RALENTIR: Reducing land degradation and carbon loss from Ethiopia's soils to strengthen livelihoods and resilience

Report on Baseline Survey Treatment & Control Areas

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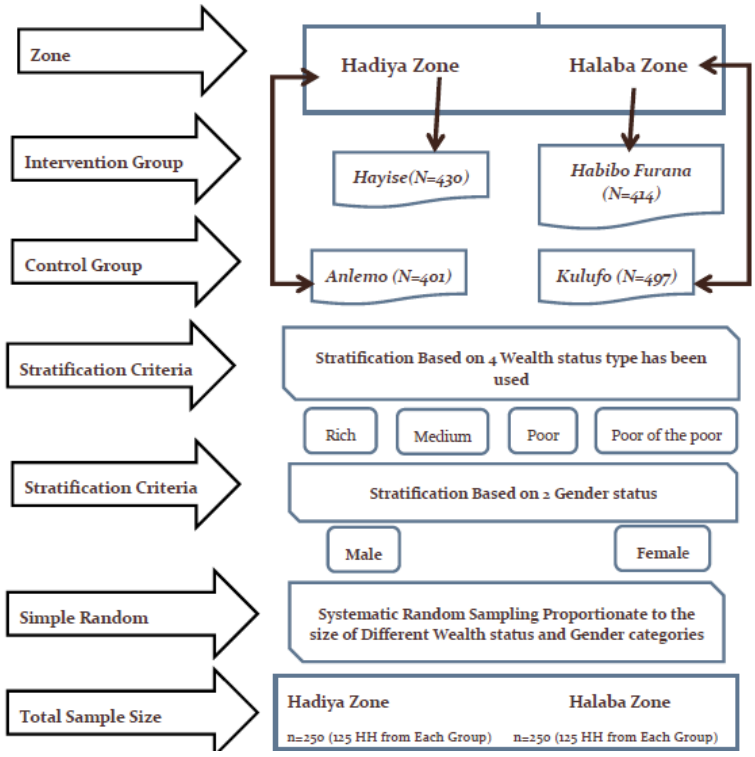
Introduction

This report summarizes the information collected in the baseline survey in the RALENTIR project in Halaba and Hadiya zones in the treatment and control areas. The survey aims to provide a picture of the sample characteristics across the treatment and control areas, and to provide base information on preferences on exclosures prior to the interventions.

This report also draws on the baseline survey field report by the Hawassa University survey team (Dr Thomas Lemma, Mr Yitna Tesfaye and Dr Awdenegest Moges) described in Lemma et al (2021).

Sample Design

The sample across the Halaba and Hadiya areas was drawn from treatment and control areas using multiple stage proportionate sampling techniques following the schema below.



Source: Lemma et al (2021)

The data collected reflects this plan with slight over-sampling in Hayse

	Name of kebele	Freq.	Percent
Halaba	Habibo Furana	123	23.56
	Kulfo	125	23.95
Hadiya	Hayse	145	27.78
	Sanite Wasala	129	24.71
	Total	522	100

Data Processing and Analysis

The data was collected during February and March 2021 using a team of enumerators employing tablets, with versions of the questionnaires available in both English and Amharic. The data was transferred and coded in Stata. Some basic cleaning was required for variables with multiple choices with these converted to sets of dummy variables or categorical variables as appropriate.

To explore the extent of sample balance across treatment and control areas, we employ a number of standard measures used in propensity score matching drawing using programme developed by (Leuven and Sianesi, 2003). A Difference in Difference approach is going to be used to identify overall preferences changes associated with the interventions in the treatment areas. We do expect differences across treatment and control groups. In addition to the basic description of characteristics in the sample a further focus of attention is to identify characteristics which we might expect would influence any common trend in changes in preferences assumed across the treatment and control groups.

Demography

The table below summarizes the similarity of the means and variances of the variables across all control and treatment sites across the two zones Halaba and Hadya where a control site was chosen. The table reports a number of statistics to compare across the different samples. First in column 3 the standardized percentage basis.[1] This is a useful measure in allowing comparison across variables. There is no formal definition of what constitutes a large difference, in RCT studies where sample balance is being considered, values over 20 or 25% are considered "large" (Rosenbaum and Rubin, 1985). For example, we see for Halaba the difference in all the demographic variables are below this threshold. In contrast the Hadiya case there are a number of variables e.g. age of respondents, years of schooling, whether respondent is married, where there are a number of larger differences.

The fourth column provides the observed t value associated with the null hypothesis that the means are identical across the treatment and control sample. For Halaba, here we do see a number of variables where the mean differences are statistically significant at least at 10%, while for Hadiya many of the variables which showed larger standardized biases in the means, also have statistically significant differences e.g. years of education.

For variables which are considered continuous, the final column reports the ratio of the variance in the treated versus the control sample. This is a measure of the heterogeneity across the samples. Under the null hypothesis that this ratio equals one, this statistic is F distributed. When the observed value of this statistic falls below the 2.5th or over the 97.5th percentile value the associated value in the table is highlighted. For Halaba, there is little evidence of differences in the variances for the variables treated as continuous, although in Hadiya, years of education does appear to distributed differently. Figure 1 illustrates this by plotting the histogram of years of education across the four sub-samples. In the figure the top two plots Habibo Furana and Kulfo represent the treatment and control areas within the Halaba zone and Hayse and Sanita Walasa the areas within the Hadiya zone. In all areas there is a spike at zero representing those who have had no formal education.

Below the table there are a number of heuristic summary indicators calculated from all the variables included in the Table. The first is the pseudo R squared from the probit using the treatment dummy as the dependent variable with the set of the variables used as covariates. The second and third values report the chi squared value and its associated p-value from the joint significance test of all the

[1] $\frac{100\left(\bar{X}_1 - \bar{X}_2\right)}{\sqrt{V\left(X_1\right) + V\left(X_2\right)/2}}$

variables in this estimation. It therefore provides a test of whether the set of variables jointly predict whether an individual is in the treated or control sample. The value of Rubin B is calculated as the standard percentage bias in the linear propensity score across treated and control samples. As the propensity score takes all the variables into account this provides an overall indicator of the difference between the means for the set of variables included in the table. This is starred if this value is greater than 25%. The final statistic is the Ruben's ratio of the variances of the propensity score index which ideally should fall between 0.5 and 2 (Leuven and Sianesi, 2003). In both areas, the variables jointly are statistically significant predictors of whether the individual is in the treated sample, while the Ruben B statistic also shows in both cases an overall difference in the standardized score. There is also some evidence that the differences in education across the Hadiya samples translates into an overall difference.

The main sources of the differences in the samples appears to come from differences in age, years of education which are both higher in the treated sample in Halaba but lower in Hadiya. There are also some differences in the numbers married, and some differences in household composition.

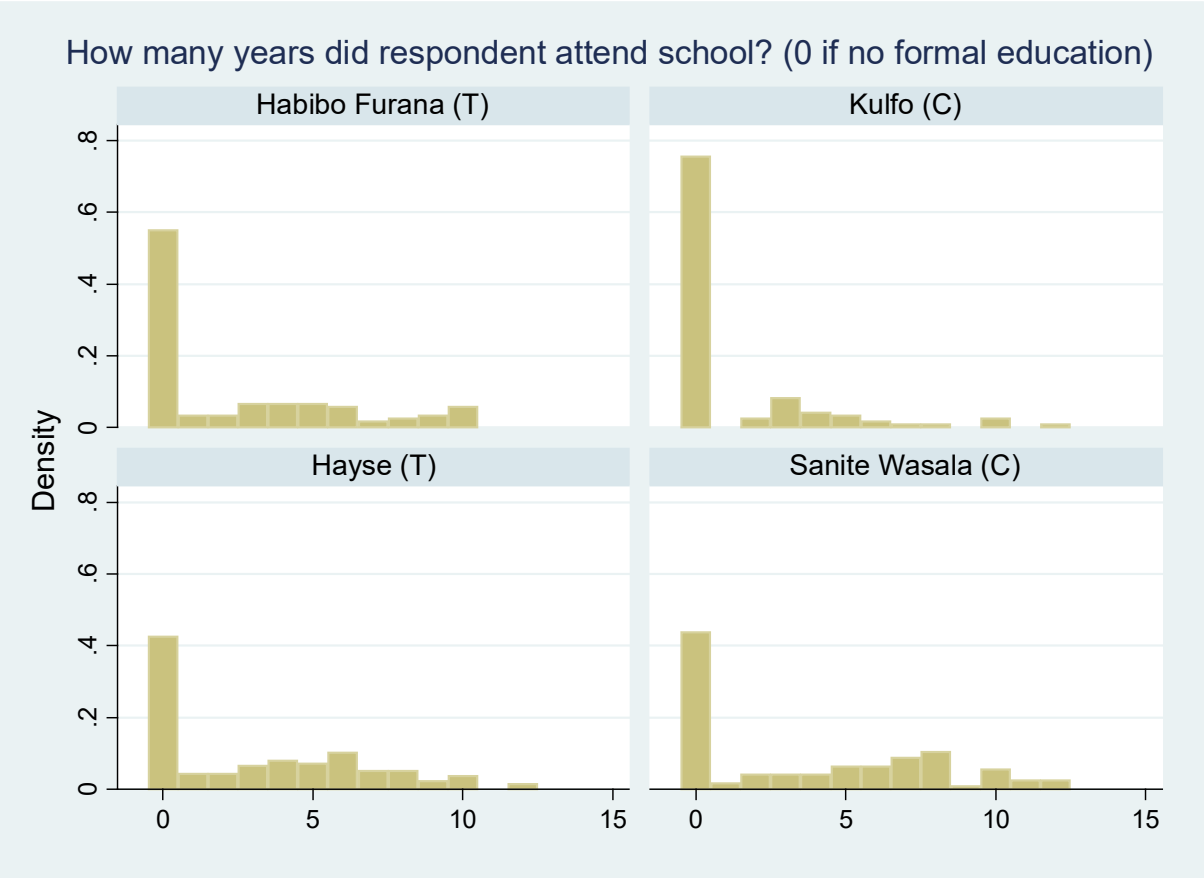


Figure 1: Respondent Years of Education

Table 1. Demographic Variables

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Age Respondent	40.71	43.69	-24.5	-1.93	1.05
Gender Respondent	0.28	0.37	-17.8	-1.40	.
Years of Education Respondent	2.80	1.57	23.5	1.85	1.14
Married	0.76	0.75	0.9	0.07	.
Married-polygamy	0.10	0.03	26.8	2.11	.
Single	0.06	0.06	0.4	0.03	.
Divorced	0.00	0.02	-18.0	-1.41	.
Widowed	0.09	0.14	-14.7	-1.16	.
Family size	6.46	6.48	-0.6	-0.05	1.01
Males <17 years	1.60	1.78	-13.0	-1.03	0.90
Female <17 years	1.44	1.49	-3.7	-0.29	0.98
Males 18-64 years	1.73	1.68	4.3	0.33	0.90
Females 18-64 years	1.67	1.45	21.3	1.68	1.75*
Males 65 years +	0.24	0.13	10.5	0.83	2.76*
Females 65 years +	0.09	0.12	-4.1	-0.32	1.00
	Hadya				
Age Respondent	51.60	46.88	35.3	2.92	0.92
Gender Respondent	0.47	0.26	45.3	3.73	.
Years of Education Respondent	3.39	3.77	-8.7	-0.71	1.49*
Married	0.66	0.84	-41.1	-3.37	.
Married-polygamy	0.01	0.00	11.7	0.94	.
Single	0.02	0.04	-10.6	-0.88	.
Divorced	0.01	0.00	16.7	1.34	.
Widowed	0.28	0.12	42.4	3.47	.
Family size	6.36	6.69	-12.9	-1.05	1.30
Males <17 years	1.15	1.37	-18.7	-1.54	0.78
Female <17 years	1.02	1.43	-34.1	-2.83	0.61*
Males 18-64 years	2.03	1.86	11.8	0.97	1.36
Females 18-64 years	1.89	1.84	4.4	0.36	1.07
Males 65 years +	0.18	0.28	-10.5	-0.87	0.51*
Females 65 years +	0.16	0.07	27.4	2.23	2.03*

Summary Stats		**Halaba**			
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.08	25.5	0.030	55.8*	1.32
		Hadiya			
	0.10	36.4	0.001	66.2*	3.64*

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39]

Livestock

Table 2 reports the information across the samples on livestock holding for the respondent's households, while Figure 2 illustrates the distribution of Total Livestock units across the samples. There are significant differences with greater livestock ownership in the treatment areas both overall, and in the composition and distribution of animal holdings. This is more marked in Halaba where in the control area there appear to be a larger number of households without any livestock (although they appear to have held more livestock previously). In both cases the summary statistics suggest that the overall patterns of livestock holding are significantly different across the samples.

Table 2 Livestock

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Did you have or keep livestock in the last dry season? (1-yes, 0-no)	0.86	0.74	31.6	2.49	.
Cows (number)	1.45	0.58	78.9	6.22	3.29*
Oxen/Bulls	0.95	0.57	43.3	3.41	2.01*
Calves	0.80	0.17	83.3	6.58	7.09*
Sheep	2.19	0.82	61.0	4.81	2.87*
Donkey/Horses	0.86	0.54	49.4	3.89	2.11*
Total Livestock Units	4.06	1.93	78.7	6.21	3.31*
	Hadiya				
Did you have or keep livestock in the last dry season? (1-yes, 0-no)	0.95	0.95	-0.8	-0.07	.
Cows (number)	1.92	1.37	46.8	3.81	2.96*
Oxen/Bulls	1.05	0.90	17.9	1.47	1.35
Calves	0.97	0.66	45.7	3.76	1.36
Sheep	0.53	0.97	-35.9	-3.00	0.45*
Donkey/Horses	0.67	0.95	-48.3	-4.00	0.79
Total Livestock Units	4.24	3.69	24.0	1.96	1.81*
Summary Stats	**Halaba**				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.18	60.9	0.000	92.6*	6.97*
	Hadiya				
	0.20	76.0	0.000	106.9*	1.25

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.70; 1.43].
Where no animal was present a value of zero is recorded.

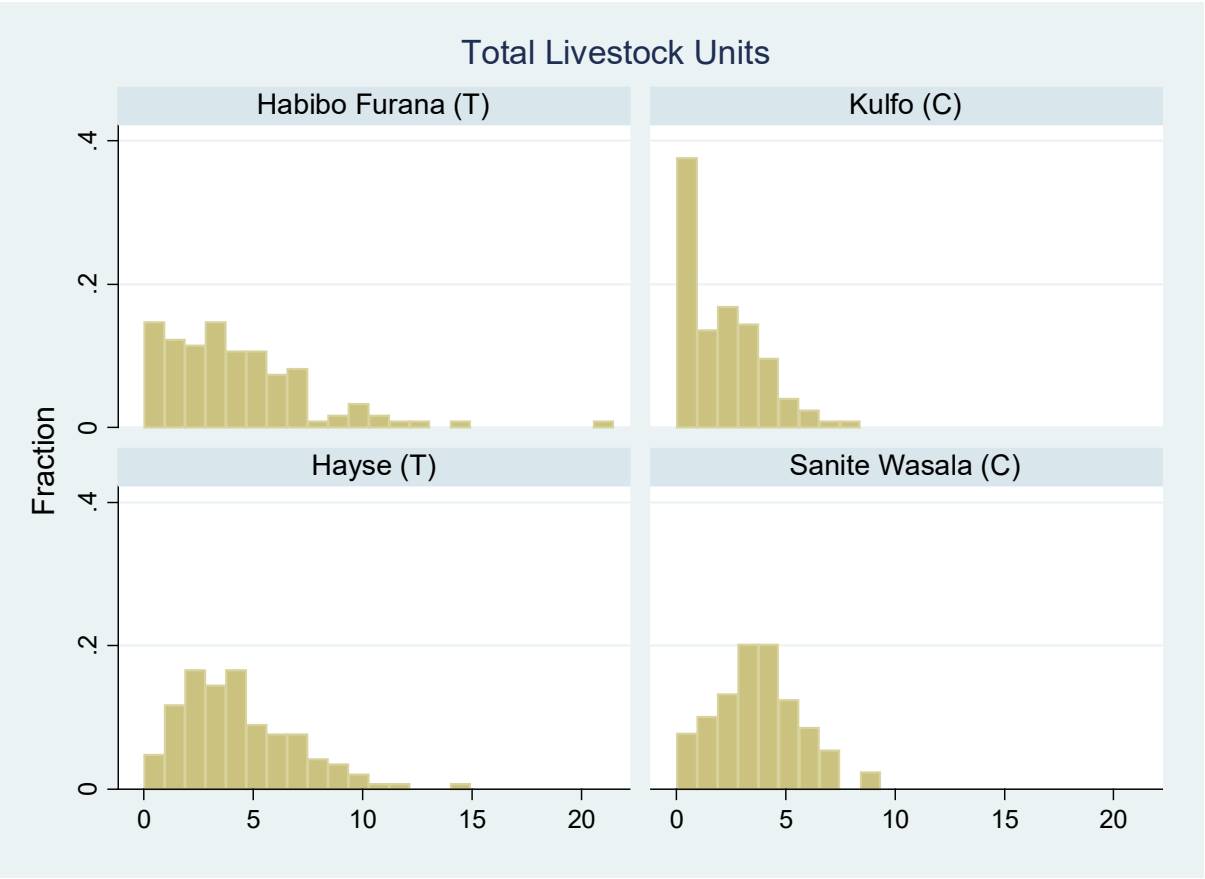


Figure 2: Distribution of Total Livestock Units

Landholding

Table 3 reports the statistics across the samples on land holding for the respondent households, while Figure 2 illustrates the distribution of land holding across the different types. In both zones average holding and number of plots is significantly larger in the treatment groups. There are also differences observed across the zones with the average holding in Halaba larger than that observed for Hadiya. In all areas most of the land is designated as own cultivated land although there do appear some differences in what is counted as the home garden area with the size of this area significantly larger in the Hadiya treatment group.

