorporation is the most common practice for 81% of those interviewed. Its second most common use is as livestock feed at 39%. Other uses include as manure 10%, fuel 9%, composting 8% and burning at 4%. The bean stover is returned to the soil by 34% while 10% use it as livestock feed. Other uses (burn, manure and compost) of bean stover are practiced by a minority of the respondents. Sugar cane was used for soil fertility by 17% of the respondents while 5% used it as a cattle feed. Groundnut stover was used for soil fertility by 13% of the respondents with other uses reported by few farmers

Livestock

Of the 117 farmers in the study, over 80 own cattle and about 60 also keep local chicken (Figure 10). Other livestock species kept include goats (25) and sheep (<10) with negligible ownership of other livestock.

Figure 10: Comparison of livestock endowment and feeds in Kitutu Chache North
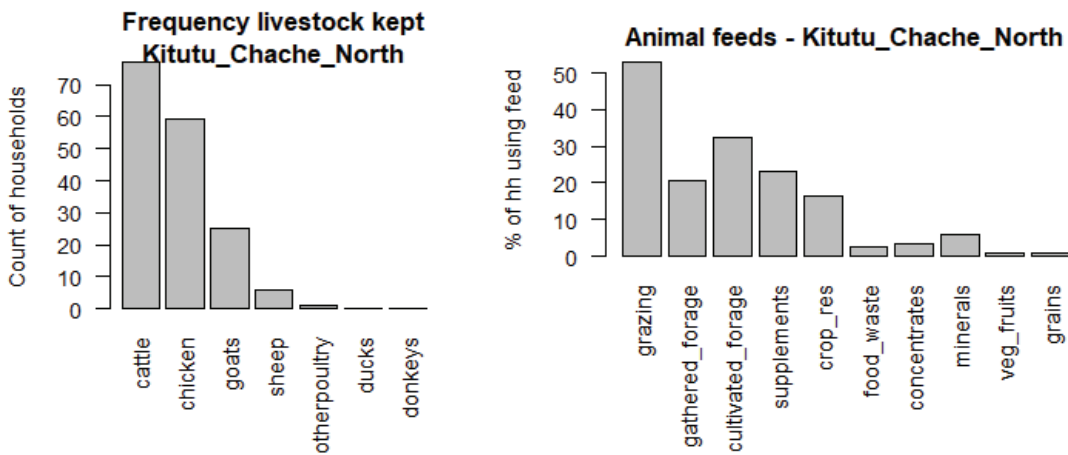
Open grazing on natural pasture is the common practice reported by over 60 of the respondents. Other more commercially oriented dairy farmers cultivate high yielding forages (40) to supplement the low yielding natural pasture. About 25 of the respondents gathered forages (cut and carry), nearly 30 give supplements to their animals, 20 use crop residues as feed and less than 10 farmers reported giving minerals to their livestock.

As corroboration for the results reported on crop residue use as livestock feed, livestock keepers reported crop residue among their mix of feeding options, with the practice being more entrenched in the Kisii than in the Migori sites. Similarly, the use of mineral supplementation (dairy meal and salt) was reported. Dairying in this site has the potential to grow to a commercial level with the right institutional support to farmers.

Figure 11: Comparison of livestock endowment and feeds in Nyaribari Chache
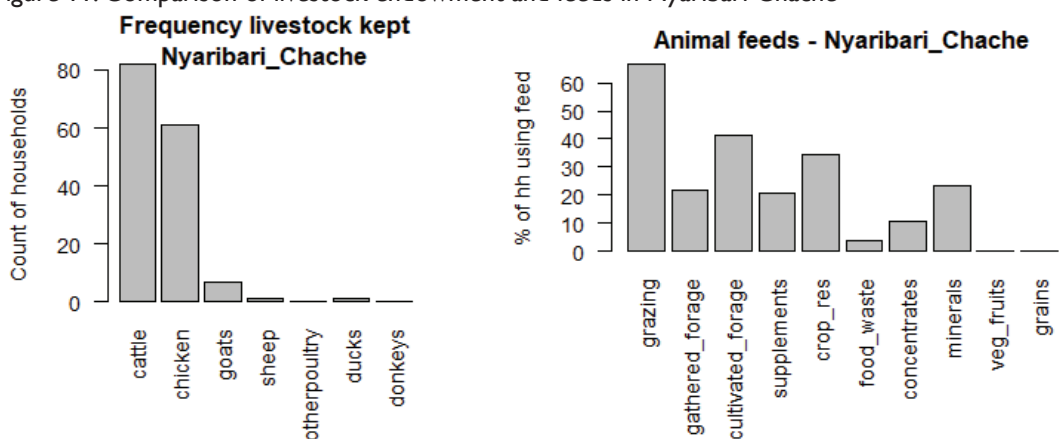
The two livestock types owned by farmers in Nyaribari Chache were mainly cattle (>80) and chicken (60) with a few households reporting ownership of goats (<10) – see Figure 11. Open grazing on natural pasture is the common practice reported by 60 of the respondents. Other more commercially oriented dairy farmers practice the cultivation of high-yielding forages (40) like Napier grass and a diversity of legume crops such as *desmodium*, *calliandra*, etc.

As corroboration for the results reported on crop residue use as livestock feed, 40 livestock keepers reported using crop residue as animal feed. Similarly, the use of mineral supplementation (dairy meal and salt) was reported. Farmers at this site have the potential to grow into commercial dairy producers with the right institutional support mechanism.

Figure 12: Comparison of livestock endowment and feeds in Kamagambo
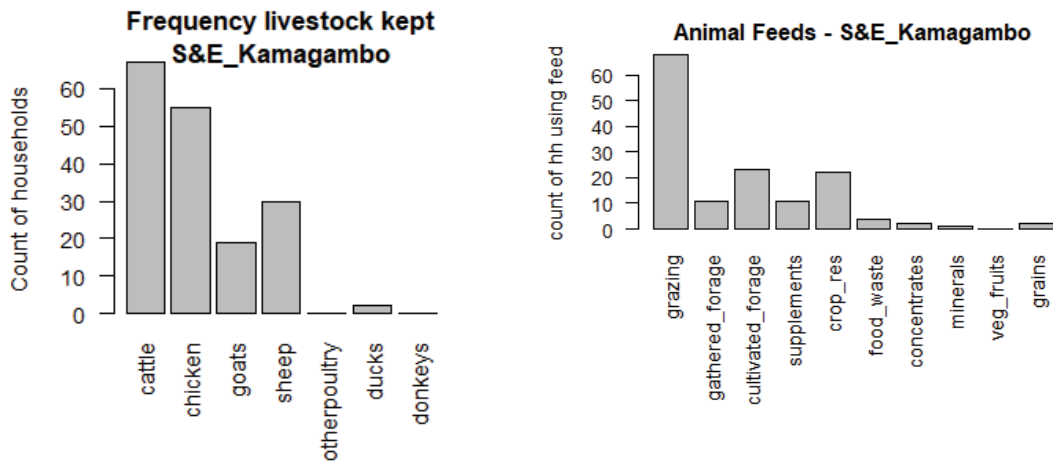
Figure 12 shows that four livestock types owned by farmers in Kamagambo were mainly cattle (>70), chicken (55), sheep (30) and goats (20) with a few households reporting ownership of ducks.

Open grazing on natural pasture is the common practice reported by 70 of the respondents. Other more commercially oriented dairy farmers cultivate high-yielding forages (20) like Napier grass and a diversity of legume crops such as *desmodium*, *calliandra*, etc.

As corroboration for the results reported on crop residue use as livestock feed, 20 livestock keepers reported using crop residue as animal feed. Similarly, the use of feed supplementation (dairy meal and salt), and cut and carry, etc. was reported. With the right institutional support mechanism, farmers at this site have the potential to grow into commercial dairy producers.

Figure 13: Comparison of livestock endowment and feeds in Suna West
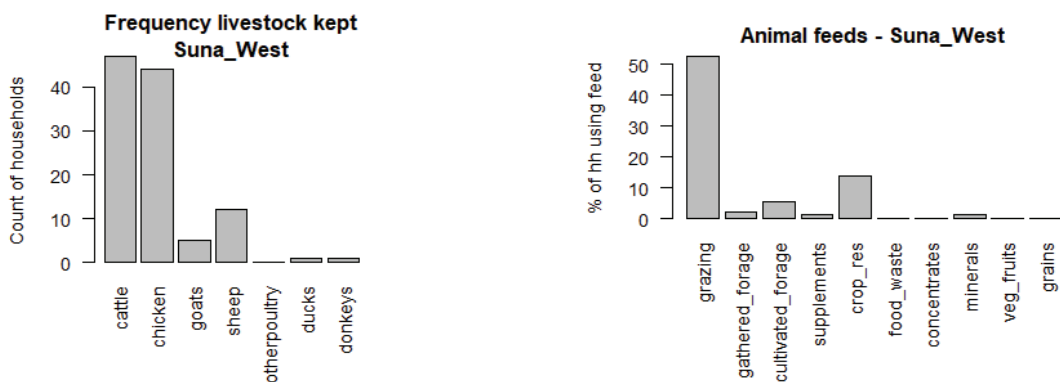
Figure 13 shows that the four livestock types owned by farmers in Suna West were cattle (>55), chicken (50), sheep (>20) and goats (5). Open grazing on natural pasture is common and practiced by 50 of the respondents, whilst crop residue is used as animal feed by >10 farmers and forages by 5 farmers. This site is the least developed compared to the other three with respect to livestock management. Whereas the farmers in the other three sites have diversified the array of feeds for their livestock, in this site there is still over-reliance on natural pasture in an open grazing system.

