LegumeSELECT: Rural Household Multi-Indicator Survey (RHoMIS) report for South Kivu, Eastern Democratic Republic of Congo

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LegumeSELECT: Rural Household Multi-Indicator Survey (RHoMIS) report for South Kivu, Eastern Democratic Republic of Congo

Wivine Munyahali[1], Jim Hammond[2], Michel Kulemba[3], Pascal Chakirwa[1], Jean Walangululu[1], Bernard Vanlauwe[3] and Generose Nziguheba[3]

1 Catholic University of Bukavu
2 International Livestock Research Institute
3 International Institute of Tropical Agriculture

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Patron: Professor Peter C Doherty AC, FAA, FRS
Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

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Abbreviations and acronyms

DRC	Democratic Republic of Congo
FIES	Food Insecurity Experience Scale
HH	Household
MAE	Male adult equivalent (in terms of calorie demand)
ODK	Open Data Kit
RHoMIS	Rural Household Multi-Indicator Survey
SSA	sub-Saharan Africa
TLU	Tropical Livestock Units
TVA	Total value of activities
USD	United States dollar
yr	year

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1. Introduction

The LegumeSELECT project aims at improving the use of legumes in smallholder farming systems in sub-Saharan Africa (SSA) through improved decisions support that considers the farming context, farmer objectives, the legume attributes and their relation to the biophysical environment. The project combines existing data and new data from on-farm and on-station experiments to better understand the relationship between legume traits and farmers' aspirations in a range of biophysical and socio-economic contexts. The project focuses on addressing a major question of the under-exploitation of the potential of legumes in improving smallholder livelihoods.

The project is implemented in three African countries namely, the Democratic Republic of Congo (DRC), Ethiopia and Kenya. In DRC, the project is implemented in two territories, Kabare and Walungu located in the South Kivu Province, in eastern part of the country.

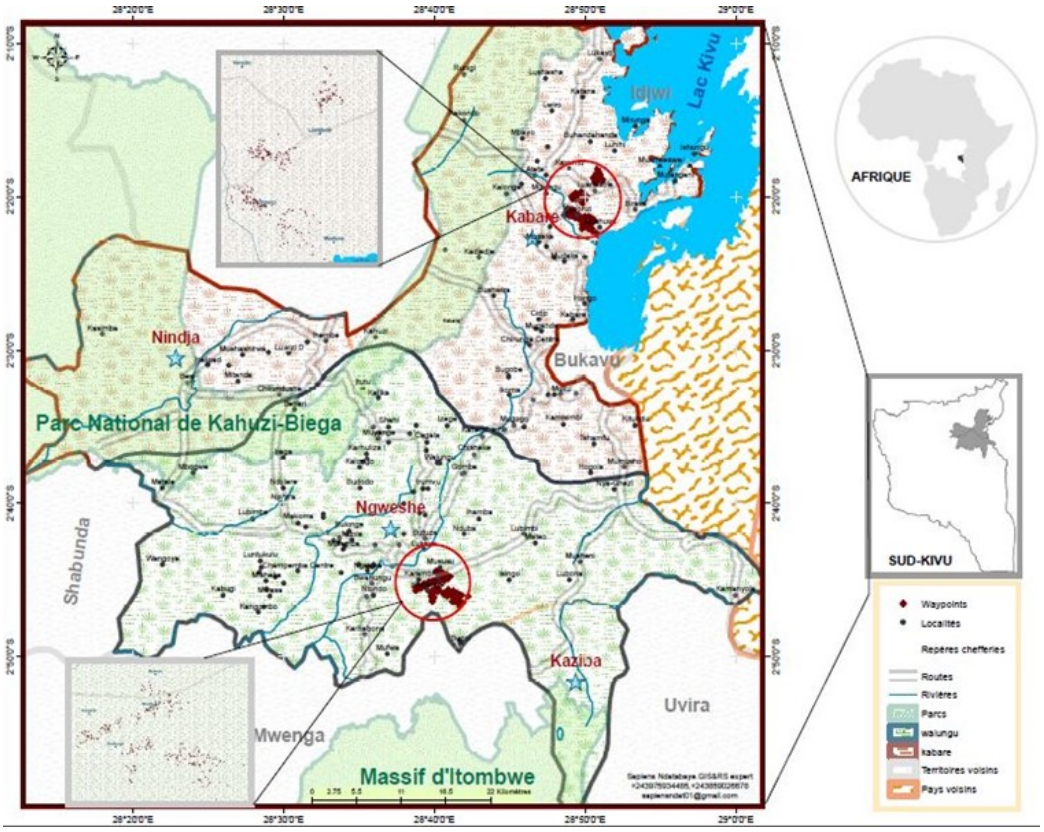
To understand the prevailing situation in the sites, a baseline survey (RHoMIS) was conducted to capture various characteristic of the farming context, with a particular accent on the share and role of legumes in the existing cropping system. This report highlights the results from the survey.

2. Materials and methods

2.1 Study area

The baseline survey was carried out in the Bushumba 'groupement' located in Kabare Territory (2.304 – 2.373° S, 28.811 – 28.853° E, 1448.9 – 2571.7 m above sea level[asl].) and Mushinga 'groupement' in Walungu Territory (2.739 – 2.779° S, 28.646 – 28.705° E, 1364.5 – 2139.8 m a.s.l) of the province of South Kivu in the eastern part of the Democratic Republic of Congo (Figure 1). In both territories, rainfall follows a bimodal pattern and allows crop cultivation during two seasons. There is a so called 'A' season lasting from mid-September through mid-January while the 'B' season lasts from mid-February to mid-June. Both 'A' and 'B' are rainy seasons where the former season is followed by about one month of dry season while the latter is followed by about three months of dry period, which is often referred to as the 'C' season, when farmers cultivate in valleys and drained marshlands (Pypers et al. 2011; Munyahali et al. 2017). The area receives on average 1,100-2,700 mm of rain per year and the altitude for both sites is between 1,300-2,000 m above sea level (Munyahali et al. 2020). The two surveyed territories are along a north to southwest axis, with the provincial capital town of Bukavu in the centre (Maass et al. 2012) and comprise a total of eight villages.

Figure 1: Geographical location of the two surveyed territories (Kabare and Walungu) in South Kivu, DRC



2.2 Household selection and characterization

This study focused on smallholder farmers in the Bushumba and Mushinga sites. Eight villages were randomly selected in the two sites based on population density (more than 100 households per km^2) and market access (good and medium).

A total of 525 households (HH) were selected (271 households in Bushumba and 254 in Mushinga) using the transect method, which consisted of drawing lines in the target areas of the study and selecting one household after each 100 metres of the line. Where the household head was absent, the next household was considered. A structured questionnaire was used to characterize each household in terms of socio-economic importance of legumes, land use, crop management practices (intercropping system, rotation, crop arrangement, etc.), inputs used (local or improved germplasm, manure or fertilizers), soil fertility status as perceived by the farmer (poor, average or good), farm size and land tenure status (owned, hired, borrowed). Prior to the interviews, the Open Data Kit (ODK) application was installed on the tablets (smartphones) used by the enumerators and was used for conducting the survey. The farmer surveys were carried out in June 2019, and questions referred to the previous 12 months from the date of the survey (i.e. June 2018–June 2019).