Table 3 Land holdings

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Total land holding (timad)	4.21	3.48	33.3	2.62	2.52*
Own cultivated land (timad)	3.98	3.21	19.0	1.50	12.13*
Total irrigatable land (timad)	0.11	0.70	-11.7	-0.92	0.01*
Private grazing land (timad)	0.23	0.13	15.0	1.18	0.84
Home garden land (timad)	0.64	1.02	-27.7	-2.18	1.04
How many plots do you cultivate ?	5.06	2.45	23.0	1.81	4.77*
What is the average land quality of your land? (1-fertile, 2-medium, 3 – poor)	1.96	1.77	41.8	3.29	1.32
	Hadiya				
Total land holding (timad)	2.72	2.30	26.9	2.17	1.92*
Own cultivated land (timad)	2.45	1.91	19.4	1.56	9.57*
Total irrigatable land (timad)	0.05	0.01	14.0	1.12	23.04*
Private grazing land (timad)	0.20	0.06	51.4	4.14	4.50*
Home garden land (timad)	1.38	0.44	12.8	1.03	532.50*
How many plots do you cultivate ?	5.09	1.87	23.8	1.74	438.42*
What is the average land quality of your land? (1-fertile, 2-medium, 3 – poor)	1.82	1.84	-6.0	-0.49	1.70*
Summary Stats	**Halaba**				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.10	29.2	0.000	33.0*	85.18*
	Hadiya				
	0.11	38.0	0.000	80.8*	1.04

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39]. A Timad

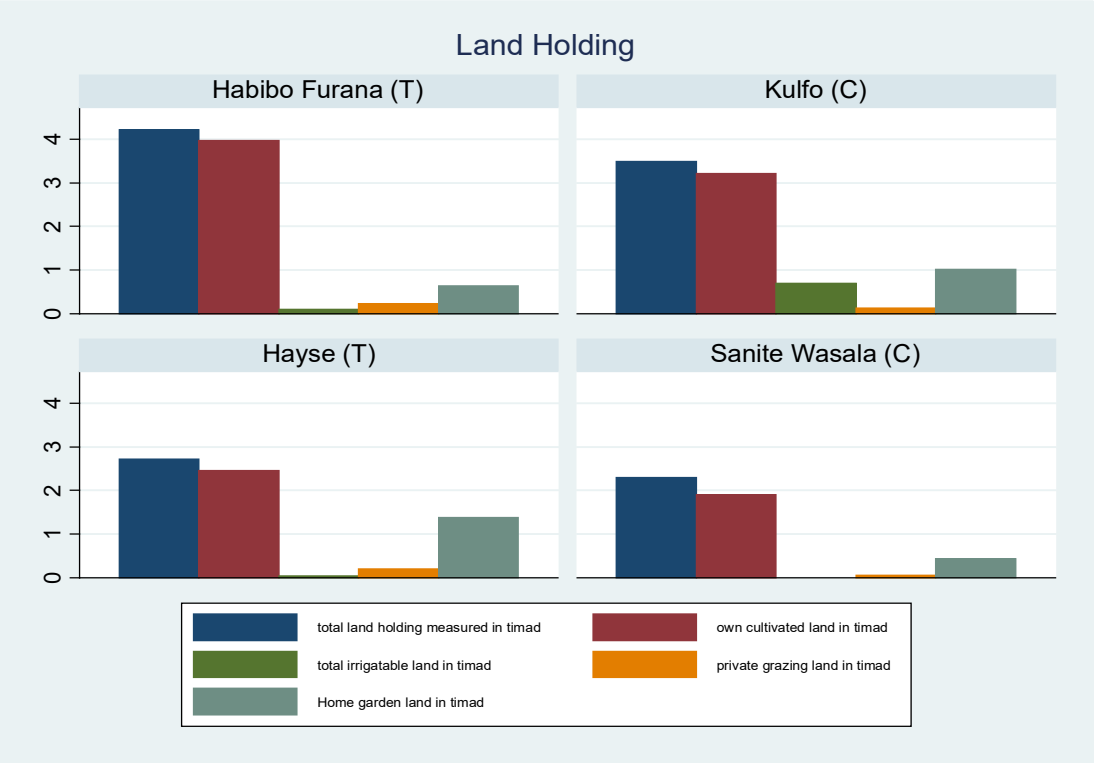


Figure 3. Structure of land holdings

Crops grown

Table 4 reports the statistics across the samples on the types of crops grown, while Figure 4 illustrates these values. Maize is the crop most frequently grown in Halaba zone. There are differences across the control and treatment in terms of the other crops grown with teff and finger millet more important in the treatment area relative to the control, while sorghum is less often grown. In Hadiya wheat is most commonly grown with teff and sorghum more frequently grown in the treatment areas.

Table 4 Crops Grown

Variable	Treated	Control	%bias	t
	Halaba			
Whether Crop Grown (1=Yes, 0=No)				
Teff	0.32	0.11	51.1	4.02
Maize	0.93	0.96	-14.3	-1.13
Wheat	0.05	0.19	-44.9	-3.53
Barley	0.00	0.02	-22.1	-1.72
Finger millet	0.72	0.49	47.6	3.74
Sorghum	0.21	0.35	-31.5	-2.48
Pepper	0.01	0.00	12.8	1.01
Field pea	0.00	0.00	.	.
Chickpea	0.00	0.00	.	.
Haricot Bean	0.03	0.04	-4.0	-0.31
Faba Bean	0.00	0.00	.	.
Other	0.70	0.59	24.4	1.91
	Hadiya			
Teff	0.58	0.15	99.8	8.15
Maize	0.36	0.33	5.9	0.49
Wheat	0.94	0.90	14.0	1.16
Barley	0.15	0.22	-17.4	-1.43
Finger millet	0.00	0.02	-17.7	-1.47
Sorghum	0.19	0.00	68.6	5.51
Pepper	0.00	0.00	.	.
Field pea	0.00	0.00	.	.
Chickpea	0.00	0.00	.	.
Haricot Bean	0.02	0.00	20.9	1.67
Faba Bean	0.00	0.23	-77.9	-6.50
Other	0.00	0.02	-18.0	-1.48

Summary Stats	Halaba			
	Psuedo-R2	chi2	p-value	Rubin-B
	0.16	51.2	0.000	98.8*
	Hadiya			
	0.13	34.1	0.000	88.9*

* if B>25%, R outside [0.5; 2]

* if variance ratio outside [0.70; 1.43]

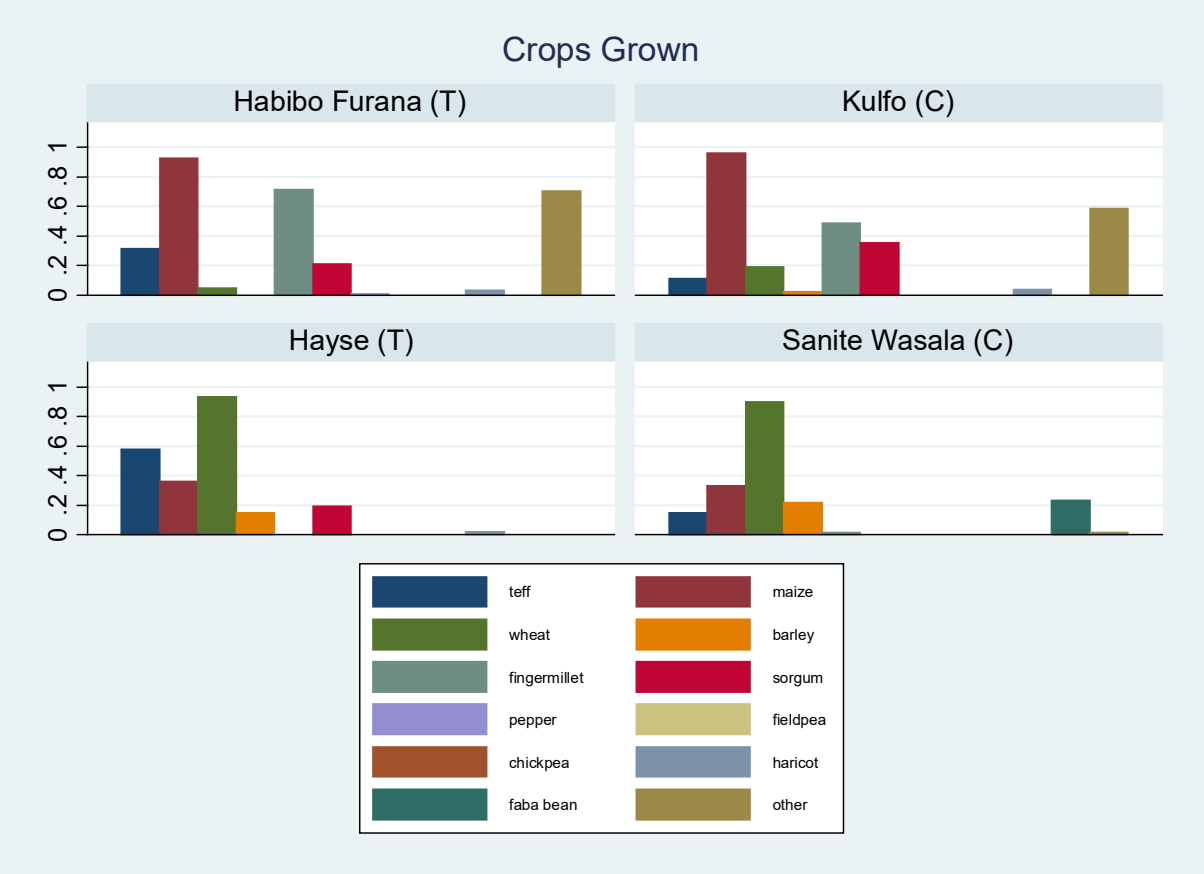


Figure 4: Crops grown

Fertilizer and Compost use

Table 5 reports the use of fertilizer, improved seed and grasses across the different samples. Here we do see differences with higher fertilizer, improved seed and grasses use apparently in both control areas relative to the treatment areas, although overall these differences do not appear significant in terms of the summary measures for Halaba. Figure 5 provides a further insight with the histogram of DAP and NPS bags purchased. These emphasise the bimodal nature of the distributions with most farmers using very little fertilizer but a small number using significantly more (although this pattern might change if cultivated land area was controlled for).

Table 5 Fertilizer Use

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Number bags DAP&NPS fertilizer purchased (50kg)	4.02	5.78	-21.4	-1.68	0.65*
Number bags UREA fertilizer purchased ? (50kg)	4.49	5.99	-17.2	-1.35	0.72
Did you use improved seed for any of your crops ? (1 – yes, 0 -no)	0.76	0.69	16.9	1.33	.
Do you use improved grass/multipurpose trees as livestock feed? (1 – yes, 0 - no)	0.92	0.84	24.2	1.91	.
	Hadiya				
Number bags DAP&NPS fertilizer purchased (50kg)	2.29	4.61	-34.8	-2.74	0.34*
Number bags UREA fertilizer purchased ? (50kg)	2.33	4.97	-38.2	-3.01	0.32*
Did you use improved seed for any of your crops ? (1 – yes, 0 -no)	0.47	0.33	27.5	2.18	.
Do you use improved grass/multipurpose trees as livestock feed? (1 – yes, 0 - no)	0.85	0.71	34.7	2.89	.
Summary Stats**	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.01	3.4	0.330	23.5	0.61
	Hadiya				
	0.04	13.2	0.004	46.2*	0.52

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39] ** excludes improved grasses used

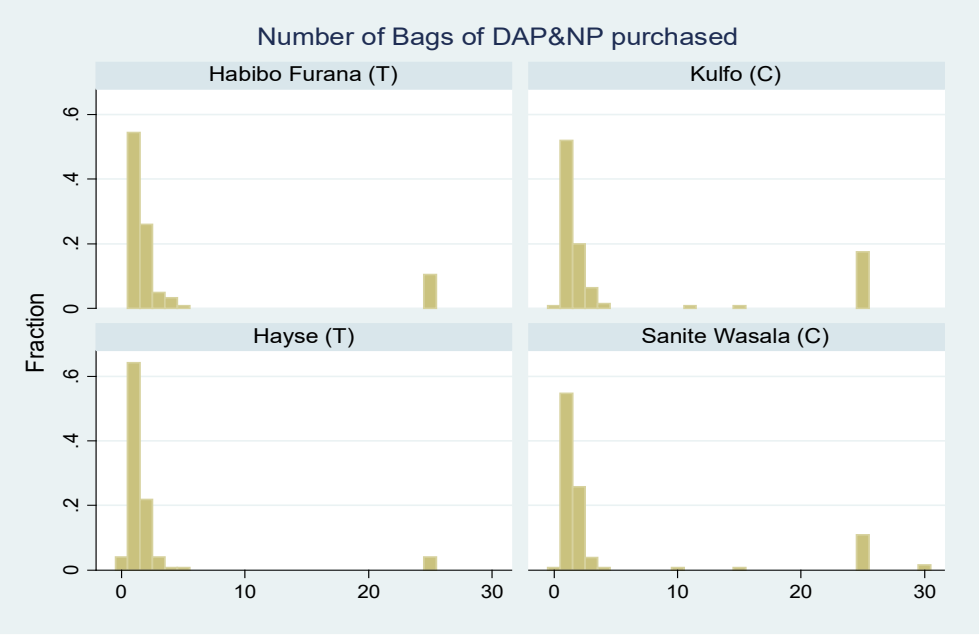


Figure 5: Fertilizer

The data on manure and compost use has a number of issues. First it is complicated by the different units which the respondents consider when thinking about how much manure and compost they spread. The most common measure used is Qirchat-Small which is used by 138 respondents when they consider compost and 150 respondents when they think about manure. Other measures, e.g. kg, are only considered by a handful of respondents and therefore the reported values below use only those respondents thinking in terms of Qirchat-Small. From Figure 6 there appear large apparent differences in the application of compost and manure across the different samples although further investigation is required as to whether the individuals in each area were thinking of the measure in similar ways.[2]

