Community adaptation of action research designs for land restoration in communal grazing lands

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Community adaptation of action research designs for land restoration in communal grazing lands

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Abstract

Land restoration provides corrective measures which improve and restore productivity of agricultural ecosystems. This study collected data from four sites using focus group discussions. These sites were Amhara and Borana in Ethiopia and Kajiado and Wajir in Kenya. Data collected were on livestock holdings, feed basket and preferred feed species. Pearson correlation was used to establish the relationship between the total number of livestock units and the size of cropland used by households among communities. On a site-by-site basis, the Amhara site yielded a positive significant relationship, Wajir showed an insignificant positive association and the Borana site demonstrated an insignificant negative association. In Kajiado, no correlation was established. Crop residue was the predominant source of feed in Amhara. The dominant feed source for Borana, Kajiado and Wajir was open grazing and browsing. The plant genera that were preferred in more than one of the four sites were Cynodon spp., Sporobolus spp, Chrysopogon spp and Pennisetum spp. Based on the data collected and the biophysical differences of the sites, various land restoration trials were developed, each using a different protocol customized to fit the management goals of each site. Adaptation data was used to design restoration action research trials: (i) improved forage grasses were planted and weeding was done in exclosures in Amhara;; (ii) land was placed under partial resting/grazing termed 'communal kallo' in Borana and (iii) low-cost (short resting) and higher-cost (reseeding) restoration options were tested in Kajiado and Wajir.

Introduction

Land degradation often results from human-induced activities such as overgrazing, unsustainable cultivation practices and deforestation among others. Many of these practices arise from the pressure of population growth but ultimately decrease the productivity of agricultural ecosystems. To restore productivity, corrective measures are needed to promote land restoration. For land restoration strategies and practices to be successful, social and economic goodwill is required. Land restoration plans and activities involve many different stakeholders such as the farmers/pastoralists, governments, nongovernmental organizations (NGOs) and scientists who provide research support.

The overall goal of the project 'Restoration of degraded land for food security and poverty reduction in East Africa and the Sahel: taking successes in land restoration to scale'is to reduce food insecurity and improve the livelihoods of poor people living in African drylands by restoring degraded land, returning it to effective and sustainable tree, crop and livestock production. In line with the selected approach and methodology, key partners from the private and public sectors across research, extension, market and government institutions were brought together to work in an iterative co-learning cycle. This work was carried out in Ethiopia and Kenya with two sites from each country. Each of these sites are different and a planned comparison of land restoration options by context was applied. The idea behind this approach is that options are tested against specific contexts and the lessons learned are shared with the stakeholders involved as well as other stakeholders who may benefit from similar options. In this way, communities of practice can share knowledge created from implementation of action research through a reiterative co-learning cycle.

A community research adaptation exercise was carried out in each of the four sites to engage community members in discussions around livestock holdings, feed sources and preferred high-value plant species. The data collected from these exercises guided the design of the land restoration comparison trial plans at each site. The study focused on Amhara in the highlands of Ethiopia, Borana in semi-arid Ethiopia, Kajiado in the semi-arid southern rangelands of Kenya and Wajir in the arid northern rangelands of Kenya. Each site represents a different position along a gradient of livestock systems management intensity, which is linked to their agroecological zones. In Ethiopia, Amhara is a farming site while Borana is a pastoralist system transitioning to agropastoralism. The two sites in Kenya, Kajiado and Wajir, are both pastoralist systems. Land restoration options were applied to fit the local context at site level. This aligned with the project goal of testing land restoration options against specific contexts to draw lessons.

The ultimate purpose of this adaptation research was to characterize livelihoods and resource use, and to vet and confirm the applicability of various management options tested in action research trials. Ensuring local relevance of these trials is essential to improving site ownership and to target options likely to scale.

The data collected for this site research adaptation assessment included:

i Livestock holdings for each of the proposed sites.

ii Main sources and types of livestock feed used and the proportions in which they are consumed.

iii Preferred, useful and high value feed species.

Methods

Study areas

This site research adaptation assessment was carried out in Ethiopia and Kenya, focusing on two sites in each country. In Ethiopia, the study was carried out in Amhara and Borana regions. In Amhara, 19 exclosures were selected from six woredas while in Borana, four communal kallos were selected from one woreda.

Amhara communities (exclosure user groups): Agalo, Mender 8, Degebassa, Yinashka, Chulchulit, Workmeda, Zalant, Guber, Addis Amba, Bursa, Beletech Bursa, Simira, Zuma, Zagri, Bosimesk, Gelbatit, Jint, Shanko and Zerehila.