Photo 1: Data collection in Itara (left) and Luduha (right). Photo credit Michel Kulumba

2.3 Data analysis

Descriptive statistics were carried out for the selected socio-economic parameters using the R software environment.

3. Results and discussions

3.1 Socio-economic profile of respondents

Almost two thirds of the respondents were female in both Bushumba and Mushinga sites, and according to the enumerators, responses on survey implementation (reliability and rapport), were satisfactory (Table 1). Where the respondent did not self-identify as the household head, usually they considered themselves to be the partner of the household head. The survey duration was less than one hour in general (Table 1).

Table 1: Selected socio-economic characteristics of households (HH) included in the survey in Bushumba and Mushinga. Abbreviations: Nr: number, rspnts: respondents, avg: mean average.

Groupement	Nr interviews	% Female rspnts	% HH head rspnts	% HH heads married	% Single female	% Single male	% Polygamous	Survey duration (avg and sd mins)	% Reliable or very reliable	% Easy or medium rapport
Bushumba	271	61	64	75	21	1	4	44 (18)	91	99
Mushinga	254	66	57	80	13	3	5	47 (16)	85	99

The average size of a household was similar in both Bushumba and Mushinga (6.8 members per HH). Similarly, the average cropped land was the same in the two sites (0.8 ha) (Table 2). Areas of land owned and cultivated were collected on a per plot basis, with each plot's estimated length and width in metres. This was because it was thought that most farmers would not know their land area in acres or hectares or other area measurement. This system does entail a large variability of estimates so we should treat land areas (and related measures such as yield/ha) with even more caution than usual. The number of livestock owned per household was higher in Mushinga than in Bushumba (Table 2). Agriculture is the main source of income generation for farmers in the two sites, and most of it comes from crop production. Livestock production and off-farm activities also contribute to the income of households in both sites but to a much lesser extent (Table 2).

Table 2: Key site characteristics. Abbreviations: HH = household; MAE = male adult equivalent; TVA = Total value of activities; pers = per person.

	Bushumba		Mushinga	
	Mean	sd	Mean	sd
HH size (members)	6.8	3.0	6.8	2.8
Land cultivated (ha)	0.8	1.1	0.8	1.2
Total livestock holdings (TLU)	0.5	0.9	0.7	0.9
Total value of production (USD/MAE/day)	0.3	0.4	0.3	0.6
Cash income (USD/MAE/day)	0.1	0.2	0.1	0.4
Crop production value (USD/HH/year)	352	618	306	670
Livestock production value (USD/HH/year)	39	159	81	372
Market orientation (% produce sold)	29	29	20	27
Off-farm income (USD/HH/year)	13	121	14	151
Head person education (1-5)	2.4	1.3	2.7	1.2
Female control of production (%)	36	33	36	36
Male control of production (%)	64	33	64	36
Youth control of production (%)	3	15	4	17
TVA (USD/pers/day)	0.3	1.2	0.3	0.8
Cash income (USD/pers/day)	0.1	1.2	0.1	0.6
Income sources (count)	1.8	1.4	1.7	1.6

3.2 Livelihoods

Figures 2 and 3 indicate the size and source 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 2019 purchasing parity power. 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 colour 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 both locations, the total value of activities produced by households is very low, and predominantly crop based. In Bushumba, cash crops become more important as households become wealthier, whereas in Mushinga, livestock sale and consumption become more important as households become wealthier. There is almost no off-farm income.

