# Final Report

Assessment of Pasture Condition in Sagarejo Municipality, Georgia

October 2019, 1st Edition

REC Caucasus

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Assessment of Pasture Condition in Sagarejo Municipality, Georgia including a Socio-Economic Assessment

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1. BACKGROUND

2.1 INTRODUCTION

Georgia has long-standing and well-established traditions of animal husbandry. The variety of natural, climatic and relief conditions of Georgia (with the coexistence of alpine, subalpine, valley and lowland pastures) has facilitated the development of pastoral farming and sheep farming. Kakheti is the foremost pastoral region (GeoStat, 2016) and an estimate 75% of the national sheep population winter in Kakheti. As such, the pastoral system in Kakheti is largely mobile, with migrating pastoralists using high summer pastures in Javakheti, Tusheti and Kvemo Kartli and wintering in the lowlands of Kakheti (UNDP, 2014).

In spite of enabling natural and climatic conditions for the development of agriculture in Georgia, the development rate of this sector has been significantly lagging behind the development rate of other sectors of economy for the past decades. Due to an array of various developments following the restoration of independence on April 9, 1991 – with growing export demand for sheep, a decrease in pasture care measures provided by the state (i.e. sown and planted areas of annuals and perennials) and irrigation infrastructure that has not been maintained to the same extend etc. and a decreased availability of winter pastures with the end of the Soviet Union due to the loss of access to winter pastures in Azerbaijan and Russian Federation (Kizlar, Dagestan) – unadjusted stocking densities and pressure on land have increased. The resulting unsustainable use of pastures and forests are being reinforced by climate change, the legacy of past reforms[1], and asymmetric information, knowledges and experiences regarding sustainable land management, because often pastoral developments are being led by "farmers by default" i.e. individuals with no previous experience in farming (Phulariani 2018, cited in Westerberg et al. 2018). However, especially for the rural population in Georgia livestock keeping is of high socio-economic importance as it provides a subsistence livelihood and income (Neudert et al. 2019; Didebulidze and Plachter 2002) and its performance is crucial to poverty reduction (FAO 2011). Therein, particularly common village pastures represent an important resource for the rural population. In addition, agriculture has an important role in securing food security.

Because of the massive accumulation of challenges in Kakheti, the region has been identified as one of the regions, most vulnerable to desertification and land degradation by the National Action Programme of Georgia to Combat Desertification (Government Decree #742)[2].

The current report aims at applying the combination of remote sensing and ground assessment of pasture condition developed under the GIZ programmes SMBP and IBiS in Azerbaijan and Georgia (e.g. Tusheti, as well as the methodology for assessing winter pastures applied under UNDP-Clima East in Dedoplistskaro) in Sagarajo Municipality. That, in turn, will reveal the importance and applied value of sustainable pasture management practices, and therefore will play a role of a subsidiary pre-demonstration component of the state programme on sustainable pasture management.

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[1] After Georgia declared independence in 1991 in the early 1990s a first period of land reforms was implemented. Since then many changes in laws and regulations have occurred. As of now there is no standalone law or regulation that exclusively governs pasture resources and their use in Georgia. However, various laws indirectly deal and regulate pasture resources in Georgia which of course could not be comprehensive and all inclusive. This legacy of past reforms on pastures in Georgian led to privately and government owned pastures.

[2] Second National Action Program of Georgia to Combat Desertification 2014-2022 / Approved by the Government of Georgia - Decree #742 of December 29, 2014.
https://www.rec-caucasus.org/files/publications/pub_1481807666.pdf

The objective of this report is to assess the condition of the entire pasture-land in Sagarejo Municipality, Georgia (i.e. scaling up the methodology of estimation of grassland quality under pasturing using multispectral remote sensing data and ground assessment developed under IBiS). The assessment can provide the baseline to identify specific entry points for LDN activities at municipal level. Therein, the assessment of pasture conditions and its preparatory steps (Activities 1 to 3.) is seen as an important aspect. The socio-economic analysis in chapter 5 (Activity 4) included an analysis of stakeholders relevant for pasture use in Sagarejo municipality and an assessment of the socio-economic situation by means of a survey or focus group discussions with pasture users. This latter activity predominately is supposed to assess the willingness, preconditions and feasibility for the implementation of measures like pasture care, rotational grazing schemes, self-organization and rule development for pasture use- and management by local actors. The involvement of local actors is of utmost importance for proceeding towards a more sustainable pasture use, and is a precondition for the understanding and joint implementation of results and recommendations from Activity 5 in chapter 6.

2.2 KAKHETI REGION

Kakheti, located in eastern Georgia is the region with the largest area of arable land, permanent cropping and pastures or meadows in Georgia, with 315,499 tsd ha of agricultural land and 149,230 tsd ha of natural hay meadows and pastures 40% percent of the country's agricultural land is located in the Region. Natural hay meadows and pastures make 47.3% from total agricultural area (GeoStats, Agricultural Survey of 2014). According to the "Kakheti Regional Development Strategy 2014-2021" (2013) Kakheti ranks first in Georgia in this category of lands and is therefore a leading region in the production of cereals and livestock.[3]

With 9% of the total population of the country Kakheti region is the fourth largest region[4] of Georgia (after Imereti, Kvemo Kartli and Samegrelo-Zemo Svaneti regions), but in the same time, it is the least urbanized region of the country. 80% of the Kakheti population live in villages which are remarkable for their large population and dense settlements. Hence, beyond the large share of agricultural lands in the region, those features play an important role in determining Kakheti's economic profile which is agriculture-dominated mono-profile economy.

According to the Regional Development Strategy 2014-2021 "In 2011, agriculture accounted for 24% of the region's GDP, while the share of industry was only 9%, trade was 5%, transport and communication - 1,2% and construction - 1,7%. it is noteworthy that there are no data available about the share of tourism (…)" (MFA 2013:10). The strategy further states: "(…) the level of salaries in Kakheti is below average. moreover, there is a clear lack of gender equality - the difference between the salaries of men and women engaged in the same area is largely favorable to men. Kakheti ranks second last, just ahead of Shida Kartli, in terms of incomes per household

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[3] *The Regional Development Strategy states "Among autumn cereal crops of Kakheti, barley is the second most important cereal crop used primarily for animal feed. Georgian breweries do not use locally produced barley but import it from other countries. the comparison of the 2006-2011 data in the table demonstrates that barley crop was more or less stable in Kakheti and declined slightly in Samtskhe-Javakheti. however, Kakheti is still far behind this region in the amount of barley production, as both of the regions are the largest producers of livestock, barley production is quite important here so there is a great potential for its growth. Farmers in the Dedoplistskaro and Signagi municipalities produce a relatively large amount of barley whereas farmers in the other municipalities of Kakheti produce barley for feeding their own livestock." (MFA 2013)*

[4] *In view of potential future developments of the region it's important to note, that according to the Kakheti Regional Development Strategy 2014-2021 "for the (…) recent years there has been a natural decrease and ageing of population in the region. the migration of young people has increased. young people aged from 20 to 39 make up only 17% of the total population in the region. as a result of in- and out-migration, the region's population has declined 0.2% from 2002, and 7.9% from 1989."*

https://www.mfa.gov.lv/data/Georgia/kakheti%20regional%20development%20strategy%202014-2021.pdf

and per capita.[5] Hence (small-scale) subsistence livestock farming plays an important role for securing livelihoods in the region.

Table 1: Total areas of pastures and number of livestock in Sagarejo municipality according to Kakheti ELD study 2018 (table extract from Westerberg et al. 2018).

Municipality	**Number of households/ holdings[6]**	*Total area of grasslands as detected by satellite imagery (hectares)**	*Total number of ewes in 2016 (National Statistics Office of Georgia, 2017)*	*Total number of cattle in 2016 (National Statistics Office of Georgia, 2017)*	*Total number of goats in 2016 (National Statistics Office of Georgia, 2017)*
Sagarejo	190	54,774	185,945	31,079	12,635
Total Kakheti	**2,877**	**382,338**	**369,300**	**97,200**	**23,300**

In the same time 40.1% of all agricultural holdings of the country are found in the Kakheti region (National Statistics Office of Georgia, 2016b). In terms of sheep farming, Kakheti is the main region – with an estimated 64.6% of the total number of sheep and goats that are owned in Georgia – followed by Kvemo Kartli, which has not had a large population of sheep in the past, but the last 12 years this sector has been stably developing.

Kakheti Regional Developments Strategy 2014-2021: Livestock production

Livestock has traditionally been an important component of the agricultural industry of Kakheti. large areas of pastures and grasslands, favourable agricultural and climatic conditions are major factors contributing to the development of this sector. Although Kakheti accounts for a small share of the total livestock population in the country, this sector has a great potential for development. the region's strength is its proximity to the capital city. Kakheti ranks fifth with a share of 9% after Imereti, Samegrelo, Kvemo Kartli and Samtskhe-Javakheti.

Cattle-farming is an important part of Kakheti's livestock sector. The cattle stock in Kakheti is higher than in previous years, especially in households where it is 99.3 - 99.8%, with the remaining share belonging to agricultural enterprises.

Each municipality of Kakheti has livestock driveways which link together winter and summer pastures both inside and outside the region. the driveways are measured according to: driveway, cattle stall, area of driveway (in hectares), length of driveway (km). unfortunately, the disorder prevailing on livestock driveways causes many problems both to farmers and the state such as spread of very dangerous animal diseases in the region and in the country, as a whole, unfavourable epizootic condition and increasing risks in the livestock sector of the region.

Kakheti ranks fourth in **meat production** after Imereti, Samegrelo, Kvemo Kartli and Shida Kartli. there was a decline in meat production in 2006-2011 until 2010, with an upward trend in 2011, which is due to the improvement of state registration service.[7]

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[5] *The source of household incomes in Kakheti, including employment incomes, is pensions (17%) and benefits (16%). the same percentage of household incomes (16%) comes from borrowings or savings account. the percentage of in-kind incomes (15%) is also high whereas the percentage of proceeds from the sale of agricultural production is lower (14%). this means that pensions and benefits, loans or savings, including natural products, make up a larger portion of household incomes than salaries*

[6] *Identifying as farm/shepherd household and operating at least partly on pastureland with cattle, sheep or goats in excess of 50 sheep units (c.f. Westerberg et al. 2018).*

[7] Meat is produced by officially operating slaughterhouses that have the required permit. The situation in other slaughter-houses of the region is very poor: hygiene practices are not followed; there are no sewer and water-supply systems, no cooling chambers for storage of meat, and no laboratories at the site; slaughter-houses are not isolated from market areas; the major problem is the absence of local oversight agencies and the inability of Food standards agency to control the quality of production (MFA 2013:10).