Borana communities: Difa Okekotu, Husa Dulacha, Duba Dabaso and Waafo-Aboo.

In Kenya, the sites selected were in Kajiado and Wajir counties, with 12 communities and seven communities, respectively. In Kajiado, communities were selected from Olkiramatian and Shompole group ranches.

Kajiado communities: Ilgoso Loonkishu, Oldorko, Kimelor, Komitii, Ntigiya, Olosinyai, Corner Maziwa, Entaamo, Oloika, Oloosaen, Oltalet and Lenkobei.

Wajir communities: Well-Garas, Shimbirey, Jilibey, Burder Central, Burder 2, Abaq-Deera 1 and Abaq-Deera.

The scope of the research work was explained to all participants. The participating site members were given a chance to ask questions and to seek clarification. After gaining a good understanding of the research scope, focus group discussions were held with an average of 10 community members from each of the proposed communities. In the focus group discussions, the questions that were asked were on livestock holdings, main livestock feeds and proportions, and preferred high value feed species.

In most pastoral areas, collection of data on livestock assets was difficult because livestock is used as a measure of wealth. Therefore, participants found questions related to livestock assets very personal and preferred to keep this information private to keep other community members from gauging their wealth. In Wajir, participants declined to share the number of camels owned by community members. For this reason, livestock numbers provided may be underestimated.

Results and discussion

a. Livestock holdings across sites

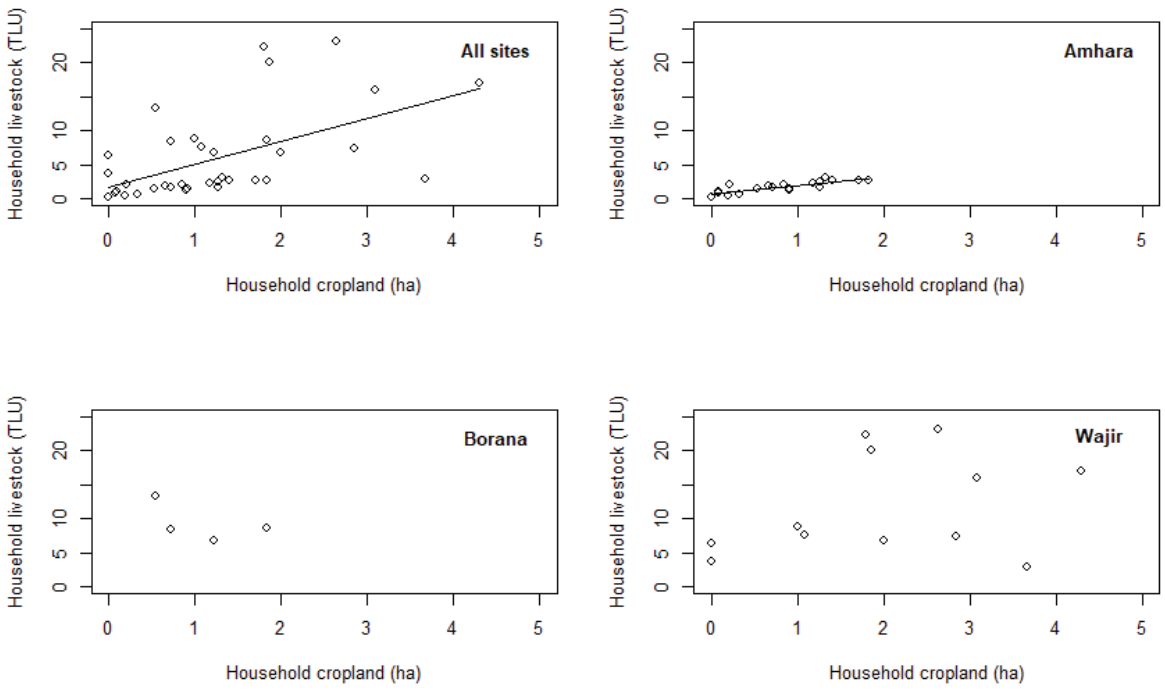
Table 1: Livestock holdings in the four sites

Site	Cattle	Shoats	Donkey	Camels	Total
Amhara	1.18	0.32	0.23	0	1.73
Borana	5.70	1.53	0.51	1.60	9.34
Kajiado	4.30	6.08	1.16	0	11.54
Wajir	7.78	3.67	0.40	N/A*	11.85

*Site members in Wajir county were not willing to share information regarding the number of camels owned.