Figure 2: Total value of households' activities in Bushumba

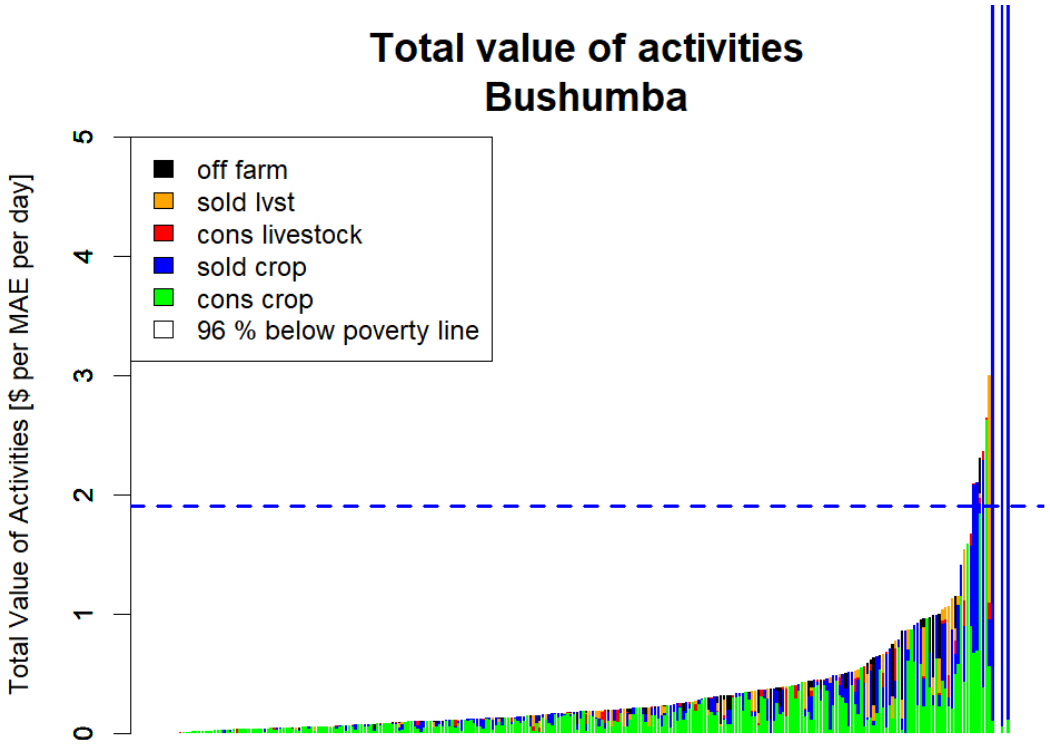


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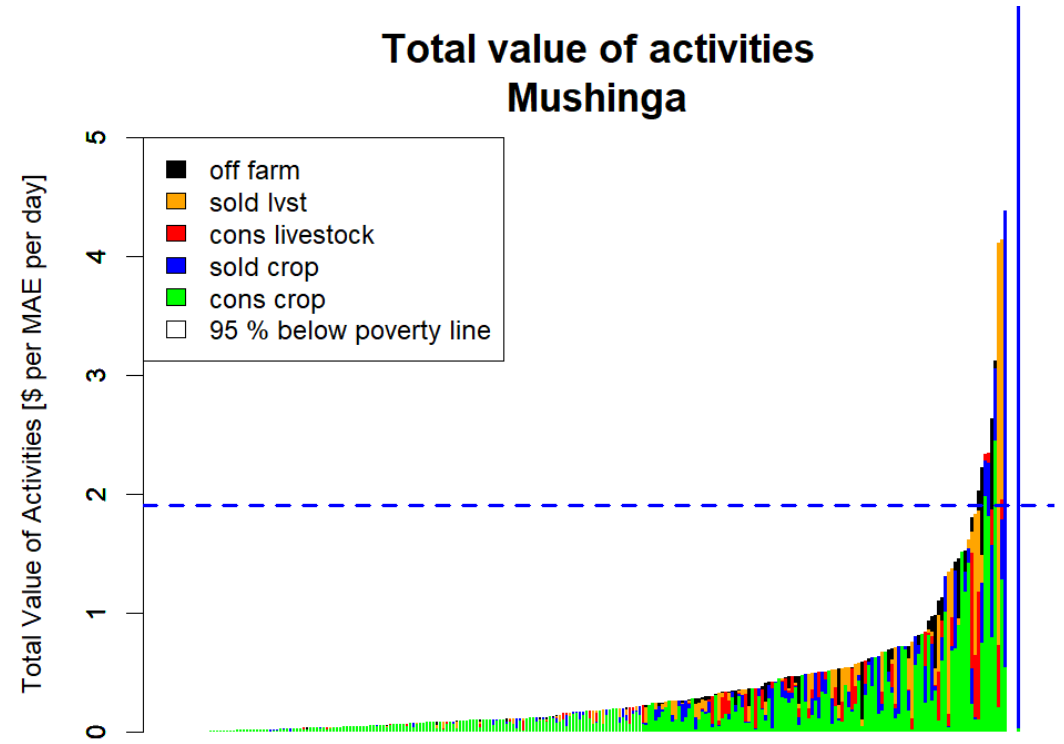
Figure 3: Total value of households' activities in Mushinga



3.3 Crops

Cassava is the most cultivated crop in both Bushumba and Mushinga while common bean (bush bean) is the most cultivated legume crop in this area (Figures 4 and 5). Fruit and legume trees are the least cultivated crops in the two sites. This can be explained by the fact that cassava is an important staple food and a major source of income in South Kivu Province of DRC (Munyahali et al. 2017). Results of this study are in line with the findings by Munyahali (2018) who found that cassava was the first and most important staple food for the majority of farmers followed by common bean or maize, in a study conducted in Kalehe and Uvira territories of South Kivu. In a series of surveys carried out by CIALCA (2010) in South Kivu, cassava and common bean were also ranked as the most important crops by the majority of households, followed by sweet potato and banana.

Figure 4: Crops grown by at least 10% of households in Bushumba

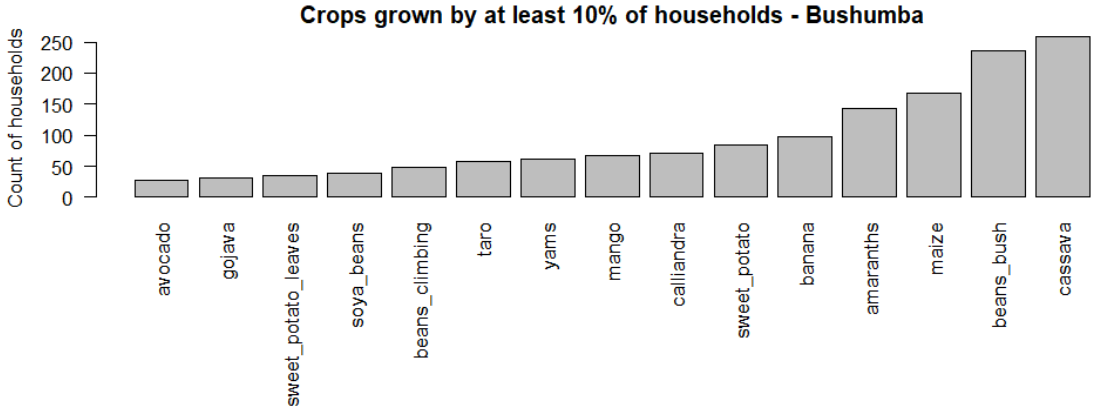
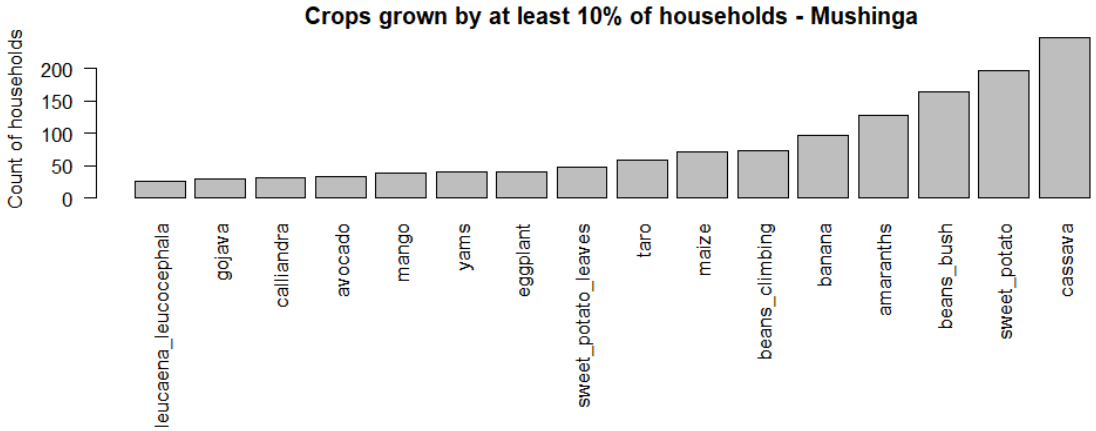


Figure 5: Crops grown by at least 10% of households in Mushinga



Cassava yields are almost similar in the two sites (Table 3). However, the yields are very low, which could suggest issues in the estimate of area occupied by the crop, given that cassava is mainly grown as an intercrop as shown in Tables 6 and 7. Maize yields were also similar in the two sites. The two crops occupied a similar land area in both Bushumba and Mushinga and are mainly cultivated for household consumption, as 67.5% (on average) of the production is consumed by the producers (Table 3). However, at least 32.5% of cassava and maize yields are sold and therefore constitute an important source of income for the households. Banana yield was higher in Bushumba than in Mushinga but the land area occupied by the crop was almost similar in both sites (Table 3). This crop is cultivated for both market and household consumption, as 53% of the production is sold while 47% is consumed by the producers

in the two sites (Table 3). Although the land area occupied by sweet potato was higher in Bushumba than in Mushinga, their yields were similar in both sites. Sweet potato is mainly produced for household consumption, 65.5% of the production is consumed by the producers while only 31% is sold.