Legumes grown

Figure 14: Legumes types and their uses in Kitutu Chache North
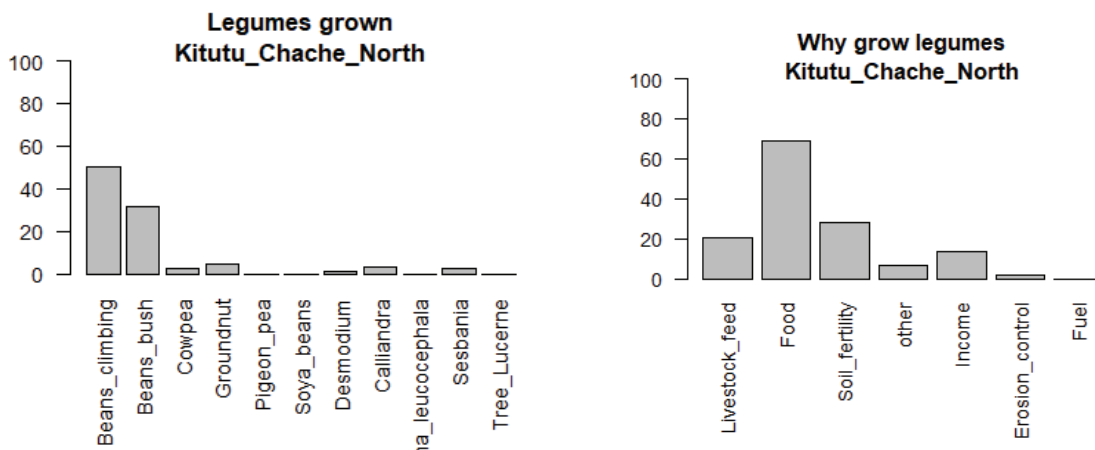
Common beans (bush and semi-climbers) were the most common legume crop in Kitutu Chache North, grown by over 40% (Figure 14) of farmers surveyed. Farming groundnuts and a host of other legumes was reported but by very few respondents. The percentage of respondents reporting the growing of improved fodder shrubs was very low in this study despite past research and extensive efforts to promote them among smallholder mixed farmers. Improved fodder shrubs include *calliandra*, *leucaena* and *desmodium*. In this site far fewer farmers reported the growing of the indigenous leguminous *sesbania* compared to the other sites.

Food (70%), livestock feed (20%), soil fertility (<30%) and income (>10) were the priority functions given by farmers for preferring the different legumes. The two functions of erosion control and fuel were reported by far fewer percentages of farmers.

Figure 15: Legumes types and their uses in Nyaribari Chache
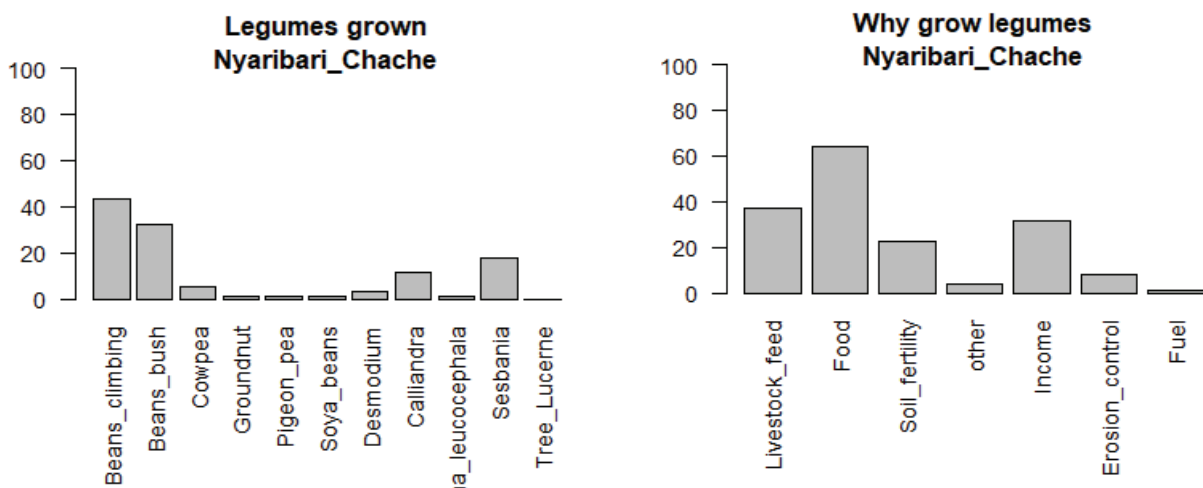
In Nyaribari Chache, common beans (bush and semi-climbers) were the most common crop, grown by nearly 40% (Figure 15) of farmers surveyed. The locally adapted *sesbania* tree legume was reported by nearly 20% and *calliandra* (a relic of past research and extension initiatives) by more than 10% of the respondents. Other legumes were reported by far fewer respondents in the site. Food (>60%), livestock feed (<40%), income (<40%) and soil fertility (20%) in that order were the priority functions given by farmers for preferring the different legumes. The two functions of erosion control and fuel were only reported by very few farmers.

Figure 16: Legumes types and their uses in S&E Kamagambo
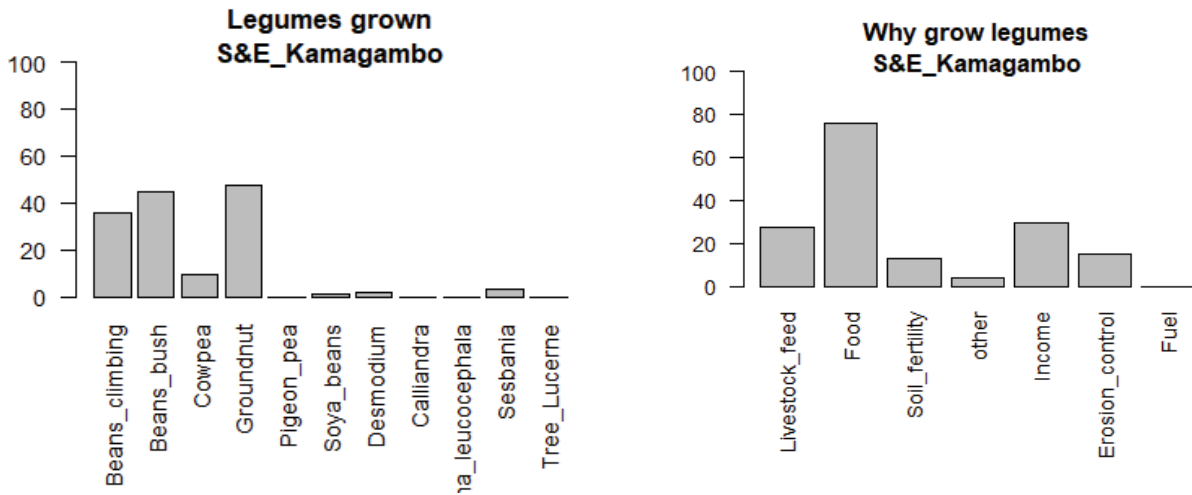
In S&E Kamagambo, common beans (bush and semi-climbers) were the most common crop, grown by nearly 40% (Figure 16) of farmers surveyed. Farming groundnuts was nearly as popular as common beans and was reported by nearly 40% of respondents. Cowpeas were being grown by about 10% of the respondents. Groundnuts and cowpeas are adapted to lower altitude and relatively drier regions of Migori compared to the higher altitude and wetter Kisii County. The percentage of respondents reporting the growing of improved fodder shrubs was very low in this study site despite past research and extension efforts to promote them among smallholder mixed farmers. These include *calliandra*, *leucaena* and *desmodium* and the locally adapted *sesbania*.

Food (<80%), livestock feed (<30%), soil fertility (<20%), income (30%) and erosion control (20%) were the priority functions given by farmers for preferring the different legumes. The functions of fuel was reported by a far smaller percentages of farmers.

