LegumeSELECT: Rural Household Multi-Indicator Survey (RHoMIS) report for characterization of smallholder farming in Sinana and Digga Woredas, Oromia, Ethiopia

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LegumeSELECT: Rural Household Multi-Indicator Survey (RHoMIS) report for characterization of smallholder farming in Sinana and Digga Woredas, Oromia, Ethiopia

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Abbreviations and acronyms

avg	mean average
BBSRC	Biotechnology and Biological Sciences Research Council
FIES	Food Insecurity Experience Scale
HH	Household
IQQO	Oromia Agricultural Research Institute
LegumeSELECT	Science-driven Evaluation of Legume Choice for Transformed livelihoods
MAE	Male adult equivalent (in terms of calorie demand)
masl	metre above sea level
Nr	number
ODK	Open Data Kit
pers	per person
RHoMIS	Rural Household Multi-Indicator Survey
rspnts	respondents
sd	standard deviation
TLU	Tropical Livestock Units
TVA	Total value of activities
USD	United States Dollar
yr	year

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Executive summary

The LegumeSELECT project was implemented in Ethiopia between 2019 and 2021 in two woredas, Sinana and Digga, located in southeastern and western Ethiopia, respectively. To understand the prevailing situation in the sites, a baseline survey (RHoMIS) was conducted to capture various characteristics of the farming context, with a particular interest in the share and role of legumes in the cropping system. This report presents the results from the survey. A total of 383 households were interviewed (202 households in Digga and 181 in Sinana). A structured questionnaire was used to characterize each household in terms of livelihoods, land use, crop management practices, livestock management and feeding, use of legumes, inputs used, soil fertility status as perceived by the farmer, farm size and land tenure status.

There were large differences between study sites in terms of livelihoods and in farming systems. Households from Sinana generated much greater amounts of grain and incomes compared to households from Digga. Crop production and sales dominated livelihood activities in both sites, and although livestock production was similar in absolute terms, it was relatively more important in Digga. Off-farm income generation was rare. Households in Digga cultivated a greater diversity of crops compared to Sinana. Nearly all households from Digga cultivated and generated the majority of their income from maize; and millet and sorghum were the other two main crops. Wheat was the main crop grown and sold in Sinana being cultivated in nearly all farms, with relatively high yields achieved. Barley and maize were the other two main crops cultivated in Sinana.

In terms of legume crops in Digga, households tended to cultivate groundnuts and bush beans, while in Sinana field peas and faba beans were the most popular legume crops. Income from legume crops was dominated by groundnuts in Digga and by field peas in Sinana. Of those households cultivating the crops, around 1 ha of land was dedicated to the cultivation of groundnuts in Digga, while only 0.4 ha of land was dedicated to the cultivation of field peas by producers in Sinana. Crop residues tended to be used as feed or ploughed back into the soils, while intercropping was rare in both study sites. Soil fertility, erosion, and moisture problems were reported to be more prevalent in Digga than Sinana, with over 95% of households in Digga reporting soil fertility problems compared to only 50% in Sinana. Crop inputs were commonly used in both sites, although more industrialized inputs (fertilizers, pesticides, and hybrid seeds) were used in Sinana, and more organic fertilizers (manures and composts) used in Digga. More sustainable land management techniques were also practiced in Digga compared to Sinana, such as contour ploughing, ridge and furrows, soil and stone bunds, and strip planting.

Nearly all households owned cattle, while chicken and sheep were also commonly owned by households in both study sites. Horses and donkeys were also owned by many households in Sinana. Livestock inputs such as spraying, deworming, vaccinations, and antibiotics were more commonly used by households in Sinana. Food security indicators varied by study site with greater food diversity consumed by households from Digga, but fewer months when households experienced hunger in Sinana. Control of production decisions was skewed toward male control, however, slightly more women were reported to control production decisions in Sinana than in Digga.

1. Introduction

The LegumeSELECT project aims at improving the use of legumes in smallholder farming systems in sub-Saharan Africa 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 Ethiopia, the project is implemented in two woredas, Sinana and Digga, located in southeastern and western Ethiopia, respectively.

To understand the prevailing situation in the sites, a baseline survey (RHoMIS) was conducted to capture various characteristics 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 Digga woreda, western Ethiopia and Sinana woreda, southeastern Ethiopia. Arjo Qonnan Bula and Jirata kebeles were selected from Digga woreda; and Aman Laman and Shallo kebeles were chosen from Sinana woreda based on their access to market, mainly their distance from the main road to the central marketplace (Table 1).

Digga woreda is located around 350 km west of Addis Ababa. Digga has an altitude ranging from 1,200-2,300 m; mean total annual rainfall of 2,080 mm and mean temperature of 21.18^{0}C. The second target woreda, Sinana, is located around 450 km southeast of Addis Ababa. Sinana has an altitude ranging from 2,300-2,500 m; mean total rainfall of 930 mm and mean temperature of 17.57^{0}C (Sparks 2018). The farming system in Digga is dominated by maize, teff, and finger millet-based crop-livestock production but at Sinana it is dominated by wheat, faba bean-based crop-livestock production. The soil pH of Digga and Sinana can be categorized as from moderately to strongly acidic; and from slightly acidic to neural, respectively (Hengl et al. 2015; Leenaars, van Oostrum and Gonzalez 2014).

Table 1. Descriptions of the study sites in Ethiopia

	Digga		Sinana	
	Arjo Qonnan Bula	Jirata	Aman Laman	Shallo
Latitude	9.0120	9.0294	7.1305	7.0975
Longitude	36.4335	36.4838	40.2969	40.0971
Altitude (average masl)	1,379	2,238	2,373	2,373
Rainfall (annual in mm)	2,080	2,080	931	929
Temp (mean monthly °C)	21.18	21.18	17.57	17.57
Soil pH (average)	5.32	5.33	6.42	7.37
Market access	Low	High	Low	High
Rainfall pattern	Unimodal		Bimodal	
Main farming system	Maize, teff, finger millet-based crop-livestock		Wheat, faba bean, based crop-livestock mixed	

Figure 1. Geographical location of the two surveyed woredas (Digga and Sinana) in Ethiopia.