At the Amhara site, which is in the highlands and is a farming area, lower livestock numbers were recorded. This is attributed to the smaller parcels of land they hold and because they are primarily farmers. Households in Amhara, Borana and Wajir kept more cattle than shoats, while in Kajiado, the number of shoats was higher than for cattle. In Borana, in Ethiopia, the people are pastoralists transitioning to agropastoralism, while in Kajiado and Wajir, the people are pastoralists.

Figure 1: Relationship between household cropping and livestock holdings (TLU=tropical livestock units) among all communities across all sites (top left), and among all communities in Amhara (top right), Borana (bottom left) and Wajir (bottom right).



Pearson correlation was used for the Amhara, Borana, and Wajir sites to establish the relationship between total livestock units and size of land available for cropping. The Amhara site showed a positive significant relationship (r=0.821; p=0.00001) (Figure 1, top right), Borana showed a weak, insignificant negative association (r=-0.544; p=0.456) (Figure 1, bottom left) and Wajir demonstrated a weak, insignificant positive association (r=0.327; p=0.299) (Figure 1 bottom right).

In Amhara, the size of land and livestock holdings are positively correlated (Figure 1). This site consists of mainly farmers who practice mixed farming. As part of their traditional farming system, oxen are used to till the lands. Farmers with bigger parcels of land likely own more oxen for tilling and cows for milking, which consume most livestock feed (Gizaw et al. 2012). Owning more land also increases availability of feed from crop residues and as a result, more livestock are kept, hence the positive correlation between cropland size and total livestock units.

The Borana site consists of pastoralists transitioning to agropastoralism. The negative association of total livestock units and cropland shows that areas with smaller parcels of land tend to have more livestock, which may indicate that those with more livestock are less reliant on farming (Solomon et al. 2007). The transition from pastoralism to agropastoralism was necessitated by the loss of pasture to bush encroachment. Farming is for both fodder as well as for grain, and livestock keeping continues to be their major source of livelihood.

In Wajir, almost all available land is dedicated to grazing of livestock. Some cropping was undertaken inside private grazing exclosures by the respondents we interviewed, as reported in Table 2. However, since there is a great deal of land available, and combined crop/exclosure areas are a common traditional practice in the area, the number of livestock (excluding camels, which respondents declined to quantify) and cropland size showed only a weak, insignificant positive association (r=0.327; p=0.299) (Figure 1), suggesting that wealthier pastoralists might have larger herds, as well as larger parcels of cropland.

In Kajiado, cropland size and total livestock units were uncorrelated because all community members have access to portions of the group ranches for cropping purposes. The main cropping sites are separate from the homesteads.

b. Feed basket and household cropland area across sites

Table 2: The proportion and type of feed consumed at each site and average household cropland area

Sites	Grazing and browsing (%)	Hay, crop residue, supplements (%)	Average land (ha)
Amhara	9.4	87.8	0.81
Borana	91.75	8.25	1.08
Kajiado	85	15	N/A*
Wajir	84.2	15.8	2.02

*In Kajiado, all community members have access to cropland under group ranch regulations.

In Amhara, a mixed farming area, crop residues were the dominant livestock feed. In this area, cut and carry is increasingly common. Due to increasing population, land use change, exclosures closed to grazing, small parcels of land, and a preference for cropping and private woodlots, grazing land is reduced and this leads to heavy reliance on crop residues (Table 2). Farming is the predominant livelihood and land is mainly used for mixed farming rather than for open grazing.

Borana, Kajiado and Wajir, which had huge parcels of land available for grazing, were seen to heavily rely on naturally occurring grasses and utilization by grazing and browsing. Kajiado is located within a group ranch and large parcels of communal land are accessible for use by any registered group ranch member. Despite the availability of grazing land, it was noted that due to increasing incidences of drought and dry seasons, the use of hay, crop residue and supplements was increasing.

c. Top preferred species across sites

Amhara

i Sardo (Cynodon dactylon)

ii Tucha (Pennisetum glabrum)

iii Warate (Digitaria adscendens)

Borana

i Ogondno (Pennisetum mezianum)

ii Alaloo (Chrysopogon aucheri)

iii Eddo (Cynodon dactylon)

Kajiado

i Entiamonyua (Cenchrus ciliaris)

ii Enkapururu (Sporobolus spp)

iii Oldorko (Cordia sinensis)

iv Emurua (Cynodon dactylon)

v Osangash (Pennisetum mezzianum)

Wajir

i Biila (Aristida adoensis)

ii Jarbi (Sporobolus spp)

iii Darema (Chrysopogon spp)

iv Coows Modul (Pennisetum spp)

The plant genera that were preferred in more than one of the four sites were Cynodon spp, Sporobolus spp, Chrysopogon spp and Pennisetum spp.