Figure 17: Legumes types and their uses in Suna West
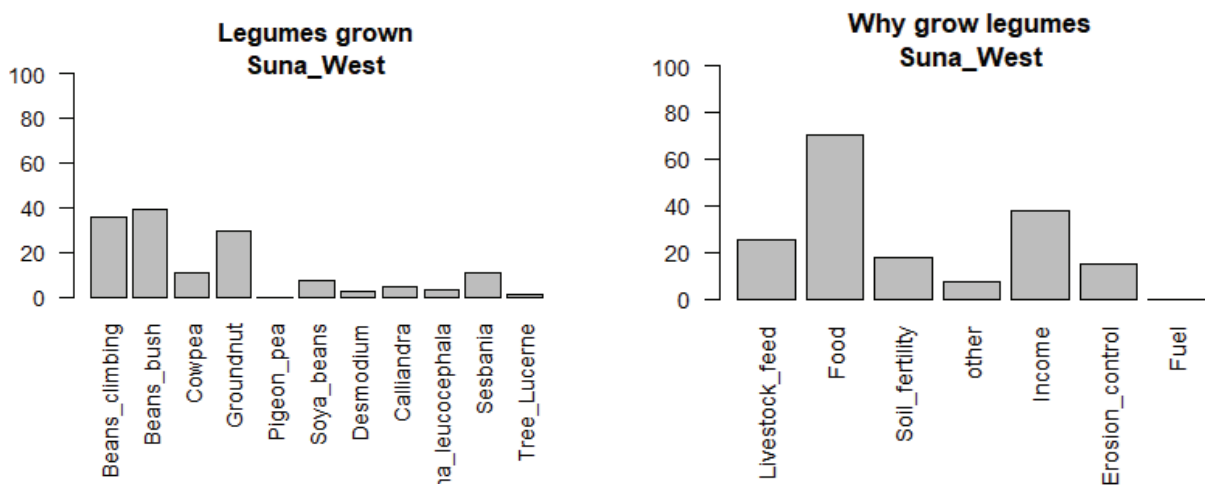
Figure 17 shows that in Suna West, common beans were the most common crop, grown by nearly 40% of farmers surveyed. Groundnut and cowpea farming was reported by 30% and 10% of respondents, respectively. Sesbania and soya beans were grown by 10%, and less than 10%, respectively. Other legumes grown by far fewer farmers include *calliandra*, *desmodium* and pigeon pea.

Food (70%), livestock feed (<30%), soil fertility (20%), erosion control and income (<40) were the priority functions given by farmers for preferring the different legumes. The function of fuel was reported by far smaller percentages of farmers.

Legume production

The yield/ha of common beans across the sites shows no discernible pattern but varies from under 0.1 to under 0.5 tonnes, which is extrapolated from small plot yields of between 0.1 and 0.5 ha (Table 12). These are bean yields realized from intercropped maize/common bean mixtures.

Groundnuts in Migori sites show yields of over 0.2 to under 0.3 tons per ha estimated from plots of 0.2 ha and 0.5 ha, respectively. The viability of these estimates needs to be corroborated given the high variability shown by the standard deviations.

Table 12: Legume productivity in Kisii sites

Grain legumes		Kitutu Chache North		Nyaribari Chache	
		Mean	Sd	Mean	Sd
Climbing bean	Harvest (kg)	133	344	26	25
	Land area (ha)	0.2	0.2	0.3	0.2
	Yield (kg/ha)	295	618	92	65
	Sale income (USD/yr)	49	121	32	27
Bush bean	Harvest (kg)	42	54	45	57
	Land area (ha)	0.1	0.1	0.1	0.1
	Yield (kg/ha)	289	282	482	751
	Sale income (USD/yr)	56	98	79	34
Groundnut	Harvest (kg)	275	247	-	-
	Land area (ha)	0.2	-	-	-
	Yield (kg/ha)	-	-	-	-
	Sale income (USD/yr)	1,016	-	-	-
Non-grain legumes (data scarce)					
Calliandra	Plant count	4	1	6	5
	Harvest (kg)	60	-	38	29
Sesbania	Plant count	9	9	8	5
	Harvest (kg)	10	-	23	23
Desmodium	Land area (ha)	0.0	-	0.0	0.0
	Harvest (kg)	100	-	50	-

Common bean production in Kitutu Chache North (Table 12) is done on small plots of between 0.1 and 0.2 ha within the main maize crop. The extrapolated yields of between 0.1 and less than 0.5 tons/ha is far below the proven yield of 2.5t/ha for this region (ICRISAT 2013).

Table 13. Legume productivity in Migori sites

Grain legumes	Mean	S&E Kamagambo		Suna West	
		Sd	Mean	Sd	
Climbing bean	Harvest (kg)	216	664	45	30
	Land area (ha)	0.5	0.4	0.5	0.4
	Yield (kg/ha)	99	78	125	135
	Sale income (USD/yr)	110	83	32	17
Bush bean	Harvest (kg)	66	89	56	299
	Land area (ha)	0.2	0.3	0.2	0.2
	Yield (kg/ha)	324	321	341	520
	Sale income (USD/yr)	154	158	261	636
Groundnut	Harvest (kg)	110	116	49	27
	Land area (ha)	0.5	0.4	0.2	0.1
	Yield (kg/ha)	276	171	212	74
	Sale income (USD/yr)	299	333	111	107
Non-grain legumes (data scarce)					
Calliandra	Plant count	NA	NA	6	4
	Harvest (kg)	NA	NA	NA	NA
Sesbania	Plant count	7	8	4	1
	Harvest (kg)	NA	NA	NA	NA
Desmodium	Land area (ha)	0.1	0.1	0.1	0.0
	Harvest (kg)	25	NA	25	NA

In S&E Kamagambo and Suna West sites in Migori, groundnuts were planted on 0.5 and 0.2 ha plots with a corresponding yield of 276 and 212 kg/ha, respectively (Table 13). This reported yield is far lower than the proven yield of nearly thrice these levels on research trials in this region (Kidula et al. 2010).

Planting strategies for legumes

In Kitutu Chache North (Table 14) common beans are mainly grown as intercrops (nearly 90%) while all the *sesbania* was intercropped. Cowpea is grown as an intercrop by all the respondents as are groundnuts, *desmodium* and *calliandra*.

In Nyaribari Chache common beans were also mostly intercropped (85%) with about 15% being sole cropped. Half of the respondents were intercropping cowpeas with the other half practicing sole cropping. *Leucaena leucocephala* was all sole cropped as was most of *calliandra* (67%). *Desmodium* is either monocropped (33%), grown on strips (33%), or field margins/contours (33%). Also growing mainly on field margins/contours is the locally adapted *sesbania*. Vetch grass though reported by few respondents was sole cropped when grown.

In S&E Kamagambo (Table 15) common beans were, again, mostly intercropped (90%) as were all the cowpea (100%). Nearly half of the respondents were intercropping groundnuts (46%) with the remainder practicing sole cropping. *Sesbania* was planted on field margins and contours by all the respondents. *Desmodium* and vetch grass, though only reported by few respondents, were sole cropped when grown.

Table 14: Proportion of households in each location who follow specific planting strategies for legumes, in the Kisii County sites

| | Kitutu Chache North (% of HH with crop) | | | | Nyaribari Chache (% of HH with crop) | | | |
	Intercrop	Sole crop	Strip	Field margin or contour	Intercrop	Sole crop	Strip	Field margin or contour
Climbing bean	82	–	18	–	93	7	–	–
Bush bean	96	–	–	4	77	23	–	–
Cowpea	–	100	–	–	50	50	–	–
Groundnut	–	100	–	–	–	–	–	–
Soya bean	–	–	–	–	–	–	–	–
Desmodium	–	100	–	–	–	33	33	33
Vetch grass	–	–	–	–	–	100	–	–
Calliandra	–	100	–	–	8	67	–	25
Leucaena leucocephala	–	–	–	–	–	100	–	–
Sesbania	100	–	–	–	22	11	6	61
Tree lucerne	–	–	–	–	–	–	–	–

In Suna West common beans were also mostly intercropped (90%) as was all the cowpea grown (87%). Half of the respondents were intercropping groundnuts and soya beans with the remainder practicing sole cropping. *Leucaena* and *calliandra* were mainly grown as monocrops with a minority being planted on field margins/contours. Half of the respondents were growing *desmodium* on strips and the other on field margins/contours. Half of the respondents grew vetch grass as sole crop and the other on field margins/contours. *Sesbania* was planted by all the respondents on field margins and contours.

Table 15: Legume cropping systems comparison Migori County sites

| | S&E Kamagambo (% of HH with crop) | | | | Suna West (% of HH with crop) | | | |
	Intercrop	Sole crop	Strip	Field margin/ contour	Intercrop	Sole crop	Strip	Field margin/ contour
Climbing bean	88	–	13	–	79	11	5	–
Bush bean	93	7	–	–	95	5	–	–
Cowpea	100	–	–	–	–	–	–	–
Groundnut	46	54	–	–	50	50	–	–
Soya bean	–	–	–	–	50	50	–	–
Desmodium	–	100	–	–	–	–	50	50
Vetch grass	–	100	–	–	–	50	–	50
Calliandra	–	–	–	–	–	75	–	25
Leucaena leucocephala	–	–	–	–	–	67	–	33
Sesbania	–	–	–	100	–	20	–	80
Tree lucerne	–	–	–	–	–	–	–	100

Land and land management

Farm sizes and tenure

Land cultivation by households across the four sites is highly variable with land constraints being a more acute problem in Kisii than Migori. In Kitutu Chache North the bulk of the study respondents (>90) own up to 1 ha of land while over 90 farmers in Nyaribari Chache and Kamagambo cultivate up to 2 ha. The picture is different for Suna West where up to 3.5 ha of land ownership was reported.

Across all sites, the majority of land cultivated is owned by the respondents. This is the case even for Suna West where land for hire is readily available. Low take-up of rented land suggests rental charges are probably beyond the income ability of the majority of households surveyed. Across all the sites only a negligible proportion of farmers are renting in land. Even fewer are those that are renting out land.