2.2. Household selection and characterization

This study focused on smallholder farmers in the Digga and Sinana woredas. The comprehensive list of all households (HHs) lives in the targeted kebeles (Aman Laman and Shallo kebeles from Sinana woreda; Arjo Qonnan Bula and Jirata kebeles from Digga woreda) were used to draw households for the interview using MS Excel random generator. Additional lists of households were generated and used as reserve in case of the absence of HHs selected for the interviews. The interviewed farmers were brought to the rural main roads to decrease the risk of contaminations, even if the enumerators fulfilled the precaution procedures for COVID-19 transmissions.

Finally, a total of 383 households were interviewed (202 households in Digga and 181 in Sinana). 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 from March 2020 to November 2020. This extended period was because of the travel bans implemented by the government due to the COVID-19 pandemic. However, questions referred to the previous 12 months from the date of the survey (i.e. for March 2020, from March 2019 to March 2020; and for November 2020, from November 2019 to November 2020).

Figure 2. Interviewing of farmers at Digga.

Photo credit: Alemayehu Dabessa.

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

More males than females were the respondents to the survey, with less than a fifth of respondents in Digga and a tenth of respondents in Sinana being female. The majority of household heads were a couple. According to the enumerators, the reliability of the responses was mostly reliable or very reliable, although with slightly lower reliability scores in Digga. Enumerators reported that it was relatively easy to develop a rapport with respondents in both study sites. The survey duration was around 45 minutes in Digga and 30 minutes in Sinana (Table 2).

Table 2. Selected socio-economic characteristics of households (HHs) included in the survey and survey reliability in Digga and Sinana

Location	Nr interviews	% Female rspnts	% HH head rspnts	% HH heads couple	% Single female	% Single male	% Polygamous	Survey duration (avg and sd mins)	% Reliable or very reliable	% Easy or medium rapport
Digga	202	19	93	80	14	1	4	43 (21)	60	95
Sinana	181	9	99	94	2	1	3	33 (20)	81	100

Abbreviations: Nr: number, rspnts: respondents, avg: mean average

The average size of a household was similar in Digga and Sinana (5.8 and 5.6 members per HH respectively). The heads of household tended to be more educated in Sinana than Digga. The average cultivated land area was the same in the two sites (2.6 ha). The number of livestock owned per household was higher in Sinana (2.6 Tropical Livestock Unit [TLU]) compared to Digga (0.4 TLU). Farming was the main source of income generation for farmers in the two sites, and most of it came from crop production. Livestock production and off-farm activities also contributed to the income of households in both sites but to a much lesser extent. While livestock production value was similar between sites (around USD1,000 year^{-1}), crop production value was much greater in Sinana (USD8,579 year^{-1}) compared to Digga (USD1,834 year^{-1}). Farming households from Sinana were also more market oriented that households in Digga. (Table 3).

Table 3. Key site characteristics

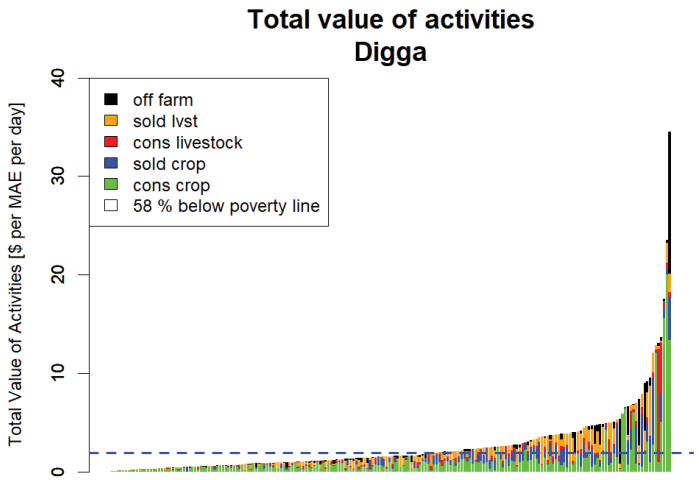
	Digga		Sinana	
	Mean	sd	Mean	sd
HH size (members)	5.8	2.1	5.6	2.0
Head person education (0-6)	0.6	0.7	1.2	0.9
Land cultivated (ha)	2.6	2.2	2.6	2.2
Total livestock holdings (TLU)	0.4	0.6	1.4	1.0
Total value of production (USD/MAE/day)	2.1	3.8	6.2	11.3
Cash income (USD/MAE/day)	1.0	1.6	3.4	8.5
Crop production value (USD/HH/year)	1,834	3,952	8,579	12,684
Livestock production value (USD/HH/year)	1,046	1,764	939	1,712
Market orientation (% produce sold)	39	27	54	25
Off-farm income (USD/HH/year)	134	1337	64	987
Income sources (count)	3.3	2.0	1.9	1.1

Abbreviations: HH = household; MAE = male adult equivalent; TVA = total value of activities; pers = per person

3.2. Livelihoods

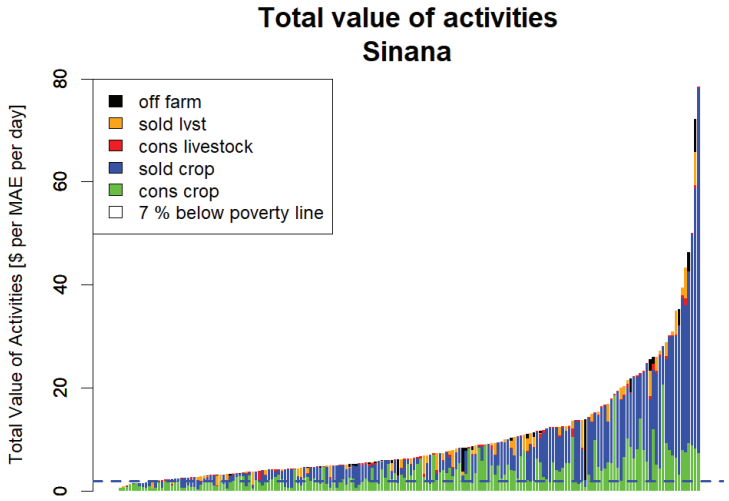
A large difference in total value of activities can be observed between study sites with Digga households generating much less value per male adult equivalent than households from Sinana. These differences are also borne out in the proportion of households living below the international poverty line of USD1.90 a day, with nearly 60% of households in Digga living below this poverty level, while only 7% of households in Sinana do. Crop production dominates value production in both sites, with a greater proportion of households generating value from livestock production in Digga than in Sinana. In Sinana, value production is largely generated through the production and sale of crops. There is barely any off-farm income generation in either of the study sites (Figures 3 and 4).