Kakheti accounts for a smaller share of **milk production** than Imereti and Kvemo Kartli or other regions. however, milk production is one of the most important sources of livelihood for the Kakheti population and accordingly, has a potential for growth. Kakheti accounts for 6.1-6.8% of the total milk production in the country, with a potential for growth. demand for milk is constantly growing. in fact, liquid milk is in short supply in the domestic market. to a certain extent, this shortage paves the way to the growth of dairy breeding in a favourable business environment. local farmers having 3-6 or more cows produce their own Sulguni or other type of cheese from which they earn more income. (…). Local producers of milk and dairy products such as sante, Ecofood, soplis nobati and other companies operating in the Kakheti region do not buy milk in Kakheti as the region cannot meet their daily demand. Other regions are also unable to supply sufficient milk, so the companies make up for the shortage by using milk powder.

Pig-breeding is one of the most ancient branches in Georgia. today, the top pig-producing regions are Imereti, Samegrelo, Kvemo-Kartli and Zemo Svaneti, including Kakheti. Pig production suffered a great damage due to the outbreak of swine flu. Kvareli has the largest pig population in Kakheti (4035) followed by Dedoplistskaro (3815), Sagarejo (3421) and the smallest in the Akhmeta municipality (700). there are different breeds of pigs in Kakheti, among them the "Kakhetian breed" is on the brink of extinction. unfortunately, there are no breeding farms in Kakheti where farmers can buy pure-bred pigs. Kakheti plays a special role in pork production. there is a great demand for pork in the domestic market which peaks in December and January. although local pork is more expensive that imported pork, it is still in great demand in the country. today, Kakheti accounts for 10,5-14,1% of pork production in the country. Pork is primarily produced by small farms so proceeds from the sale of pork are a very important source of livelihood for this segment of producers. Pork production will increase with the improvement of epizootic conditions.

There are the following constraints to the development of meat production and other livestock sectors:

- deficiency of legal regulations on control of meat quality
- unfavourable epizootic condition in the region and in the country
- inefficiency of veterinary system in the region and in the country
- low nutritive value and high cost of fodder
- lack of high-yield breeds
- inefficiency of product quality control system
- poor infrastructure in butcher shops;
- big influence of monopolistic companies in the domestic meat market

Kakheti has a long history of **sheep-breeding** and in general, livestock production traditionally pursued by farmers in Akhmeta, Dedoplistskaro and Sagarejo due to the availability of large winter and summer pastures which have been and are major contributing factors to the development of this sector. Today the sheep population is lower than before. Kakheti is actually a top sheep-producing region followed by Kvemo Kartli where the sheep population was not large in previous years but was steadily increasing for the last 12 years. Among the other municipalities of Kakheti, Akhmeta (67.5 thousand sheep) and Sagarejo (96 thousand sheep) are leaders in sheep production. The growing demand for Tusheti sheep in the Arab countries has caused a sharp increase in the sheep population encouraging farmers to produce more sheep. However, the outbreak of dangerous animal diseases poses a great risk for export.

Sheep is primarily produced and consumed at a local level. Sheep meat is imported in the form of various tinned food or products, and the remaining part is produced locally. Although the country has been exporting live sheep for the past four years, primarily for meat production, there are no sheep producing and processing plants in the region. It should also be noted that export data were unavailable at the time of research. In terms of the amount of sheep produced Kakheti is at

the top, followed by Kvemo Kartli, Samtskhe-Javakheti and Mtskheta-Mtianeti. Sheep production is one of the most profitable sectors as annual stocking rates of sheep are quite high. Production of sheep cheese is quite profitable due to the high price. Moreover, sheep wool is a raw material used in the textile industry. Although the price of wool is lower today than in previous years, it still provides some source of livelihood.

The constraints to the development of this sector are as follows:

- unfavourable epizootic condition in the region and in the country
- inefficiency of veterinary system in the region and in the country
- no adherence to hygiene practices during the milk and cheese production in farms
- low nutritional value of winter and summer pastures, partial desertification of pastures
- inefficiency of product quality control system
- poor infrastructure in butcher shops

2.3 SAGAREJO MUNICIPALITY

In anticipation of later presented results of the socio-economic assessment, some findings are already presented in this chapter.

The municipality of Sagarejo, located to the south of Kakheti, is one of the main areas for winter pastures in Georgia (Gonashvili et al., 2013). Sagarejo is traversed by a migratory road that connects winter pasture areas in Kakheti with summer pasture areas in Javakheti (Ninotsminda), and Kvemo Kartli (Tsalka, Dmanisi) it also connects with the main route between Tusheti and Vashlovani protected areas (MoEP/EU/UNDP, 2016).

The total land area of the municipality is 1,532 km² with a population density of 34.13/km² (2018). According to the GeoStat National Population Census (2014) Sagarejo municipality has a total population of 51,761. Of which 40,890 are rural i.e. the rural population amounts 79% (21% urban population).

Data provided by representatives of the municipality the pastureland of the municipality sums up to 64,000ha of registered pasture territory, but has further land available for pasture use. According to satellite imagery evaluated for the ELD study (2018) the total area of grasslands as detected is 54,774 ha in Sagarejo municipality.

In Sagarejo municipality 6,094 ha from the total agricultural land is privately owned, 38,288 ha belongs to state. According to the municipality, privatization processes in the 90ies lead to large areas of privatized land in Sagarejo municipality – some of which nowadays are: a) leased out (subleased); b) turned into arable lands. Those areas are confining, or limiting livestock mobility (transhumance, but also area for herding of village LS).

According to representatives of the municipality, the mayor problem of these large privatized territories is that they are cutting migratory roads; i.e. do not allow livestock mobility (along historical transhumant road). Nowadays, however, the privatization of agricultural land is hardly possible, since land is too expensive and under current laws, pastures are not subject to privatization and should be accessed through leasehold contracts (either from the ASP or municipalities). However, large areas of state-owned lands are used informally, and many aspects

are undefined, i.e. around Udabno some villagers have territory, and de-facto have to make payments for use but possess no agreement.

Sagarejo municipality sums up to 56,884 ha, of which 40% is degraded due to overgrazing, 400 ha of arable land is degraded because of water- and wind erosion and salinization, and about 70% of windbreaks have been destroyed. The Kakheti Regional Development Strategy 2014-20121 states that "(…) farmers do not take good care of soil and do not enrich it with a sufficient amount of mineral or organic fertilizers. due to the poor management of soil, lands are often infested with weeds. due to a large number of animals grazing on pastures there is a process of desertification, especially in Sagarejo (…) most agricultural lands are affected by soil erosion caused by wind and water" (MFA 2013:12). Further threats according to the Regional Development Strategy (2013) are the inundation of arable and pasture lands, and the spread of pests (especially *Melolontha aceris*) in soils.

2.3.1 CLIMATE IN KAKHETI AND SAGAREJO MUNICIPALITY

Table 2: Climate data of basic weather stations in the Kakheti region (according to 1980s state; UNDP 2014)

Climate district	Weather station	Height above sea level, m	Year of starting observation	Average annual temperature, °C	Annual sum of precipitation, mm	Climate zone
	Eldari	500	1950	11.6	470	2
	Sagarejo	802	1916	11.0	768	3
	Udabno	750	1951	10.4	430	3
Gare Kakheti	Sighnagi	795	1950	11.0	735	5
	Dedoplistskaro	800	1951	10.1	585	5
	Shiraki	550	1931	10.3	501	5
	Gombori	1 085	1940	8.1	730	6
Average		**755**		**10.4**	**603**	

Sagarejo weather station, located at 802 meters above sea level is the main reference point for climate data of the municipality.

The climate in Sagarejo municipality is characterized by cold winters and hot summers, and two precipitation maxima per year.

In view of climate change, according to the UNDP report on "Climate Change and Agriculture in Kakheti Region" the analyses of changes of climate elements between the periods 1961-1985 and 1986-2010 show that the average annual temperature in Sagarejo municipality has increased by +0.5 C, and compared with the period of 1923-1960 by +1.7 C (UNDP 2014). An ongoing raise of temperatures for all seasons can be observed – with strongest trends in summer (+0.9 0C) and autumn.[8] Winters became milder during the last 25 years. In parallel "(…) annual precipitation has decreased by 82 mm, or by 10% and almost got back to the level existed in 1923 – 1960" (UNDP 2014:24). The seasonal total of precipitation is reduced by 25% and periods of draught became more frequent. "Finally, summer in Sagarejo zone became significantly hotter and relatively drier" (UNDP 2014:24). In sum according to UNDP (2014) on one hand Sagarejo municipality has one of the shortest vegetation periods, with low levels of precipitation[9], it furthermore

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[8] *For other seasons the increments of temperature are nearly equal (and lie within +0.50C).*

[9] *As for the vegetation period, the changes in transition periods to various temperatures, starting from the transition of 50 and ending with 200, was assessed for each municipality.*

suffers increasing numbers of all types of one month-long and extreme droughts, and hence is amongst the most sensitive regions of Kakheti in terms of response of climate elements to ongoing global warming processes.

2.3.2 MAIN TYPES OF PASTURE USE IN SAGAREJO MUNICIPALITY

Summer pastures
There are two summer pasture areas at the territory of Sagarejo municipality located at altitudes from 1700 to 2800 m above the sea level. Due to climatic conditions at these altitudes these are only used in summer season. 54 ha of the Sagarejo summer pastures are privatized, the other areas are used by local population or leased out.

8% of the case study participants are using local summer pastures.

Winter pastures
Winter pastures of the Sagarejo municipality stretch over vast lowland areas in the South-and of the municipality's territories. They are either leased (by individuals or groups), or privatized (and then individually used or subleased). Yormughanlo, located in the South-East of the municipality accommodates 60% of all sheep of Georgia – using also other municipalities pasture territories, not only the territory of Sagarejo municipality. According to representatives of the municipality, what is particular about Yormughanlo is that although education is theoretically available to all, traditions and values of the local i population do not allow to go for higher education and other professions, which hence makes them stay in the livestock sector.
60% of the case study participants are using local winter pastures.

Village pasture territories
Village pasture territories are not officially determined and include unfenced land in and around many of the villages of Sagarejo municipality. However, according to representatives of the municipality, each village knows the extend and borders of their territory. In addition, some villagers use arable lands for herding their livestock. Villagers themselves (in rotating shifts) or by employing hired herdsmen move village livestock to the pastures every morning. In the evening, the livestock returns back its homestead where it (often) receives additional fodder. Sometimes cows are left unattended and freely roam pastures during daytime (Raaflaub & Dobry, 2015). Many villages of Sagarejo municipality have little common village pasture, as most of the land is used for agriculture (i.e. wine etc.) according to representatives of Sagarejo municipality. According to the authors of the ELD study (2018), privately owned fields are rarely used for pastoral activities exclusively[10], as cropping is more profitable (RECC 2018). This implies that villagers often use various fragile public lands such as windbreaks, scrublands and secondary forests for grazing.

30% of the case study participants are using local common village pastures.

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[10] *For the most part, they are used as arable fields, grazed after harvest.*

2.3.3 LIVESTOCK PRODUCTION IN SAGAREJO MUNICIPALI-TY

Among the municipalities of Kakheti, Sagarejo has the largest stock of cattle with 31,079 heads in 2016 (National Statistics Office of Georgia, 2017 cited in Westerberg et al. 2018, see also Table 1). Sagarejo has also traditionally been amongst the largest milk producers in Kakheti.