Figure 18: Cultivated acreage and the types of land tenure by site – Kitutu Chache North
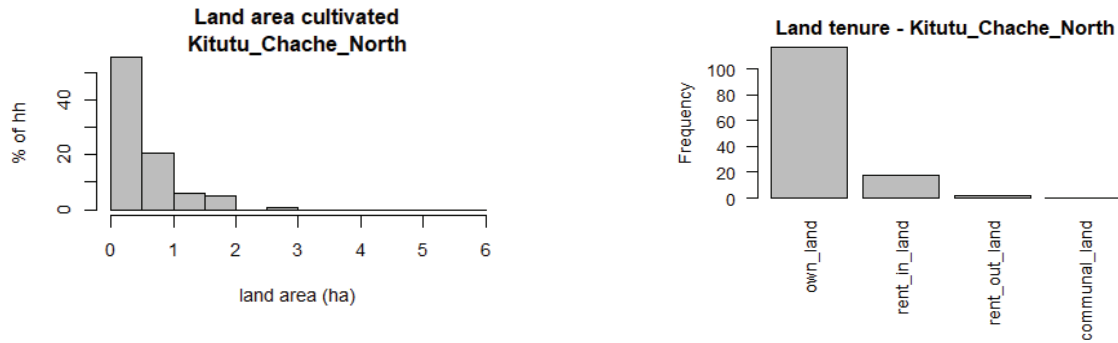
In Kitutu Chache North, 70 of the 117 households (Figure 18) in the study own less than 0.5 ha of land, nearly 95 of the households own 1 ha or less and nearly all of them own 2 ha or less. This finding demonstrates the limitation of land as a factor of production in this site specifically and Kisii County generally. The land tenure system for the majority (> 110) is private ownership with the remaining few (<10) renting in land for cultivation as a coping strategy. There is little reported renting out of land or use of communal land, which emphasizes the acute shortage of land for cultivation in this region.

Figure 19: Cultivated acreage and the types of land tenure by site – Nyaribari Chache.
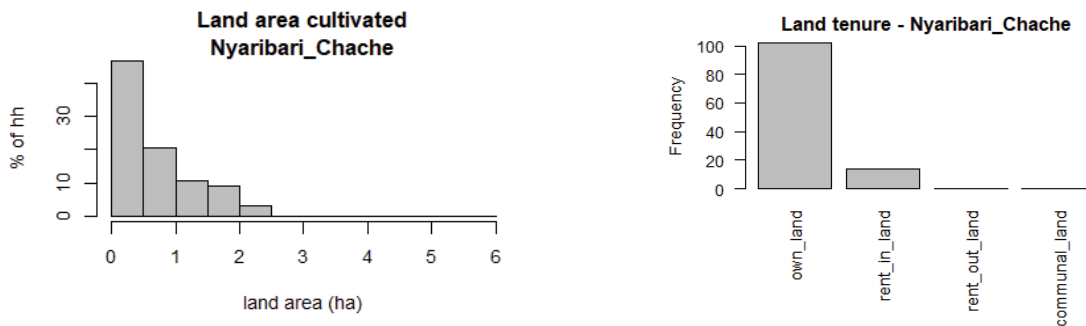
Figure 19 shows that less than 40 of the 102 households in the study own less than 0.5 ha of land, nearly 60 of the households own 1 ha or less and nearly 80 of them own 2 ha or less. The land tenure system for the majority (approx. 100) is private ownership with the remaining few renting in land for cultivation. No one reported renting out of land or use of communal land.

Figure 20: Cultivated acreage and the types of land tenure by site – S&E Kamagambo.
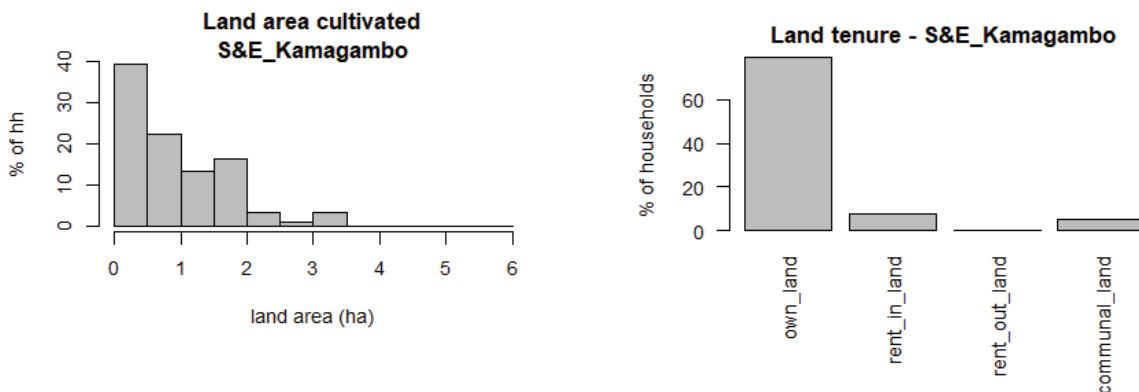
In S&E Kamagambo (Figure 20) less than 40 of the 99 households in the study own less than 0.5 ha of land, nearly 60 of the households own 1 ha or less. Nearly 85 of them own 2 ha or less. A few households (<10) own larger holdings of between 2 and 3.5 ha. The land tenure system for the majority (nearly 100) of households is private ownership with the remaining minority renting in land or using communal land.

Figure 21: Cultivated acreage and the types of land tenure by site – Suna West.
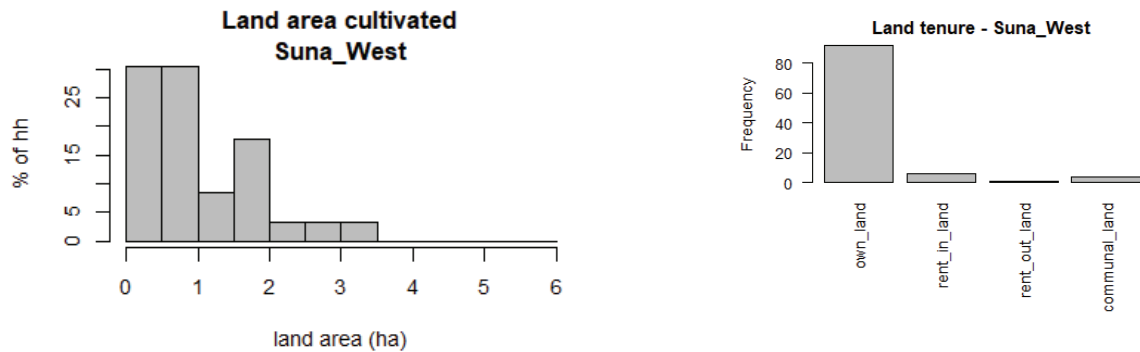
In Suna West (Figure 21) less than 60 of the 95 households in the study own less than one ha of land. Less than 85 of them own 2 ha or less. Some households (>10) own larger holdings of between 2 and 3.5 ha. The land tenure system for the majority (nearly 90) of households is private ownership with the remaining minority renting in land or using communal land.

Land management

In Kitutu Chache North (Table 16) fertilizer use is the most widely reported farm management practice at 98%, followed by spraying (plunge dipping livestock and disease and pest control in crops) reported by 54% of the households. There are other farm productivity boosting practices that were reported but by a minority of farmers. These include manure use (26%), use of hybrid seeds (32%), deworming (35%) and contour ploughing among others. Several other key practices that are critical to sustainable agriculture like afforestation, composting, terracing, etc. were reported by a negligible number of respondents. Nearly half of the respondents were not applying any land conservation measures on their farms at all. These results emphasize the importance of increasing the percentage of households applying these best practices as a basis for transforming on-farm productivity. It is also significant that the low level of awareness within the study sample of soil problems of moisture (16%), fertility (29%) and erosion (16%) means a significant proportion of the respondents that are ignorant of these key soil parameters.

In Nyaribari Chache fertilizer use is the most widely reported farm management practice, at 97%, followed by spraying (plunge dipping livestock and disease and pest control in crops), which was reported by 64% of the households. Other productivity enhancing practices that were reported by a sizable proportion of the respondents include manure (47%), livestock vaccinations (44%), deworming (42%) and use of hybrid seed (40%) and general veterinary use (31%). It is noteworthy that the percentage of the study sample reporting on the application of best practices in livestock management is higher than in the Kitutu Chache North site. There are several other farm productivity boosting practices that were reported but by a minority of respondents. More attention needs to be put to help adopt productivity boosting practices so that they can further along the path of adoption of these best practices.

In S&E Kamagambo, fertilizer use is the most widely reported farm management practice at 95% followed by spraying (plunge dipping livestock and disease and pest control in crops), which was reported by 56% of respondents and livestock vaccinations (52%). Other practices that were reported by a sizeable proportion of respondents include deworming (45%), manure use (38%), use of hybrid seed (35%), perception of soil erosion and fertility (32%). There are a range of other farm productivity boosting practices that were reported but by a minority of farmers. It is noteworthy that similar to all sites, nearly half of the study sample farmers were not applying any meaningful land

conservation measures. This is where more attention needs to be put to help to move the farmers along the path of adoption of these best practices for desired change to be achieved.

In the Suna West site fertilizer use is the most widely reported farm management practice at 86%. The proportion of farmers reporting other best practices is generally low at this site compared to the other three sites, save for their perception of soil fertility and erosion at 42% and 41%, respectively. Other practices that were reported by a sizeable proportion of respondents include deworming (21%), spraying/vaccinations (31%), strip planting (21%), manure use (31%) use of hybrid seed (35%) and perception of soil erosion and fertility (32%). It is noteworthy that similar to all sites, more than half (55%) of the farmers in the study were not applying any meaningful land conservation measures, an area that needs more attention to help farmers adopt more of these best practices.