Figure 3. Total value of households' activities in Digga.



Each vertical bar represents one household, and the height of each bar represents the total annual value of all farm and non-farm produces and incomes. The households have been randomly ordered from poorest to richest, and the blue dashed line indicates the international poverty line of USD1.90 per person per day.

Figure 4. Total value of households' activities in Sinana.



Each vertical bar represents one household, and the height of each bar represents the total annual value of all farm and non-farm produces and incomes. The households have been randomly ordered from poorest to richest, and the blue dashed line indicates the international poverty line of USD1.90 per person per day.

3.3 Crops

There was a greater diversity of crops grown in Digga compared to Sinana. Wheat was the most cultivated crop in Sinana (99% of households) with many farming households also cultivating barley and maize. In Digga the most common crops were maize (cultivated by 94% of households), millet, and sorghum (cultivated by over 70% of households). Field peas and faba beans were the most cultivated legume crops in Sinana (over 50% of households), while in Digga groundnuts were the most popular legumes (over 40% of households). Other legume crops cultivated in Digga included bush beans, faba beans, climbing beans, and *Sesbania*. Acacia was the only legume tree that was grown by more than 10% of households in Digga. Fewer than 10% of households grew legume trees in Sinana (Figures 5 and 6).

Figure 5. Crops grown by at least 10% of households in Digga.

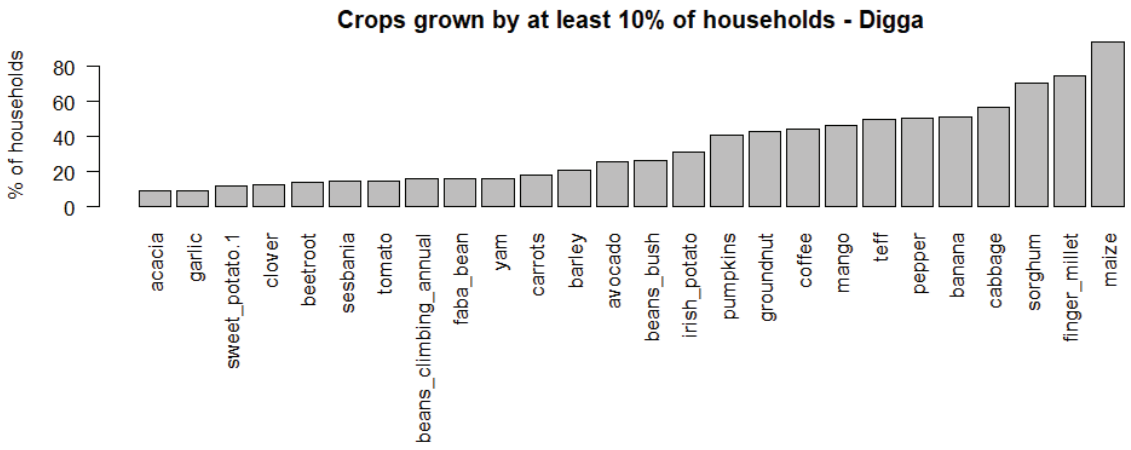
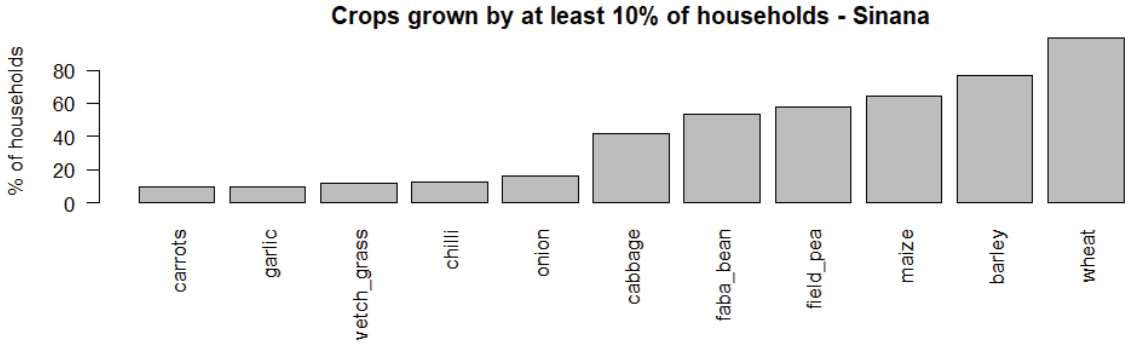


Figure 6. Crops grown by at least 10% of households in Sinana.



Overall, yields for the main crops were much greater in Sinana than Digga (Table 4). Yields for barley, maize, wheat, teff and sorghum were often well below 1 tonne per hectare in Digga. In Sinana, yields for barley, maize and wheat (sorghum and teff were not cultivated in Sinana) varied between 2-4.5 tonnes per hectare. Among the households cultivating the crops, on average, around 1 ha of land per household was dedicated to the cultivation of barley, maize, teff, and sorghum in Digga. The cultivation of wheat occupied less land (0.2 ha). Barley and maize occupied around 0.5 ha of land per household cultivating the crops in Sinana, while wheat occupied 2 ha of land per household cultivating the crop. Wheat could be considered the main cash crop in Sinana, with the highest proportion of the harvest sold to market (over 65%) and average HH income from wheat crop sales around nearly USD4,500 per year. Barley and maize tended to be mainly consumed by the household. In Digga, around 25-40% of the main crops were sold to market, while the rest were consumed by the households. Maize generated the greatest amount of income through crop sales in Digga (just less than USD600 per year).