Due to the availability of large winter pastures areas, sheep-breeding has traditionally been pursued by farmers in Sagarejo, which is with 185,945 (2016) of sheep (ewes) among the leading municipalities of Kakheti in terms of sheep production (National Statistics Office of Georgia, 2017 cited in Westerberg et al 2018). As for goats the total number amounted to 12,635 in 2016.

3. PREPARATION OF PASTURE ASSESSMENT

3.1 PASTURELAND DELIMITATION REPORT, SAMPLING DESIGN AND MAP PREPARATION OF FIELD WORKS (ACTIVITY 1)

The plot-based pasture assessment widely follows the original highland pasture monitoring manual by Etzold & Neudert (2013) and its adaptation to lowland pastures (Etzold et al., 2015).
In contrast to the preferential sampling design originally foreseen for the settings described in the abovementioned manuals, for Sagarejo municipality, due to the large-scale character of the study, a randomized sampling design was developed. The outlines are described in the ToR for this study.

The tasks of Activity 1 were conducted by GISLab as described in the ToR and specified in Mikeladze & Megvinetukhutsesi (2019) (see separately handed in report[11]).

Steps were:

a. Using cadaster, satellite and other data the exact boundaries of the Sagarejo district were delineated.

b. Processing of multi-spectral satellite images of Sentinel-2 to create an unsupervised classification, after which pasture/grassland boundaries and clusters for study area were defined.

c. By using a classification raster, 385 sampling points were generated, considering the spectral characteristics of the area [12].

d. Creation of six sets of field maps (1:50,000 topographical maps, high resolution satellite maps, Multi-spectral satellite Infrared map, Unsupervised Classification Map, Landownership maps) (see the 6 tiles below in Figure 1 and examples in Appendix A/8.2).

e. Preparing sampling points for uploading to GPS devices (.gpx).

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[11] *Mikeladze, G. & Megvinetukhutsesi, N. (2019). Remote Sensing Applications in pasture analysis for Sagarejo Municipality, GISLab on behalf of RECC.*
[12] *How many plots would be finally needed, was already calculated in a pre-screening process, by delineating pastures using cadaster data and satellite imagery for Sagarejo region and determining the pasture/grassland area, counting the number of pixels falling into a given territory and thus determined the "population size" and the necessary "sample size" to meet the desired statistical constraints (95% confidence level). As a result, 385 plots were seen as required to collect sufficient groundtruthing data for the level of the municipality's whole pasturelands.*
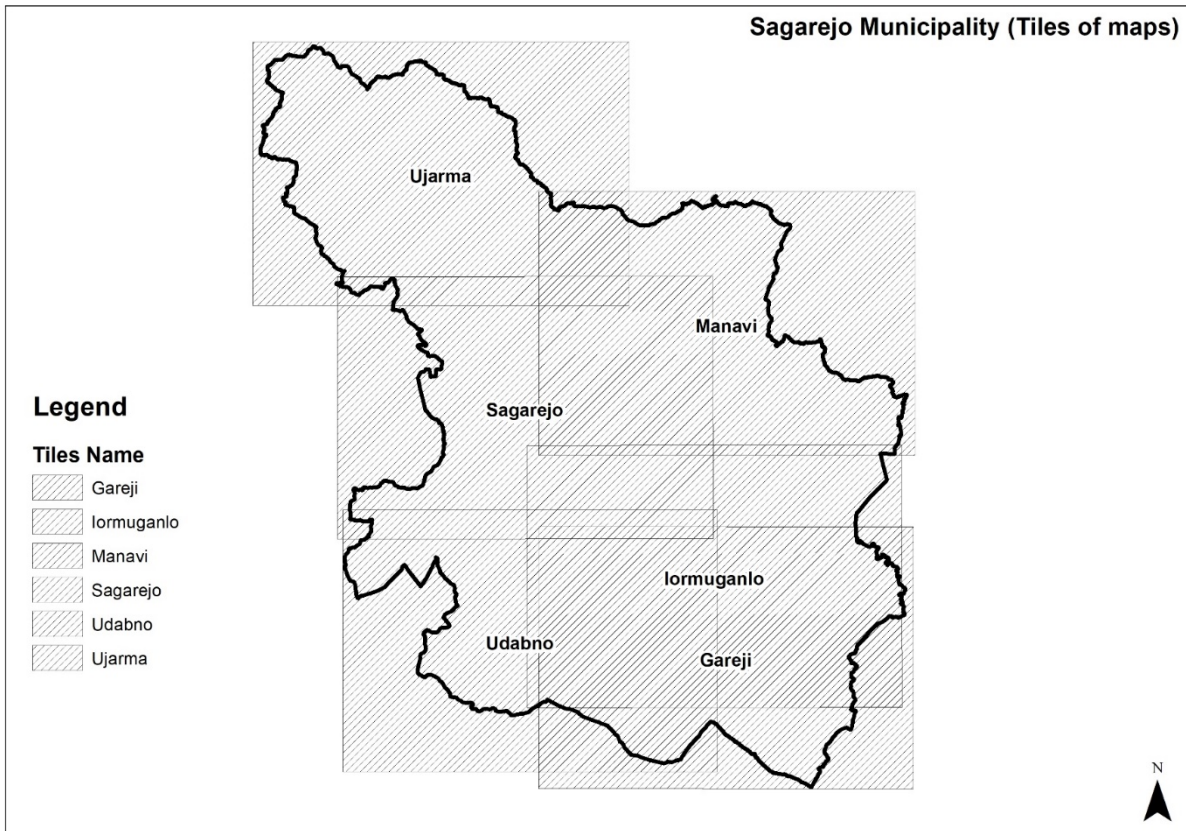
Figure 1: Six overlapping tiles used for creating each six sets of field maps (as described under 3.1 d.)

3.2 OUTLINE FOR PASTURE INVENTORY IN SAGAREJO MUNICIPALITY (ACTIVITY 2)

The assessment was to cover the full range of pastures in Sagarejo municipality, from winter pastures in the lowlands to village and summer pastures in the foothills and mountains, respectively. For the final methodology and sampling design, a reconnaissance visit to Sagarejo municipality was conducted to assess, amongst others, the dominant pasture plant groups necessarily to be included into the field sampling for later allowing best possible supervised classification. Another outcome of this reconnaissance visit was the division of the district's pastures in 'highland' and 'lowland' pastures along the main road crossing +- West-East along the foothills and through the main settlements like the district centre town Sagarejo.

Due to the findings of the reconnaissance visit the data sheets from the original methodology had to be adapted.

3.2.1 ADAPTATION OF DATA SHEET

As there are a few differences in the assessment of winter and summer pastures in the original methodology, a combined data sheet (see chapter 8.1) was developed that could serve as a complete solution for any situation encountered as well as for any allocation of the assessment team during the course of the field work.

One adaptation to the requirements of this study was the reduction of the homogeneous radius from 50 m down to 30 m. For analysis and extrapolation of the ground assessment using Sentinel-2 data, a 30 m homogeneous radius was regarded to be of sufficient extent for the attribution to the 10x10 m resolution of satellite imagery. The sections 'location' (1.1) as well as 'slope' (1.2.) are the same in both methodologies, but three more items were added to the location section (i.e. pasture category, ownership, currently observed land use). The section regarding underground (1.3) was merged from both methodologies. In the mountainous area the type of bedrock has a high influence on erosion processes, whilst the soil texture is of high importance in the lowlands. The decision which information to gather is based on the category checked under the additional item 'pasture category' (highland or lowland pasture). The decision which pasture category the specific plot is situated in then also guides through the following parameters to be assessed.

In chapter 2 of the data sheet, where erosion/degradation parameters are to be given, the original tables from both summer and winter pastures were included individually and the decision which table to be filled needed to be based on the defined pasture category. The only parameter that was excluded from the assessment was 'soil structure' (by the drop shatter test), which is part of the original winter pasture manual. The main reason to exclude this parameter was that, on the practical side, the assessment of this parameter requires the soil to be in the condition of digging at least 20 cm into the ground, but given the late start of the field campaign and the dry weather conditions before, this was impossible to carry out.

For the assessment of the vegetation composition (section 3.2) the original table from the summer pasture manual, which is distinguishing 8 cover ranges, was used to create a similar, but individual table for the lowland (winter) pasture. This step was necessary because the original winter pasture manual is only asking for dominant plant groups with more than 20 % cover, but detailed information on the vegetation composition was needed for later attribution to remote sensing data. These tables were then extended by the dominant plant groups revealed by the results of the reconnaissance trip. Specifically, the assessment of the vegetation composition on highland pastures paid individual attention to the coverage of hairy Asteraceae (specified as '*Centaurea sp.*') and *Leucanthemum sp.* as well as it differentiated bush cover into broad-leaved bushes and coniferous bushes. On the other hand, the assessment of lowland pastures needed additional specification of individual coverages of *Bothriochloa ischaemum*, *Stipa spp.*, *Achillea sp.* and *Glycyrrhiza glabra*.

4. PASTURE ASSESSMENT (ACTIVITIES 3 & 5)

The pasture assessment took place in a field campaign during late spring/early summer 2019, following the methodology and outline from Activity 2.

4.1 FIELD CAMPAIGN (ACTIVITY 3)

Reporting of the field campaign is given chronologically.

4.1.1 INITIAL TRAINING (03. - 04.06.2019)

The first training day has mostly been spent on final organisation at RECC office in Tbilisi, but one initial training plot was accomplished on the road to Sagarejo. The second training day was needed to practice the methodology for both lowland and highland pastures. The distances that had to be covered for reaching representative conditions were long, which is why the training was continued at further two plots that day.

4.1.2 FIELD ASSESSMENT (05. - 16.06.2019)

The first field day started with alternating teams of two and repeating the training were needed. This was necessary to see whether each member of the assessment team fully understood the methodology, whether there were still open questions and, most importantly, how the approach to the estimation of cover percentages was. The targeted number of plots per day required an independent working and a reliable performance was necessary to reach the required data quality. The last plot of the first day was the first plot for each person working individually. So, to those team members having less field experience some time was given for getting acquainted to independent work and self-organisation.

For the second field day two sets of plots for each person were chosen according to the individual physical capability, starting with one set each at the first drop off point. Roughly one hour per plot was calculated and a time was arranged for the return to the drop off point. Spreading out at a common spot and working sets of plots was regarded to be the only option meeting the demanded total plot number. Hence, it had to be tested whether this approach would be suitable for the entire assessment team.