Table 3: Main crops grown by households in Bushumba and Mushinga

		Bushumba		Mushinga	
		Mean	Sd	Mean	Sd
Cassava	Harvest (kg)	236	395	245	521
	Land area (ha)	0.4	0.8	0.4	0.7
	Yield (kg/ha)	947	1285	874	1315
	Consumed (%)	61	26	74	16
	Sold (%)	39	19	26	20
	Sale income (USD/yr)	116	160	145	244
Maize	Harvest (kg)	140	167	148	250
	Land area (ha)	0.3	0.5	0.2	0.2
	Yield (kg/ha)	756	1666	786	1050
	Consumed (%)	58	27	72	18
	Sold (%)	42	18	28	14
	Sale income (USD/yr)	104	159	1114	2435
Banana	Harvest (kg)	504	688	240	632
	Land area (ha)	0.4	0.5	0.3	0.6
	Yield (kg/ha)	2185	2460	1795	2769
	Consumed (%)	41	30	53	32
	Sold (%)	59	23	47	30
	Sale income (USD/yr)	122	240	59	82
Sweet potato	Harvest (kg)	298	606	209	210
	Land area (ha)	0.4	0.5	0.2	0.3
	Yield (kg/ha)	1334	1114	1457	1265
	Consumed (%)	59	34	72	22
	Sold (%)	41	22	28	19
	Sale income (USD/yr)	112	92	35	48

3.4 Crop residues

This section focuses on the use of crop residues in the study area. Crop residues remaining after harvest can act as a mulch that counteracts the destructive impact of rain on soils and help retain soil moisture, enhancing yields for subsequent crops.

Cassava, beans, maize, banana and sweet potato are the widely grown crops in the study area (Figures 4 and 5) and their residues are the main sources for soil amendment in both Bushumba and Mushinga sites (Tables 4 and 5), particularly given the low use of mineral fertilizers in the region.

Table 4: Percentage of households reporting uses of crop residues in Bushumba

	Fuel	Compost	Soil	Burn	Feed	Manure	Construction	Sell
Cassava	18	18	57	9	9	1	-	-
Bush beans	1	14	64	7	4	1	-	-
Maize	0	4	19	5	1	1	-	-
Banana	0	3	13	1	2	1	1	-
Sweet potato	0	1	8	1	2	0	-	0
Yam	0	0	5	3	-	-	-	-
Taro	-	0	3	2	-	-	-	-
Climbing beans	-	2	8	0	0	0	-	-
Soya bean	-	2	5	1	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. Dash (-) means not relevant.

Table 5: Percentage of households reporting uses of crop residues in Mushinga

	Fuel	Compost	Soil	Burn	Feed	Manure	Construction	Sell
Cassava	15	6	59	7	34	1	-	-
Bush beans	2	15	44	5	10	4	-	-
Maize	0	0	6	2	0	0	-	-
Banana	0	2	11	0	3	0	1	-
Sweet potato	0	3	31	4	20	1	-	0
Yam	0	1	2	1	-	-	-	-
Taro	-	0	5	1	-	-	-	-
Climbing beans	-	4	13	0	4	1	-	-
Soya bean	-	0	1	1	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. Dash (-) means not relevant.

3.5 Cropping systems

This section discusses the main crops and companion crops that were mentioned by at least 10% of the respondents.

Intercropping is the most common cropping system practiced by farmers in the two study sites. In Bushumba, the most common intercrops combinations are: bush/climbing beans-cassava, bush beans-maize, cassava-maize, cassava-climbing beans (see Table 6; the crop named first is the primary crop). In Mushinga, the most common intercrops are cassava-sweet potato, cassava-bush beans, bush beans-sweet potato, sweet potato-bush beans, cassava-maize, bush beans-maize (Table 7). This could be explained by the scarcity of land as well as the population explosion

characteristic of the region. As a result, most households are forced to cultivate relatively small areas of land. In earlier studies, farmers stated that they also practiced intercropping to reduce the risk of crop failure due mostly to diseases and pests or to rainfall failure (Weber et al. 1979; Leihner 2002; Fermont et al. 2008, 2009; Munyahali 2018).

Table 6: Percentage of households reporting intercropping practices in Bushumba. Dash (-) means not relevant.

Main crop	Companion crops							
	Cassava	Bush beans	Maize	Climbin beans	Sweet potato	Banana	Taro	Yams
Bush beans	62	-	40	1	7	4	6	3
Cassava	-	54	32	8	4	5	5	6
Maize	14	16	-	3	1	0	2	0
Banana	4	4	0	1	0	-	0	3
Yam	6	3	3	1	0	1	1	-
Climbing beans	6	0	4	-	0	0	0	0
Taro	4	3	2	1	1	0	-	0
Sweet potato	3	3	1	0	-	0	0	0
Coffee	1	2	0	0	0	2	0	0

Table 7: Percentage of households reporting intercropping practices in Mushinga. Dash (-) means not relevant.

Main crop	Companion crops							
	Cassava	Sweet potato	Bush beans	Maize	Climbing beans	Banana	Yams	Taro
Cassava	-	52	46	15	12	11	9	7
Bush beans	43	29	-	13	2	6	3	2
Sweet potato	35	-	20	4	7	2	2	3
Climbing beans	14	9	2	3	-	2	1	2
Banana	4	4	2	0	0	-	1	1
Taro	4	2	2	1	0	0	0	-
Maize	3	1	4	-	0	0	0	0

3.6 Livestock

Most households in Bushumba keep guinea pigs, chickens, goats, pigs and rabbits (in the order of their importance) while in Mushinga households keep chickens, pigs, guinea pigs, goats and rabbits (Figure 6). The average number of each type of animal kept per household was almost the same in both sites, except for guinea pigs and goats (Table 8). The average number of guinea pigs was lower in Bushumba than in Mushinga (8.6 and 11.2, respectively) while the average number of goats was higher in Bushumba (2.9) than in Mushinga (1.9) (Table 8). Regarding livestock feeding, households use grazing, crop residues, gathered forage and food waste as animal feed in the two sites (Figure 6). Concentrates, minerals and supplements are rarely used as animal feeds in the study area.