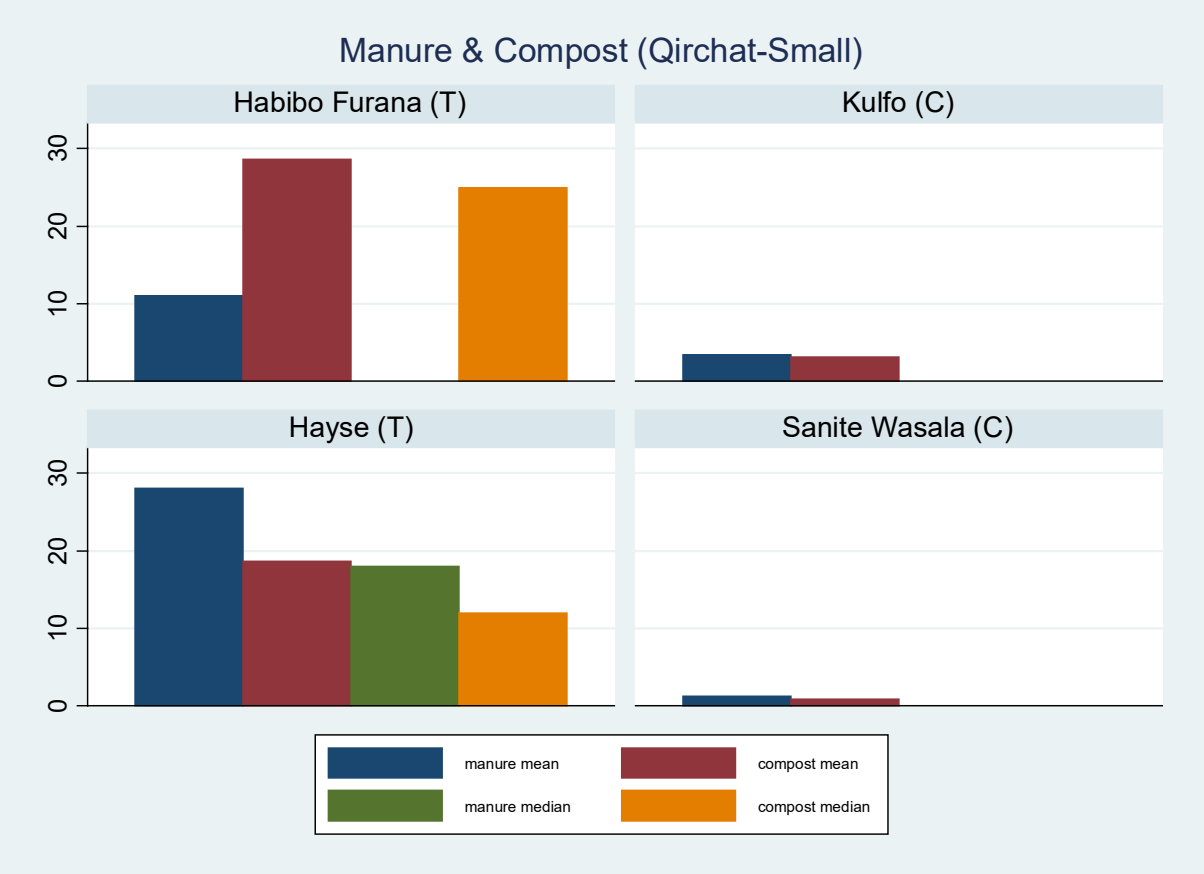


Figure 6. Reported Manure and Compost Use

[2] Because of this apparent unreliability in this data we do not report the formal statistics.

Income Sources & Livelihoods

Table 6 reports the statistics across the samples on sources of income for each household, and Figure 7 illustrates these values. The underlying question here asks whether a household received income from this source or not (yes=1, no= 0). Crop income, livestock and livestock products sales are the most frequent sources of income across both zones, but with some differences across zones with off farm income more important in the control area in Halaba.

Table 6 Income Sources

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Crop sales income	0.89	0.80	23.8	1.87	.
Income sale of livestock/livestock products	0.33	0.14	46.5	3.66	.
Off farm income	0.19	0.31	-28.7	-2.25	.
Remittances	0.03	0.00	25.8	2.04	.
Government Cash for work	0.24	0.17	18.0	1.42	.
	Hadiya				
Crop sales income	0.68	0.86	-44.1	-3.61	.
Income sale of livestock/livestock products	0.41	0.21	43.9	3.58	.
Off farm income	0.33	0.39	-13.4	-1.10	.
Remittances	0.10	0.12	-6.5	-0.53	.
Government Cash for work	0.11	0.12	-2.8	-0.23	.

Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.06	21.5	0.000	61.1*	1.54
	Hadiya				
	0.09	31.2	0.000	72.2*	1.54

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39]

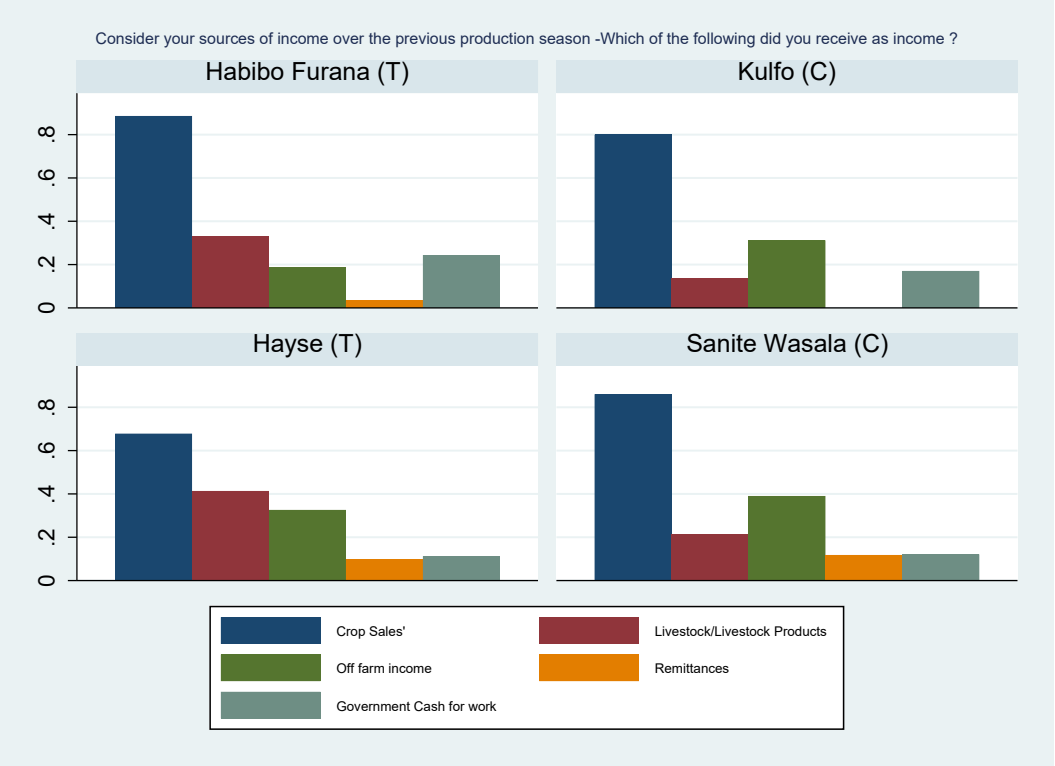


Figure 7: Income Sources

Main Sources of Income

Respondents were also asked to rank the importance of the three most important sources of income.[3] Table 7 reports the values obtained from these ranking questions. The underlying variables here are categorical (1,2,3) with a value of 4 used to indicate if the income source is not relevant). Hence lower averages indicate a higher importance of the income source, with values closer to 4 indicating low relevance as an income source. Figure 8 illustrates the full distribution of the ranks across the different sources. The Table results and Figure 8 indicate that crop sales tend to be the most important source of income, with livestock sales typically the second most important. The other sources of income appear to be less important to households.

Table 7 Rank Income Sources

Variable (Ranks)	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Crop sales income	1.57	1.74	-16.1	-1.26	0.72
Income sale of livestock/livestock products	3.28	3.58	-34.1	-2.60	1.33
Off farm income	3.51	3.44	7.6	0.58	0.98
Remittances	3.96	4.00	-21.8	-1.68	.*
Government Cash for work	3.35	3.60	-24.6	-1.90	1.61*
	Hadiya				
Crop sales income	1.90	1.62	25.7	2.03	1.46*
Income sale of livestock/livestock products	2.80	3.24	-44.4	-3.33	1.37
Off farm income	2.94	2.95	-1.4	-0.11	1.32
Remittances	3.45	3.50	-6.8	-0.49	1.28
Government Cash for work	3.41	3.41	0.4	0.03	1.01

Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.05	17.2	0.002	56.3*	1.39
	Hadiya				
	0.04	11.9	0.036	49.1*	1.96

* if B>25%, R outside [0.5; 2]

* if variance ratio outside [0.72; 1.39]

Treatment - Hayse , Control- Sanite Wasala

[3] "Consider your sources of income over the previous production season. Can you the rank the 3 most important sources to your household (1= most important)"

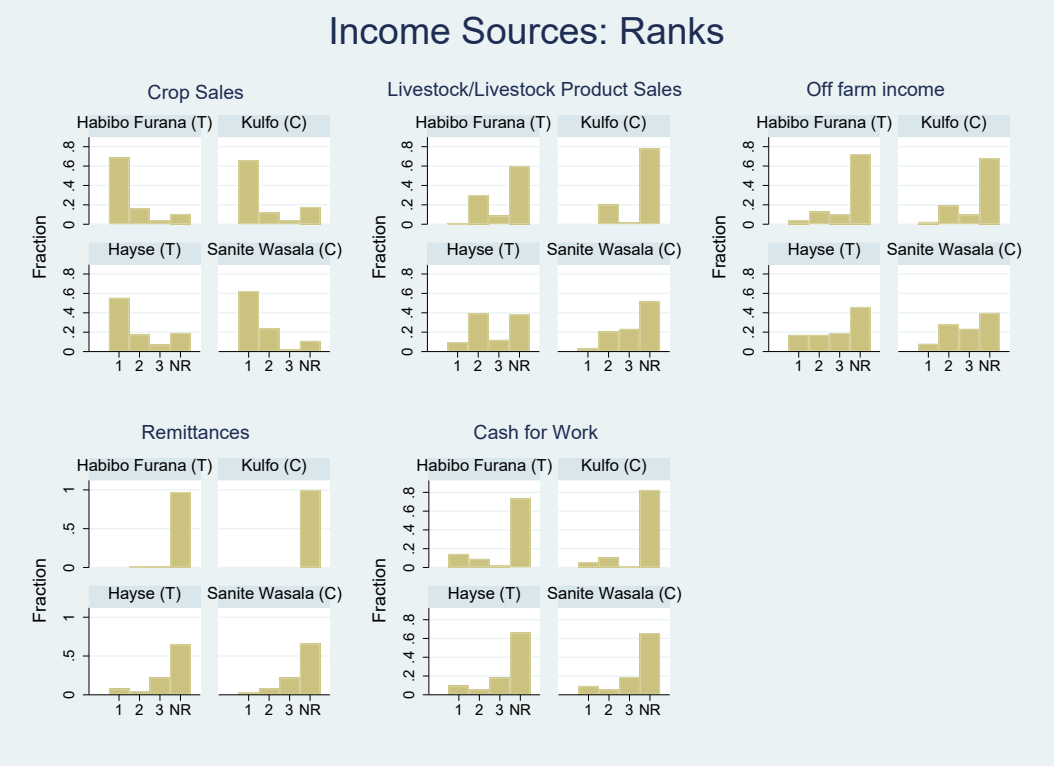


Figure 8: Rank of Income Sources

Asset Ownership

Table 8 (and Figure 9) report on which types of assets are owned by the household. In each case if the household owns the asset the answer is coded as a one and zero otherwise. From these results there are indications that the treated areas are richer, with for example significantly higher ownership of radios in Halaba and of TVs in Hadiya. Overall, the different pattern of ownership does predict whether the household is in the treatment areas.

Table 8 Assets

Variable	Treated	Control	%bias	t
	Halaba			
TV	0.00	0.00	.	.
Radio	0.29	0.05	68.6	5.41
Bike	0.01	0.00	12.8	1.01
Motorbike	0.04	0.00	29.0	2.28
Mobile phone	0.53	0.49	8.1	0.64
Grinder mill	0.00	0.00	.	.
Water pump	0.01	0.01	0.1	0.01
Traditional stove	0.45	0.47	-5.0	-0.39
Modern stove	0.00	0.00	.	.
Plough	0.93	0.69	63.1	4.94
Cart	0.03	0.02	10.6	0.83
Sewing Machine	0.00	0.00	.	.

	Hadiya			
TV	0.17	0.08	27.4	2.24
Radio	0.51	0.62	-22.2	-1.83
Bike	0.01	0.00	11.8	0.94
Motorbike	0.10	0.05	15.8	1.29
Mobile phone	0.67	0.71	-9.5	-0.79
Grinder mill	0.00	0.01	-12.5	-1.06
Water pump	0.00	0.00	.	.
Traditional stove	0.28	0.36	-18.6	-1.53
Modern stove	0.01	0.00	16.7	1.34
Plough	0.86	0.84	4.8	0.40
Cart	0.33	0.04	81.5	6.59
Sewing Machine	0.01	0.00	11.8	0.95

Summary Stats	Halaba			
	Psuedo-R2	chi2	p-value	Rubin-B
	0.16	51.9	0.000	96.7*
	Hadiya			
	0.18	63.1	0.000	104.2*

* if B>25%, R outside [0.5; 2]
* if variance ratio outside [0.72; 1.39]

Treatment - Hayse , Control- Sanite Wasala

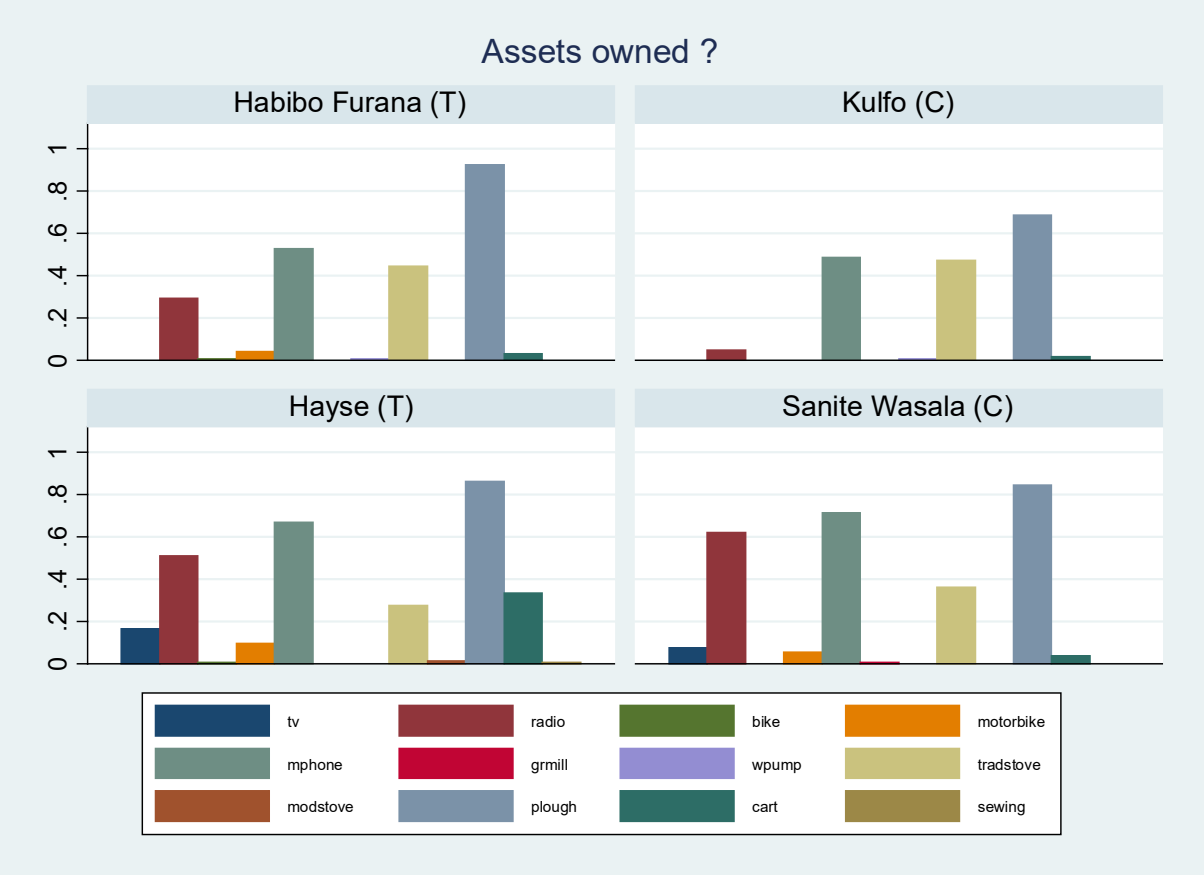


Figure 9: Assets Owned (Proportion)

Health, Happiness and Agency

Respondents were asked a number of standard questions on their happiness and current health values and how much control they felt they have over their lives. There does appear to be some differences with lower happiness and control felt in the treatment area in Halaba.