After the appointed meeting time has been exceeded by more than two hours, the core of the debate were the long walking distances, which were further complicated by the strong heat. Due to the obvious exhaustion, the second day's mission was aborted after the first set of plots (3 each person). As any result of the field campaign relies on the physical condition as well as motivation of the team members, a new approach was developed for the continuation:

Many plots from the original set of 385 plots were situated far from roads and the track to reach them was often characterised by strongly alternating terrain, so the aim was to find plots that cover a wide variety of vegetation but also saving time and energy of field staff. The principle of the new approach was to divide the municipality (by visual analysis of aerial imagery) into as many subregions as field days were left and a set of 6 plots per person[13] in each subregion was chosen to be covered by one day trip. Each set (or cluster) of plots within each subregion was identified in order to be reached with minimised effort but also covering various pasture conditions. For those subregions that either would not have sufficient plots covering different vegetation types or would not be in the vicinity to each other, one or two representative plots would be chosen, reached together by car and the spot searched for different representative vegetation types with sufficient homogeneous radius plus varying topographical conditions.

Obviously, the late and fast progressing season in the lowlands called for setting the priority to the southernmost parts of the study region being assessed first. However, the furthest parts of the study site also required a minimum of 1 hour driving to be reached and the high daytime temperatures in combination with permanent exposure to the strong solar radiation drained energy levels quickly. As it was necessary to balance the progress of field work and energy drain of field staff in the face of ensuring health as well as long term motivation, it soon became clear that even 6 plots per person per day would not be achievable. Hence, the approach was further adjusted by setting priority on areas of governmental or unknown ownership, because it was assumed that it would anyway be difficult to enforce management recommendations on private property. The assessment then continued with an average of 4 plots per person per day.

Only the last two days of the field campaign have been affected by a noteworthy incident. Heavy rains had altered a crucial section of the track between the western and eastern part of the summer pastures above Sagarejo impassable, so that the car got stuck and could only be released by the help of heavy machinery (URAL). The late return to the accommodation (around midnight) in combination with the exhaustion caused by the incident gave reason to focus on office work for the last day. As the engine of the vehicle seemed to have severe problems, it was decided not to risk the safe return to Tbilisi and do only one more plot per person in the vicinity of the road on the way back.

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[13] *Due to the long driving distances as well as the high daytime temperatures it had already become clear that the initial target of 7 plots per person per day would not be achievable.*

4.2 RESULTS OF PASTURE ASSESSMENT (ACTIVITY 5)

4.2.1 GENERAL FINDINGS OF THE FIELD CAMPAIGN

Besides setbacks by the car getting stuck and car breakdowns and despite strategy change, 146 lowland plots and 23 highland plots were assessed. This sums up to 169 plots in total, which was 44% of the original target of 385 plots. This means that in average only 3 plots per person and day were possible. The reasons were explained in the previous chapter.

Besides the result that the adjusted approach was suitable for continuing the field campaign without interruption, a few general observations emerged during the course of the assessment:
a) The south-western pastures of the municipality (towards Rustavi) were in poor condition.
b) The village pasture adjacent to Iormughanlo was widely overgrazed. Clearance of *Paliurus* shrubs from valleys could increase available pasture area, but would not a be a sufficient measure (> conflict about missing pasture territory due to privatisation).
c) Parts of the municipality have been converted to arable land (i.e. almond plantations, cereal fields etc.) and conversion is ongoing.
d) Large parts of the village pastures north of the main road are affected by a (partly strong) shrub encroachment.

4.2.2 DATA PROCESSING

Data entry to Excel sheets took place until August 2019. Some of the required information, especially assessing soil texture in Tbilisi from the collected soil samples was time consuming. The plan to conduct this soil-by-feel methodology in the field was not possible under the given time pressure and the harsh conditions.

For both parts, lowland and highland pastures, the assignment of values and the calculations of the Susceptibility to Erosion Index (SEI) and Pasture Degradation Index (PDI) followed the respective manual versions (Etzold & Neudert, 2013; Etzold et al., 2015), however considering the adaptations described under 3.2.1.

Index ranges were accordingly translated to the three traffic lights green, yellow and red and the corresponding figures as given in Table 3 below.

Table 3: Susceptibility to Erosion Index (SEI) and Pasture Degradation Index (PDI) depicted as traffic lights.

Index range	Risk to erosion/ degradation level	Traffic light	Traffic light as numeric figure
68-100	Low	Green	5
34-67	Medium	Yellow	2.5
0-33	Strong	Red	0

4.2.3 ANALYSES
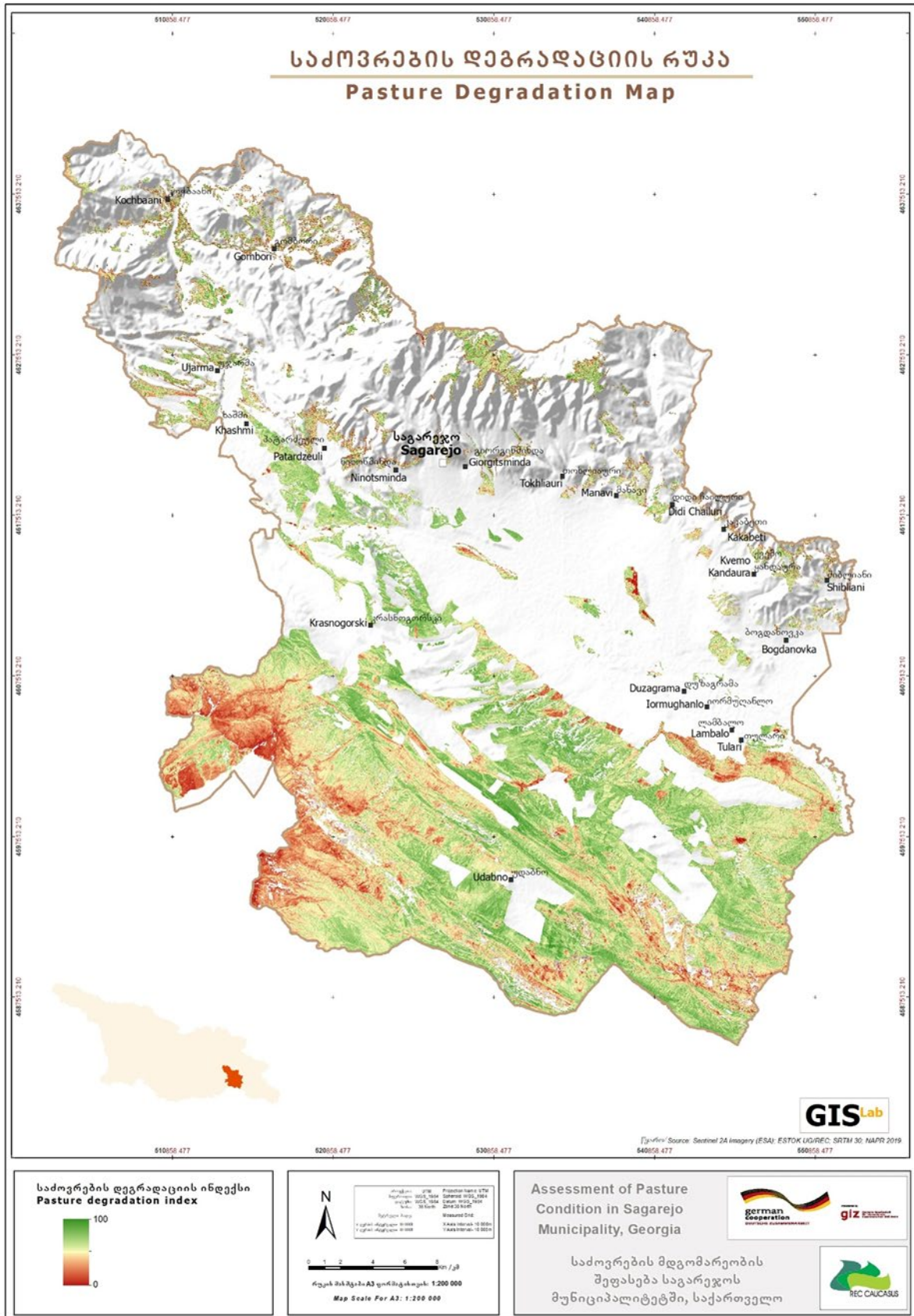
Figure 2: Pasture degradation map depicting the Pasture Degradation Index (PDI) for Sagarejo municipality.

4.2.3.1 BASIC ANALYSES STEPS

While the remote sensing analyses of Mikeladze & Megvinetukhutsesi (2019) (see separately handed in report, p. 7) revealed no good correlations for the calculated SEI values, a map depicting the PDI for the whole municipality could be produced (see Figure 2). Here hotspots of pasture degradation become obvious with red colours, which are massively concentrated in the southwest of the municipality, hence the driest parts of the district. However, also strong signs of degradation are visible near settlements, representing mainly village pastures.

Both indices combined result in the State of the Pasture Index (SPI) which allows for the recommendation of stocking rates. In the case of Sagarejo lowland and highland pastures we applied recommendation schemes based mainly on Soviet time scientific knowledge (see Table 4). The first recommendation column uses legal prescriptions of maximum stocking rates for highland pastures (4-8 sheep units (SU)/ha) and lowlands (1-4 SU/ha) in Azerbaijan. The second respective column uses recommendations for Georgia with maximum stocking rates for highland pastures (6 SU/ha) and derived for lowlands (3 SU/ha). According to this Table 4, as example for the lowland pastures of Sagarejo, on the best sites (with green+green (low risk of erosion + little degradation signs) = SPI of 10) up to 4 or 3 SU/ha, respectively, can be kept. There against, on the worst sites (with red+red (high risk of erosion + strong degradation signs) = SPI of 0) no grazing should take place, at least for one season, allowing for the regeneration of pasture vegetation.

Table 4: Calculating the State of the Pasture Index (SPI) and recommended stocking rates (highland/lowland).

Susceptibility to Erosion-Index (SEI) based on physical site properties	Pasture Degradation-Index (PDI) based on variables alterable by livestock impact	State of Pasture-Index (SPI), colours as of Figure 3	Recommended stocking rate (Sheep Units (SU)/ha) according to Azeri law [14]	Recommended stocking rate (Sheep Units (SU)/ha) according to Soviet time recommendations for Georgia [15]
5 (green)	5 (green)	10	8 / 4 SU/ha	6 / 3 SU/ha
5 (green)	2.5 (yellow)	7.5	6 / 3 SU/ha	4.5 / 2.25 SU/ha
5 (green)	0 (red)	5	4 / 2 SU/ha	3 / 1.5 SU/ha
2.5 (yellow)	5 (green)	7.5	6 / 3 SU/ha	4.5 / 2.25 SU/ha
2.5 (yellow)	2.5 (yellow)	5	4 / 2 SU/ha	3 / 1.5 SU/ha
2.5 (yellow)	0 (red)	2.5	2 / 1 SU/ha	1.5 / 0.75 SU/ha
0 (red)	5 (green)	5	4 / 2 SU/ha	3 / 1.5 SU/ha
0 (red)	2.5 (yellow)	2.5	2 / 1 SU/ha	1.5 / 0.75 SU/ha
0 (red)	0 (red)	0	No grazing	No grazing

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[14] *Cabinet of Ministers of the Azerbaijan Republic (2000). Resolution of the Cabinet of Ministers of the Azerbaijan Republic No. 42 of March 15, 2000: Rules of Allocation and Use of Pastures, Commons and Hayfields, III.13.*

[15] *Kruashvili (1984), cited in Didebulidze, A. and H. Plachter (2002). Pasture-landscapes and preservation problems of traditional grazing in the mountainous regions of Georgia. Pasture-landscapes and Nature Conservation. Berlin, Springer (p. 87-105). Here, for Georgia, in Soviet times 4.5 to 6 sheep per ha were recommended for mountainous pastures. However, this is not legally binding. At present the Georgian legislation, e.g., the Law on Soil Protection, refers to "established allowed maximum headcount," but exact stocking rates are not defined ("Law of Georgia on Soil Protection," issued 12.05.1994, amended 19 November 2002, No. N 1751). In the application here, stocking rates for lowland pastures are halved, following the Azerbaijani example.*

Officially registered livestock numbers for Sagarejo municipality from 2016 are given in Table 5, where the figures of mother sheep (ewes), cattle and goats are transformed into SU. According to these calculations 537,457 SU were kept during 2016 here. Please note, that due to the combination of sedentary and transhumance livestock system, from these figures it cannot be seen when how many heads of livestock were grazing where. Most of these animals are either kept only on the lowland (=winter) pastures, then only in a small proportion these animals are grazed also on the district's relatively small summer pastures (whilst the majority is on summer pastures elsewhere), while others are kept all around the year on village pastures. Therefore, the following calculations for separately lowland and highland pastures follow the coarse assumption that the livestock numbers stay during the particular grazing season only on these pastures.