Table 4. Main crops grown by households in Digga and Sinana

		Digga		Sinana	
Crop	Variable	Mean	sd	Mean	sd
Barley	Harvest (kg)	117	49	1,070	775
	Land area (ha)	0.8	0.6	0.6	0.5
	Yield (kg ha-1)	393	386	2304	3648
	Proportion consumed (%)	57	21	87	13
	Proportion sold (%)	43	NA	13	6
	Income (USD year-1)	173	NA	1,047	741
Maize	Harvest (kg)	745	1,059	1,191	829
	Land area (ha)	1.1	1.6	0.4	0.7
	Yield (kg ha-1)	983	6,655	4,307	3,956
	Proportion consumed (%)	63	25	76	40
	Proportion sold (%)	37	20	24	31
	Income (USD year-1)	588	980	342	275
Wheat	Harvest (kg)	-		7,150	8,484
	Land area (ha)	-		2.0	1.4
	Yield (kg ha-1)	-		3,922	4136
	Proportion consumed (%)	-		34	27
	Proportion sold (%)	-		66	25
	Income (USD year-1)	-		4,496	11,441

		Digga		Sinana	
Crop	Variable	Mean	sd	Mean	sd
Millet	Harvest (kg)	173	1,790	-	
	Land area (ha)	0.7	1.2	-	
	Yield (kg ha-1)	458	1931	-	
	Proportion consumed (%)	79	18	-	
	Proportion sold (%)	21	12	-	
	Income (USD year-1)	370	822	-	
Teff	Harvest (kg)	132	115	-	
	Land area (ha)	0.8	0.7	-	
	Yield (kg ha-1)	253	477	-	
	Proportion consumed (%)	71	20	-	
	Proportion sold (%)	29	19	-	
	Income (USD year-1)	219	252	-	
Sorghum	Harvest (kg)	482	572	-	
	Land area (ha)	1.1	1.8	-	
	Yield (kg ha-1)	902	2725	-	
	Proportion consumed (%)	76	18	-	
	Proportion sold (%)	24	15	-	
	Income (USD year-1)	331	548	-	

3.4 Crop residues

Crop residues in Digga and Sinana are most frequently used as feed, construction material, or ploughed back into the soil. In Digga, a number of households also practiced the burning of crop residues, especially maize, millet, and sorghum. Teff crop residues in Digga and wheat crop residues in Sinana are also sold (Tables 5 and 6).

Table 5. Percentage of households reporting uses of crop residues in Digga

Crop	Feed	Construction	Soil	Burn	Manure/ compost	Fuel	Sell
Wheat	1	0	<1	0	0	0	0
Maize	69	0	17	29	<1	58	0
Millet	52	2	12	9	0	1	4
Sorghum	46	5	4	15	0	44	1
Teff	35	11	2	3	0	<1	29
Barley	9	0	4	2	0	<1	<1
Groundnut	36	0	23	4	0	2	0
Faba bean	2	0	8	4	<1	<1	0
Field pea	0	0	3	1	0	0	0

'Soil' refers to direct return to soil. Residues are left in the 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 6. Percentage of households reporting uses of crop residues in Sinana.

	Feed	Construction	Soil	Burn	Compost	Manure	Fuel	Sell
Wheat	92	32	31	3	1	1	2	15
Maize	12	0	3	0	0	0	9	0
Barley	36	7	17	2	1	1	1	1
Faba bean	27	0	22	0	1	0	0	0
Field pea	25	0	22	0	1	1	2	0

'Soil' refers to direct return to soil. Residues are left in the 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 Intercropping

Intercropping was rare in the two study sites. Barely any farms practiced intercropping in Sinana. In Digga, intercropping was sometimes practiced with maize cultivation (by just over 20% of households). The main companion crops were bush beans, climbing beans, Irish potatoes, and vegetables.

3.6 Livestock

Nearly all households in Digga and Sinana kept cattle, around 50% from each study site kept chickens, and around 40% kept sheep. Many more households in Sinana kept horses or donkeys compared to Digga. On the other hand, more households in Digga kept goats and bees compared to Sinana (Figure 7). Animal feeds were dominated by grazing practices and crop residues in both sites. With regards to the other types of feed, slightly more households in Sinana used concentrates and grains, while slightly more households in Digga used minerals (Figure 8).

Figure 7. Livestock kept in Digga and Sinana.

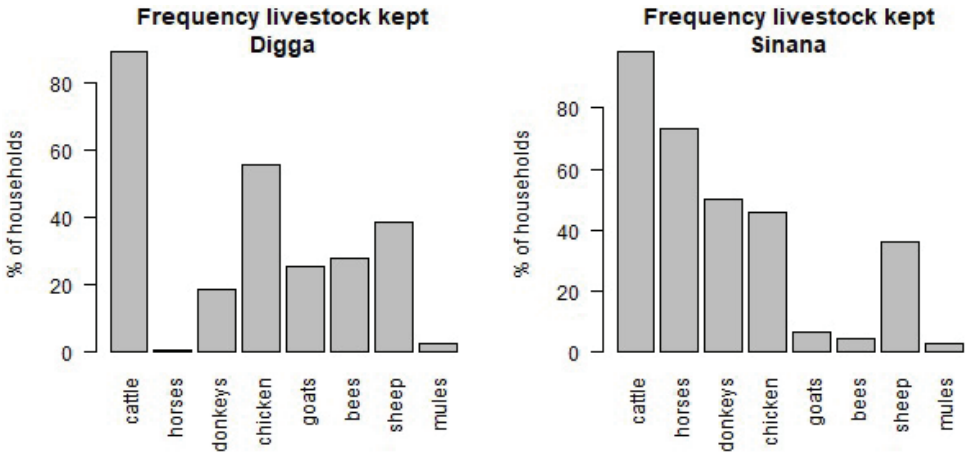
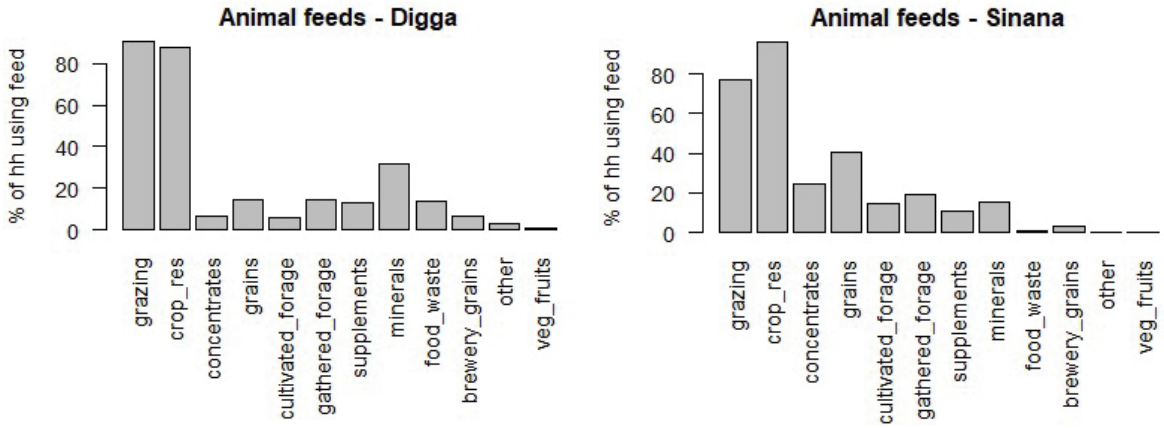