Use of adaptation information to design restoration action research trials

Based on the data collected from the research adaptation workshops and due to the biophysical variances in the selected sites in Ethiopia and Kenya, different land restoration trials were developed, each using a separate protocol. These protocols were customized to fit the management goals identified by stakeholders in each community.

In Amhara, a highland zone, government mandated exclosures are used in the area where sections of former communal grazing land are closed to grazing for land rehabilitation. To fit the research to context, the option of exclosure productivity improvement was used. Improved forage grasses (desho and Rhodes grasses) were compared with weeding of exclosures over a two-year period. Improving the productivity of exclosures is an effective strategy for increasing forage supplies, especially in areas where few grazing lands remain.

In Borana, a semi-arid zone, bush thinning had been previously undertaken without much improvement. Bush encroachment led to loss of pasture resulting in low livestock numbers and contributed to the move from pastoralism to agropastoralism in Borana. Therefore, this study selected the options of reseeding and use of fire treatments to reinforce the bush-thinning activities. This required the land to be rested for a year under partial grazing/resting, and a fire treatment to be applied thereafter. Although bush thinning is generally viewed as only a partial and perhaps ineffective solution to rangeland degradation, the prevalence of bush thinning supported by government and NGOs in Borana means that information on the effectiveness of bush thinning is valuable.

In Kenya, both Kajiado and Wajir sites adopted resting and reseeding protocols where an area was rested for a short period at the beginning of the rainy season, and then opened for grazing thereafter. This was done by initially closing off the one month resting blocks then opening them up for grazing after a period of one month. The two month resting blocks remained closed for another month and thereafter, opened for grazing after the two-month period elapsed. In doing so, both low-cost (short resting) and higher-cost (reseeding) restoration options were tested to identify the success of each option under a variety of contexts, such as different soil properties and grazing intensities.

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Annexe

I Household livestock and land holdings

Table 3: Amhara site livestock and land holdings by community

Woreda	Exclosure	Kebele	Watershed	Cattle	Shoats	Donkey	Total TLUs	Land (ha)
North Achefer	Agalo	Ambashen	Agalo	2.38	5.14	1.57	9.09	1.71
North Achefer	Degebassa	Liben Dankura	Baka	1.36	2.45	1.18	4.99	1.27
North Achefer	Mender 8	Liben Dankura	Marwonz	2.42	5.91	0.36	8.69	1.27
Sekela	Bursa	Ambisi	Gugiri	1.33	2.77	0	4.1	0.9
South Achefer	Zalant	Kurba	Warkaber	2.67	5.8	0.8	9.27	1.4
South Achefer	Addis Amba	Korench	Kassen	1.14	3	0.14	4.28	0.09
South Achefer	Guber	Lalibela	Bambisi	2.14	5.43	0.29	7.86	0.21
Dangila	Zuma	Ligaba	Zuma	2.78	2.67	1.33	6.78	1.83
South Achefer	Workmeda	Ambashen Jana	Kok-Terara	0.88	1.27	0.18	2.33	0.08
Sekela	Beletech Bursa	Ambisi	Gugiri	0.57	2.3	0	2.87	0.33
Sekela	Simira	Ambisi	Muzirit	1.48	3.56	0	5.04	0.53
North Achefer	Yinashka	Legdia	Adiba	0.48	0.67	0	1.15	0.19
North Achefer	Chulchulit	Legdia	Adiba	0.26	0	0	0.26	0
Dangila	Zagri	Zubura-Zagri	Chereka	3.14	7.29	0.71	11.14	1.32
Mecha	Bosimesk	Dagi	Bosi	2.19	2.42	1.17	5.78	1.18
Mecha	Gelbatit	Dilbetigil	Gelbatit	1.97	4.75	0.5	7.22	0.85
Bahir Dar Zuria	Jint	Gombat	Abagerima	1.54	2.13	0.25	3.92	0.91
Bahir Dar Zuria	Shanko	Fereswega	Birbara	1.59	2	1.25	4.84	0.66
Bahir Dar Zuria	Zerehila	Yinessa	Gudagudit	1.77	1	1	3.77	0.72