Table 5: Total areas of pastures and number of livestock in Sagarejo municipality according to Kakheti ELD study 2018 (table extract from Westerberg et al. 2018) and re-calculation to Sheep units (SU).

Total area of grasslands as detected by satellite imagery (hectares)*	54,774
Total number of ewes in 2016 (National Statistics Office of Georgia, 2017)	185,945
Sheep in Sheep units (SU) according to conversion factor 1.84 following Neudert et al. (2016)[16]	**342,139**
Total number of cattle in 2016 (National Statistics Office of Georgia, 2017)	31,079
Cattle in SU according to conversion factor 6 following Etzold & Neudert (2013)	**186,474**
Total number of goats in 2016 (National Statistics Office of Georgia, 2017)	12,635
Goats in SU according to conversion factor 0.7 following Etzold & Neudert (2013)	**8,845**
Total number of SU	**537,457**

4.2.3.2 CALCULATING RECOMMENDED STOCKING RATES BY PLOT-BASED CONSIDERATIONS

In Table 6 the results for the indices for both pasture parts are summarized. For the lowlands the Susceptibility to Erosion Index (SEI) values range between high risk of erosion (red) and very low risk (green), averaging to the yellow range of medium risk of erosion. There against, there were no highland sites recorded with a high risk of erosion (red), while the range goes to low risk of erosion (green) as well. Interestingly the mean value is with approx. 62 lower than the one of the lowlands (64).

The range of the Pasture Degradation Index (PDI) for both parts is wider, with the mean values being less, too. This hints on circumstances that indeed pasture degradation is more severe at many sites than the risk of erosion would let you to expect under moderate grazing pressure.

On average for the whole district's lowland pastures (with the current grassland territory assessed by GISLab of 55,004.4 ha), following Azerbaijani practice, not more than 2.7 SU/ha should be grazed, leading according to this simple calculation to 146,176 SU there. There against on the more productive 8175.3 ha highland pastures, on average 5.2 SU/ha can be kept, leading accordingly to 42,654 SU. For both pasture parts together, 188,830 SU could be sustainably kept.

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[16] *Neudert, R., Etzold, J., Münzner, F., Manthey, M. and Busse, S. 2013. The Opportunity Costs of Conserving Pasture Resources for Mobile Pastoralists in the Greater Caucasus. Landscape Research: 38(4), 499-522. "1 sheep unit (SU) consisting of 1 ewe, 0.04 and 0.8 shares of males and lambs, respectively."*

With the lower recommended stocking rates of Kruashvili (1984) the total livestock numbers would be around 25% less. Following Westerberg et al. (2018), with their very careful stocking recommendation for winter (=lowland) pastures of only 1.2 SU/ha, livestock numbers would be still 40% less (around 66,000 SU).

Table 6: Summarized results from all assessed plots of the Susceptibility to Erosion Index (SEI), the Pasture Degradation Index (PDI), and the State of the Pasture Index (SPI), resulting in recommended stocking rates following the ones from both manuals and a source from Georgia.

Sagarejo (No. of plots), hectares (ha) grasslands from Remote sensing-analyses	Lowlands (n=146), 55004.4 ha			Highlands (n=23), 8175.3 ha			Sum total grasslands Sagarejo (n=169), 63179.7 ha		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
SEI	31.5	90.0	**64.2**	41.3	81.3	**61.9**			
PDI	21.1	95.6	**62.0**	33.1	85.0	**60.6**			
SEI as figure	0	5	**3.4**	2.5	5	**3.3**			
PDI as figure	0	5	**3.2**	0.0	5	**3.3**			
SPI (colours as of Figure 3)	2.5	10	**6.6**	5	10	**6.5**			
Recommended stocking rate (Sheep Units (SU)/ha) according to Azerbaijani law (Cabinet of Ministers of the Azerbaijan Republic, 2000)	1	4	**2.7**	4	8	**5.2**			
Recommended SU calculated from recommended **Azerbaijani** stocking rates (Cabinet of Ministers, 2000) and lowland grassland territory	55,004	220,018	**146,176**	32,701	65,402	**42,654**	87,706	285,420	**188,830**
Recommended stocking rate (Sheep Units (SU)/ha) derived accordingly from Soviet time recommendations for **Georgia** (Kruashvili, 1984)	0.75	3	**2**	3	6	**3.9**			
Recommended SU derived accordingly from Soviet time recommendations for **Georgia** (Kruashvili, 1984) and lowland grassland territory	41,253	165,013	**109,632**	24,526	49,052	**31,990**	65,779	214,065	**141,622**
Recommended stocking rate (SU/ha) for **Kakheti** by Westerberg et al. (2018) (only mean value known)	?	?	**1.2**	?	?	?			
Recommended SU derived for **Kakheti** from Westerberg et al. (2018) (only mean value known)	?	?	**66,005**	?	?	?	?	?	**?**

4.2.3.3 CALCULATING RECOMMENDED STOCKING RATES BY UP-SCALING REMOTE SENSING ANALYSES' RESULTS

By means of the Remote sensing analyses by GISLab (see Mikeladze & Megvinetukhutsesi, 2019, p. 9) a map depicting the SPI values with high accuracy rates both for the lowland and highland pastures could be created (see Figure 3). The remote sensing-analyses allowed for upscaling the plots' SPI values to the whole grassland area in Sagarejo Municipality and by this determine areas (in ha) for each of the PDI classes. As these classes are underpinned with recommended stocking rates, more accurate estimations on sustainable livestock numbers can be derived (s. Table 7). Interestingly they only slightly differ from the mean calculations in Table 6.
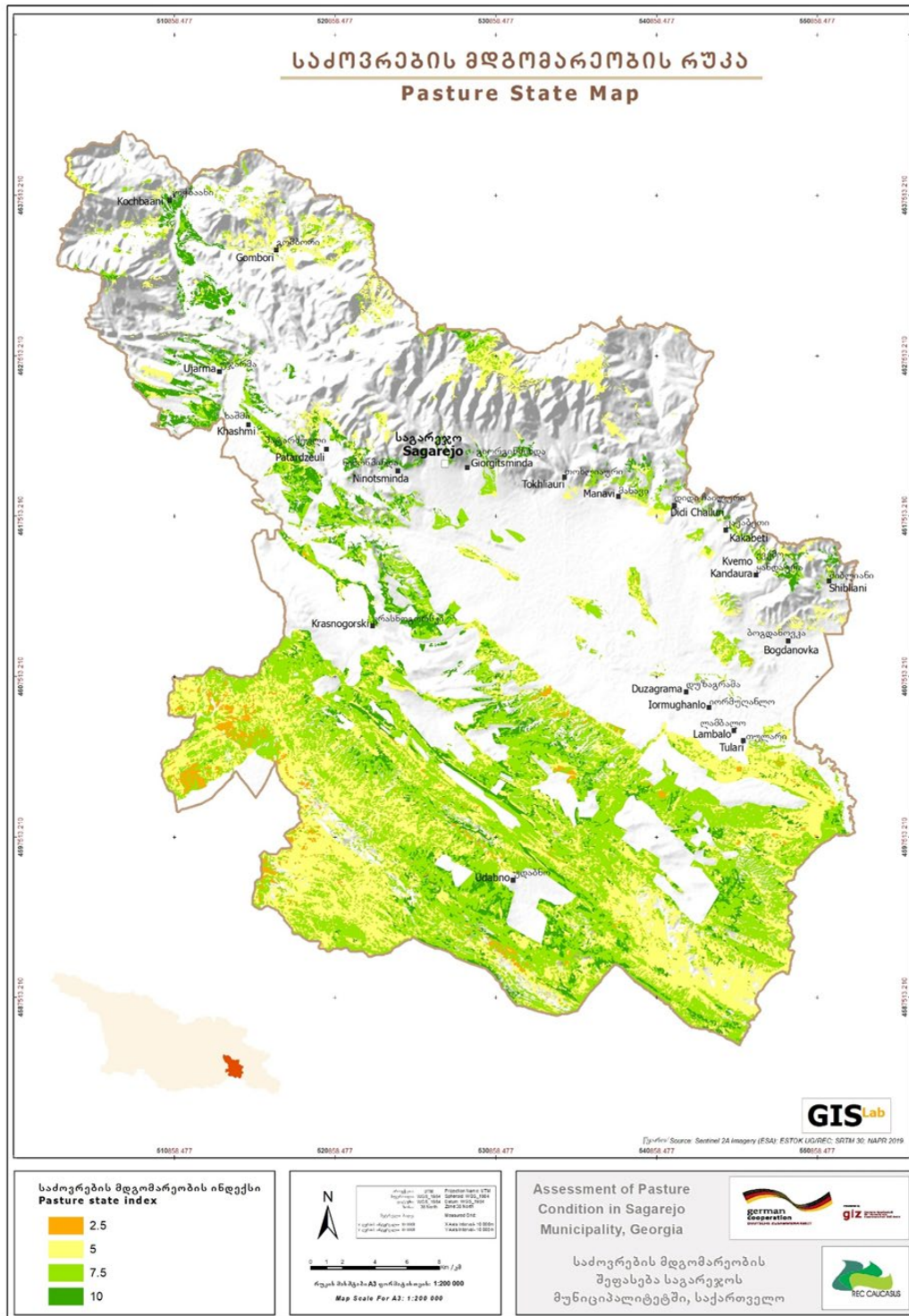
Figure 3: Map depicting the State of the Pasture Index (SPI) for Sagarejo municipality.

Table 7: SPI values upscaled by Remote sensing-analyses to concrete grassland areas (ha) leading to more accurate livestock estimates.