Table 16: Land and livestock management practices in households (HH) in the four study sites

(% of HH)		Kitutu Chache North	Nyaribari Chache	S&E Kamagambo	Suna West
		(% of HH)	(% of HH)	(% of HH)	
Farmer perceptions	Soil fertility problems	29	18	32	42
	Soil erosion problems	15	18	32	41
	Soil moisture problems	16	16	16	17
Crop inputs used	Fertilisers	98	97	95	86
	Manure	26	47	38	31
	Pesticides	9	12	2	0
	Hybrid seeds	32	40	35	38
	Compost	6	0	1	3
	None	0	1	1	6
Livestock inputs used	Spraying	54	64	58	31
	Deworming	35	42	45	21
	Vaccinations	28	44	52	31
	General vet	21	31	28	18
	Antibiotics	3	2	5	2
	Traditional	3	3	10	12
Land conservation practices	Contour ploughing	30	16	12	7
	Cut off drain	18	20	10	16
	Hill afforestation	2	6	3	0
	Ridge and furrow	1	3	12	9
	Soil or stone bunds	0	2	2	1
	Strip planting	13	22	21	21
	Terraces	0	4	3	1
	Water ponds	1	0	1	1
	None	48	48	49	55

Human welfare

Food security

During the lean period, respondents reported significant reduction in some foods including meat, eggs, fruits, nuts and legumes. Other foods whose consumption is only marginally reduced during this period include grains and tubers, vegetables and milk.

The results across sites demonstrate that women have less decision-making power compared to men over household income and consumption of foodstuffs. Depending on the site, between one-third to two-thirds of households reported no or very little female decision-making. The next most common response was of shared decision-making, with women taking a slightly lesser role compared to men. The third most common response was of very high levels of female control over income and foodstuffs, which is typical of households headed by a single female.

Figure 22: Food deficit months and foods consumed in Kitutu Chache North
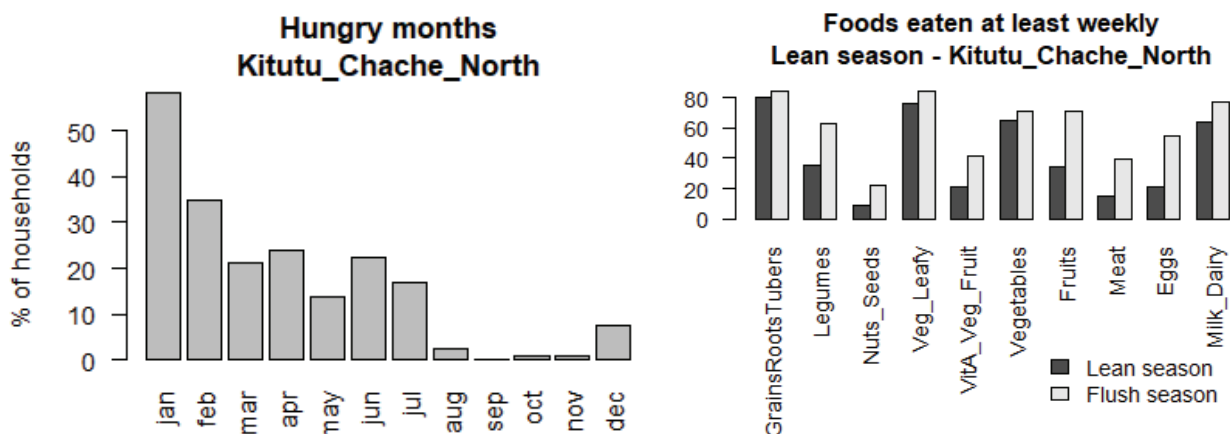
Generally, in Kitutu Chache North (Figure 22) there are two hunger peaks in one year. The main peak is in January and February where it affects more than 70% and 35% of the respondents, respectively. There is a minor hunger peak from May to July (May 15%, June 25% and July 20%). August to November months represent the hunger free period at the site with a small or negligible number of households reporting hunger. In the lean season, the foods consumed include grains/roots/tubers (80%) leafy vegetables (<80%), vegetables and milk (60%), legumes and fruits (>30%), and milk and meat at <20%. The pattern of food consumed during the flush season is similar to that in the lean season except that the percentage of households reporting is consistently higher for each food type. This increase is highest for eggs, meat, fruits, nuts and legumes, which show a doubling of consumption in the flush season compared to the lean season. The corresponding increase in milk, vegetables and grains/roots /tubers consumption is marginal.

Figure 23: Food deficit months and foods consumed in Nyaribari Chache
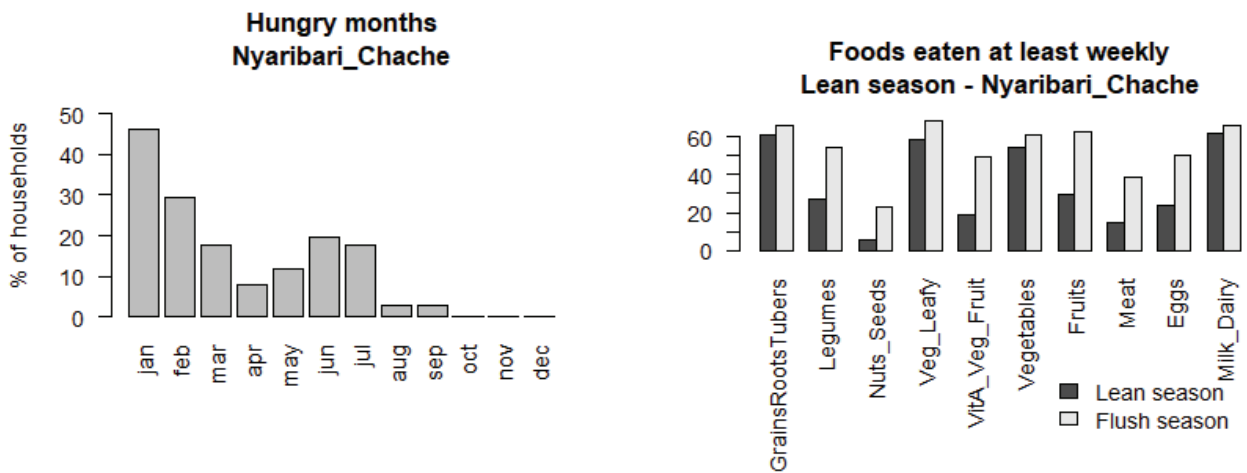
Generally in Kitutu Chache North (Figure 23), there are two hunger peaks in one year. The main peak is in January, February and March where it affects up to more than 45%, 30% and 20% of the respondents, respectively. There is a minor hunger peak from May to July (May 15%, June 25% and July 20%). The August to December months represent the hunger free period in the site with a small or negligible number of households reporting hunger. In the lean season, the foods consumed include grains/roots/tubers (60%) leafy vegetables (55%) and milk (60%), legumes and fruits (>30%), meat (20%). The pattern of the food consumed during the flush season is similar to that in the lean season except that the percentage of households reporting is consistently higher for each food type. This increase is highest for eggs, meat, fruits, nuts and legumes, which shows a doubling of consumption in the flush season compared to the lean season. The corresponding increase in milk, vegetables and grains/roots/tubers consumption is marginal.

Figure 24: Food deficit months and foods consumed in S&E Kamagambo
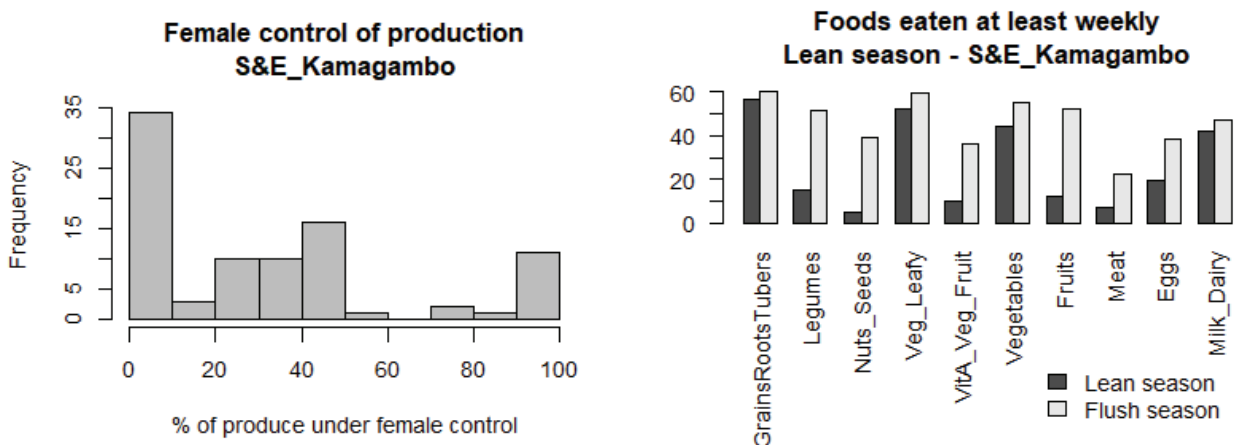
Generally in S&E Kamagambo (Figure 24), there are two hunger peaks. There is a main one from May to July (May <30%, June <40% and July 15%). The second peak is in January and February where it affects up to 25% and <10% of respondents, respectively. The August to December months represent the hunger free period in the site with a small or negligible number of households reporting hunger. A second hunger free period covers the months of March and April. In the lean season, the foods consumed include grains/roots/tubers (60%) leafy vegetables and milk (<60%), vegetables (50%) and milk (40%). The foods that are sparingly consumed during these lean times are eggs (<20%) meat (<10%) fruits (>10%), nuts/seeds (<5%) and legumes (>10%). The pattern of the food consumed during the flush season is similar to that in the lean season except that the percentage of households reporting is consistently higher for each food type. There is a doubling, trebling and even quadrupling in the frequency of the households that are consuming the food that were only moderately reported in the lean season. This increase is highest for fruits, nuts, legumes, eggs and meat. The corresponding increase in milk, vegetables and grains/roots /tubers consumption is marginal.