Table 4: Borana site livestock and land holdings by community

Woreda	Kebele	Reera	Ola	Cattle	Shoats	Donkey	Camels	Total TLUs	Land (ha)
Dirre	Arallo	Dambalaa Dibaayyo	Difa Okekotu	6.81	6.31	0.25	1.38	14.75	1.22
Dirre	Goloicha	Harda Goloiha	Husa Dulacha	8.80	14.60	0.93	0.40	24.73	0.73
Dirre	Magado	Sake/Tesso	Duba Dabaso	8.31	28.06	2.50	3.75	42.62	0.54
Dirre	Diid Jaarsa	Haadua	Waafo-Aboo	8.63	12.31	1.44	0.88	23.26	1.84

Table 5: Kajiado site livestock and land holdings by community

Site	Cattle	Shoats	Donkey	Total TLUs	Land (ha)
Ilgoso Loonkishu	12.20	115.00	9.50	136.7	NA*
Oldorko	9.50	145.83	3.42	158.75	NA*
Kimelor	3.38	63.44	1.50	68.32	NA*
Komitii	2.27	65.45	1.91	69.63	NA*
Ntigiya	1.29	22.00	0.00	23.29	NA*
Olosinyai	2.27	61.36	0.00	63.63	NA*
Corner Maziwa	0.44	9.00	0.89	10.33	NA*
Entaamo	2.25	46.00	2.25	50.5	NA*
Oloika	4.94	40.25	4.13	49.32	NA*
Oloosaen	17.33	50.11	3.44	70.88	NA*
Oltalet	6.50	51.75	6.00	64.25	NA*
Lenkobei	11.25	59.44	1.88	72.57	NA*

*In Kajiado, all community members have access to cropland under group ranch regulations.

Table 6: Wajir site livestock and land holdings by community

Site	Cattle	Shoats	Donkey	Total TLUs	Land (ha)
Well-Garas	5.18	31.09	0.27	36.54	2.00
Well-Garas 2	1.11	18.89	0.89	20.89	3.67
Shimbirey	22.50	52.00	3.40	77.9	1.80
Jilibey	7.62	21.46	0.54	29.62	1.08
Burder Central	25.91	42.18	1.82	69.91	2.64
Rababale	7.00	22.08	0.85	29.93	2.85
Kursin	8.14	28.50	0.57	37.21	1.00
Burder 2	21.86	44.36	0.86	67.08	1.86
Warg Deer	13.82	60.00	0.82	74.64	3.09
Matateyz	10.10	93.00	1.40	104.5	4.30
Abaq-Deera 1	6.55	16.36	0.27	23.18	0.00
Abaq-Deera 2	3.56	10.56	0.38	14.5	0.00

II Feed basket (major livestock feed sources and proportion)

Table 7: Amhara site feed basket by community

Woreda	Exclosure	Kebele	Watershed	Grazing and browsing	Hay/Crop residue
North Achefer	Agalo	Ambashen	Agalo	0	100
North Achefer	Degebassa	Liben Dankura	Baka	0	100
North Achefer	Mender 8	Liben Dankura	Marwonz	0	100
Sekela	Bursa	Ambisi	Gugiri	12.5	87.6
South Achefer	Zalant	Kurba	Warkaber	0	95.8
South Achefer	Addis Amba	Korench	Kassen	8.3	91.7
South Achefer	Guber	Lalibela	Bambisi	8.3	86.2
Dangila	Zuma	Ligaba	Zuma	8.3	91.7
South Achefer	Workmeda	Ambashen Jana	Kok-Terara	8.3	91.6
Sekela	Beletech Bursa	Ambisi	Gugiri	25	70
Sekela	Simira	Ambisi	Muzirit	16.7	50
North Achefer	Yinashka	Legdia	Adiba	25	75
North Achefer	Chulchulit	Legdia	Adiba	16.7	83.3
Dangila	Zagri	Zubura-Zagri	Chereka	33.3	66.7
Mecha	Bosimesk	Dagi	Bosi	0	100
Mecha	Gelbatit	Dilbetigil	Gelbatit	0	100
Bahir Dar Zuria	Jint	Gombat	Abagerima	0	100
Bahir Dar Zuria	Shanko	Fereswega	Birbara	0	95.8
Bahir Dar Zuria	Zerehila	Yinessa	Gudagudit	16.7	83.3