Figure 8. Livestock feed use in Digga and Sinana.



While more cattle were owned by households in Sinana, more cattle were sold in Digga (Table 7). Reflecting these higher sales, cash income from cattle was also higher in Digga (USD638.4 year-1 compared to USD586.7 year-1), however variability in income was high with the standard deviation being around double that of the mean. More goats were owned and sold in Sinana compared to Digga, as such income from goats was also higher in Sinana. Similarly to cattle, while more sheep and chickens were owned by households in Sinana, more sheep and chickens were sold and income from sheep and chickens was higher in Digga. Cattle milk was only produced in both sites, with milk yield being slightly higher in Sinana. More horses and donkeys were owned in Sinana. Around a third of households owned improved cattle breeds in Sinana, while this figure was only 2% in Digga. On the other hand, more households owned improved chicken breeds in Digga (17%) compared to Sinana (7%).

Table 7. Animals kept in Digga and Sinana.

Livestock species	Variable	Digga		Sinana	
		Mean	sd	Mean	sd
Cattle	Kept (count)	5.0	3.7	5.5	2.8
	Sold (count)	0.6	1.0	0.4	0.9
	Slaughtered (count)	0.0	0.3	0.0	0.1
	Milked (count)	1.6	1.0	1.4	0.7
	Milk yield (l/animal/day)	1.0	0.6	1.4	1.3
	Cash income (USD/yr)	638	1,124	587	1,408
% of HH with improved breeds		2		31	
Goats	Kept (count)	3.3	3.9	5.5	3.7
	Sold (count)	0.9	1.5	2.2	1.3
	Slaughtered (count)	0.2	0.7	0.4	0.9
	Milked (count)	-		2.5	0.7
	Milk yield (l/animal/day)	-		0.2	0.2
	Cash income (USD/yr)	84	173	147	220
% of HH with improved breeds		0		0	
Sheep	Kept (count)	2.5	1.8	5.0	4.0
	Sold (count)	0.9	1.3	0.4	1.4
	Slaughtered (count)	0.2	0.6	0.7	1.0
	Milked (count)	-		-	
	Milk yield (l/animal/day)	-		-	
	Cash income (USD/yr)	82	186	28	263
% of HH with improved breeds		0		1	-

Livestock species	Variable	Digga		Sinana	
		Mean	sd	Mean	sd
Horses and donkeys	Kept (count)	1.4	0.7	1.7	1.1
	Sold (count)	0.1	0.4	0	0.2
	Slaughtered (count)	-		-	
	Cash income (USD/yr)	0	70.1	0	65.9
% of HH with improved breeds		0		1	
Chicken	Kept (count)	5.1	5.6	5.4	4.4
	Sold (count)	1.2	2.0	0.2	1.3
	Slaughtered (count)	1.1	1.7	0.9	1.3
	Egg yield (eggs/chicken/day)	0.7	0.9	0.5	0.4
	Cash income (USD/yr)	152	395	29	897
% of HH with improved breeds		17		7	

3.7 Legumes

Grain legumes were the most commonly grown legumes in both study sites. Bush beans and groundnuts are cultivated by around 30% and 50% of households, respectively, in Digga. In Sinana, field peas and faba beans were the most commonly grown legumes, being cultivated by around 50% of households (Figure 9). In Digga, groundnuts were the legume crop that contributed most to farm income, generating around USD640 a year. Bush beans, climbing beans, and faba beans generated much smaller amounts (USD130, USD33.8, and USD60.3 a year, respectively), while field peas and lentils were not cultivated for sale in Digga. In Sinana, on the other hand, bush beans climbing beans and groundnuts tended not to be cultivated. However, field peas contributed around USD1,020, faba beans USD611.9, and lentils USD115.3 a year to farm income (Table 8). Tree legumes, particularly acacia and Sesbania are grown by at least 10% of households in Digga, but by less than 5% of households in Sinana. Forage legumes are also cultivated in the two study sites. In Digga, the most common forage legume grown was clover. In Sinana it was vetch grass. Soil fertility improvement and livestock feed were the most common reasons for cultivating legumes in both sites. Fuel, income generation, and for self-consumption are other reasons why legumes species were cultivated in the two study areas. In Digga, legumes were also used for erosion control.

Figure 9. Legumes grown and the purpose of growing them in Digga and Sinana.