Figure 6: Livestock kept and animal feeds in Bushumba and Mushinga

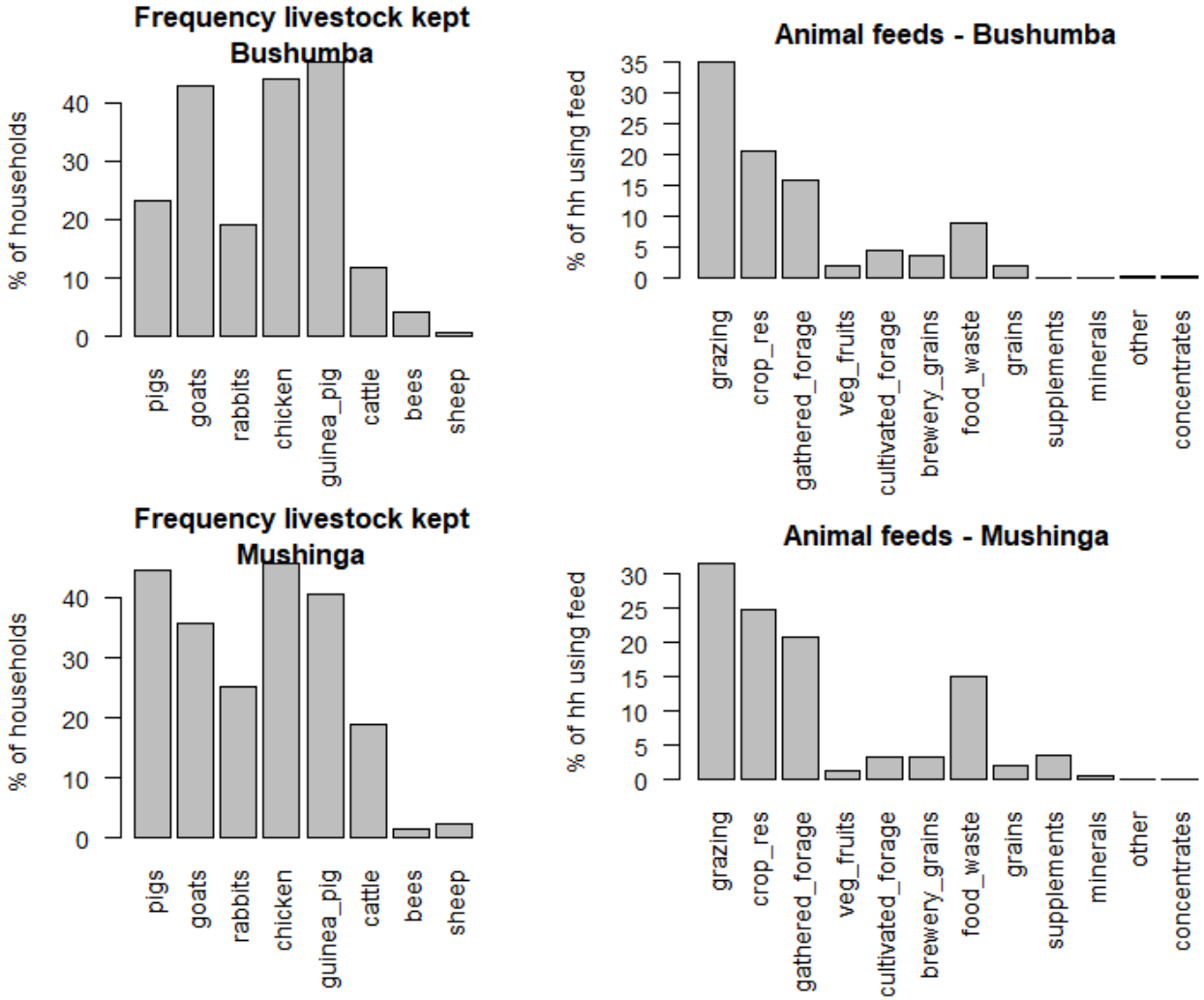


Table 8: Animals kept in Bushumba and Mushinga

		Bushumba		Mushinga	
		Mean	Sd	Mean	Sd
Cattle	Kept (count)	2.4	1.8	2.1	1.4
	Sold (count)	0.2	0.5	0.2	0.5
	Slaughtered (count)	0.0	0.2	0.0	0.0
	Milked (count)	1.5	0.7	1.3	1.8
	Milk yield (l/animal/day)	1.0	1.1	1.1	1.0
	Cash income (USD/yr)	81	613	184	722
% of HH with improved breeds		0.0	-	0.8	-
Goats	Kept (count)	2.9	1.7	1.9	2.3
	Sold (count)	0.4	1.1	0.3	0.8
	Slaughtered (count)	0.0	0.3	0.0	0.0
	Milked (count)	NA	NA	2.0	1.4
	Milk yield (l/animal/day)	NA	NA	0.5	0.7
	Cash income (USD/yr)	19	71	14	57
% of HH with improved breeds		0.0	-	0.4	-
Pigs	Kept (count)	1.4	1.4	1.4	1.0
	Sold (count)	0.7	1.5	0.6	1.5
	Slaughtered (count)	0.0	0.2	0.0	0.2
	Cash income (USD/yr)	45	123	38	101
% of HH with improved breeds		0.0	-	0.0	-
Chicken	Kept (count)	3.5	2.5	4.0	4.8
	Sold (count)	0.5	1.7	0.6	1.5
	Slaughtered (count)	0.6	1.1	0.9	2.2
	Egg yield (eggs/chicken/day)	1.2	NA	1.6	3.1
	Cash income (USD/yr)	3	21	5	34
% of HH with improved breeds		0.0	-	0.0	-
Guinea pigs	Kept (count)	8.6	8.8	11.2	7.7
	Sold (count)	0.4	2.7	2.2	5.1
	Slaughtered (count)	3.8	5.9	5.8	7.9
	Cash income (USD/yr)	1	11	3	11
% of HH with improved breeds		0.0	-	0.0	-
Rabbits	Kept (count)	2.9	3.7	2.6	2.4
	Sold (count)	0.5	2.7	0.5	2.3
	Slaughtered (count)	0.3	0.8	0.8	1.3
	Cash income (USD/yr)	2	27	1	12
% of HH with improved breeds		0.0	-	0.4	-