Table 8: Borana site feed basket by community

Woreda	Kebele	Reera	Ola	Sites	Grazing and browsing	Hay/crop residue
Dirre	Arallo	Dambalaa Dibaayyo	Difa Okekotu	Difa Okekotu	90	10
Dirre	Gololcha	Harda Gololcha	Husa Dulacha	Husa Dulacha	95	5
Dirre	Magado	Sake/Tesso	Duba Dabaso	Duba Dabaso	87	13
Dirre	Diid Jaarsa	Haadua	Waafo-Aboo	Waafo-Aboo	95	5

Table 9: Kajiado site feed basket by community

Sites	Grazing and browsing	Hay/crop residue
Ilgoso Loonkishu	85	15
Oldorko	85	15
Kimelor	85	15
Komitii	85	15
Ntigiya	85	15
Olosinyai	85	15
Corner Maziwa	85	15
Entaamo	85	15
Oloika	85	15
Oloosaen	85	15
Oltalet	85	15
Lenkobei	85	15

Table 10: Wajir site feed basket by community

Sites	Grazing and browsing	Hay/crop residue
Well-Garas	80	20
Well-Garas 2	70	30
Shimbirey	70	30
Jilibey	90	10
Burder Central	90	10
Rababale	80	20
Kursin	100	0
Burder 2	90	10
Warg Deer	90	10
Matateyz	70	30
Abaq-Deera 1	90	10
Abaq-Deera 2	90	10

III Preferred species

Table 11: Amhara site preferred species for cut and carry

Species name	Frequency of occurrence as top-five pre-ferred species	Growth form	Specific characteristics	Method of utilization
Sardo Cynodon dactylon)	18	Grass	Highly palatable and fast growing High biomass (filling) and highly produc-tive Grazing resistant (revives fast), stays green, high-value feed, easily available Drought tolerant	Grazing Cut and car-ry Hay
Tucha (Pennise-tum glabrum)	17	Grass	Palatable, High biomass Emergency feed Requires fertile soil, evergreen, used as bee forage	Grazing Hay
Warate (Digitaria adscendens)	10	Grass	Highly palatable (very soft), less fibre Germinates fast but short seasoned (can grow with light rain but stays only for short period) Low biomass, common on well-drained soil Grows poorly on black/wet soil Drought sus-ceptible	Grazing
Wajma	7	Grass	Very palatable before flowering and during maturity (not good during flow-ering) Very short seasoned	-
Gaja	6	Grass	Palatable, productive, long storage life, not readily available Fast growing, re-produces by seed Good for fattening, good if harvested at blossoming	Grazing Hay
Chiwchi-wa/ Muregn	3	Grass	Highly palatable Fast growing High biomass (productive)	Grazing Hay
Godir/Tusha	3	-	Fast growing, palatable but low biomass, nutritious, good milk and butter quality Graze resistant, does not stay green	-
Kuaya/Sirsira	2	Grass	Palatable at early stage (while green), high fibre and hard when dry Locally used for building houses	-
Sunbelt/mela sar	2	Grass	Palatable at early stage (while green), high fibre and hard when dry Locally used for building houses	-
Gagirda	2	-	Good for hay making, relatively harder (high fibre) Palatability decreases as it matures, used for large animals such as oxen	Grazing
Yahiya murign	2	Grass	Very palatable, smells good Low biomass, does not regenerate	Hay
Grawa	2	Shrub	Very palatable, used green	Cut and carry
Sekek/Metol	1	Grass	Palatable before flowering	-
Armi	1	-	Palatable, grows in wet/swampy area, slow growing Short height (unsuitable for cutting), less productive (low biomass),	Grazing
Gosh sar	1	-	Palatable at early stage, grows high Suppressive to non-palatable grasses like Metol Grows on less fertile soil,	-
Yekok/Yewef sar	1	-	Very palatable Preferred by all livestock	Grazing Cut and car-ry
Shenkotit	1	-	Palatable, grows flat and expands easily Grows in swampy area, stays green throughout the year	Grazing Cut and car-ry
Gicha	1	-	Palatable, strong for grazing, stays green Deep rooted	-