Table 9: Health, Happiness & Contrl Halaba

Variable	Treated	Control	%bias	t	V(T)/V(C)
Happiness (1-very happy, 4 – not at all happy)	1.74	1.95	-37.4	-2.94	0.83
Health State (1 very good, 4-poor)	1.85	1.98	-20.7	-1.63	1.14
Freedom and control (Likert 1-10) [4]	7.73	8.14	-25.6	-2.02	0.87
	Hadiya				
Happiness (1-very happy, 4 – not at all happy)	1.59	1.60	-3.1	-0.26	1.01
Health State (1 very good, 4-poor)	1.79	1.83	-5.4	-0.45	1.26
Freedom and control (Likert 1-10)	7.79	7.88	-6.3	-0.52	1.00
Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.04	15.1	0.002	50.2*	1.06
	Hadiya				
	0.00	0.8	0.859	10.5	0.87

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39]

[4] Respondents were asked to rate on a Likert scale from 1 ("no choice at all") to 10 ("a great deal of choice") to indicate how much freedom of choice and control they felt they have over the way their life turns out:

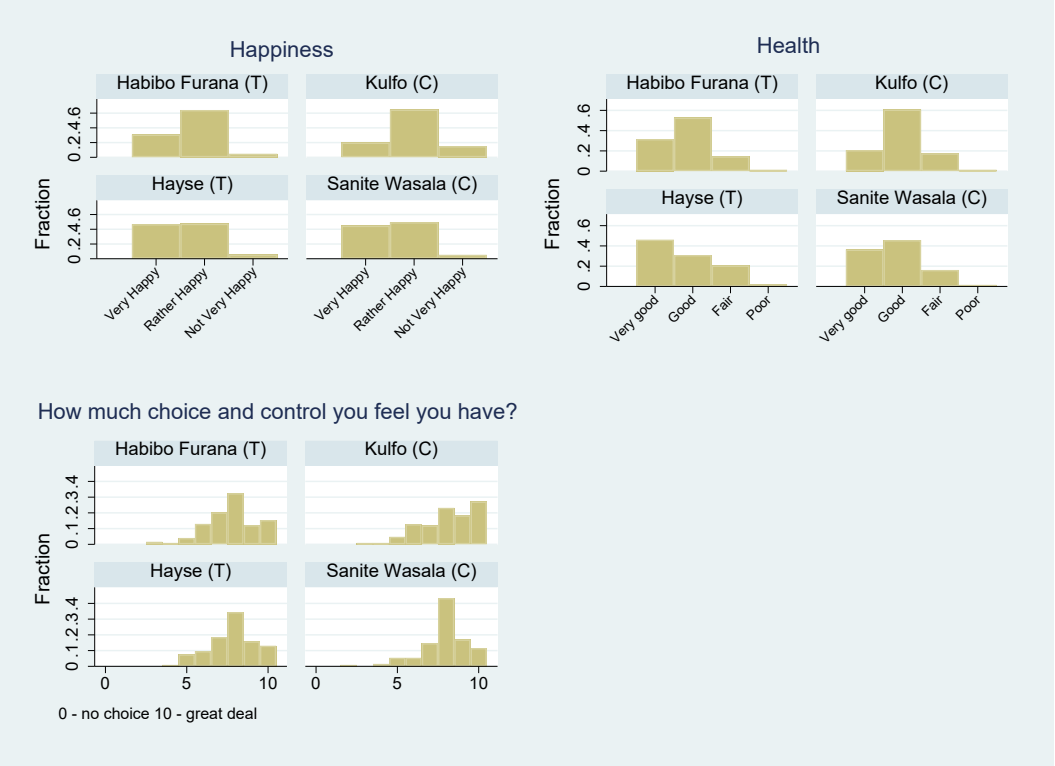


Figure 10. Happiness, Health & Control

Values

These latter were captured by a series of questions reflecting Schwartz approach to basic values. Respondents were provided with a behaviour and asked how to identify how similar it is with their own on a six-point scale from 1- *Very much like me* to 6 - *Not like me.* Hence, lower average values correspond with values with which respondents most identified. Table 10 and Figure 11 report the average values across the 11 characteristics. Some values do show differences between control and treatment groups. In Halaba these appear around the importance of being rich, the importance of doing good for society, adventure and the importance of tradition, while in Hadiya the only individual difference occurs for the value associated with security (although overall the set of values is still jointly significant in the probability of a household being in the treatment area).

Table 10 Schwartz Values

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
It is important to					
be creative	3.01	3.05	-2.6	-0.20	1.27
be rich..	3.37	3.76	-27.6	-2.17	1.55*
live in secure surroundings	3.20	2.98	16.2	1.27	1.62*
have a good time..	3.55	3.48	4.9	0.38	1.25
do something for the good of society..	3.10	2.69	27.8	2.18	1.31
help the people nearby..	3.15	2.78	23.5	1.85	1.21
be very successful and recognized..	3.54	3.43	7.6	0.60	1.41
take risks and adventure..	4.69	5.07	-28.4	-2.24	1.96*
always behave properly...	3.43	3.17	18.9	1.49	1.62*
look after the environment	3.40	3.10	21.2	1.67	1.62*
tradition and customs	3.53	2.98	37.8	2.96	1.28
	Hadya				
It is important to					
be creative	2.84	2.74	6.8	0.57	0.75
be rich..	3.26	3.20	4.2	0.34	0.94
live in secure surroundings	2.66	3.05	-26.9	-2.22	0.91
have a good time..	3.58	3.45	7.9	0.65	0.90
do something for the good of society..	2.66	2.70	-2.7	-0.22	0.83
help the people nearby..	2.67	2.81	-8.4	-0.70	0.85
be very successful and recognized..	3.35	3.24	7.7	0.64	0.71*
take risks and adventure..	4.45	4.59	-8.8	-0.72	0.96
always behave properly...	3.06	3.25	-12.8	-1.05	1.05
look after the environment	2.90	3.12	-13.5	-1.11	0.95
tradition and customs	3.48	3.50	-1.1	-0.09	1.06
Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.10	34.2	0.000	76.5*	1.08
	Hadiya				
	0.08	30.8	0.001	69.3*	0.97

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39]

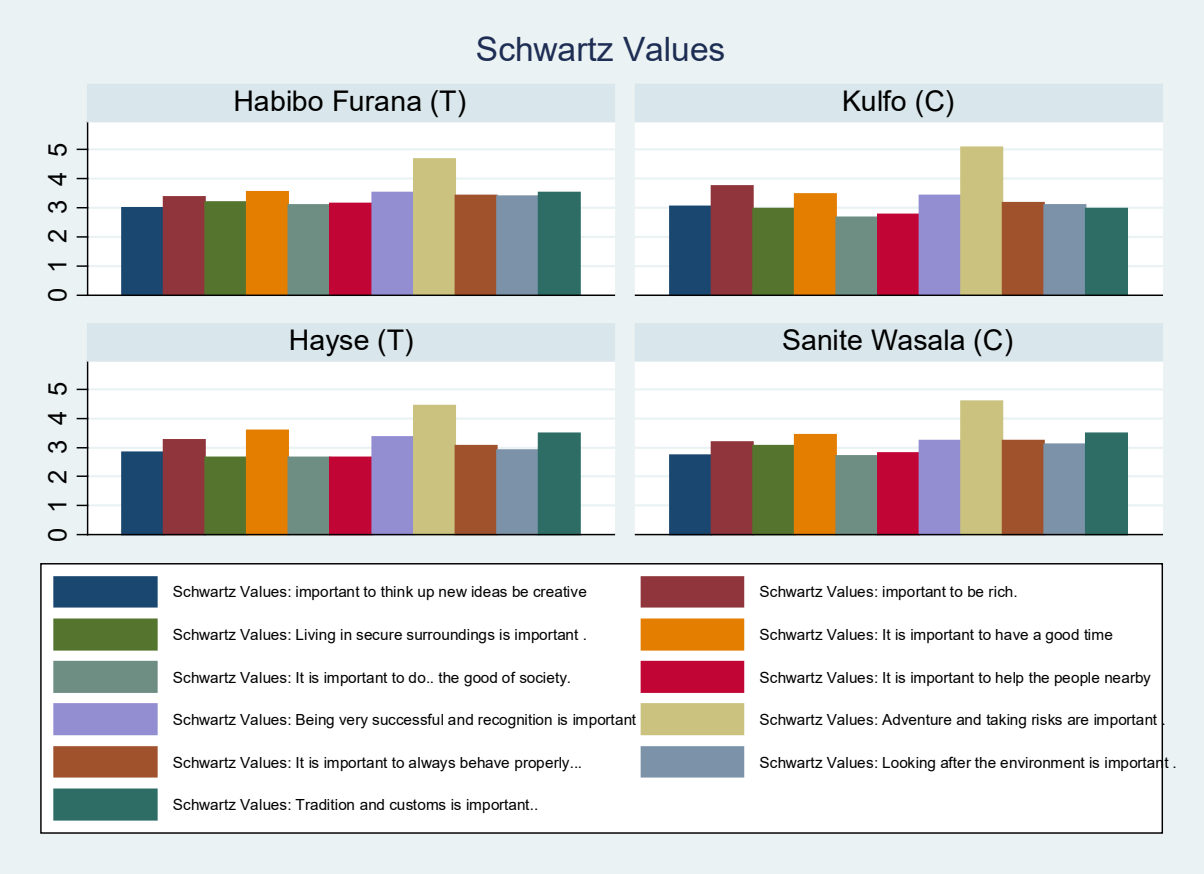


Figure 11: Schwartz Values

Dietary Diversity & Consumption

Table 11 reports which foods the household consumed in the last 7 days. These are also illustrated in Figures 12a and 12b which shows the proportion of households who consumed each food group over the 7 days before the survey, and the distribution of dietary diversity as measured by the total number of food groups. There are a number of differences in the patterns of consumption. In Halaba these appear in the proportion of households consuming teff, beans and pulses, and in milk products, with overall a statistically significant difference in the total number of food groups consumed. In Hadiya there are apparent differences in the proportions consuming teff, beef and red meat products, eggs and milk products, although there is no difference in the overall number of food groups consumed. In contrast, at least visually, there would appear greater difference in the distribution of the number of food groups consumed across the treatment and control areas in Hadiya.

Table 11: Food Groups Consumed in the last 7 days

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Teff	0.15	0.06	26.8	2.11	.
Other cereals (rice, sorghum, millet, maize, wheat bread)	1.00	1.00	.	.	.
Potatoes and other root crops	0.33	0.28	11.5	0.91	.
Pasta, Macaroni and Biscuits	0.30	0.20	23.3	1.84	.
Sugar, sugar products (honey etc)	0.29	0.29	-0.2	-0.02	.
Beans, lentils, nuts, other pulses	0.53	0.36	34.3	2.70	.
Vegetables	0.76	0.87	-30.0	-2.36	.
Fruits	0.09	0.10	-4.9	-0.39	.
Beef, Sheep, Goat etc	0.04	0.01	21.2	1.68	.
Poultry	0.00	0.00	.	.	.
Eggs	0.04	0.02	14.8	1.17	.
Fish	0.00	0.00	.	.	.
Oils/fats/butter	0.91	0.90	2.3	0.18	.
Milk/yogurt/cheese/other dairy	0.29	0.07	59.4	4.69	.
Other condiments (Spice etc)	0.98	0.99	-7.5	-0.59	.
Kocho/Bula	0.03	0.00	25.8	2.03	.
Number of food groups	5.73	5.16	34.0	2.66	1.13
	Hadiya				
Teff	0.61	0.39	46.4	3.80	.
Other cereals (rice, sorghum, millet, maize, wheat bread)	0.92	0.91	3.2	0.27	.
Potatoes and other root crops	0.31	0.22	20.2	1.66	.
Pasta, Macaroni and Biscuits	0.12	0.13	-2.6	-0.21	.
Sugar, sugar products (honey etc)	0.32	0.36	-9.0	-0.74	.
Beans, lentils, nuts, other pulses	0.49	0.55	-12.8	-1.06	.
Vegetables	0.81	0.83	-5.8	-0.48	.
Fruits	0.18	0.19	-3.9	-0.32	.
Beef, Sheep, Goat etc	0.09	0.02	27.5	2.23	.
Poultry	0.00	0.01	-12.5	-1.04	.
Eggs	0.16	0.07	27.2	2.21	.
Fish	0.00	0.00	.	.	.
Oils/fats/butter	0.93	0.95	-8.9	-0.72	.
Milk/yogurt/cheese/other dairy	0.60	0.44	31.0	2.50	.
Other condiments (Spice etc)	0.98	0.99	-12.1	-0.98	.
Kocho/Bula	0.84	0.93	-27.9	-2.25	.
Number of food groups	7.36	7.02	17.0	1.33	1.54*
Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.13	43.0	0.000	88.3*	2.12*
	Hadiya				
	0.10	32.4	0.003	74.3*	1.44