Sagarejo municipality	Lowlands						Highlands						Sum total grasslands	
SPI value	SPI 10	SPI 7.5	SPI 5	SPI 2.5	SPI 0	Sum	SPI 10	SPI 7.5	SPI 5	SPI 2.5	SPI 0	Sum		Plot-based mean calculation (see Table 6)
SPI value grassland areas (ha) upscaled by Remote sensing-analyses	5,329	27,032	21,347	1,297	0	**55,004**	2,309	2,040	3,827		0	**8,175**	**63,180**	
Recommended stocking rate (Sheep Units (SU)/ha) according to Azerbaijani law (Cabinet of Ministers of the Azerbaijan Republic, 2000)	4	3	2	1	0		8	6	4	2 / 0				
Recommended SU calculated from recommended **Azerbaijani** stocking rates (Cabinet of Ministers, 2000) and respective grassland territory	21,316	81,095	42,693	1,297	0	**146,401**	18,468	12,238	15,309		0	**46,014**	**192,415**	**188,830**
Recommended stocking rate (Sheep Units (SU)/ha) derived accordingly from Soviet time recommendations for **Georgia** (Kruashvili, 1984)	3	2.25	1.5	0.75	0		6	4.5	3	1.5 / 0				
Recommended SU derived accordingly from Soviet time recommendations for **Georgia** (Kruashvili, 1984) and respective grassland territory	15,987	60,821	32,020	973	0	**109,801**	13,851	9,178	11,482		0	**34,511**	**144,312**	**141,622**

With abovementioned recommendations for sustainable livestock numbers in Sagarejo municipality (from Table 7) now a comparison to officially registered livestock numbers (from Table 5) is possible. According to the figures in Table 8 the change in livestock numbers required for a sustainable pasture management sums up to **345,042 to 393,145** Sheep units.

Table 8: Comparison of official (see Table 5)and recommended livestock numbers in Sagarejo municipality (from Table 7).

Total number of SU in 2016 (National Statistics Office of Georgia (2017) in Westerberg et al., 2018)	**537,457**
Recommended SU calculated from recommended Azerbaijani stocking rates (Cabinet of Ministers, 2000) and respective remotely assessed grassland territory	192,415
Recommended SU derived accordingly from Soviet time recommendations for Georgia (Kruashvili, 1984) and respective remotely assessed grassland territory	144,312
Required change in livestock numbers (SU)	**345,042 to 393,145**

4.2.3.4 ATTEMPT TO DIFFERENTIATE STOCKING RECOMMEN-DATIONS TO LANDOWNERSHIP CATEGORIES

As cadastre data was available differentiating the three landownership categories *churchland, governmental land, private land,* an attempt was undertaken to recommend stocking rates or livestock numbers for each of these categories. This attempt is found in Table 10 in chapter 8.3 (Appendix A). The idea was to tailor specific management recommendations to these three different stakeholder groups.

However, the assignment by GISLab of the SPI value grassland areas (ha) upscaled by Remote sensing-analyses yielded also significant amount of territory given as "SPI N/A". In the presented attempt this category was misinterpreted as the lacking values for "SPI 2.5" and "SPI 0" and accordingly calculated with their specific stocking recommendations.

The resulting recommended stocking numbers (second but last column) are very low, which can be understood, as the mentioned "SPI N/A" territories (seen as "SPI 2.5" and "SPI 0") are particularly high, used for calculating with low recommended stocking densities (from "SPI 2.5" and "SPI 0"). This finding does not match the results of the chapter 4.2.3.3 (Table 7), where in the grassland areas depicted by remote sensing analyses these two classes almost do not appear.

According to Giorgi Mikeladze from GISLab the explanation is as follows: "SPI N/A" defines lands on which we cannot identify pastures / natural meadows, but they have been identified in the official land cadastre data. Thus, our calculations show the difference between our LandCover data and the National Land Cadastre. For example, all church zones are associated with caves and rocky terrain and are defined as "church zones", but our data (LandCover) does not contain this information, since the "No- Grassland" area was excluded. Government and private lands also have many territories that were not interpreted as grasslands. There were also many small sections (Silvers) related to the irregular geometry of the official land registry.

Possibly with better future cadastre information the attempted goal of tailored management recommendations can be solved.

5. SOCIO-ECONOMIC ASSESSMENT (ACTIVITY 4)

5.1 METHODOLOGY AND SAMPLE

The socio-economic analysis predominately is supposed to assess the willingness, preconditions and feasibility for the implementation of measures like pasture care, rotational grazing schemes, self-organization and rule development for pasture use- and management by local actors. As the involvement of local actors is of utmost importance for proceeding towards a more sustainable pasture use and is a precondition for the understanding and joint implementation of results and recommendations from Activity 5. The collection of Information on pastoralist perceptions and knowledges, is of significance in so far as in managing pastures, livestock owners can not only influence stocking rates but also "(…) frequency, duration and intensity of grazing. Rotational grazing management for example, can vary from yearly to daily resulting in a continuum of grazing methods and stocking intensities (Holechek 2004). (ELD 2018).

5.1.1 SAMPLE FOR THE CASE STUDY

According to the ELD study "(…) the number of households in Kakheti that are pastoralists is unknown. There are 88,800 households in Kakheti that have some sort of agricultural activity, including wine making, arable production, fruit growing and livestock rearing (National Statistics Office of Georgia, 2016a). On average, the area of land per household is 1.4 hectares, indicating that this statistic includes properties with small areas of land as well as larger scale livestock operators. However, based on this, an estimate of households within Kakheti that own grazing livestock is 2,877 (taken to be the upper bound of the estimate for number of holdings with at least 10 cows, or 50 sheep units)" (Westerberg et al. 2018).

To represent the households in Sagarejo municipalitiy, a sample size of 350 households representing the underlying population with 90 % certainty, would be appropriate to allow for a high degree of confidence for the population of the municipality, However, since "The economics of pasture management in Georgia - An economics of land degradation case study" was conducted with a total sample size of 355 households provided for survey data for the entire Kakheti region including 80 households from Sagarejo municipality an approach was chosen, which allows to compare basic data with each other and at the same time to deepen the results by means of additional qualitative data as well as to cover further aspects like local practices of pasture users regarding existing and potential pasture management and care, as well as collective action and local perceptions of pasture users regarding access right to pasture in terms of existing and potential rules and regulations etc.

5.1.2 TARGET RESPONDENTS

Survey respondents were required to be members of a household engaged in livestock keeping. Since no controlled random sample could be determined in advance (i.e. from a register of households or livestock owners), convenience sampling was used. Some sampling bias may therefore exist. To overcome this, interviewers approached respondents as randomly as possible without targeting specific sub-groups.

5.1.3 DESIGN OF FOCUS GROUPS DISCUSSION (FGD) GUIDE-LINES AND QUESTIONNAIRES

The methodology comprised mapping techniques and questions for focus group discussions as well as a questionnaire using multiple choice or short form open numeric responses provided in chapter 7 (Appendix B).

The questionnaire was pre-tested in the municipality of Sagarejo on the 01.05.2019. The content, working and structure of the methodology was thereafter modified according the results of this pre-test phase. A kick-off meeting with representatives of the municipality was held the same day in Sagarejo municipality, which provided context for the study, helped provide data sources for analysis and informed the design of the questionnaire and FGD guidelines.

The study was implemented by surveyors from RECC to the target respondents, between May and July 2019. The study was conducted handwritten on paper, supported by maps and subsequently inserted into a data base for further analysis.

5.1.4 HOUSEHOLD DEMOGRAPHIC

The average (mean) number of household members for the study is 4.3 (ELD 4.7) people per household. The study found that 68% of the sample were found to migrate their stock seasonally to winter, and/or summer pastures, whereas the remaining 32% are sedentary, using village pastures near their homestead (almost) all year round.

65% of the assessed households are mainly occupied with livestock farming. And for 60% of these households were found to depend on pastoral activities for more than half of their household income.

Table 9: Baseline data for case study participants

	Average	Min.	Max.
Age (years)	54,92	29	77
HH-size (Nr.)	4,3	2	6
Nr. of livestock			
Sedentary- village pasture users (32%)			
Sheep	*36,57*	*3*	*100*
Cattle	*5,71*	*3*	*12*
*Mobile – summer/winter pasture users (68%)**			
Sheep (ewes)	*633,43*	*10*	*2200*
Goat	27,70	8	200
Cattle (older than 6 months)	*74,64*	*30*	*190*
Horses	3,29	2	6
Pigs, donkeys	2	2	2
Pasture size (ha)			
	167	5	504
Occupation	Mainly livestock farming	Mainly other work	
	65%	35%	
Importance of livestock farming as source of income	Most important	2nd most important	3rd most important
	60%	30%	10%
Type of pasture use in Sagarejo municipality	Winter pastures	Summer pastures (local)	Village pasture
	60%	10%	30%

*8% of which local summer pasture users.

5.1.5 ADDRESSING GENDER IN PASTURE MANAGEMENT

A shortcoming of the study is that 100% of the respondents from are male. Hence, the study is to be read with a massive gender bias. Although "one important lesson from several decades of gender research is that although gender relations play a critical role in the management of natural resources, women tend to be systematically disadvantaged in terms of access to resources, decision-making, and, ultimately, power relations. Women are not passive victims, however. Women have critically valuable knowledge and agency — as researchers, farmers, natural resource managers, water users, pastoralists, entrepreneurs, scientists, engineers, artisans, preservers of culture, and important players in many other roles that are key to ensuring sustainable environments and the well-being of mountain communities. Gender analysis is a valuable tool for understanding these roles and processes, but action, resources, and policies that specifically support and improve women's lives are also necessary — just as it is necessary to recognize the important role that men play in championing gender empowerment." (Molden et al. 2014) Hence, a lesson learnt for the future is not only to design a study that allows women to become equally involved, but also to stress the importance of equal representation in interviews.

5.2 RESULTS OF SOCIO-ECONOMIC ASSESSMENT

5.2.1 PASTURE-RELATED STAKEHOLDER ANALYSIS FOR SAGA-REJO MUNICIPALITY

A pasture-related Stakeholder Analysis for Sagarejo municipality was conducted in the initial stage of the socio-economic assessment. It is presented in chapter B 9.2.

5.2.2 PRESENT STATE OF PASTURES IN SAGAREJO MUNICIPALI-TY: ECOLOGY AND LOCAL PERCEPTION

5.2.2.1 PERCEPTION OF PASTURE QUALITY AMONGST LOCAL PAS-TURE USERS

Perceptions about the fodder value, water availability, accessibility of pasture amongst local pasture user provide insights indicating pasture quality and productivity in the eyes of local respondents.

Concerning the perception of pasture areas used/accessible to respondents themselves the median in pasture quality is 2,57 (evaluated on a range from 0 to 4). Whereby **only 6.7%** of the respondent considered their pasture to be **highly productive** (4), **53.3%** consider their pasture **moderately productive** (3), **35% little productive** (0% not productive, and 6,7% didn't know how to evaluate the quality of their pasture). Especially the consideration of low productivity exceeds results from the Kakheti wide ELD survey which showed that 25% of pastoralists consider their pastures as little productive.