Table 12: Borana site preferred species for grazing and browsing

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Ogondno (Pennisetum mezianum)	3	Grass	Strong roots, highly palatable Lasts all seasons, high biomass	All except camel	Grazing Cut and carry	Both
Alaloo (Chrysopogon aucheri)	3	Grass	Highly palatable, low biomass Lasts for a short period	All except camel	Grazing Cut and carry	Wet only/ both
Eddo (Cynodon dactylon)	2	Grass	Highly palatable, lasts all seasons	All except camel	Grazing	Both
Dheekka	2	Shrub/ tree	Palatable for both livestock and humans	All, camel, goats	Browsing	Both
Seernicha	1	Grass	Palatable	All except camel	Grazing	Wet only
Barbarreessa	1	Shrub	Used for many species	All except camel	Browsing	Wet only
Marra	1	Grass	High biomass	All	Cut and carry	Wet only
Arooressa	1	Shrub	Used for all livestock	All	Browsing, cut and carry	Both
Ogondi	1		Food for livestock and humans	All	All	Wet only
Madheera	1		Food for livestock and humans	All	All	Wet only
Dhadacha	1	Tree	Stays green, drought resistant Palatable for all, high biomass	Cattle, goats, sheep	Grazing	Both
Mat guddeessa	1	Grass	Soft, palatable, less drought resistant	Cattle, goats, sheep	Grazing	Wet only
Daboobessa	1	Tree	Palatable for both livestock and humans	Camel, goats	Browsing	Both
Andaraha	1	Tree	Palatable, less resistant to drought	All	Browsing	Both

Table 13: Kajiado site preferred species for grazing and browsing

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Entiamonyua (Cenchrus ciliaris)	8	Grass	Resistant, nutritious Strong roots Disease resistant Highly palatable Always green Fast growing Milk yielding	All Cattle	Grazing	Both/ Dry only
Enkapuru (Sporobolus spp)	7	Grass	Nutritious Fast growing Milk yielding Highly palatable Highly resistant	All	Grazing	Both/wet only
Oldorko (Cordia sinensis)	5	Tree	Supports other vegetation Not thorny Important in dry season Drought resistant	All	Grazing Cut and carry	Both/dry only
Emurua (Cynodon dactylon)	5	Grass	Germinates quickly Fast growing Strong roots Highly nutritious Palatable	Cattle All	Grazing	Both/ wet only/ Dry only
Osangash (Pennisetum clandestinum)	5	Grass	Strong roots Lasts long Fattens herds Highly resistant Highly nutritious	All Cattle	Grazing	Both/ Dry only
Oirii	4	Herb	Fast growing Palatable, good forage	Shoats All	Grazing	Wet only/ both/ dry only
Enkampa	3	Grass	Fattens herd, ever green, milk yielding, highly resistant, nutritious, long lasting, fast growing	All Cattle	Grazing	Both/ wet only

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Erikaru	3	Grass	Nutritious, fattens herd Sweet and palatable Highly resistant Milk yielding Strong roots	All	Grazing Hay	Both
Orkereiyian	3	Grass	Lasts long Drought persistent Nutritious, strong roots Highly resistant	All	Grazing Cut and carry	Dry only/ both
Orkitagures	3	Herb	Fast growing, fattens herd Palatable	All Shoats	Grazing	Both/ dry only/ wet only
Orkusese	2	Herb	Fast growing, easily available, highly palatable	All	Grazing	Wet
Oitii	2	Tree	Widely available Grows easily Good and healthy for all herds	All Shoats	Grazing	Dry only
Oltepesi	2	Tree	Palatable fruits Edible seeds	All Shoats	Grazing Cut and carry	Dry only/ both
Ormangulai	2	Shrub/Grass	Edible seeds, fast growing Palatable	Shoats All	Grazing	Dry only/ both
Olkiramatian	2	Grass	Lasts long, strong roots Good forage	All	Grazing	Both/ dry only
Enasampurri	2	Herb	Highly nutritious Milk yielding Fattens herds	Shoats	Grazing	Wet only/ both
Oirii	2	Tree	Nutritious, fattens herds Palatable, accessible	All Shoats	Grazing	Both/ dry only
Ekampa	1	Grass	Fast growing, fattens herd Easy to dry	All	Grazing	Wet
Orkujata-Onyokie	1	Grass	Strong roots Good for cows	Cattle	Grazing	Both