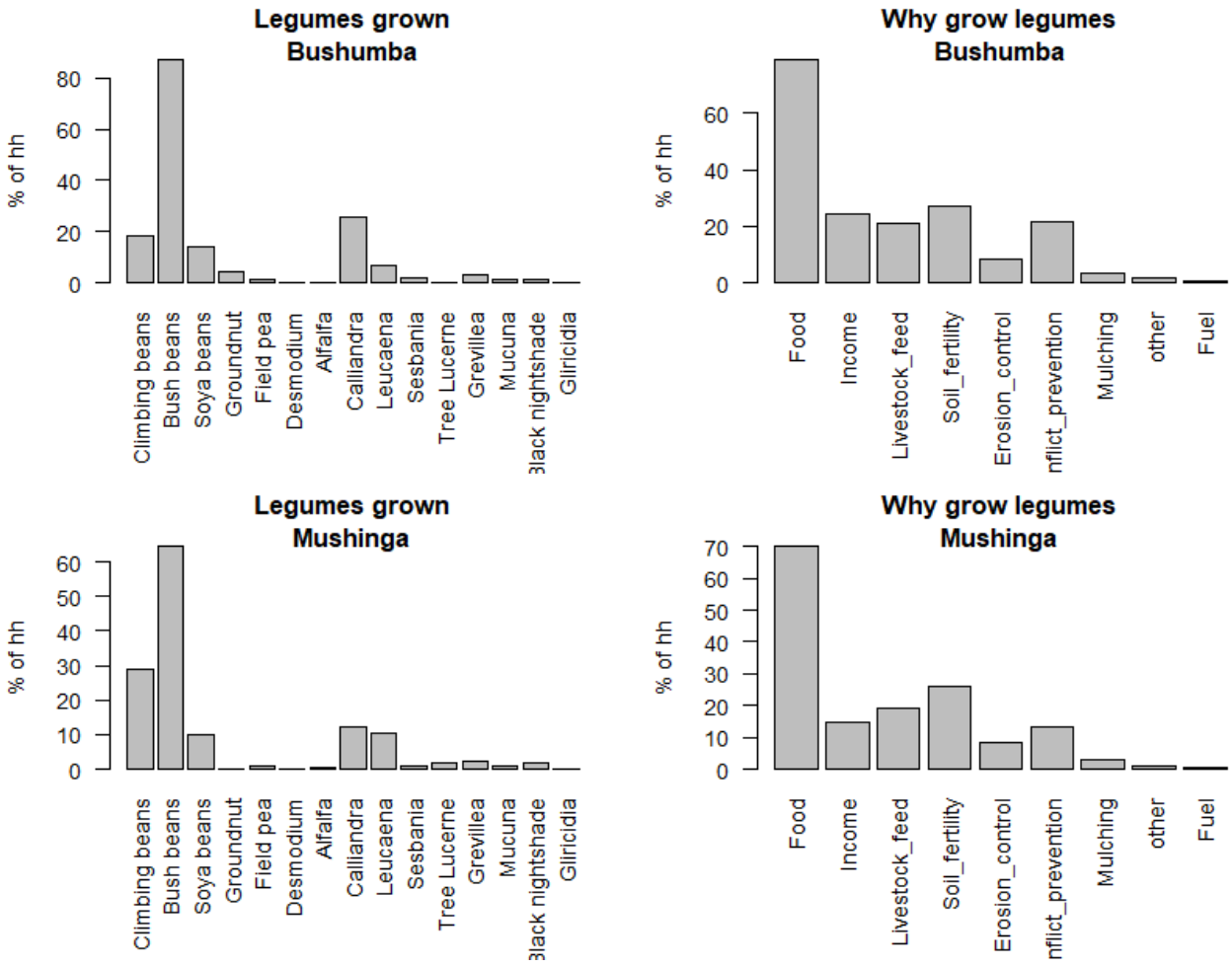
3.7 Legumes

Grain legumes are the commonly grown legume types (Figure 7). Bush beans, climbing beans and soya bean (in the order of their importance) are cultivated by the majority of households in both sites. All the three legumes contribute to household income, with tendency of bush bean to give the highest contribution (Table 9). Tree legumes, particularly *Calliandra* and *Leucaena* are grown by at least 10% of households on average in both sites (Figure 7). The preference of grain legumes by the majority of farmers is mainly explained by the fact that legumes are generally grown as human food in the study area (Figure 7). Soil fertility improvement, income generation, livestock feeds and prevention of land conflicts are other reasons why legumes species are cultivated in study area. The predominance of *Calliandra* and *Leucaena* is the result of previous interventions to promote these species in the area.

Table 9: Legume species cultivated in Bushumba and Mushinga. The land area is calculated for only the households who planted the specific crop.

Grain legumes Mean		Bushumba		Mushinga	
		Sd	Mean	Sd	
Climbing beans	Harvest (kg)	72	74	69	100
	Land area (ha)	0.3	0.3	0.2	0.7
	Yield (kg/ha)	632	1,027	813	1,248
	Sale income (usd/yr)	84	64	84	69
Bush beans	Harvest (kg)	79	210	40	221
	Land area (ha)	0.2	0.5	0.2	0.8
	Yield (kg/ha)	515	832	389	798
	Sale income (usd/yr)	92	417	110	234
Soya bean	Harvest (kg)	59	59	44	71
	Land area (ha)	0.4	0.5	0.1	0.1
	Yield (kg/ha)	350	379	841	931
	Sale income (usd/yr)	54	67	99	102
Non-grain legumes (data scarce)					
Calliandra	Plant count	37	69	18	14
	Harvest (kg)	59	35	165	20
Leucaena	Plant count	22	23	22	20
	Harvest (kg)	67	52	175	175
Desmodium	Land area (ha)	0.0	0.0	0.0	0.0
	Harvest (kg)	0	0	0	0

Figure 7: Legumes grown and the purpose of growing them in Bushumba and Mushinga



3.8 Planting strategies for legumes

In Bushumba, most legume species are grown as intercrops. Some legumes have a high proportion of use as trips and as field margin/contours (Table 10). In Mushinga, intercrops and sole crops are both common depending on the legume species. The predominance of intercrops, particularly for the most cultivated grain legumes reflects the land scarcity in the sites (Table 11).

Table 10: Proportion (%) of households using planting strategies for legumes in Bushumba

	Bushumba			
	Intercrop	Sole crop	Strip	Field margin/contour
Climbing beans	64	36	0	0
Bush beans	94	3	1	1
Soya bean	50	38	0	0
Groundnut	100	0	0	0
Field pea	0	100	0	0
Desmodium	100	0	0	0
Calliandra	37	17	37	9
Leucaena diversifolia	42	0	37	21
Sesbania	40	0	60	0
Mucuna	33	0	67	0
Black nightshade	50	50	0	0
Gliricidia	0	0	100	0

Table 11: Proportion (%) of households using planting strategies for legumes in Mushinga

	Mushinga			
	Intercrop	Sole crop	Strip	Field margin/contour
Climbing beans	87	11	0	0
Bush beans	95	3	0	0
Soya bean	75	25	0	0
Alfalfa	0	100	0	0
Calliandra	65	13	23	0
Leucaena diversifolia	62	12	19	8
Sesbania	50	50	0	0
Tree lucerne	80	20	0	0
Mucuna	0	50	50	0
Black nightshade	40	60	0	0

3.9 Land tenure and management

Land area under cultivation was less than 2 ha for the majority of interviewed households in both the Bushumba and Mushinga sites (Figure 8). The majority of households in both sites were not renting land for crop production but use their own fields (Figure 8). However, some farmers did not own any land, they had rented or borrowed fields from other farmers or used communal fields for crop production.

Most farmers in Bushumba and Mushinga perceive soil fertility problems as their major constraints to agricultural production, followed by soil erosion and finally moisture problems (Table 12). Indeed, land degradation is the most limiting factor to agricultural production in the region.

Mineral fertilizers and pesticides are not applied to crops in either of the sites while organic fertilizers (manure and compost) are the most used inputs in both sites (Table 12). With regards to the germplasm, hybrid seeds are commonly used in the study area. Though integrated soil fertility management has long been popularized in the region as one of the most successful approaches for increasing agricultural production, improved seeds and organic input (manure and compost) are the main components used, whereas fertilizer use remains a challenge, which could explain the perceived low soil fertility and the observed low crop yields. Livestock inputs used are mainly general veterinary, antibiotics and traditional methods of care.