According to the interviewees from Sagarejo municipality **water availability** is the most decisive factor for **a good or moderate pasture productivity** (productive or moderately productive) - mentioned by **77%** of the interviewees. Followed by **"nature"** - i.e. the quality and capacity of the respective resource itself with **62%** of mentions. **Grazing control** is only mentioned by **7%** whereas the weather conditions seem to be an additional factor important in the perception of local pasture users. According to the household survey undertaken for the ELD study for the entire Kakheti Region, those that consider pastures as moderately or highly productive, 94% attributed this to "nature" and 1% only to grazing control. These results provide first indications that water availability plays a major role for municipality.

Little productive or not productive pastures are, in the perception of the respondents caused by **a lack of irrigation**, which is **with 32%** the main factor responsible, followed by **fallowing** with **23%**. In addition, the "lack of windbreaks" with 7%, the weather (7%) and the **lack of grazing control** (7%) are according to local pasture users factors responsible for low pasture productivity. Compared to survey data for the entire Kakheti region, these responses suggest that the awareness regarding the impact of grazing on the quality of pastures is slightly lower in Sagarejo than on average in Kakheti where amongst those who consider their pasture areas little or unproductive, 24% assume that this is due to lack of grazing control. Altogether, these results suggest that among pastoralists themselves there is no widespread perception about pasture degradation being caused by livestock.

According to the Regional Development Strategy 2014-2021 "Irrigation of agricultural lands in Kakheti is provided by united amelioration systems company of Georgia. this company has four structural divisions in the region: Zemo Alazani, Kvemo Alazani, Lagodekhi-Kvareli and Kvemo Samgori structural divisions which provide irrigation water to all municipalities of Kakheti (…) the agricultural lands of Sagarejo were irrigated by mechanical irrigation systems." (MFA 2013: 22) Nowadays, "(…) mechanical irrigation systems in Sagarejo and Dedoplistskaro are out of operation, the internal irrigation network linked to the systems is out of order; management of the systems is inefficient" (MFA 2013:36).

Seasonal changes of pasture quality (confirmed by 100% of the interviewees) occur on all pastures. Overall – i.e. not taking into consideration whether summer, winter or village pastures are used – according to the respondents of the Sagarejo study **"spring"** (i.e. April-June**) is the season with the highest availability of fodder**. Therein the month of **May** is named most, i.e. the month in which the fodder availability is highest. As for summer pasture users, the early summer months – from May to July – are the best in terms of fodder availability. From the perspective of mobile winter pasture users, the month in spring before migration seem to be the best. October-and November are additionally named by one winter pasture user. Grazing seasons according to respondents are May/June till the end of September/ beginning of October for summer pastures (i.e. complementary to winter pasture use) and January/April till November/December for village pastures.

Only 18% of respondents have observed that there are **places** on their pasture, that are **particularly liked by livestock**. These are mainly **areas around water sources** like wells or springs or alike, around which the grass is "more vital" / "grows better". Other preferential places for livestock are **canyons** (most likely because of shade and airflows) and areas that are clean from shrubs. Other grazing preferences of livestock, according to respondents, are more seasonal i.e. "in autumn/November grow Prickly plants and cattle don't eat it." (INT_6; INT_36).

On average **more than half (60%)** of the total pasture areas used for grazing by the respondents of this study are **of good quality** in terms of fodder availability, whereas around **40% are of bad quality** i.e. little productive.

All respondents (100% use **hay** as additional fodder for their livestock in winter. In addition, **supplementary feed** like **cereals** with **78%** and **25% concentrated feed** are used. Some also use straw, corn or "Medicago" (commonly known as medick or burclover, a legume from the family of *Fabaceae* (note: multiple nominations were possible).

5.2.2.2 LOCAL PERCEPTION ON THE DEVELOPMENT OF LIVESTOCK NUMBERS AND PASTURE DEGRADATION

In terms of **livestock develop in the last years**, **46,7%** of those surveyed stated livestock numbers **decreased**, **38,3%** stated the **number stayed the same** and **15%** stated that the number of livestock **increased**. However, it has to be differentiated, that **only winter pasture users stated increasing numbers**, whereas on village pastures the number of livestock stayed the same or decreased.

As with regards to reasonable livestock numbers (**stocking rates**) on pastures used by interviewees in the Sagarejo municipality, **58%** consider the **pasture area** which is at the disposal of their livestock **not enough**, whereas the other **42%** consider it **just enough.** This is also due to the fact, often not the entire pasture is accessible to livestock. According to pasture users in Sagarejo **55% of the pastures have some inaccessible areas** – namely canyons and rocky parts.

According to the interviewees from Sagarejo municipality, the **effects of keeping too much livestock on the pasture** are twofold: A) for livestock they cause 1. a **loss of weight** of the livestock (according to 98%) and 2. a **decrease in the quantity of milk** (according to 88%); B) as for the pastures, keeping too much livestock on a limited pasture area results in **overgrazing** (stated by 95% of the respondents) and **degradation** (stated by 5%).

In terms of (mid-term) **development tendencies of pasture degradation in Sagarejo municipality 83%** of the respondents assume, that the condition of the pasture they use change during the last 10 years towards the **worse**, **15%** consider it the **same**, whilst 2% of the respondents claim the quality of their pasture became better, due to their own efforts in cleaning the pasture from shrubs.

Asked more generally for degradation problems on pastures in the Sagarejo municipality, **66%** of the respondents declared of having observed **severe problems**, **31% few problems** at the municipalities pasture areas (and 2% didn't know). According to representatives of the municipality, in Sagarejo municipality there is no land degradation at this stage. In their opinion the quality of pastures depends on the climate. But they also pointed out, that the head of communities know best about the quality of the respective pastures – i.e. pasture improvement measures and monitoring should be done in close collaboration with them.

5.2.2.3 MAIN SOURCE OF ENVIRONMENTAL PROBLEMS

According to the interviewees, the main source for environmental problems in the area of winter or village pastures are **drought** (with 93% of mentions), followed by **overgrazing** (48% of mentions, the **lack of trees** (32% of mentions) and **pollution** (5% of mentions). As an additional factor **"climate change"** is mentioned by local pasture users.
Survey respondents were required to be members of a household engaged in livestock keeping. Since no.

5.2.2.4 EFFECTS OF CLIMATE CHANGE ON PASTURES IN THE PERCEPTION OF LOCAL PASTURE USERS

95% of the interviewees witness influences of climate change. The most frequently cited effect of climate change is **drought** (cited by 75%), which is associated with **decreasing rain- and snowfall,** especially the absence of winter snowfall. At the same time, **rising temperatures** are observed (by 33% of respondents). Some of the interviewees (6.6%) put **erosion** phenomena in connection with climate change, others (6.6%) observed **changes in species composition** ("other species growing").

5.2.3 PASTURES UTILIZATION PRACTICE(S) IN SAGAREJO

5.2.3.1 PASTURE INFRASTRUCTURE

Access to water (river, pond, lake) is given for **72%** of the respondents' herds on the pastures (summer, winter, village) they are using – often this, however, is only a small well / or groundwater. Changes in water level are predominantly occurring seasonally according to the observations of 38% of the interviewees in Sagarejo Municipality. However, there is no case of water level increase, whereas a decrease is observed by 15% of the respondents. Which hints on climate change or changing techniques of agricultural land-use – i.e. irrigation of plantations relying on ground water

65% of the interviewed have a **camp** on the pasture site. Apart from one, all winter- and summer pastures (the respondents were referring to) are equipped with a camp. As for village pastures – with the exception of one person privately using village pasture territories – no village pasture is equipped with a camp, since most of the village grazing areas are in the immediate vicinity of the villages and cattle and herders return to the village in the evening.

100% of the respondents have an **access road** to their pastures (dirt road, asphalted); **45%** of the total pastures have a **staple** the pasture, which is 20% less than the number of camps on pastures. Staples are located on summer and winter pastures – as expected there is no staple on any village pasture.

Collective herding
60% of the interviewees herd their livestock together with others, on average (mean) with 10.26 (min 1 max. 23) other people involved and since about 19.36 years (min 4, max 45). For the future 45% are planning to cooperate with other in joint herding.

5.2.3.2 PASTURE USE AND MANAGEMENT

Measures employed to improve pasture quality
37% of the respondents have actively employed specific measures to improve the condition of their pasture or reduce erosion. Amongst those measures **5,5%** of the respondents have experimented with **fencing**, 3,3% with **rotational use of pastures**[17], and **33,3%** with other **measures like seasonal pasture rest** (i.e. regulated grazing)[18] and **pasture cleanup measures**. According to 62% of the respondents no measures have been used to improve pasture quality on summer-, winter- or village pastures. Looking at the types of pastures it is noteworthy **that improvement measures on pastures have only been made by winter and summer pasture users**, whereas none of the common village pasture users has implemented any measure. As with regards to erosion 35% of the respondents claim to employ specific measures to reduce erosion, whereas 65% don't.

In order to understand the potential of collective action regarding pasture care and management, participants of the survey were asked whether they would like to change something regarding the pastures (winter; summer; or the ones surrounding their village) and Sagarejo municipality and if so, what they

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[17] One of the efficient ways of pastures management is rotational grazing which is considerably different from so-called regulated grazing practices which are permanent and more or less approbated and common in Georgia.

[18] *A regulated grazing system refers to a limited amount of grazing time and area. For Georgia, such practices mean dividing the pastures into several plots and using them alternately. Therefore, normally the pasture is divided into parts (as usual, alongside natural landmarks, i.e. rivers, ranges, valleys, forest borders). The shepherds let the livestock graze only on one part and then drive it to another part. The selection of plots is at the discretion of the shepherd. Regulated grazing system ensures a resting period between grazing and aims to preclude long and continuous grazing periods.*

would change. Only 4% (all of them winter pasture users) showed no interest in collective action for pasture improvement. **96% declared their (general) willingness to engage in pasture care and management activities in future**. Amongst the activities or changes proposed the **installation of an irrigation system (with 45%)** is the most frequently mentioned (especially by winter pasture users), followed by the use of **fertilizers** (26%) and **pasture clean-up activities** (15%) sowing different grasses and soil ploughing.

Amongst the measures (theoretically) considered to be useful, **in order to prevent the pastures from being harmed in future** or to improve pasture quality/ fodder availability by the respondent's **irrigation (36%)**, and measures **cleaning pastures from shrubs and bushes** (no one mentioned weed) were mentioned the most. Other proposed measures include "sowing different grasses", "plowing", "fallowing", "fencing" and "seasonal pasture rest".

The answers by the respondents point at two observations: 1. Many of the activities proposed relate to measures that require substantial financial input, but the joint work effort is relatively low; 2. Most of the proposals mentioned are agro-technical measures of pasture improvement which refer to experience knowledge from SU-times. Collective action in the sense of managing pastures, and livestock by influencing spatial patterns, or the frequency, duration and intensity of grazing are hardly addressed.