Figure 25: Food deficit months and foods consumed in Suna West
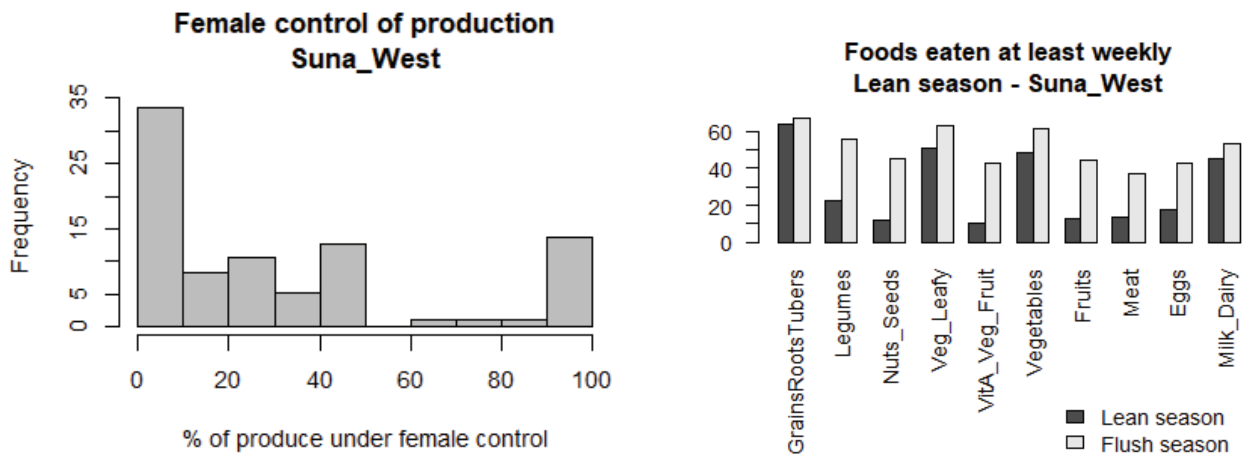
Contrary to other sites, Suna West (Figure 25) shows three hunger peaks: one in January and February, another from May to July and a minor one from October to December. The January peak affects approximately 25% of households, the next peak is in June with more than 25% of households affected and the last peak in November affecting >10% households. The results depict a site that has a serious food deficit situation, as there are no hunger free months. In the lean season, the foods consumed by the majority of the households include grains/roots/tubers (>60%) leafy vegetables (<55%) and milk (50%). The pattern of the food consumed during the flush season is similar to that in the lean season except that the percentage of households reporting is consistently higher for each food type. There is a doubling, trebling and even quadrupling in the frequency of the households consuming eggs, meat, fruits, nuts/seeds and legumes during the flush period. The corresponding increase in milk, vegetables and grains/roots /tubers consumption is marginal.

Female control of production

Figure 26: Female control of production in Kisii County sites
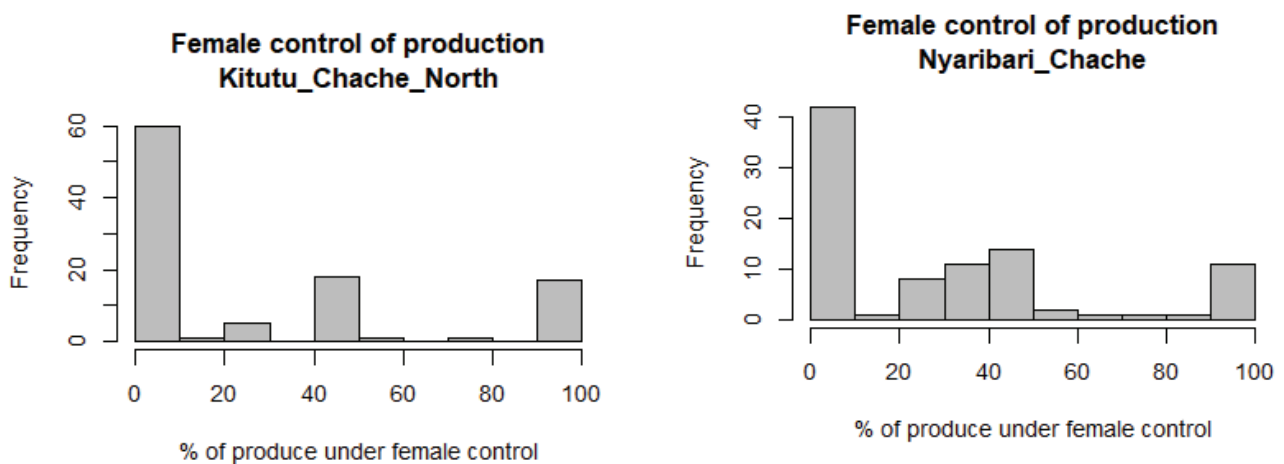
In Kenya, like in many other developing countries, women shoulder the bulk of the farm workload but they have little say in how the proceeds from their labour is utilized. Data was collected in this study to establish the situation in the specific study sites as far as female control of farm production is concerned.

Female control of production in Kitutu Chache North (Figure 26) is nil in nearly 60 of the households interviewed. At the other extreme, in slightly more than 20 of the households, women control nearly 100% of production with another significant result being some 20 households reporting 50% control (i.e. shared decision-making).

Female control of production in Nyaribari Chache (Figure 26) is nil in slightly more than 40 of the households interviewed. Shared decision-making (i.e. 50% control) was reported by about 35 households. About 10 households reported full female control (100%) of production. Overall, it shows that women are in some level of control of production in slightly more than 40 of the total 102 households studied.

Figure 27: Female control of production in Migori County sites
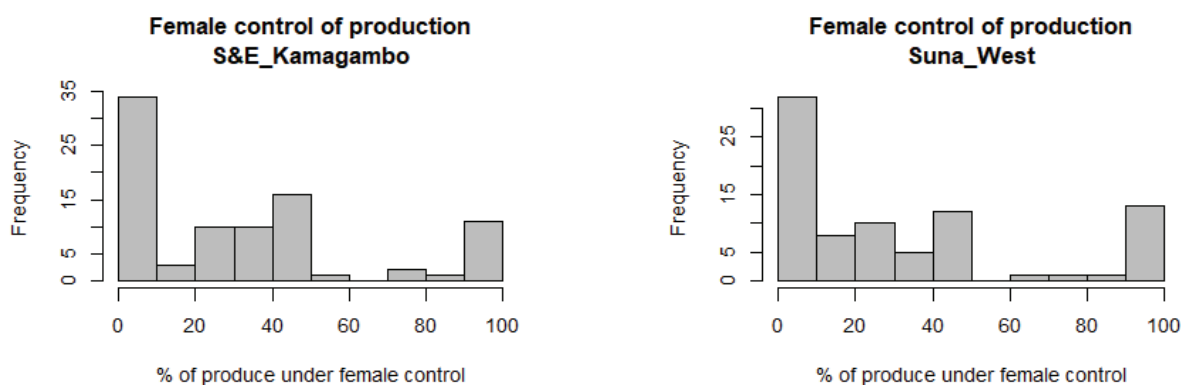
Female control of production in S&E Kamagambo is nil in slightly under 35 of the households interviewed (Figure 27). In about 35 households, the decision-making and control of production was shared. In about 10 of the households, female control of farm production was 100%. Overall, the results show that nearly 50% of women in the studied households are in some level of control of production.

Female control of production in Suna West (Figure 27) is nil in slightly more than 30 of the households interviewed. In about 30 households, control of production by women was 50%. In about 12 households production control was 100%

Concluding discussion and recommendations

More than 50% of the study sample were female respondents. While female farmers are the majority in terms of their contribution to farm production, the study has revealed that females are in the minority in terms of control of production. The average family size was four persons per household across all sites. The acreage within the sites is characteristically small-scale, generally between 0.5 and 2 ha with Kisii being on the lower range and Migori on the upper range. It is also a highly mixed crop and livestock farming system with a primary objective being self-sufficiency for home consumption with a majority (50% to 80%) living close to the poverty line (USD1.9). A secondary production objective of selling surplus to market is associated with the relatively wealthier households though selling out of desperation for cash among the poorer households too. Among the key crops grown and livestock kept are maize, beans, groundnuts, kales, bananas, sugar cane, *sesbania*, cattle, chicken, sheep and goats. Bean, groundnut and cowpea are the key legume species growing in the study area.