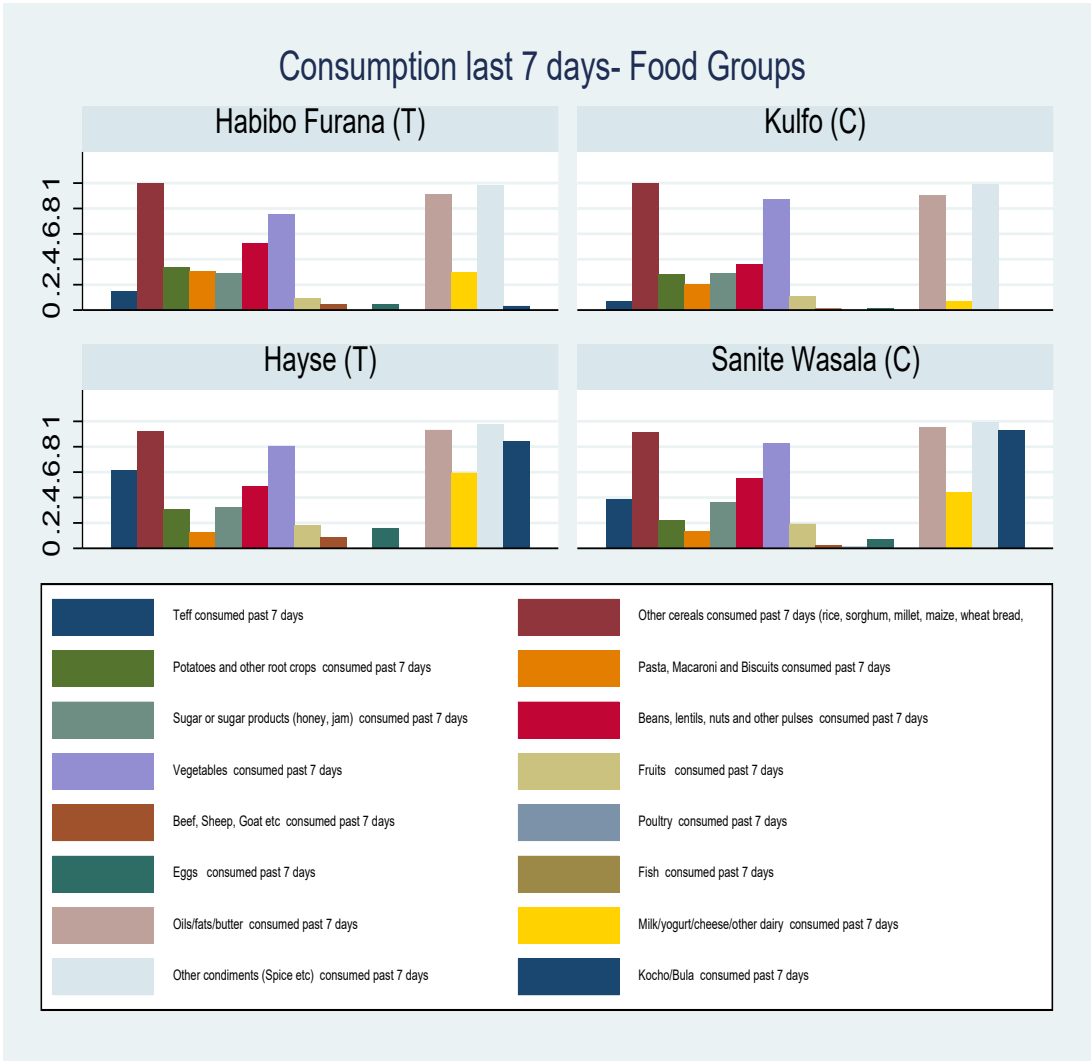


Figure 12a: Consumption Rates

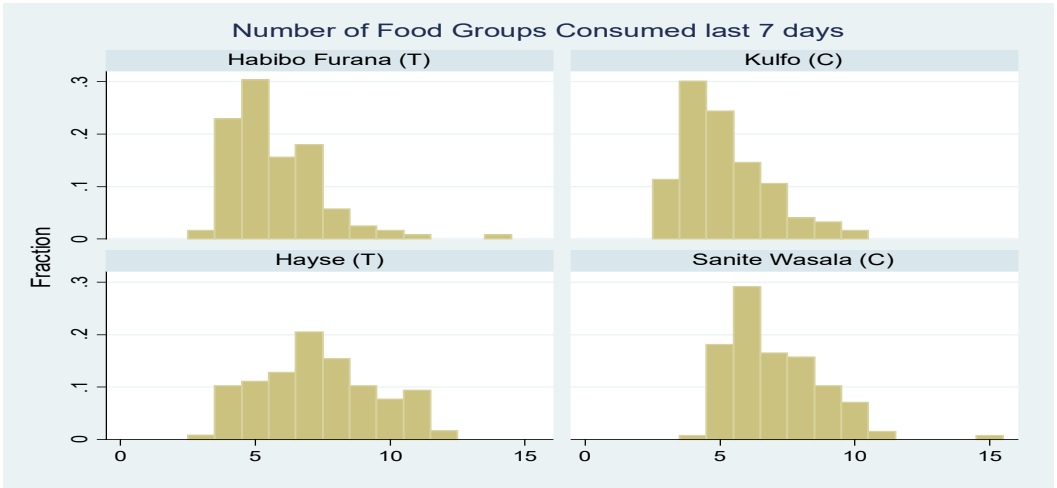


Figure 12b: Dietary Diversity

Table 12 reports on further detail on consumption. First, for number of major food groups, households were asked how many days in the last 7 food of that type was consumed. Second, households were asked to estimate their total food expenditure in the last 7 days and also their expenditure on non-food items over the last month. Cereals, vegetables, oils and other condiments are consumed on the majority of days in all cases. There are some differences across zones and also between treatment and control within zones. Notable is the greater consumption of milk in the treatment area, and somewhat lower use of cereals within Halaba, while in Hadiya overall consumption of milk products is higher in both treatment and control (although there is no statistically significant difference here).

Table 12: Main Food Groups & Total Consumption

Variable	Treated	Control	%bias	t	V(T)/V(C)
Major Food Groups No Days Consumed per week					
	Halaba				
Other cereals (rice, sorghum, millet, maize, wheat bread)	5.89	6.67	-67.6	-5.30	3.02*
Potatoes and other root crops	0.90	0.72	12.3	0.96	1.14
Sugar, sugar products (honey etc)	0.83	1.44	-29.8	-2.33	0.38*
Beans, lentils, nuts, other pulses	2.06	1.17	40.5	3.17	1.61*
Vegetables	3.50	3.68	-7.5	-0.58	1.31
Oils/fats/butter	5.34	4.88	20.8	1.63	0.92
Other condiments (Spice etc)	6.83	6.94	-13.3	-1.04	2.26*
Kocho/Bula	0.10	0.00	23.3	1.83	.*
Milk/yogurt/cheese etc	1.14	0.31	48.9	3.84	2.36*
	Hadiya				
Other cereals (rice, sorghum, millet, maize, wheat bread)	3.81	4.08	-12.2	-0.95	1.12
Potatoes and other root crops	0.65	0.55	8.7	0.71	0.97
Sugar, sugar products (honey etc)	0.74	1.06	-21.1	-1.72	0.71*
Beans, lentils, nuts, other pulses	1.42	2.13	-33.5	-2.69	0.69*
Vegetables	3.40	4.36	-37.5	-2.94	1.01
Oils/fats/butter	5.22	5.44	-11.2	-0.88	1.50*
Other condiments (Spice etc)	6.74	6.89	-16.6	-1.30	2.76*
Kocho/Bula	3.36	4.47	-49.0	-3.84	1.16
Milk/yogurt/cheese etc	2.11	1.64	20.9	1.65	0.94

Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.43	12.2	0.032	176.0*	1.33
	Hadiya				
	1.00	23.5	.	136.2*	0.51

Total Food and Non Food Expenditure					
Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Total Food (Birr)	489.75	412.56	17.1	1.34	1.96*
Total Non-Food (Birr)	225.30	195.11	7.3	0.57	1.90*
	Hadiya				
Total Food (Birr)	509.14	639.53	-19.2	-1.60	0.73
Total Non-Food (Birr)	237.24	371.29	-19.8	-1.64	0.74

* if B>25%, R outside [0.5; 2]
* if variance ratio outside [0.72; 1.39]

In the last panel of Table 12 the value for the total weekly food expenditure and monthly non-food expenditure are reported. There are no particularly striking differences in the means but some

differences in Halaba in terms of the variances. These are more obvious from Figure 13 which captures the distributions of food expenditure across the four samples. Visually, the distributions on the top row representing the treatment and control in Halaba appear to show a somewhat greater proportion of households with higher consumption levels in the control area. In contrast the distributions for Hadiya (both two graphs) appear similar.

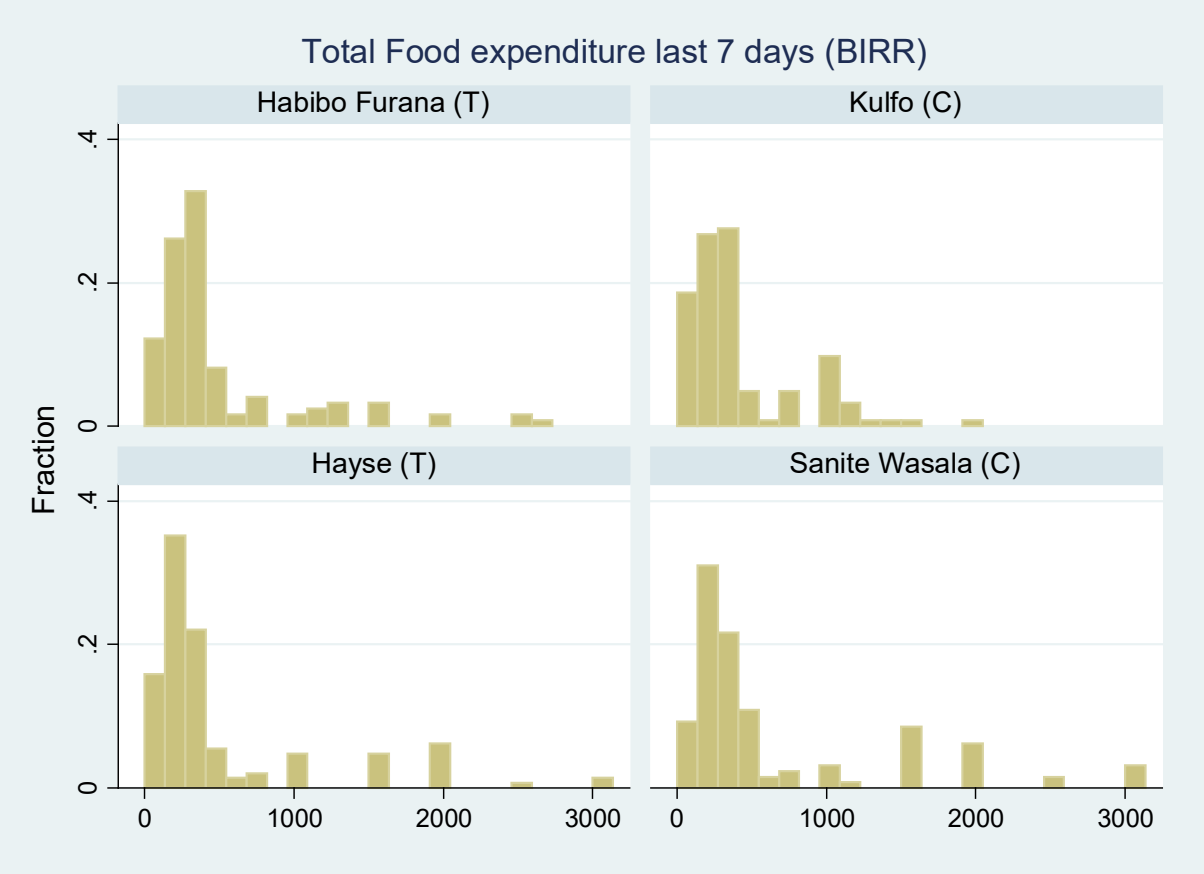


Figure 13: Distribution of total food expenditure (last 7 days)

Credit & Networks

Table 13 reports information on a number of questions around networks and availability of credit. Formal access to credit is very low, but membership of the EDIR (mutual assistance programme) typically very high. There are some small differences across the different samples in the means of these variables, most particularly in number of friends in Halaba across the treatment and control areas. Figure 14a provides the distribution of the number of friends (truncated at 10). Here the greatest proportion of respondents in all areas report they have no close friends although this slightly lower in the treatment area in Halaba. Figure 14b illustrates the number of people a household could turn to for a small amount of money in an emergency. Again, this is slightly lower in the treatment area in Halaba, it is notable that the proportion of respondents who report that there is no-one who they could turn to is typically close to or around 40%. Possibly this suggests slightly stronger networks in the treatment area in Halaba.

Table 13: Credit & Networks

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Access to Credit (Yes=1, No =0)	0.03	0.02	5.1	0.40	.
Are you a member of EDIR? Yes=1, No =0)	0.99	0.96	20.8	1.64	.
Are you a beneficiary of Safety net /food for work programs? Yes=1, No =0)	0.28	0.21	16.0	1.26	.
How many close friends ?	2.84	1.69	28.5	2.25	7.84*
If needed small amount of money in emergency [pay household expenses for one week], how many people beyond immediate household could turn to?*	2.14	1.86	16.3	1.19	0.95
In past 12 months, how many people have turned to you for assistance?	1.24	0.58	18.6	1.47	17.58*
	Hadiya				
Do you have access to Credit?	0.06	0.04	10.6	0.87	.
Are you a member of EDIR?	0.89	0.98	-39.9	-3.23	.
Are you a beneficiary of Safety net /food for work programs?	0.12	0.12	-2.1	-0.17	.
How many close friends ?	3.37	2.58	21.5	1.76	1.96*
If needed small amount of money in emergency [pay household expenses for one week], how many people beyond immediate household could turn to?	1.80	1.94	-8.3	-0.62	1.01
In past 12 months, how many people have turned to you for assistance?	1.77	0.88	38.9	3.14	8.08*
Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.02	7.2	0.304	35.8*	0.79
	Hadiya				
	0.09	27.2	0.000	69.1*	4.14*

* if B>25%, R outside [0.5; 2] , if variance ratio outside [0.70; 1.43]. Question around how many friends is categorical and value set at the midpoint of associated number e.g. where answer "one or two people" the value for the category is set to 1.5.

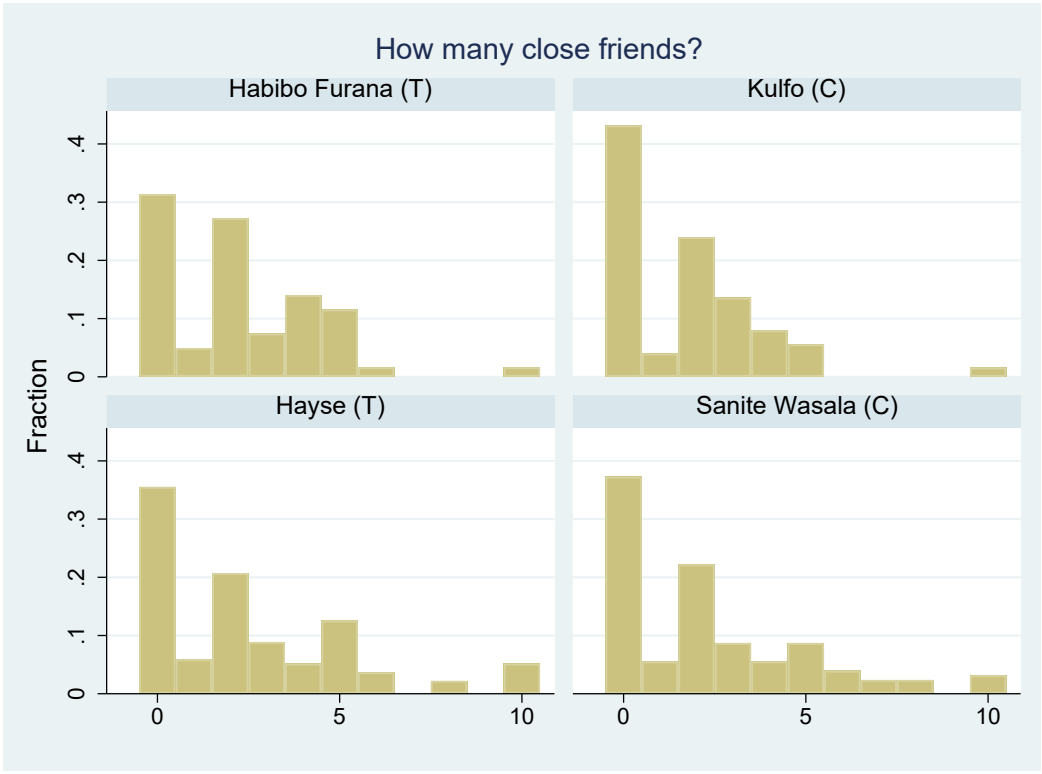


Figure 14a

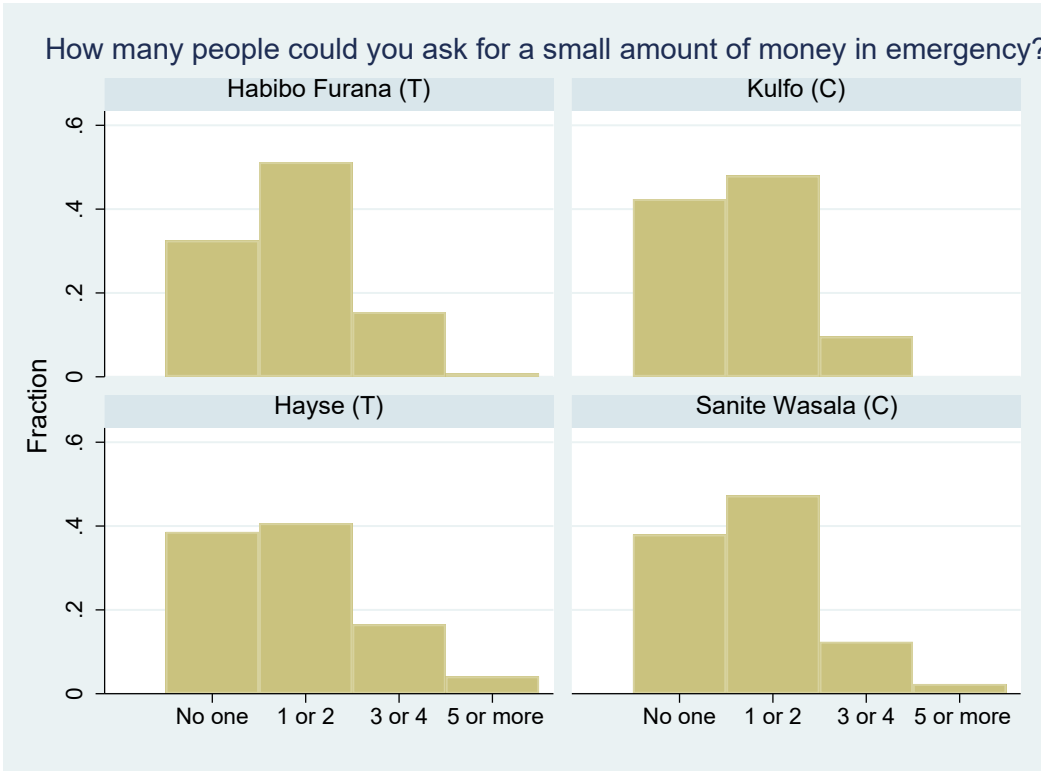


Figure 14b

Natural Resources: Access to Water and Firewood

Table 14 reports on differences in the access to water and firewood across the different samples. There do appear some differences in the distance to water for the treatment group in Hadiya, although overall average time spent appears greater than in the control. In Halaba the main source of domestic water appears closer in the treatment group, although overall time spent is around the same. There also appears to be more time spent collecting firewood on average in the treatment group.