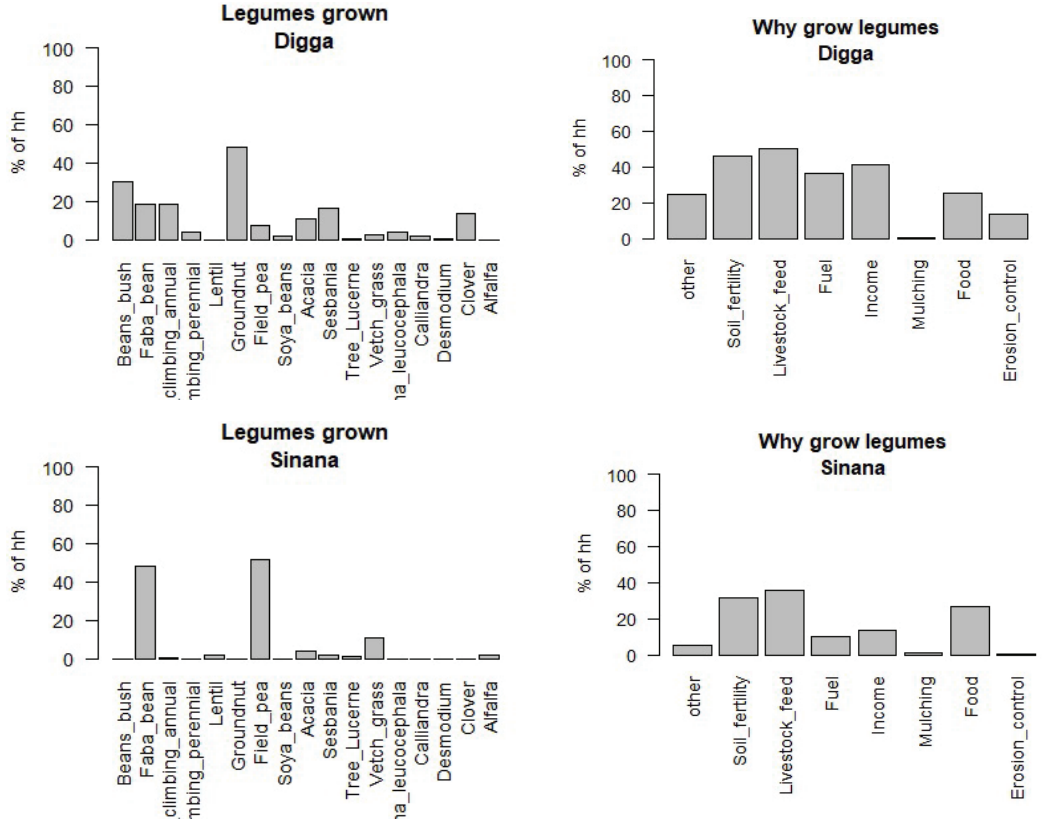


Table 8. Legume species cultivated in Digga and Sinana

		Digga		Sinana	
Grain legumes		Mean	sd	Mean	sd
Bush beans	Harvest (kg)	138	898	NA	-
	Land area (ha)	0.5	0.5	NA	-
	Yield (kg/ha)	811	2763	NA	-
	Sale income (USD/yr)	128	112	NA	-
Climbing beans	Harvest (kg)	1519	2801	NA	-
	Land area (ha)	0.2	0.1	NA	-
	Yield (kg/ha)	6978	16093	NA	-
	Sale income (USD/yr)	34	26	NA	-
Groundnut	Harvest (kg)	679	618	NA	-
	Land area (ha)	1.1	1.9	NA	-
	Yield (kg/ha)	1180	2529	NA	-
	Sale income (USD/yr)	638	682	NA	-
Field peas	Harvest (kg)	71	70	638	542
	Land area (ha)	0.3	0.1	0.4	0.3
	Yield (kg/ha)	365	493	2405	3606
	Sale income (USD/yr)	NA	-	1100	1021
Faba beans	Harvest (kg)	61	41	414	272
	Land area (ha)	0.4	0.5	0.3	0.2
	Yield (kg/ha)	296	829	1570	1970
	Sale income (USD/yr)	60	48	612	293

		Digga		Sinana	
Grain legumes		Mean	sd	Mean	sd
Lentils	Harvest (kg)	-		75	35
	Land area (ha)	-		0.3	0.2
	Yield (kg/ha)	-		340	304
	Sale income (USD/yr)	-		115	-
Non-grain legumes (data scarce)					

NB: The land area is calculated for only the households who planted the specific crop.

3.8 Planting strategies for legumes

In Digga, there was a mix between sole-cropping and intercropping of legume species. Intercropping was practiced by half to two-thirds of households planting bush beans climbing beans, field pea, and clover. Sole cropping was the more common practice for fava bean, groundnut, soya bean; as well as for herbaceous and shrub species such as acacia, *Leucaena leucocephala*, *Sesbania* and vetch grass. A notable minority planted climbing beans, acacia, or Sesbania on field margins or along contours (Table 9).

Table 9. Proportion (%) of households using planting strategies for legumes in Digga.

	Sole crop	Intercrop	Sole crop and intercrop	Field margin or contour planting
Bush beans	29	58	13	0
Climbing beans	25	67	0	8
Faba bean	88	8	4	0
Field pea	50	50	0	0
Groundnut	100	0	0	0
Soya bean	100	0	0	0
Acacia	67	11	0	22
Clover	47	53	0	0
Leucaena leucocephala	100	0	0	0
Sesbania	68	7	0	25
Vetch grass	100	0	0	0

In Sinana, the sole cropping of legumes was practiced almost exclusively. There were also fewer legume species grown (as reported in Figure 9) compared to Digga. See Table 10.

Table 10. Proportion (%) of households using planting strategies for legumes in Sinana.

	Sole crop	Sole crop and intercrop
Faba bean	98	2
Field pea	100	0
Lentil	100	0
Acacia	100	0
Alfalfa	100	0
Sesbania	100	0
Vetch grass	100	0

3.9 Land tenure and management

Land area under cultivation was less than 2 ha for the majority of households in Digga. The area of land cultivated per household was larger in Sinana, with the majority cultivating 5 ha or less. There were a handful of households in Sinana cultivating more than 10 ha of land. The majority of land cultivated was owned by the households, while sharing of land was relatively common in Digga. In Sinana around 50 households (20%) also rented in land (Figure 10).