Strip planting, ridge and furrow, soil/stone bunds and water ponds are the most common land conservation practices used in the study area (Table 12).

Figure 8: Land management in Bushumba and Mushinga. Frequency represents the count of households into each category.

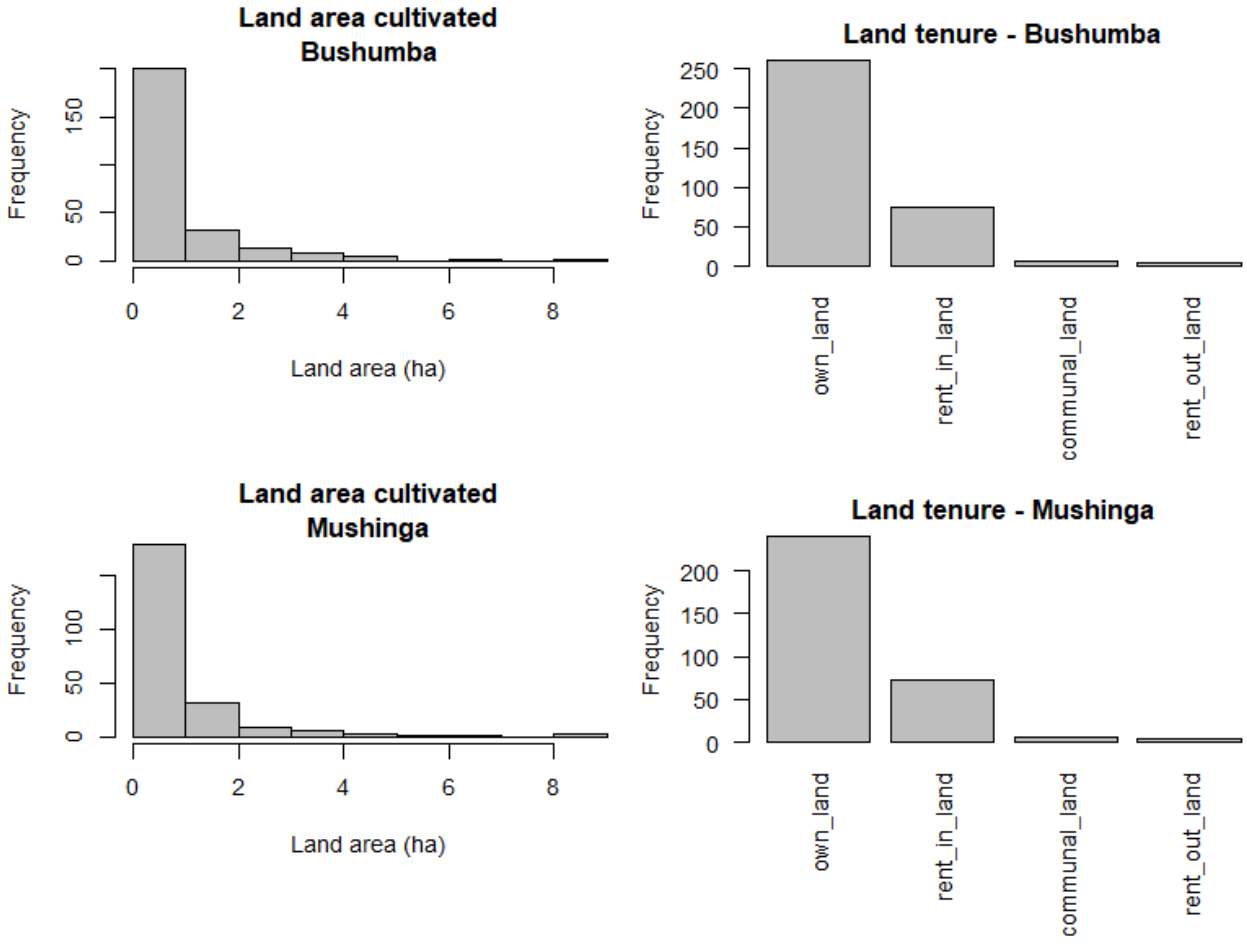


Table 12: Land and livestock management in Bushumba and Mushinga

		Bushumba (% of HH)	Mushinga (% of HH)
Farmer perceptions	Soil fertility problems	79	80
	Soil erosion problems	41	48
	Soil moisture problems	34	43
Crop inputs used	Fertilizers	0	0
	Manure	68	72
	Pesticides	0	0
	Hybrid seeds	6	4
	Compost	69	57
	None	8	8
Livestock inputs used	Spraying	1	1
	Deworming	9	22
	Vaccinations	7	14
	General vet	13	17
	Antibiotics	11	13
	Traditional	11	8
Land Conservation Practices	Contour ploughing	0	2
	Cut-off drain	1	1
	Hill afforestation	3	4
	Ridge and furrow	19	18
	Soil/stone bunds	8	3
	Strip planting	22	20
	Terraces	0	0
	Water ponds	6	3
	Basin planting	6	3
	Check dams	1	0
	Percolation pit	0	0
	None	51	55

3.10 Food security and female control of production

October, September and November (in the order of their importance) were reported by most farmers as the very hungry months in the year in both sites while March and April were reported by interviewed households (almost 40%) as hungry months only in Bushumba (Figure 9). The food shortage during this period can be explained by the fact that these months represent the beginning of the growing seasons (September to December for the A season while March to April for B season) with none or reduced food reserves. The commonly eaten foods in the study area during the lean and flush seasons are grain, root and tuber crops followed by leafy vegetables, vegetables and legume species. Milk, eggs, meat and fruits are the least eaten foods in the two sites (Figure 9). All parameters of food availability and diet were similar in the 2 sites (Table 13).