Table 14 Access to Water and Firewood

Variable	Treated	Control	%bias	t	V(T)/V(C)
	Halaba				
Drinking water: How far from home (km) (one way)?	2.30	2.53	-12.0	-0.94	0.64*
Drinking water: How far from home (time) round trip)?	3.76	2.82	13.4	1.06	1.61*
Main source domestic water: How far from home (km) (one way)?	2.68	3.86	-58.2	-4.58	0.71
Main source of water domestic use. How long there and back (incl normal waiting	3.99	3.70	4.2	0.33	1.62*
Approx how many hours members household spend last 7 days collecting firewood ?	8.99	5.84	27.7	2.18	1.30
	Hadya				
Drinking water: How far from home (km) (one way)?	1.01	2.53	-58.6	-4.97	0.07*
Drinking water: How far from home (time) round trip)?	6.50	5.28	11.4	0.94	1.20
Main source domestic water: How far from home (km) (one way)?	1.31	2.51	-45.0	-3.81	0.11*
Main source of water domestic use. How long there and back (incl normal waiting	6.76	5.22	14.4	1.19	1.20
Approx how many hours members household spend last 7 days collecting firewood ?	7.55	6.91	6.1	0.51	0.73
Summary Stats	Halaba				
	Psuedo-R2	chi2	p-value	Rubin-B	Rubin-R
	0.15	51.2	0.000	93.2*	0.83
	Hadiya				
	0.15	57.7	0.000	69.5*	0.36*

* if B>25%, R outside [0.5; 2]
* if variance ratio outside [0.72; 1.39]

Exclosure Benefits and Costs

Table 15 reports on the benefits and costs from the local exclosures reported by respondents. All variables are binary taking one if the respondent answers yes that they think the benefit or disbenefit affects them and zero otherwise. In Halaba significantly more respondents in the treatment area obtain grass, do not feel water quality has improved, and have also experienced crop damage from wild animals. However, they do not appear to feel that the exclosure takes space and effort which could be use in a better way relative to the control area. In Hadiya there are differences in the proportions having experienced crop damage in the treatment group but again fewer think that the exclosure is a waste of space and takes too much time.

Table 15 Exclosure Benefits and Disbenefits

Variable	Treated	Control	%bias	t
	Halaba	Benefits		
I get grass from the exclosure (for animal feed, or thatching)	0.74	0.60	29.6	2.34
My livestock occasionally graze in the exclosure	0.01	0.09	-37.2	-2.93
The water quality or quantity has improved because of the exclosure	0.00	0.08	-41.0	-3.22
Construction materials	0.47	0.38	17.9	1.42
		Disbenefits		
Wild animals have come from the exclosure and damaged my crop	0.54	0.31	46.4	3.67
The exclosure requires a lot of work, too much time and energy from me	0.07	0.19	-34.3	-2.71
I don't experience any negative effects from the exclosure	0.07	0.16	-26.2	-2.07
The exclosure takes space away that otherwise could be used in a better way	0.37	0.51	-28.8	-2.28
	Hadya	Benefits		
I get grass from the exclosure (for animal feed, or thatching)	0.95	0.90	20.8	1.73
My livestock occasionally graze in the exclosure	0.02	0.01	10.7	0.87
The water quality or quantity has improved because of the exclosure	0.02	0.02	3.6	0.29
Construction materials	0.46	0.33	26.7	2.19
		Disbenefits		
Wild animals have come from the exclosure and damaged my crop	0.68	0.34	72.4	5.95
The exclosure requires a lot of work, too much time and energy from me	0.11	0.11	-0.2	-0.02
I don't experience any negative effects from the exclosure	0.03	0.10	-27.3	-2.28
The exclosure takes space away that otherwise could be used in a better way	0.21	0.54	-71.1	-5.88
Summary Stats	Halaba			
	Psuedo-R2	chi2	p-value	Rubin-B
	0.07	24.2	0.001	64.5*
	Hadya			
	0.12	46.4	0.000	88.2*

* if B>25%, R outside [0.5; 2]

* if variance ratio outside [0.72; 1.39]

Attitudes to Exclosures and Watershed management

Table 16 reports on the questions asked around respondent's attitudes to exclosure management.

Table 16 Attitudes to Exclosure Management

Variable	Treated	Control	%bias	t
	Halaba			
How do you feel that access to the exclosure is being managed?				
Only those people allowed to are actually using them	0.68	0.59	18.6	1.47
Some people use exclosure, e.g., grass cutting, wood collection	0.13	0.24	-29.0	-2.29
Many people use exclosure, e.g., grass cutting, wood collection	0.19	0.16	6.0	0.48
How do you feel that access to the exclosure should be managed?				
The rules should be strictly enforced	0.85	0.88	-8.5	-0.67
It is acceptable if exemptions are made for people in need	0.11	0.12	-3.6	-0.29
Everyone able to use the exclosure without restrictions	0.05	0.01	24.8	1.98
How do you think grass from the exclosure should be distributed?				
Every household should get same share, no matter how poor	0.55	0.38	34.4	2.73
Every household should get same share in principle and pay same but kebele committee can decide to give more to some households who are in some sort of an emergency situation	0.33	0.57	-48.8	-3.87
Every household should get a share dependent on how poor they are	0.08	0.03	21.8	1.73
Households should get more if they have more livestock to feed	0.03	0.02	11.0	0.87
In an ideal world, who should decide how the exclosures are being used?				
The kebele chairman	0.46	0.22	51.5	4.08
The kebele committee	0.18	0.12	17.4	1.38
A specially elected exclosure committee	0.36	0.66	-62.3	-4.94
Everyone in the kebele together	0.01	0.01	0.4	0.03
	Hadya			
How do you feel that access to the exclosure is being managed?				
Only those people allowed to are actually using them	0.54	0.60	-11.5	-0.95
Some people use exclosure, e.g., grass cutting, wood collection	0.32	0.31	1.7	0.14
Many people use exclosure, e.g., grass cutting, wood collection	0.14	0.10	15.2	1.24
How do you feel that access to the exclosure should be managed?				
The rules should be strictly enforced	0.83	0.83	0.3	0.03
It is acceptable if exemptions are made for people in need	0.10	0.10	0.1	0.01
Everyone able to use the exclosure without restrictions	0.06	0.06	-0.6	-0.05
How do you think grass from the exclosure should be distributed?				
Every household should get same share, no matter how poor	0.49	0.45	7.4	0.61
Every household should get same share in principle and pay same but kebele committee can decide to give more to some households who are in some sort of an emergency situation;	0.33	0.31	4.6	0.38
Every household should get a share dependent on how poor they are	0.14	0.13	5.2	0.43
Households should get more if they have more livestock to feed	0.03	0.11	-29.7	-2.48
In an ideal world, who should decide how the exclosures are being used?				
The kebele chairman	0.39	0.44	-8.5	-0.70
The kebele committee	0.29	0.37	-16.3	-1.33
A specially elected exclosure committee	0.25	0.20	13.2	1.07
Everyone in the kebele together	0.06	0.00	36.7	2.91
Summary Stats	Halaba			
	PsuedoR2	chi2	p-value	Rubin-B
	0.12	40.8	0.000	82.6*
	Hadya			
	0.05	18.1	0.034	51.7*

There do appear some differences in the application of the access rules across the treatment and control areas in Halaba, but little difference on how people feel access should be managed. There do also appear differences in the attitudes to how grass should be distributed, with in the control more in favour of using the grass quota allocation as some type of insurance, and also differences on who should be making decisions. In Hadya there is some evidence of apparent differences e.g. whether those with more livestock should get more grass quota although the pattern on individual variable difference is less clearcut.

Table 17 provides a picture on the average role and engagement in exclosure decision making played by the respondents. There do appear differences in the extent of knowledge of how decisions are made across the treatment and control areas in Halaba although these appear less acute in Hadya. Figure 15a shows how respondents deal with exclosure management issues. While not reported here there overall the different responses are statistically different between the treatment and control in Hadya.

Table 17 Role in Decisions

Variable	Treated	Control	%bias	t
	Halaba			
Describe your role in the decision-making/ management of exclosure?				
I dont know much about the exclosure at all and am not involved in its management	0.28	0.13	38.3	3.05
I am informed about the annual quota and any other aspects of the exclosure that I find relevant	0.49	0.55	-13.4	-1.06
I am informed about everything relevant AND I am able to ask questions and share my thoughts about the annual quota and the management of the exclosure	0.23	0.31	-19.1	-1.51
I am part of a group who is authorized to make decisions about the annual quota and the management of the exclosure(s).	0.01	0.01	0.4	0.03
	Hadya			
Describe your role in the decision-making/ management of exclosure?				
I dont know much about the exclosure at all and am not involved in its management	0.19	0.23	-10.8	-0.89
I am informed about the annual quota and any other aspects of the exclosure that I find relevant	0.36	0.40	-9.5	-0.78
I am informed about everything relevant AND I am able to ask questions and share my thoughts about the annual quota and the management of the exclosure	0.39	0.32	15.8	1.29
I am part of a group who is authorized to make decisions about the annual quota and the management of the exclosure(s).	0.06	0.05	6.3	0.52
Summary Stats	Halaba			
	Psuedo-R2	chi2	p-value	Rubin-B
	0.03	9.6	0.022	39.2*
	Hadya			
	0.01	2.3	0.504	18.7

* if B>25%, R outside [0.5; 2]

* if variance ratio outside [0.72; 1.39]

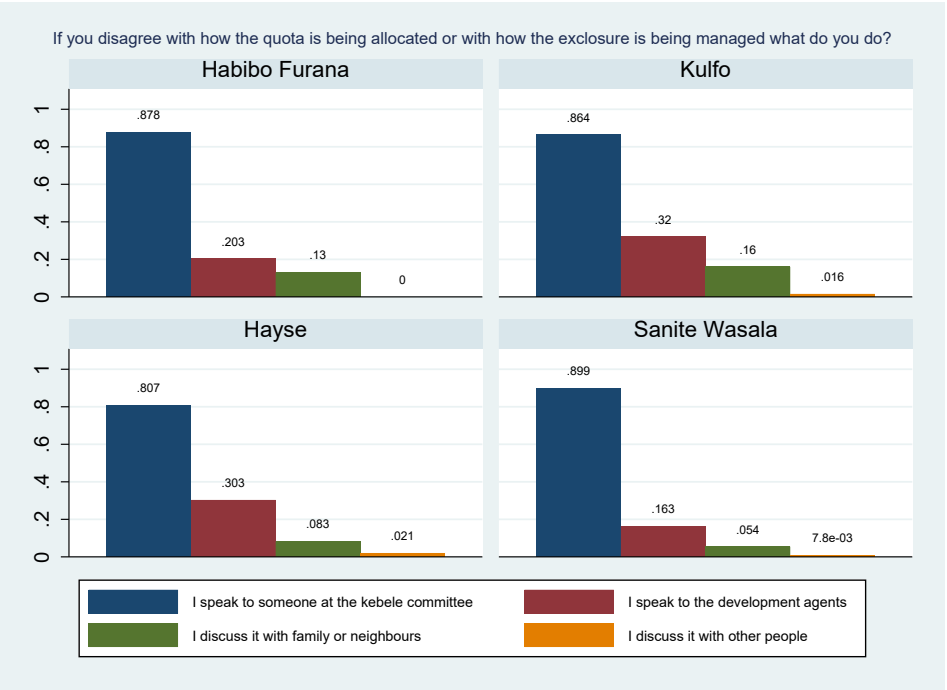


Figure 15a: What to do when disagreement

Figure 15b illustrates the answer to the question "Is there anyone in the kebele whose needs should be more strongly considered in the distribution of the benefits from the exclosures?" where respondents were able to give multiple answers. From the figure it is clear that youth and single headed female households were seen as groups which should have more priority, although older people and disabled also figured strongly.

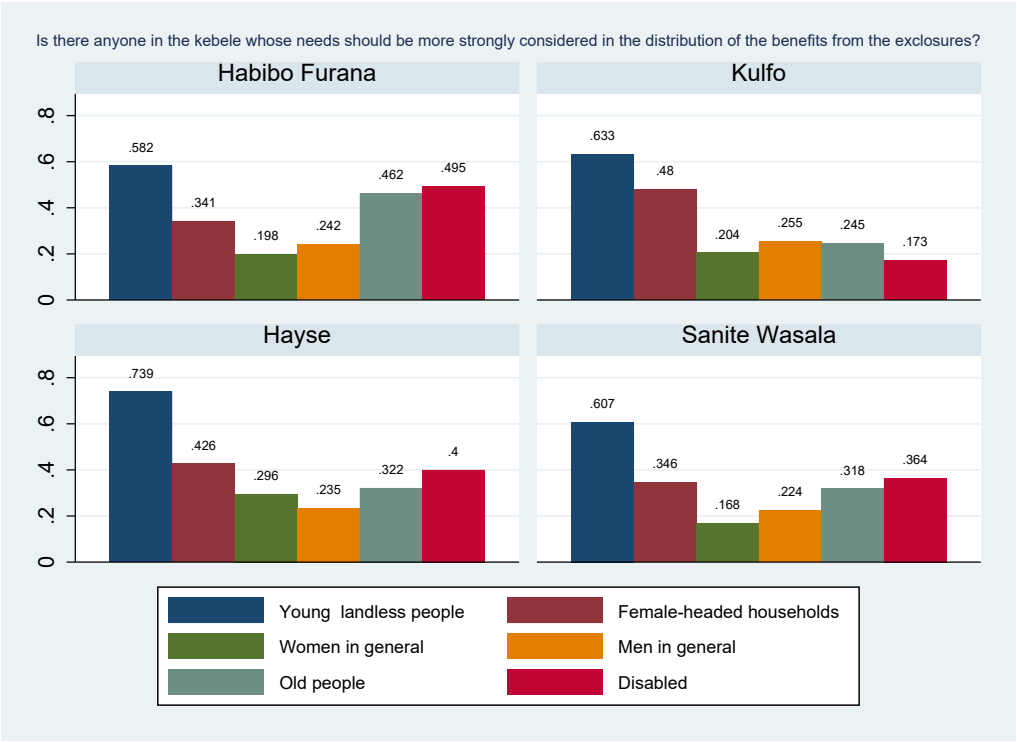


Figure 15b: Whose needs ?

Respondents were also asked using a 5 point Likert scale a) the degree kebele officials do what is good for the community? and b) the degree kebele committee for area closure does what is good for community? There were no underlying statistically significant differences in these variables although from Figure 16a and 16b, one can see some visual differences in the distributions of the two variables.