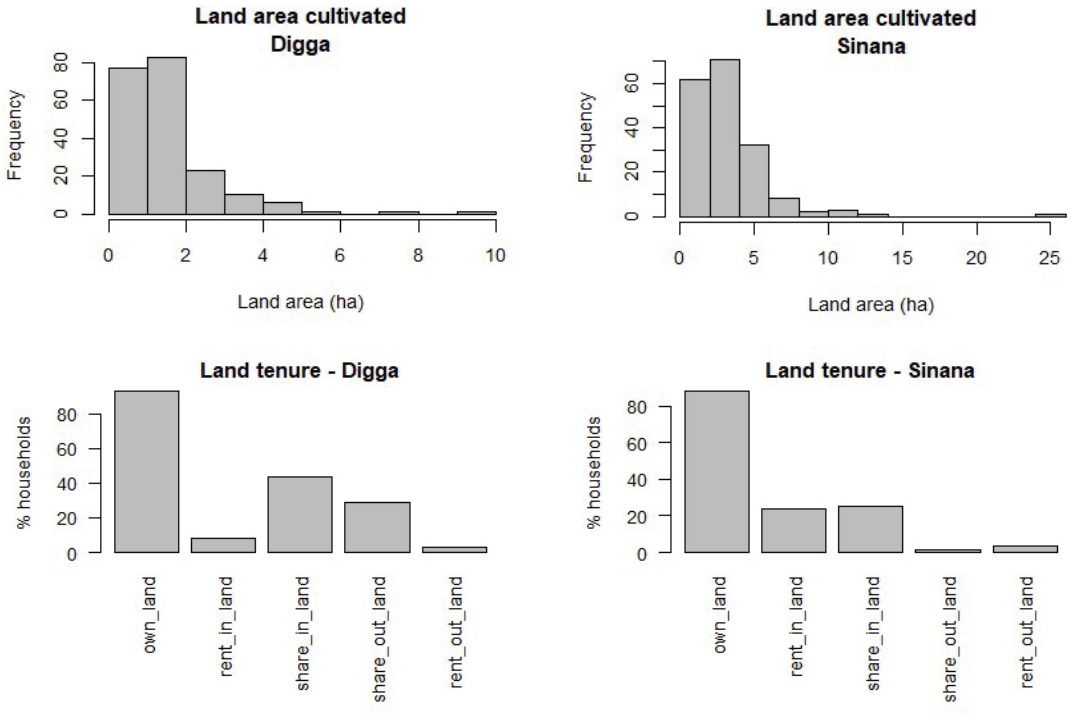
Nearly all households in Digga perceived problems in fertility of their soils (95%). More than 60% also reported soil erosion problems and more than 30% reported having soil moisture problems in Digga. Only half of the households in Sinana reported soil fertility problems, while less than 40% reported experiencing soil erosion problems. Soil moisture problems were only reported by 3% of households in Sinana (Table 11).

Mineral fertilizers and pesticides were applied to crops by the majority of households in both study sites, being applied by slightly more households in Sinana than Digga. Hybrid seeds were also more commonly used by households in Sinana (86% of households compared to 63% of households in Digga). On the other hand, organic fertilizers (manure and compost) were used by slightly more households in Digga (by 59% and 15% of households, respectively) (Table 11).

Vaccinations, deworming, and antibiotics were livestock inputs more commonly used in Sinana compared to Digga. More households in Digga tended to use the services of a general vet compared to households in Sinana (Table 11).

Cut-off drains, soil/stone bunds, and contour ploughing were sustainable land management techniques most commonly used in the two study sites. Overall, households from Digga tended to use more of these sustainable land management techniques than farming households from Sinana, with 78% of households in Sinana not using any of these techniques (Table 11).

Figure 10. Land management in Digga and Sinana.



NB: Frequency represents the count of households into each category.

Table 11. Land and livestock management in Digga and Sinana

		Digga (% of HH)	Sinana (% of HH)
Farmer perceptions	Soil fertility problems	95	50
	Soil erosion problems	64	39
	Soil moisture problems	33	3
Crop inputs used	Fertilizers	81	99
	Manure	59	46
	Pesticides	72	96
	Hybrid seeds	63	86
	Compost	15	4
	None	5	0
Livestock inputs used	Spraying	6	1
	Deworming	19	39
	Vaccinations	74	96
	General vet	34	1
	Antibiotics	40	96
	Traditional	0	5
Land Conservation Practices	Contour ploughing	17	3
	Cut-off drain	19	12
	Hill afforestation	<1	0
	Ridge and furrow	25	0
	Soil/stone bunds	27	6
	Strip planting	16	0
	Terraces	0	4
	Water ponds	0	4
	Check dams	10	2
	None	35	78

3.10 Food security and female control of production

June and July were reported by households in both sites as being months of hunger. In Digga, August was also reported to be a month when the majority of households experienced hunger. From November to April there was little hunger experienced by households from both sites (Figure 11). Overall, households in Digga experienced more food insecurity (scoring 4.5 on the Food Insecurity Experience Scale (FIES) scale indicating frequent experiences of food insecurity) than households from Sinana (scoring 1.2 on the FIES scale) (Table 12). The commonly eaten foods in the study areas during both the lean and flush seasons were grain, root and tuber crops, legumes, and vegetables. Leafy vegetables were consumed more by Sinana households during flush seasons. Milk, eggs, meat and fruits were the least eaten foods in the two sites. Households in Digga overall seemed to consume more diversity of foods, which is surprising given the greater household income generated by households from Sinana (Figure 11 and Table 12).

Figure 11. Food security indicators in Digga and Sinana.