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Oloibor-Lunkuya	I	Herb	Fast growing Good for shoats	Shoats	Grazing	Wet
Enkempa	I	Grass	Highly palatable High milk yield	All	Grazing	Wet
Oloenieni	I	Herb	Lasts long Green through out	All	Cut and carry	Dry
Oloiyeti	I	Grass	Only grows in wet areas	All	Grazing	Dry
Ormangulan	I	Tree	Fattens herd Palatable to humans	All	Grazing	Dry
Orkyapore	I	Herb	Fattens herds	All	Grazing	Both
Enkonyoro	I	Grass	Fast growing	All	Grazing	Both
Empupuoi	I	Tree	Fattens herds	All	Grazing	Both
Ositeti	I	Tree	Fattens herds	All	Grazing	Both
Oloibilo Entanae	I	Grass	Fast growing, nutritious Fattens herd	All	Grazing	Both
Orbili	I	Tree	Palatable to goats Milk yielding	Shoats	Grazing	Dry
Orngosura	I		Evergreen Highly resistant	All	Cut and carry	Dry only
Oremita	I		Highly palatable Malaria treatment	All	Grazing	Dry only
Enaimuruai	I	Grass	Grows throughout the year	All	Grazing	Both
Oldogri	I	Herb	Regrows after drying	All	Grazing	Both

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Oloiyiangalani	1	Herb	Weak roots	All	Grazing	Wet
Oloiyiapiyap	1	Grass	Strong roots Highly resistant	All	Grazing	Both
Oremit	1		Palatable fruits for humans and livestock Malaria treatment	All	Grazing	Wet
Olkuyapore	1	Herb	Fast growing Milk yielding	Shoats	Grazing	Wet
Enaibilo entanei	1	Grass	Lasts long Highly nutritious	All	Grazing	Both
Oloingoi	1		Good forage	All	Grazing, hay	Dry
Olkijita-onyokie	1		Preferred by cattle all season	Cattle	Grazing	Both
Olperesi-wuas	1	Tree	Less dominant	All	Grazing	Both
Oloingoe	1	Grass	Not easily available	All	Grazing	Dry
Orkiyapor	1	Herb	Fattens herd, milk yielding	Shoats	Grazing	Wet
Orkirian	1	Grass	Good forage	All	Grazing	Dry
Oloibor-Lunkuya	1	Herb	Palatable	Shoats	Grazing	Dry
Frikaru	1	Grass	Lasts long, resilient	Cattle	Grazing	Both
Enaimuruai	1	Grass	Lasts long	Cattle	Grazing	Both

Table 14: Wajir site preferred species for grazing and browsing

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Biila (Aristida adoensis)	9	Grass	Grows in all types of soil, highly nutritious Available all seasons Fast growing, suitable for all animals, palatable	All	Grazing Cut and carry	Wet only/both
Jarbi (Sporobolus spp)	8	Grass	Highly nutritious High regrowth rate, strong roots, thrives in drought Long lasting Soft and palatable High regrowth capability	All	Grazing Cut and carry Hay	Both/wet only
Coows Modul	6	Grass	Highly resistant to drought Palatable, highly productive Good for all livestock Long lasting, strong roots Requires a lot of rain to grow	All Cattle	Grazing Cut and carry Hay	Both
Darema (Chrysopogon spp)	6	Grass	High regrowth capability Highly nutritious, milk yielding Preferred by all livestock Fast growing Survives harsh weather, strong roots	All	Grazing Cut and carry	Both/dry only
Jeeben	5	Grass	Highly nutritious, available all seasons	All	Grazing	Wet
Xumbi-Siib	3	Grass	Fast growing, preferred by livestock Used for shelter, rarely found Good for housing, good for grazing	All	Grazing Cut and carry	Both/wet only
Rarmaa	2	Grass	Fast growing, Highly nutritious but not readily available	All	Grazing Cut and carry Hay	Both
Seeya	1	Grass	Not preferred by livestock	All	Grazing Cut and carry	Wet
Food-Cade	2	Grass	Highly nutritious, fast growing Palatable to cattle mostly	All	Grazing	Wet/Both

Species name	Frequency of occurrence as top-five preferred species	Growth form	Specific characteristics	Livestock fed	Method of utilization	Season of use
Qalan-Qul	1	Grass	Highly nutritious	All	Grazing	Both
Xalfa	2	Grass	Soft and palatable, cleans the animal's intestines	All	Grazing	Wet
Panya	1	Shrubs	Fast growing, Palatable to animals	All	Grazing	Wet
Biisir	1	Tree	Highly resistant, edible even in dry seasons	All	Grazing	Both
Acacia	1	Tree	Provides shade, provide fruits	All	Grazing Cut and carry	Both
Marer	1	Tree	Fast growing, good for all livestock	All	Grazing	Both

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