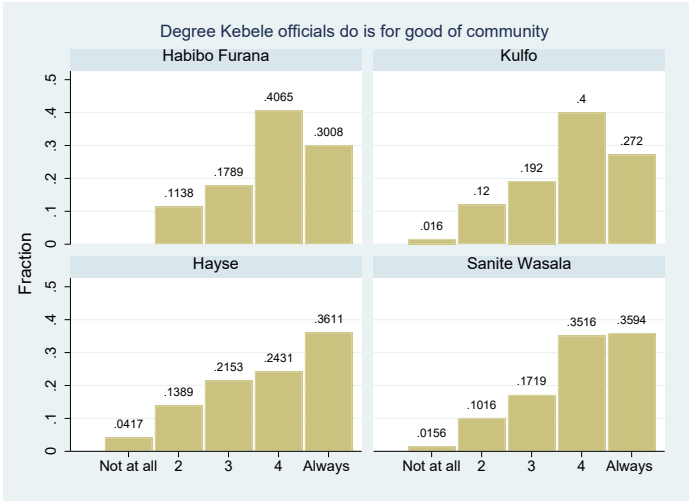


Figure 16a: Kebele Officials

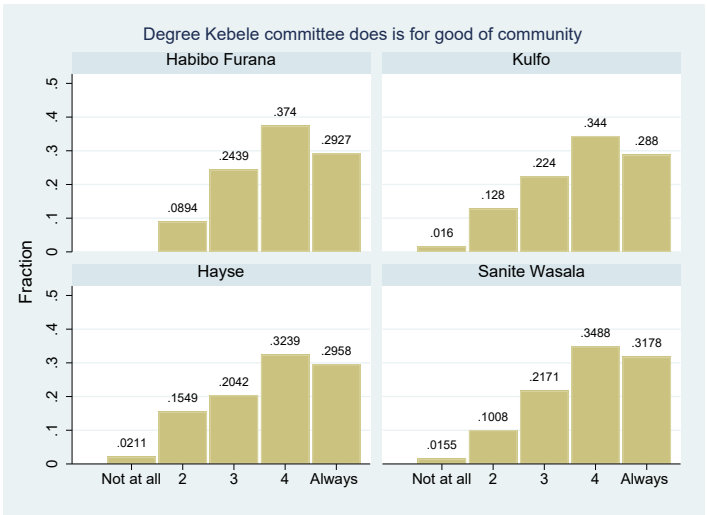


Figure 16b: Kebele Officials

Two final questions were asked using a 5-point Likert scale about the importance of exclosures for the community and the respondent's own household. These are illustrated in Figures 17 a and b, and confirm that the majority within the community do see the exclosures as important both for the community and individually.

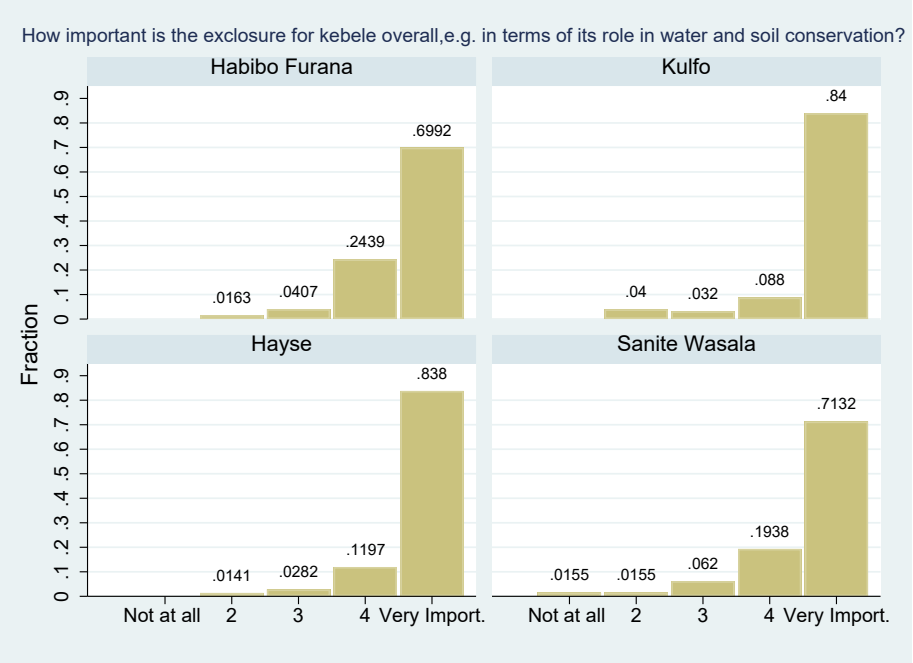


Figure 17a: Importance of Exclosure for the community

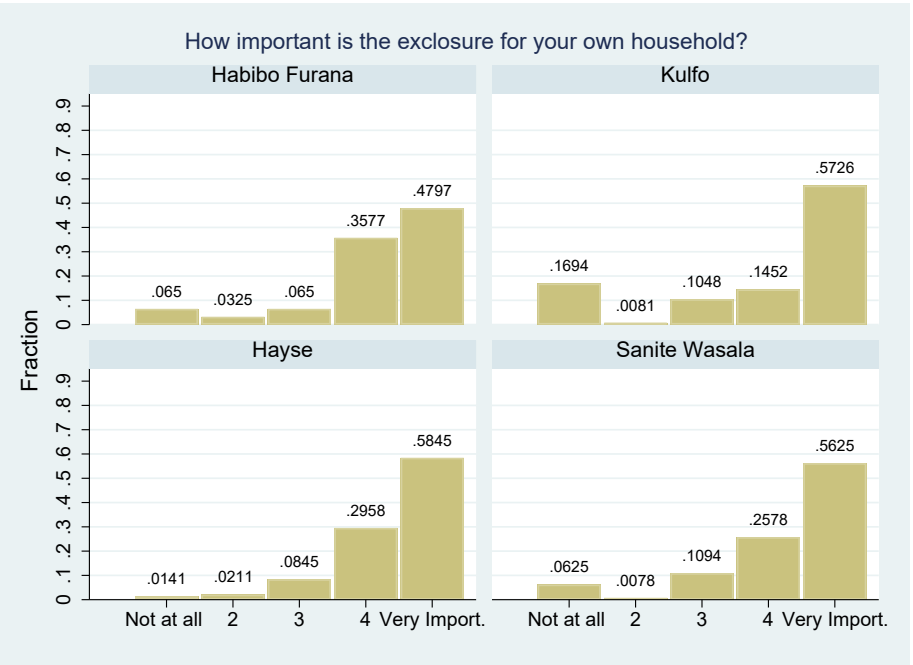


Figure 17b: Importance of Exclosure for the Individual's Household

Initial Discrete Choice Experiment

In each area, there were two version of the questionnaire were applied (A and B). Each respondent was faced with a set of 10 choice sets. The last two choice sets were identical across all respondents/versions of the questionnaire. For each choice set there are three choices 1, 2 or 3 (status quo) where the status quo also captures the individual households existing individual grass quotas

value. After each choice set respondents were asked how sure they were of their choice using a Likert scale.

Figure 18a and b provides a picture of the average choices made in each choice set by area. Informally, these do indicate that would seem to be different initial preferences across the different areas.

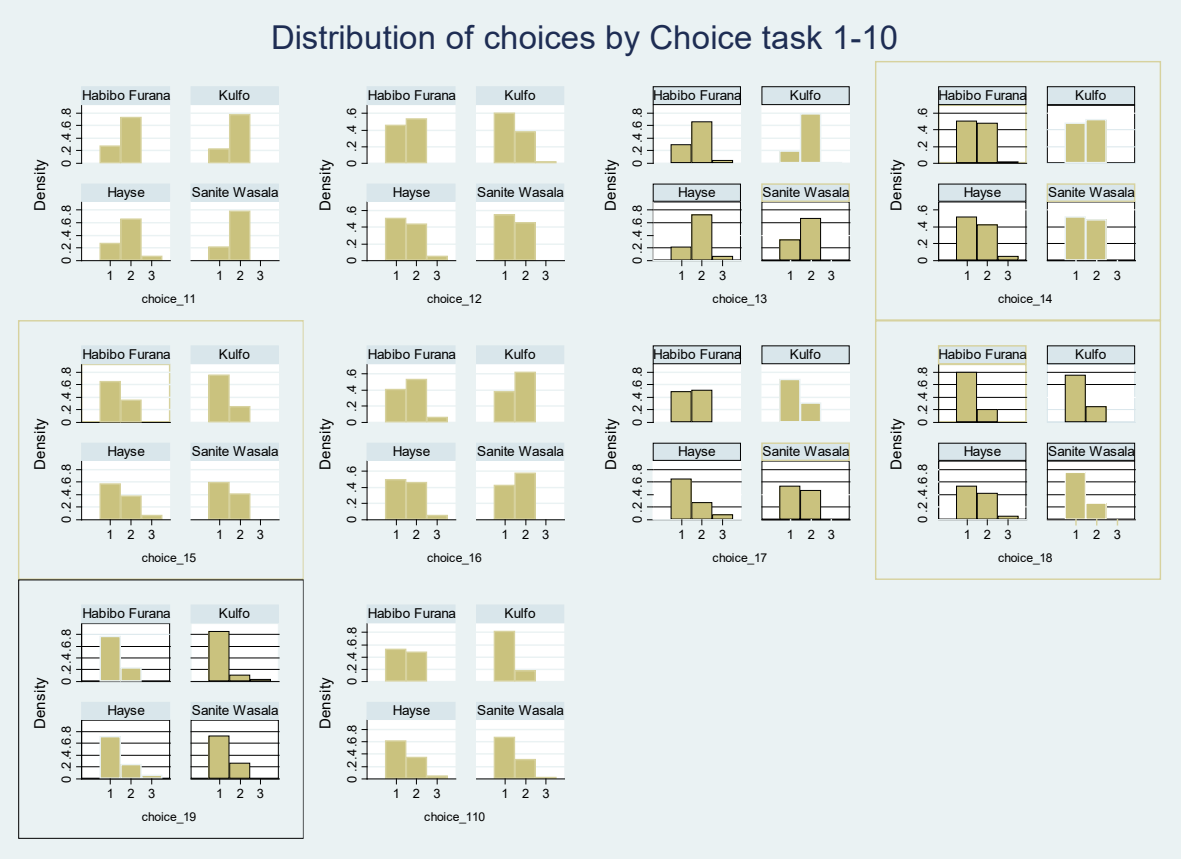


Figure 18a. Choices Questionnaire Version A

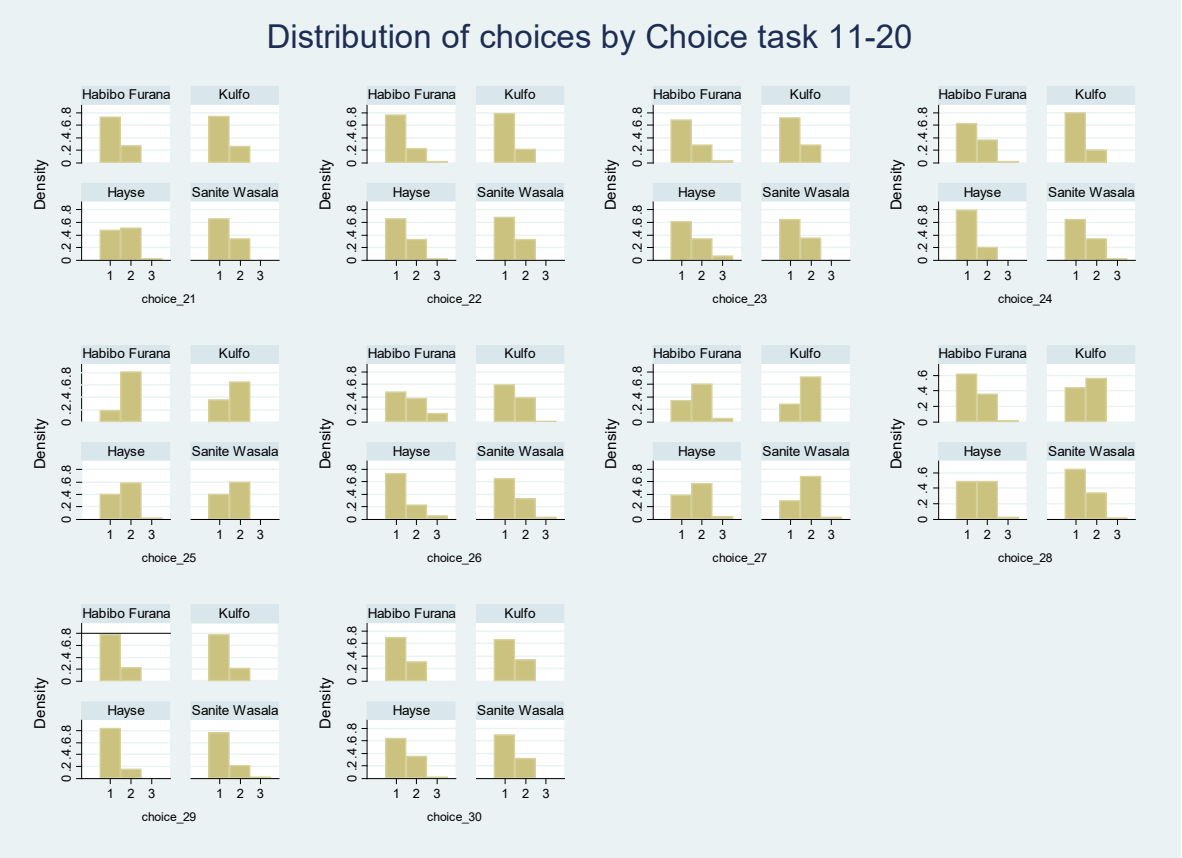


Figure 18b: Choices Questionnaire Version A

This informal conclusion also seem supported from the results from a conditional logit estimation on the DCE choice results reported in Table 18, with the basic hypothesis test of the equality of all coefficients across areas rejected at 1% significance. More generally, the individual coefficient values are mostly consistent with expectations, with positive value on the grass quota, initial positive coefficient on work data and the suggested insurance fund contribution but in both case quadratic effect is negative. In terms of the dummies for the interventions there is stronger preference for sheep and women and youth and oxen relative to the omitted category.

Table 18 Conditional Logit results: Pooled and Treatment versus Control area differences

Variable	Pooled	With Control interaction dummies	
		Treatment	Control Dummies
asc	-0.13	-0.13	-0.01
	-(3.58)	-(2.54)	-(.08)
Grass quota value	0.05	0.06	-0.01
	(3.85)	(2.82)	-(.40)
Interventions Dummies (Bees+ Youth Omitted)			
bees & women	-0.44	-0.35	-0.19
	-(6.79)	-(3.96)	-(1.47)
sheep & women	0.46	0.4	0.13
	(6.93)	(4.48)	(.95)
oxen &youth	0.69	0.63	0.15
	(12.14)	(8.20)	(1.28)
Extra work days	0.2	0.17	0.05
	(11.17)	(7.31)	(1.44)
Extra work days squared	-0.01	-0.01	0
	-(11.13)	-(7.43)	-(1.43)
Fund contribution	0.23	0.21	0.05
	(24.58)	(15.92)	(2.56)
Fund Contribution squared	-0.01	-0.01	0
	-(23.41)	-(15.57)	-(1.87)
Null: No difference All interaction dummies		chi2(9) = 23.07	Prob>chi2 = 0.006

Land Degradation management

Table 19 reports the basic questions asked around the perceived land degradation problems in the communities. It is clear that perceptions of the land degradation problem are very high in Halaba although where the problem is most acute does differ across treatment and control. The overall issue is seen as less of a problem in Hadya particularly in the treated area. Figure 19 also illustrates whether respondents feel the problem is getting better or worse. Although the levels do vary significantly in all areas the majority appear to think the problem is getting better.