Majority of the indicators of best farm practices are low ranging from nil to <20% with fertilizer being the only one in near universal use. Use of hybrid seed, spraying, veterinary services and perception of soil problems, among others, were reported by a low to moderate proportion of respondents. Livestock ownership has been shown in this study to be an indicator of economic wellness of the household as it is less apparent within poorer households than wealthier ones. The main uses of grown legumes were food, income, feed, soil fertility, erosion control and fuel in that order. The two sites each in Kisii and Migori counties are similar in the type and composition of farm activities. Suna West is located in a potentially less agricultural area compared to the other sites. There is no discernible pattern for off-farm activities, as fewer responses than expected were elicited regarding this source of livelihood. The key crops grown are also the main sources of residue on farms where it is mainly used for livestock feed and soil fertility amendment. In the two Kisii and S&E Kamagambo sites, a foundation for commercial livestock production has been laid through use of planted forages, cutting and carrying feeds, mineral supplementation and use of crop residues as feed. Households in Suna West still have a long way to go to transform livestock farming from their current reliance on open grazing on natural pasture. There are two hunger periods across all sites, the major one being in January to February and a minor one in May to July, but in Suna West these two hunger seasons are reversed. Suna West has an additional third minor hunger period from October to December. In the lean season the foods consumed include grains/roots/tubers, vegetables and milk. The pattern of the food consumed during the flush season is similar to that in the lean season except that the percentage of households reporting is consistently higher for each food type. The study depicts a picture of a male-controlled culture in which men dominate with respect to control of farm production even though the contribution of women is higher.

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Annex 1: RHoMIS questionnaire

label::English (en)
RHoMIS for Legume SELECT
Section: METADATA
INTRODUCTION
Interviewer's name
Time at beginning of survey
Location Details
Country name
Local currency:
County name:
Sub-county name:
Village name:
Household ID:
Enumerator: Introduce yourself, and then read out the following statement to the interviewee(s).

Do you consent to be interviewed for this survey today?
If you agree, please make a mark or signature here:
THANK THEM POLITELY FOR THEIR TIME AND LEAVE THE HOUSE

Section: Household information
HOUSEHOLD INFORMATION
Respondent Details
What is the respondent's name?
Is the respondent male or female?
Is the respondent the head of the household?
What is the name of the head of household?
How are you related to the head?
Is the head person married (or has a partner)?
Does the head person often live and work away from home?
Household Head Details
How old is the head man of the household?
How old is the head woman/ senior woman of the household?
What is the highest level of education the head person has completed?
How many people live in your household?
Household population
For each person who lives in your household, please tell me their age and if they are male or female.
Person number USD{hh_pop_rep_num}:
Gender:
Age in years:
Is head of household?
FARM SIZE
Section: Farm Land Sizes

Does your household own land, rent land, use common land?
In total, how much land did you use for growing crops during the last 12 months?
Unit of land area:
Specify other area units:
How much land does your household own?
Unit of land area:
Who in the family owns your household's land?
Specify other area units:
About how much land does your household rent in for use?
Unit of land area:
About how much land does your household rent out for other people to use?
Unit of land area:
Specify other area units:
Who works on your land household members or other people too? Consider crops, livestock, any farm activities.
Is your land mostly flat (straight), sloping or steep slopes?
Does your household have a kitchen garden or other place where you grow vegetables and fruits for home consumption?
CROP PRODUCTIVITY
Does your household grow any crops?
Section: Crop productivity
Cataloguing the crops
CROP PRODUCTIVITY
Which crops were grown by your household during the last 12 months?
Other Crops
Specify other crop #1 :
Specify other crop #2:
Specify other crop #3:

Who decided which crops to plant?
What vegetables does your household grow?
What fruits and fruit trees does your household have?
Please specify other fruit:
Please specify other vegetable:
Did you harvest any of your crops early during the last 12 months?
Which crops did you harvest early?
Why did you harvest the crops early?
Define "other":
Out of all of the crops grown by your household in the last 12 months, which were the MOST IMPORTANT? ENUMERATOR: If they grow any grain legumes, be sure to record at least one of those as an important crop.
Crop Details Repeat Loop
I'm going to ask you about each of these most important crops now. Define crop number USD{crop_rep_number}:
Crop Details
Crop number USD{crop_rep_number}: USD{crop_label}
In which season did you grow USD{crop_label}?
During the 12 months, was the USD{crop_label} harvest good or bad?
About how much USD{crop_label} did you harvest during the last 12 months?
Crop yield units:
About how much of your land did you use for growing USD{crop_label} during the last 12 months?
Did you grow USD{crop_label} intercropped with other plants?
What other plants were grown in combination with the USD{crop_label}?
Define other intercrop:
Crop number USD{crop_rep_number}: USD{crop_label}
Specify the crop yield 'other' units:
Crop Use
Crop number USD{crop_rep_number}: USD{crop_label}
What did you do with the main harvest of USD{crop_label} during the last 12 months? Did you eat it, use at home, sell it?

Crop number USD{crop_rep_number}: USD{crop_label}
About how much of the USD{crop_label} was consumed or used by the household during the last 12 months?
About how much of the USD{crop_label} was sold during the last 12 months?
About how much of the USD{crop_label} was fed to livestock during the last 12 months?
About how much of the USD{crop_label} was saved for seed during the last 12 months?
Crop number USD{crop_rep_number}: USD{crop_label}
How much money did you make from selling USD{crop_label} during the last 12 months?
sale price units:
Crop number USD{crop_rep_number}: USD{crop_label}
Specify the crop sale price 'other' units:
Crop number USD{crop_rep_number}: USD{crop_label}
Who usually decides what do to with the income from selling the USD{crop_label}?
Who usually decides when to eat the USD{crop_label}?
Crop number USD{crop_rep_number}: USD{crop_label}
What did you do with the crop residues from the USD{crop_label} during the last 12 months?
Did you cultivate or harvest any other legume plants during the last 12 months? For example, leguminous trees, hedgerows, or leafy plants?
Which leguminous plants did you cultivate?
Define "other" legume:
I'm going to ask you a few questions about each legume. Define legume number USD{leg_rep_num}:

What type of plant is it?
Was the USD{leg_name} intercropped or grown in combination with other plants?
What other plants were grown in combination with the USD{leg_name}?
Define other intercrop:
About how many trees / shrubs of USD{leg_name} do you have?
About how much of your land did the USD{leg_name} occupy? What proportion?
What do you use the USD{leg_name} for?
How much USD{leg_name} did you harvest in the last 12 months?
Units:
How much money did you make from selling USD{leg_name} in the last 12 months?
Thinking of any legume species you cultivate, including grain legumes, trees, or grassy species, why did you choose to grow them?
Did you use any crop inputs during the last 12 months? What did you use?
Agricultural Inputs
Define "other" agricultural input:
On which crops did you use fertilisers on during the last 12 months?
How much fertiliser in total was used during the last 12 months?
Fertiliser amount units:
What types of fertiliser does your household normally use?
Specify other fertiliser amount units:
Specify other fertiliser type:
On which crops did you use manures or compost during the last 12 months?
On which crops did you use pesticides during the last 12 months?

For which crops did you use improved seed varieties during the last 12 months?
How did you store your crops after the harvest during the last 12 months?
Define "other":
Which crops did you store during the last 12 months?
Did you add anything to help preserve the crops in the storage?
What did you add to help preserve the crops?
Define 'other' substance added during crop storage:
Did you grow any crops under irrigation during the last 12 months?
Which crops did you irrigate during the last 12 months?
What type of irrigation method did you use?
Define 'other' irrigation method:
Which months did you irrigate?
LAND MANAGEMENT
Did your household till or plough your land?
Did you do the tillage by hand? Or use animals, or machines?
Does your household make use of any trees on your land?
What does your household use the trees for?
Define 'other' tree use:
Does your household grow trees and crops mixed together?
Does your household use legumes (peas, beans) to improve your soil fertility?
Does your household practice any methods of soil and water conservation?
Define 'other' water conservation practice:
Do you still experience problems with lack of water or too dry soils?
Do you still experience problems with soil loss and erosion on your farm?
Do you still experience problems with soil fertility on your farm?

LIVESTOCK
Does your household own any livestock or animals?
Section: Livestock
Which livestock does your household keep?
Section: Livestock
Specify other poultry:
Specify other livestock #1:
Specify other livestock #2:
Specify other livestock #3:
How many head of cattle does your household own?
How many head of sheep does your household own?
How many head of goats does your household own?
How many head of pigs does your household own?
How many head of goose does your household own?
How many head of turkey does your household own?
How many head of ducks does your household own?
How many head of camel does your household own?
How many head of chicken does your household own?
How many head of USD{livestock_otherpoultry} does your household own?
How many head of rabbit does your household own?
How many head of donkeys (or similar) does your household own?
How many head of horses does your household own?
How many fish does your household own?
How many bee hives does your household own?
How many head of USD{livestock_other1} does your household own?
How many head of USD{livestock_other2} does your household own?
How many head of USD{livestock_other3} does your household own?
Does your household use any grazing land for your animals?
Does your household own any of the grazing land?
Does your household keep any of your livestock in stables or pens?
What are the MOST IMPORTANT livestock your household owns?
Livestock Details Repeat Loop

I'm going to ask you about each of your most important livestock in turn. Define livestock number USD{livestock_rep_number}:

Livestock number USD{livestock_rep_number}: USD{livestock_label}
Are they local breeds?
How many USD{livestock_label} does your household use for draught power?
How many bee hives does your household have at the moment?
How much time are the USD{livestock_label} kept inside a pen or stable?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How many USD{livestock_label} did you buy (or receive) in the last 12 months?
How many live USD{livestock_label} have you sold in the last 12 months?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How much money did you make from selling live USD{livestock_label} in the last 12 months?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Who in the household owns the USD{livestock_label}?
Who usually decides what do to with the income from selling the live USD{livestock_label}?
Did any of the USD{livestock_label} die during the last 12 months? How many?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How many USD{livestock_label} have you slaughtered for meat in the last 12 months?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
What did you do with the meat? Eat it, sell it?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
About how much did you eat?
About how much did you sell?