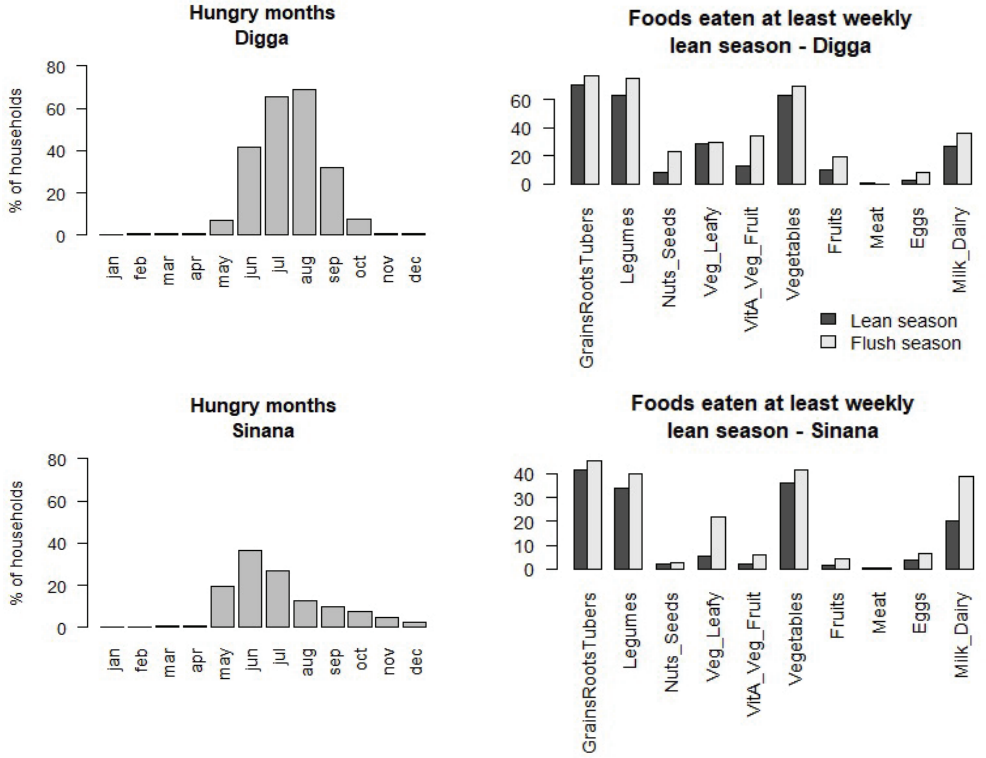
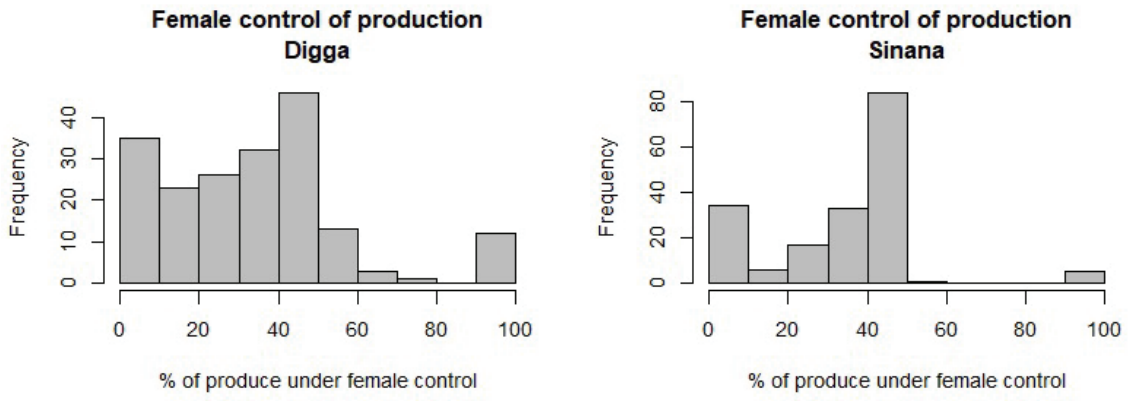


Table 12. Food availability and diet

	Digga		Sinana	
	Mean	sd	Mean	sd
Lean months (count)	2.3	1.7	1.2	1.4
Diet diversity score (lean)	4.4	2.0	3.8	1.8
Diet diversity score (flush)	5.1	2.0	4.5	1.6
Hunger experience (FIES) (1-8)	4.5	2.8	1.2	2.0
Potential food availability (kCal/pers/day)	4,379	7,604	17,980	25,884

Both in Digga and Sinana, less than 50% of produce was deemed to be under female control (Figure 12). In Sinana, there was somewhat greater equity in control over production compared to Digga, with female control of produce tending to be around 40–50%. In Digga, however, many more households reported that females had less than 40% control of production. In both sites, the number of households with female control between 50–100% of the produce was lowest.

Figure 12. Female control of household production.



Note: 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

There was a large difference between the study sites in terms of livelihood value production with households from Sinana generating much greater value production than households from Digga. Crop production and sales dominated livelihood activities in both sites, although a slightly higher proportion of livestock sales was observed in households in Digga. Off-farm income generation was rare. Households in Digga cultivated a greater variety of crops compared to those in Sinana. Nearly all households from Digga cultivated and generated most income from maize, while millet and sorghum were the other two main crops. Wheat was the main crop grown and sold in Sinana being cultivated in nearly all farms. Barley and maize were the other two main crops cultivated in Sinana. In terms of legume crops in Digga, households tended to cultivate groundnuts and bush beans, while in Sinana field peas and faba beans were the most popular legume crops.

Income from legume crops was dominated by groundnuts in Digga and by field peas in Sinana. Of those households cultivating the crops, around 1 ha of land was dedicated to the cultivation of groundnuts in Digga, while only 0.4 ha of land was dedicated to the cultivation of field peas by producers in Sinana. Crop residues tended to be used as feed or ploughed back into the soils, while intercropping was rare in both study sites. Soil fertility, erosion, and moisture problems were reported to be more prevalent in Digga than Sinana, with over 95% of households in Digga reporting soil fertility problems compared to only 50% in Sinana. Crop inputs were commonly used in both sites, although more industrialized inputs (fertilizers, pesticides, and hybrid seeds) were used in Sinana, and more organic fertilizers (manures and composts) used in Digga.

More sustainable land management techniques were also practiced in Digga compared to Sinana, such as contour ploughing, ridge and furrows, soil and stone bunds, and strip planting. Nearly all households owned cattle, while chicken and sheep were also commonly owned by households in both study sites. Horses and donkeys were also owned by many households in Sinana. Livestock inputs such as spraying, deworming, vaccinations, and antibiotics were more commonly used by households in Sinana. Food security indicators varied by study site with greater food diversity consumed by households from Digga, but fewer months when households experienced hunger in Sinana. Control of production decisions was skewed toward male control, however, slightly more women were reported to control production decisions in Sinana than in Digga.

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