Table 19 Land Degradation Problems

Variable	Treated	Control	%bias	t
	Halaba			
Is a land degradation a problem in your community? (yes=1, no=0)	0.88	0.91	-9.1	-0.72
What is the most important form of land degradation?				
Soil erosion on farm land	0.38	0.52	-27.8	-2.08
Soil erosion on communal grazing land	0.23	0.03	60.3	4.57
Gully erosion	0.19	0.04	45.6	3.45
Depletion of soil quality	0.08	0.19	-31.2	-2.32
Degradation of vegetation covers	0.10	0.22	-31.4	-2.33
	Hadiya			
Is a land degradation a problem in your community? (yes=1, no=0)	0.37	0.67	-63.2	-5.19
What is the most important form of land degradation?				
Soil erosion on farm land	0.26	0.44	-37.3	-2.12
Soil erosion on communal grazing land	0.35	0.36	-2.7	-0.15
Gully erosion	0.22	0.18	11.4	0.66
Depletion of soil quality	0.04	0.02	7.8	0.46
Degradation of vegetation covers	0.13	0.00	54.1	3.53

Summary Stats	Halaba			
	Psuedo-R2	chi2	p-value	Rubin-B
	0.14	43.9	0.000	82.3*
	Hadya			
	0.02	2.9	0.407	31.0*

* if B>25%, R outside [0.5; 2] * if variance ratio outside [0.72; 1.39]

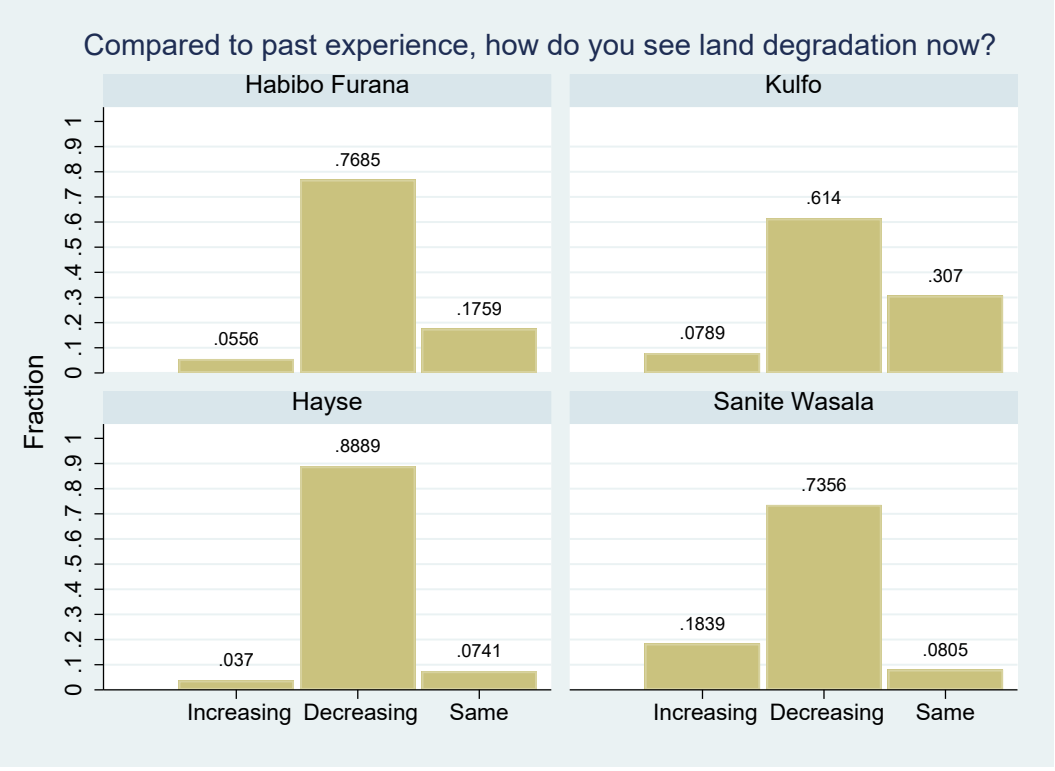


Figure 19: Land Degradation as a problem

Respondents were also asked about their perceptions of the effectiveness of watershed activities to help control land degradation as illustrated in Figure 20. Although there are some differences in the distribution of the answers taking the two higher values together does suggest these measures are seen as effective across all areas.

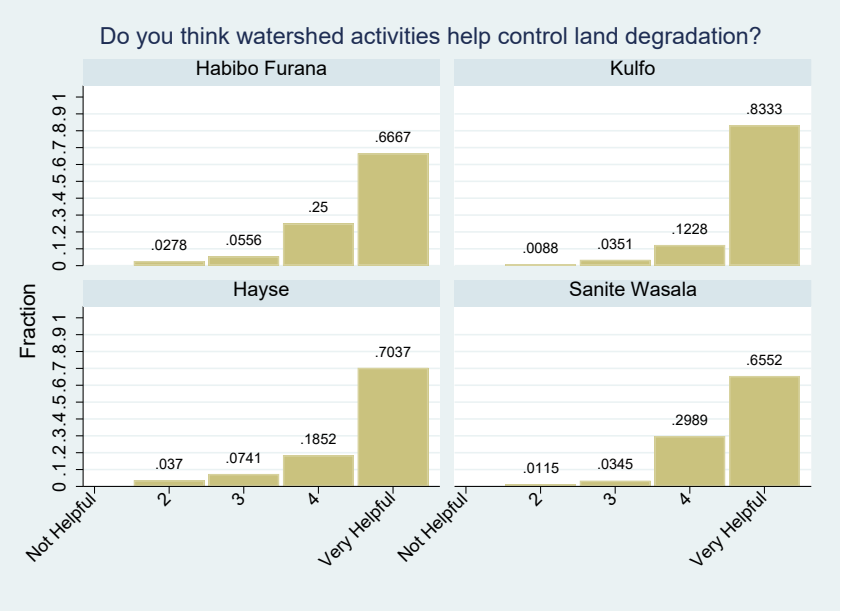


Figure 20: Usefulness of Watershed activities

Prior to the interventions in the treatment areas around gullys, respondents were also asked about their perceptions concerning gully formation. As seen in Figure 21 the responses were generally positive although in Halaba there were a higher rate of respondents who thought the problem was not improving. From Figure 22 differences across the treatment and control areas are apparent in Halaba in terms of where gullys occur, with farmland and communal land being seen as important, whereas in the control it is not seen as an issue on communal land. In contrast in Hadya, the gullys are perceived to be an issue on farmland and communal land.

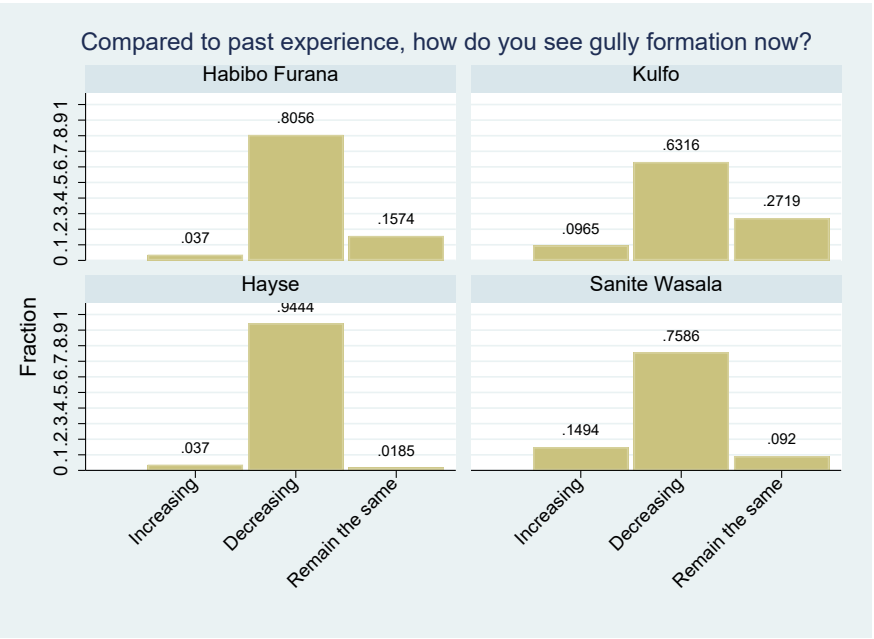


Figure 21:

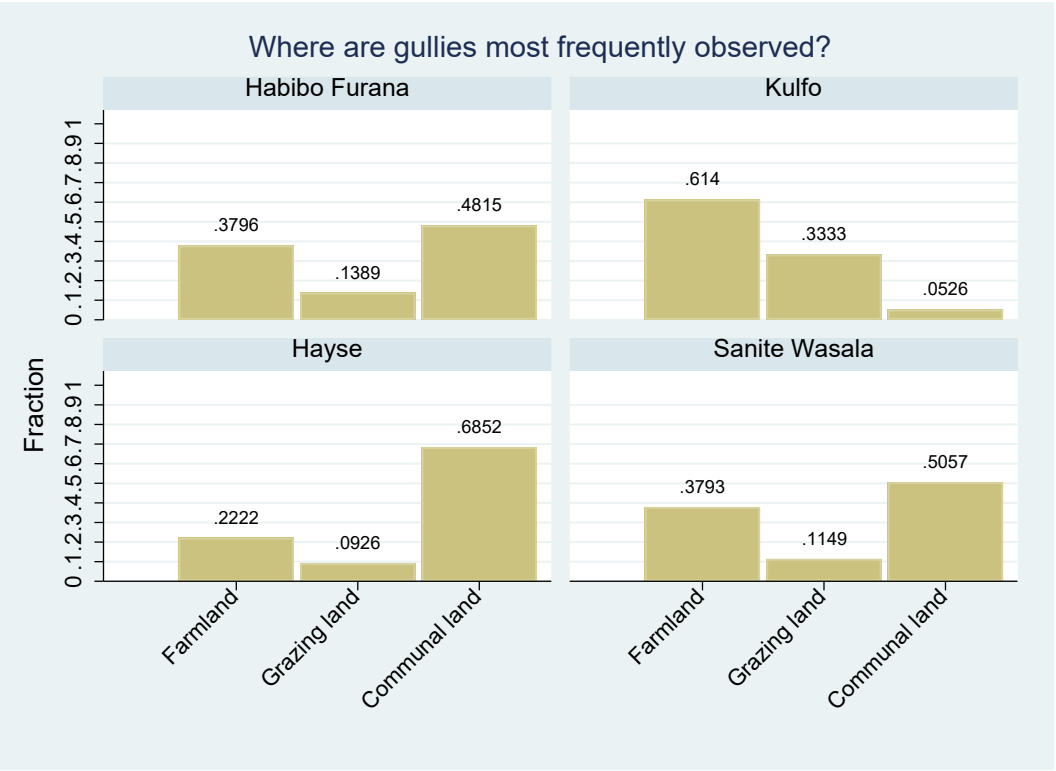


Figure 22

As seen in Figures 23 and 24, similar measures are being implemented to address gully formation across areas and that overall these measures are perceived as useful.

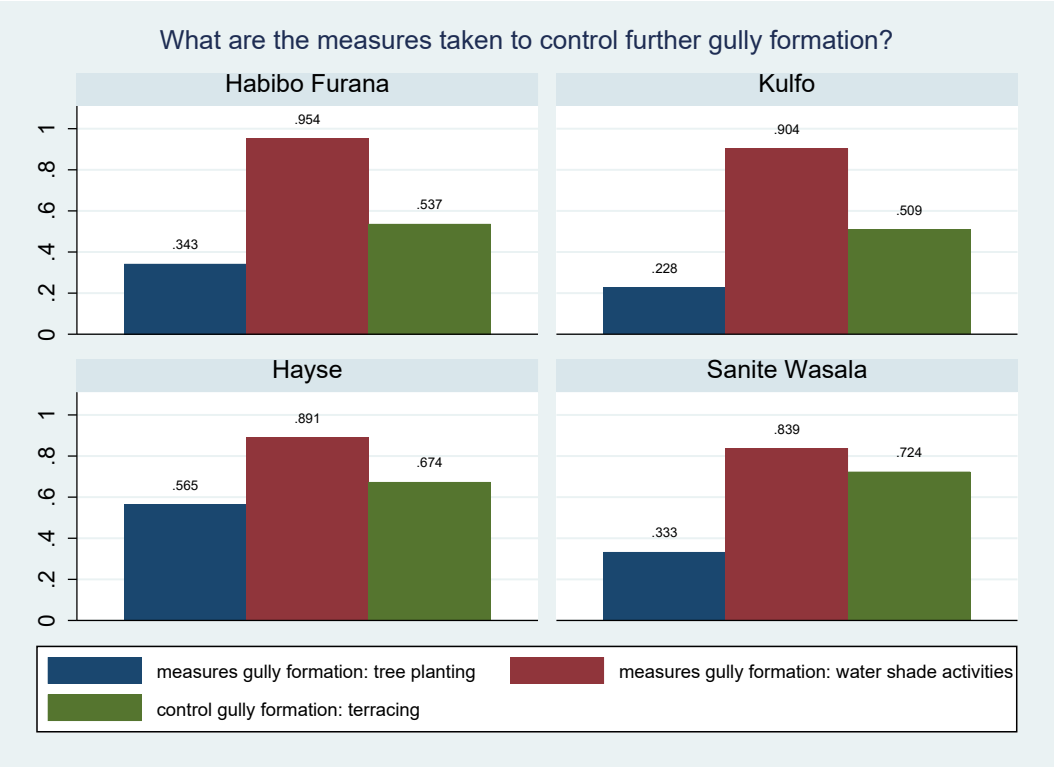


Figure 23

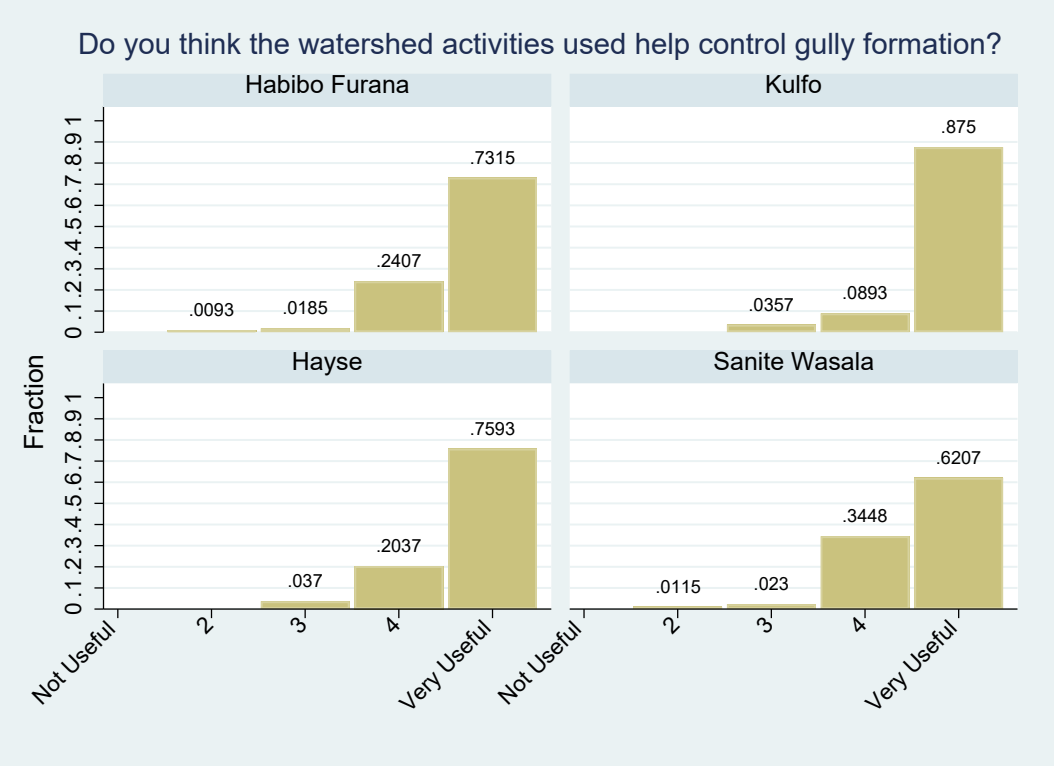


Figure 24

Finally, respondents were asked to state the number of days they contributed to watershed activities.[5] The means for each area are reported in Figure 25 show a little variation. However, the median was 30 days in each area.

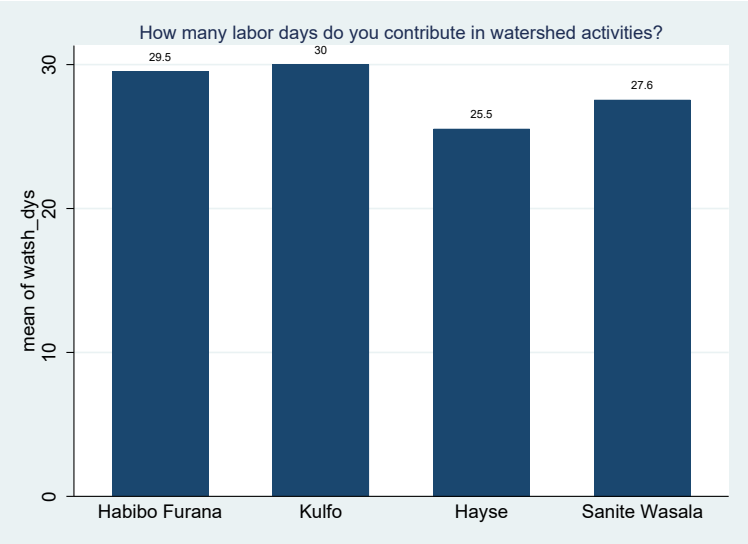


Figure 25

[5] There were a number of apparent outliers in this data.

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