Figure 9: Food security indicators in Bushumba and Mushinga

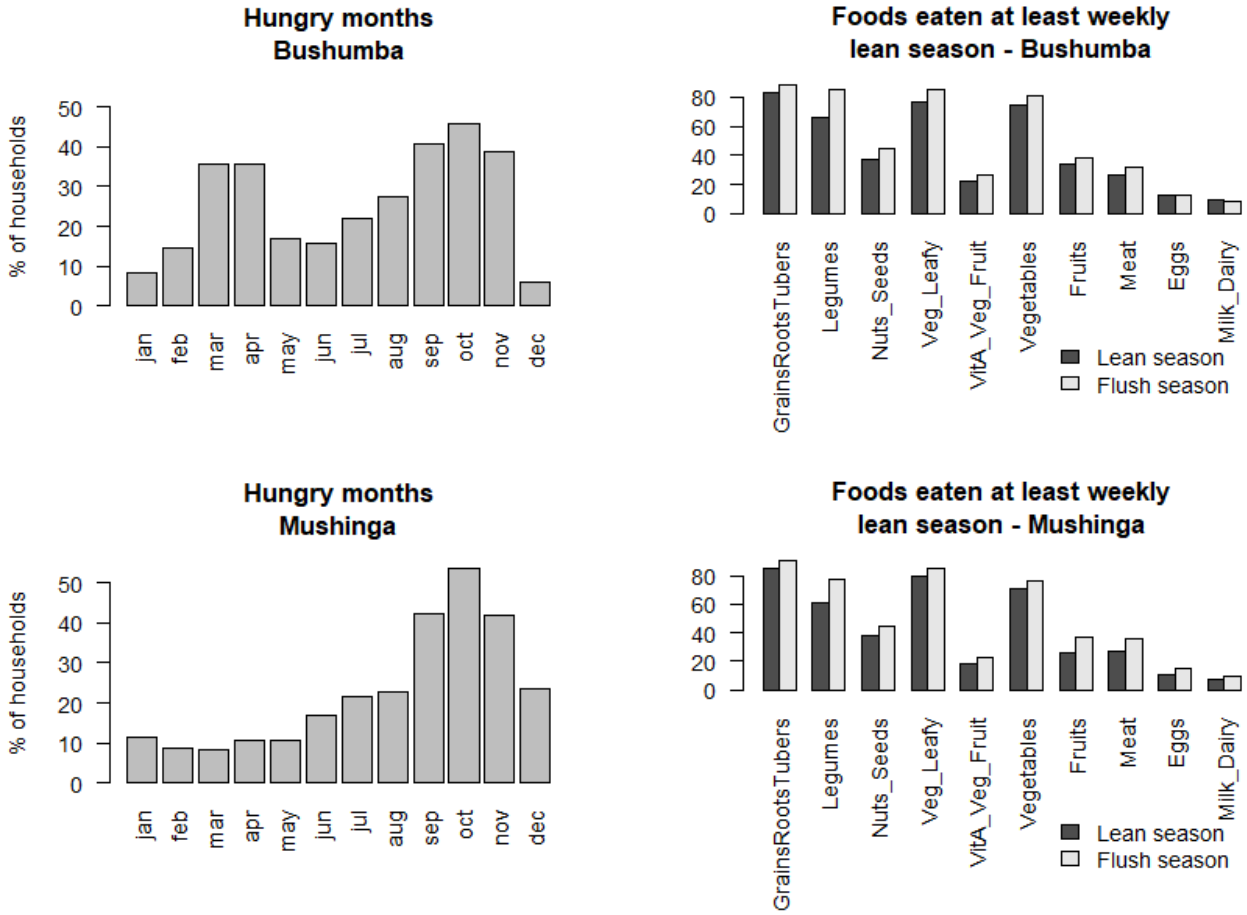
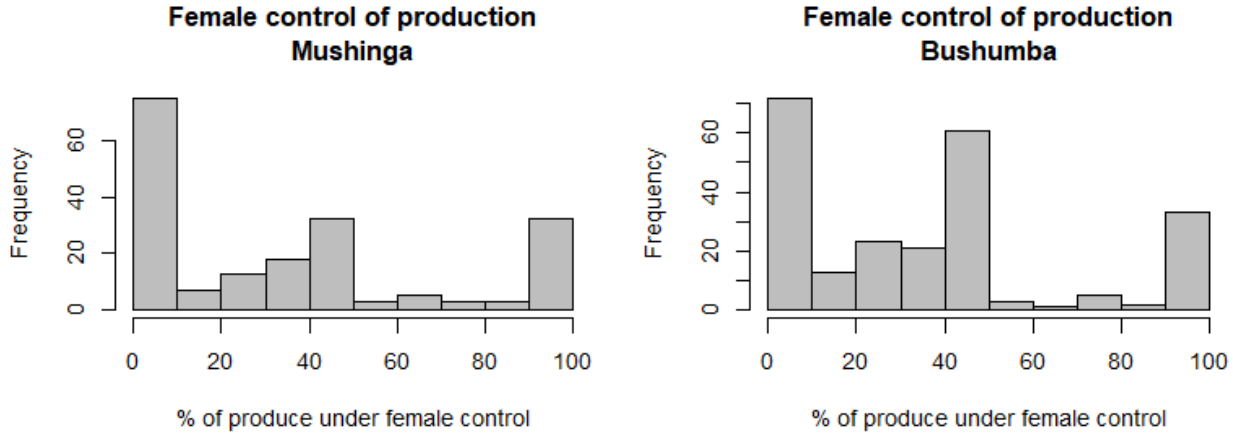


Table 13: Food availability and diet.

	Bushumba		Mushinga	
	Mean	Sd	Mean	Sd
Lean months (count)	3.1	1.6	2.7	1.5
Diet diversity score (lean)	4.9	1.9	4.7	1.8
Diet diversity score (flush)	5.5	1.6	5.4	1.7
Hunger experience (FIES) (1-8)	6.1	2.4	6.5	2.1
Potential food availability (kCal/pers/day)	587	3901	579	2236

Both in Mushinga and Bushumba, female control of production was low, with the majority of households having female control over less than 10% of produce (Figure 10). In Bushumba, the number of households with female control of over 40–50% of the produce was the second highest. In both sites, the number of households with female control over 50–90% of the produce was the lowest.

Figure 10: Female control of household production



The horizontal axis represents the proportion of all income and food production over which females have decision-making power. The vertical axis (frequency) represents the count of households whose female control is within each bin on the histogram.

Conclusions

Crops are the main source of income generation for farmers in the study area. Livestock production also contributes to the income of households in South Kivu but to a much lesser extent. However, the use of fertilizers is rare, and soil fertility problems are perceived by the majority of farmers in the study area as their major constraints to agricultural production, followed by soil erosion and finally moisture problems associated with rainfall availability. Crop yields are generally low, and the majority of farmers reported the severe hungry months to be October, September and November, in that order.

Cassava is the most cultivated crop. Among legumes, grain legumes are the commonly grown crops, with common beans (bush and climbing bean) cultivated by the majority of households followed by soya bean. Both bean and soya bean contribute to the household income, with tendency of common bean to give the highest contribution. Tree legume species, particularly *Calliandra* and *Leucaena* are also grown in the study area.

Legume species are generally grown as human food in the study area. Soil fertility improvement, income generation, livestock feeds and prevention of land conflicts are other reasons why legumes species are cultivated in study area.

Intercropping is the most common cropping system practiced by farmers. The most common intercrops are cassava-bush beans, bush beans-maize, cassava-maize, cassava-climbing beans, cassava-sweet potato, sweet potato-bush beans.

Female control of production is low, with the majority of households having female control of less than 10% of the produce.

With agriculture (crop and livestock) reported as the sole source of income for the majority of farmers in the study area, and with its productivity being very low, there is a need for interventions that boost agricultural productivity by tackling the various constraints faced by farmers in the region.

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