How much money did you make from selling the USD{livestock_label} meat in the last 12 months?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Who usually decides what do to with the income from selling the USD{livestock_label} meat?
Who usually decides when to eat USD{livestock_label} meat?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Does your household collect milk from the USD{livestock_label}?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How many USD{livestock_label} did you milk per day?
About how much milk do the USD{livestock_label} produce when they are milking well?
Unit:
About how much milk do the USD{livestock_label} produce when they are not milking well?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Define milk production 'other' units:
Livestock number USD{livestock_rep_number}: USD{livestock_label}
What does your household do with the USD{livestock_label} milk? Drink it at home, sell it, make dairy products?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
About how much of the USD{livestock_label} milk does the household consume?
About how much USD{livestock_label} milk does your household use for dairy products?
About how much USD{livestock_label} milk does your household sell?
What dairy products does your household make?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How much money does your household make from selling the USD{livestock_label} milk?
per:

Specify 'other' time units:
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Who usually decides what do to with the income from selling the USD{livestock_label} milk?
Who usually decides when to eat/drink the USD{livestock_label} milk?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Does your household collect eggs from the USD{livestock_label}?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How many eggs do the USD{livestock_label} usually produce, during the good season?
Unit:
How many eggs do the USD{livestock_label} usually produce, during the bad season?
Specify 'other' eggs production units:
Livestock number USD{livestock_rep_number}: USD{livestock_label}
What does your household do with the USD{livestock_label} eggs? Do you consume them, use them in the home, sell them?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
About how many eggs does your household keep for eating (or home use)?
About how many eggs does your household sell?
About how many eggs does your household use for hatching?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How much money does your household make from selling the USD{livestock_label} eggs?
per:
Specify 'other' time units:
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Who usually decides what do to with the income from selling the USD{livestock_label} eggs?

Who usually decides when to eat the USD{livestock_label} eggs?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How much honey did you collect in in the last 12 months?
Unit:
What did you do with the honey? Eat it, sell it?
Specify 'other' honey units:
Livestock number USD{livestock_rep_number}: USD{livestock_label}
About how honey much was consumed?
About how honey much was sold?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
How much money was made from selling the honey?
Livestock number USD{livestock_rep_number}: USD{livestock_label}
Who usually decides what do to with the income from selling the honey?
Who usually decides when to eat the honey?
Did you buy or use any medicines for your livestock?
What medicines does your household use?
Define 'other' livestock medicine:
Which animals does your household give the medicines to?
What does your household do with the manure from the animal's stables or pens?
FEEDING SYSTEMS AND FEEDS
Section: Feeding systems and feeds for cattle, sheep, goats.

| Which feeding system are you using for your animals? |
| What did you feed the animals? |
| Please specify other feed |
| |
| During the DRY SEASON, how much of your animals' feed is from… |
| Residues from legume crops? |
| Other crop residues? |
| Cultivated forage? |
| Gathered forage? |
| Brewery by-products? |
| Supplements? |
| Concentrates? |
| Minerals? |
| Grains? |
| Vegetables or fruit? |
| Food waste? |
| Other feed, such as USD{other_feed}? |
| |
| |
| During the WET SEASON, how much of your animals' feed is from… |
| Residues from legume crops? |
| Other crop residues? |
| Cultivated forage? |
| Gathered forage? |
| Brewery by-products? |
| Supplements? |
| Concentrates? |
| Minerals? |
| Grains? |
| Vegetables or fruit? |
| Food waste? |
| Other feed, such as USD{other_feed}? |
| |
| |
| |
| |
| |
| Section: Wildfoods |
| |
| WILD FOODS |

Does your household gather any wild foods?
What types of foods did you gather in the last 12 months?
What times of year does your household collect wild foods?
Does your household eat the wild foods, or sell them?
About how much money did you make from selling wild foods during the last 12 months?
Who usually decides what do to with the income from the wild foods?
Approximately how much of your household's food comes from wild foods?

Section: Food Security Status
FOOD SECURITY
Food Security
Is there a time of year when there is a less food compared to other times?
Which months were there food shortages in the last year?
Which is the worst month of the year for food?
Which is the best month of the year for food?

Section: FIES (Food Security Experience)
Think back over the last YEAR. Was there a time when, because of lack of money or other resources…
You were worried you would not have enough to eat?
You were unable to eat healthy and nutritious food?
You ate only a few kinds of foods?
You had to skip a meal?
You ate less than you thought you should?
Your household ran out of food?
You were hungry but did not eat?
You went without eating for a whole day?

SECTION: Nutritional Diversity
I'm going to ask you some questions about how often your family ate different kinds of foods, during the WORST MONTH of the last year, AND during the BEST MONTH.
I'm going to ask you some questions about how often your family ate different kinds of foods, DURING THE LAST MONTH

Think of: food made from grains, flour, or starchy white vegetables.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of: beans, peas, lentils.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where does this food come from...
During the best month?
During the worst month?
During the last month?
Think of: nuts or seeds.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of: leafy green vegetables.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?

During the worst month?
During the last month?
Think of: orange coloured vegetables or fruits.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of: other vegetables.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of: other fruits.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of: meat, poultry or fish.
Did you personally eat any of these foods in the last 24 hours?

How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of: eggs.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
Think of milk: or dairy foods.
Did you personally eat any of these foods in the last 24 hours?
How often were these eaten in your household during the best month in the last year?
How often were these eaten in your household during the worst month in the last year?
How often were these eaten in your household during the last month?
Where did this food come from...
During the best month?
During the worst month?
During the last month?
And finally, in the last 24 hours have you personally eaten...
Any foods with oils and fats. Such as…
Any savoury and fried snacks. Such as…
Any sweets. Such as…
Any sugar-sweetened beverages. Such as…
Any condiments and seasonings. Such as…
Any other packaged foods. Such as…

AID
Have you received aid from the government, NGOs or other organisations in the last 12 months?
Have you received any gifts from family, friends, neighbours in the past year?
Aid Received
What types of aid have the household received during the last 12 months, from government or organisations?
Specify other type of aid:
About how much of the food eaten by your household was from aid sources?
Gifts Received
What types of gifts have the household received during the last 12 months, from family, friends, neighbours?
Specify other type of gift:
About how much of the food eaten by your household was from gifts, from family, friends, neighbours?
Does your household have any credit, debts or loans, or did you have any in the last 12 months?
Did you ever find it difficult to pay the debts in the last 12 months?
OFF-FARM INCOME
Does your household have any sources of income apart from selling what you produce on the farm?
Section: Off-farm income
What are those sources of off-farm income?
Specify other off farm income:

Off Farm Income Details Repeat Loop
I'm going to ask you about each of your off farm income sources in turn. Define off farm income number USD{offfarm_rep_number}:
Off farm income number USD{offfarm_rep_number}: USD{offfarm_label}
Does your household earn money from USD{offfarm_label} ALL YEAR LONG?
Off farm income number USD{offfarm_rep_number}: USD{offfarm_label}
Which months does your household earn money from USD{offfarm_label}?
Off farm income number USD{offfarm_rep_number}: USD{offfarm_label}
Who decides how to spend the money from USD{offfarm_label}?
Consider all the money earned in the last 12 months from selling farm produce, and from the cash activities we just discussed. Did more money come sales of farm produce, or more from the off farm cash activities?
When spending the money on that is earned FROM OFF-FARM sources, what sorts of things does your household spend it on?
When spending the money on that is earned FROM SALES OF FARM PRODUCE, what sorts of things does your household spend it on?
FINAL HOUSEHOLD QUESTIONS
Section: Progress out of Poverty
In which county does the household reside?
What is the highest educational level that the female household head/spouse reached?
What is the highest educational level that any member of the household reached?
Over the past 7 days, did the household either purchase/consume/acquire any bread?
Over the past 7 days, did the household either purchase/consume/acquire any meat or fish?
Over the past 7 days, did the household either purchase/consume/acquire any ripe bananas?
Does your household own any towels?
Does your household own any thermos flasks?

What is the predominant wall material of the main dwelling unit?
What is the predominant floor material of the main dwelling unit?
Section: Closing the Survey
CLOSE
Thank you very much, we are now finished with the questions. Do you have any questions or comments for me?
Would you allow us to telephone you for a short conversation (5 or 10 minutes only), to follow up on this survey?
Please give phone number:
Household GPS Coordinates
ENUMERATOR: How many people contributed to answering the survey?
ENUMERATOR: In your opinion, how easily did you establish rapport with the respondent?
ENUMERATOR: How reliable do you think these answers are? Consider the accuracy and willingness to answer.
What time did you finish the survey?
Do you have any notes or comments from the interview?
Survey Complete !

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