Local involvement in pasture care and management related activities and projects – collaboration, participation, motivation and responsibility
Although 97% or the respondents claimed that they were not engaged in voluntary action during the past years, the 3% who were voluntarily engaged, were either engaged in collective works on yards/windbreaks or collective pasture related action. But, **53% of the respondents declared their readiness and willingness to collaborate more with fellow villagers regarding the pastures they are using.**

In terms of involvement in **pasture care activities 73%** of the respondents would like to get more involved, of which **77%** of the respondents would like to get more involved in **planning processes regarding pasture lands** and 33% in management processes (note: multiple responses were possible).

Participation
In order to gain a better understanding of the degree of potential participation of local pastoralists in pasture management related activities the ladder of participation by Arnstein (1963) has been used as a point of reference (see Figure 4). On the question of how the respondents would you like to be **involved in future pasture related activities and projects** it turned out that 12% of the respondents would like to be supported in drafting and executing own ideas and projects (5), 28% would like to be actively involved in the entire process and could make decisions (4), **48% would like to have a voice in decision making and deciding together** (3) whereas only 12% would like to be asked for consultation, feedback or help (2) and none of the respondents would like to be not involved or only informed.
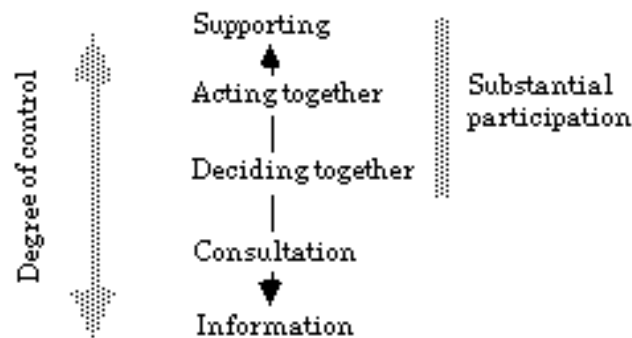
Figure 4: Participation model provided by David Wilcox in his 1994 participation framework, which was based on Sherry Arnstein's 'ladder of participation' from 1969.

77% of the interviewees in Sagarejo municipality **declared, that there is nothing that holds them back from participation in pasture related activities.** Among the factors that hold locals back or make it difficult to participate in pasture related activities, 20% named their workload, 3% health related issues, and 2% (each) age and personal time constraints; in addition, it was declared by some interviewees that work in vineyards is holding them back (note: multiple responses were possible).

Amongst the factors potentially motivating interviewees to regularly participate in pasture related activities **financial aspects** dominate – reaching from rather general quests of direct financial support, over subsidies, and grants to specific demands for government support in (co-) financing the improvement of the soil conditions of pastures, but also for the improvement of individual farm infrastructure (like renovation of staples, camps, and the provision of electricity) or the increase livestock quantities. Further motivational factors directed towards the government are the demand to **resolve irrigation problems** and the quest to the government to **care more about locals** (especially the ones who lives in mountain areas) and to **provide more pastures to locals instead of selling** (i.e. privatizing) them.

Measures, that according to interviewees would support them in pasture care are, again most prominent, **financial aspects** (a.o. for the purchase of pasture lands), but also the **provisioning of technical means and resources** for pasture care, as well as **legal support** (i.e. a pasture law) **facilitating pasture care and management activities in future.**

Regarding the concrete willingness to receive an incentive for taking care of transhumant routes near their farm/camp, **42%** of the respondents declared they were **willing to help manage transhumant routes near their farm/camp,** 37% said they would accept an incentive for construction/ put up public fencing, 2% showed willingness to cleaning or picking up litter, 20% declared they were willing to support transhumant roads with "other" measures, without further specification(note: multiple responses were possible).

Regarding the readiness to **accept a subsidy for respecting a maximum stocking density** per hectare, **57%** of the respondents from Sagarejo municipality declared they would accept subsidies. What has to be mentioned in addition is, that none of the village pasture users provided a clear response to the question.

5.2.4 LOCAL PERCEPTIONS ON LEGAL AND INSTITUTIONAL ARRANGEMENTS OF PASTURE USE AND MANAGEMENt

5.2.4.1 LAND TENURE, ACCESS RIGHTS AND INSTITUTIONAL AR-RANGEMENTS

Not a single formalized document or arrangement is securing *village pasture* users access to pastures in Sagarejo municipality, according to the respondents to this study.[19] According to representatives of Sagarejo municipality most pasture use/access right agreement regarding are oral and not precise.

By contrast, for summer- and winter pasture users' (i.e. mobile pastoralists) arrangements are various: out of the total number of winter pasture users (which are 60% of the total interviewees) 67% hold a written lease agreement with the administration, 3% hold a written sublease agreement with the original leaseholder. Only 2% have no valid lease agreement at all, however, refer to a lease agreement with ministry of Defense which they used to have. In total – similar to the results of the ELD study for Kakheti region – **72%** of the *winter pasture* users in Sagarejo municipality **lease** pastures on different terms, whereas **28%** hold a contract of purchase i.e. **own private pasture lands.**

As for *summer pastures* (which account to 8% of the total interviewees) **more than 50%** hold a written **lease agreement** with the administration, others hold a contract of purchase, i.e. own the summer pasture and again other livestock farmers access summer pastures used by local population without a contractual basis.

For 74% of the total number of pasture users in possession of a contracts/agreement i.e. summer, winter pasture but also individual/private village pasture users) the **municipality issued the original contract/agreement**. In one case the contract/agreement was issued by the Ministry of Defense but expired.

As with regards to pasture lease agreements/ contracts, according to representatives of the municipality long-term agreement were arranged with the Gamgeoba, but often, although the agreement is cancelled, shepherds are not informed. From 2009 on 60 lease contracts for 15 years were given out (i.e. term/duration contracts for another 5 years. This is also reflected in the results of the survey: the **duration of the leasing contract** of the interviewees ranges from 5-20 Years with an **average of 15 Years.** Often, the persons had a different lease contract before – on average (mean) they leased 25,5 Years ago for the first time. In terms of the security of their rights to the pasture the respondents are currently using, 23% estimate their arrangement as secure (according to the ELD study results 28%), 42% as medium and 35% as insecure.

According to the lease contract of the interviewees in Sagarejo municipality the total **area leased** by them ranges **from 5-500 ha** with an average (mean) of 208.5 ha. However, the **fertile land** contained therein is often far lower ranging from 2-350 ha, with an average (mean) of 120.5 ha and hence, **around 60% of the total area**.

Land registration

At the same time only **26%** of the pasture users (excluding village pasture users) in Sagarejo municipality are aware of a **cadastral book record** for the pastures they lease or own, showing the extent, value, and ownership of land, with land parcels precisely measured and registered in the Public Registry. Out

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[19] with the exception of one village pasture user who until 2018 had an agreement with the local municipality for the private use of 6 ha of village pastureland.

of these 17% have registered their land with the **National Agency of State Property**[20] and 2% with the **municipality,** others claim to have registered their land with a private person or bought their land from private persons.

According to the Regional Development Strategy of Kakheti 2014-2021 only 20-25% of landowners have registered their agricultural lands in the national agency of public register while others cannot afford registration fees. the survey of farmers showed that only 2-4% of landowners have registered land as their property where they grow various crops. there are often disputes over ownership between citizens or between citizens and the government (MFA 2013).

Out of the total number of pasture users possessing contracts for summer, or winter and individual/private village pasture in Sagarejo municipality 60% assess their current arrangement of use and access to the pasture as sufficient, whilst 31% of consider their arrangement insufficient, the other interviewees did not want to commit themselves to any assessment.

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[20] In Georgia, according to the law on Public Registry (2008) pastures belong to the category of agricultural land. The law determines the organisational and legal basis for maintaining the public registry and the rights and duties of the Legal Entity under Public Law (LEPL) of the National Agency of Public Registry (NAPR), which is a legal entity of public law subordinate to the Ministry of Justice. created in 2004 and responsible for maintaining the public registry.

5.2.4.2 NEEDS AND WISHES FOR THEIR PASTURE ARRANGEMENT(S) BY LOCAL PASTURE USERS

Which kind of needs and wishes for your pasture arrangement(s) do you have? I wish…		%	Other
…Pastureland would be leased out to…	actual, current users.	27	The local community; Only the ones who have cattle/or sheep; only locals who have cattle/or sheep
	locals, preferentially (according to their place of residence)	*55*	
	to the one with the highest bid	0	
…Pastureland could be subleased by….	anybody	13	Anybody who has or cattle/sheep; Persons who have livestock or a business plan
	nobody	*75*	Only locals
…Leasehold contracts would be issued by ….	*the local municipality*	*85*	
	the Agency of State Property (ASP)	0	
	the user-groups directly	13	
…Leasehold agreements would be issued for ….	*individuals*	*47*	The ones, who have pastures (owners and lessors); Only the ones who have cattle
	collective pasture user cooperatives)	*28*	
	collective pasture user communities)	*25*	
…Regulations for private owners/ or coopera-tives would be issued by…	*the local municipality*	*68*	The user-groups directly; MEPA
	a national state agency	7	
	individuals	3	
…The auction process would be…	offline/ face-to-face.	2	
	online/internet based.	2	
	NO auction at all.	*88*	
…All pastures would be privatized ….	Yes	32	Yes, but only locals; Yes/if locals will buy; No/some lands have to be on government balance
…The management of pastures would be done by…	*the local municipality*	*50*	The lessor/owner
	a national state agency	5	

	the user or user-groups directly	*40*	
…The implementation if regulations for pasture use (for private owners; cooperatives or other groups) would be done by….	*the local municipality*	*57*	The National Food Agency; the MEPA; the lessor/ owner; the local community
	a national state agency	12	
	the user or user-groups directly	2	
…Monitoring of compliance with regulations for pastures would be done by…	*the local municipality*	*73*	The MEPA; The community; Nobody
	a national state agency	12	
	the user or user-groups directly	2	
…The ownership of pasturelands would be with….	*the local municipality*	*75*	Locals; Villagers; Lessors; Community
	a national state agency	2	
	the user or user-groups directly	*22*	

The key messages of this inquiry are, that there is a clear mandate by respondents in Sagarejo municipality, that **legal procurements and pasture management related tasks should be localized**. Depending on the task or activity pasture related responsibilities should either be with the *local municipality* – e.g. the **issuance of leasehold contracts (85%) and regulations for private owners/ or cooperatives (68%)** , the management of pastures (50%), as well as the **implementation (57%) and monitoring of compliance with regulations (73%) –** *or the users or user-groups directly* – e.g. the issuance of leasehold contracts (13%), or the ownership of pastures (22%) and with 40% relatively unambiguous the **management of pastures**.

A very clear result is also that auction process for pastures, should NOT be taking place at all.

A number of respondents who opt for direct ownership of pasture (by local user or user groups) or the privatization of pastures insist on **restricting ownership to local individuals or communities**. They accentuate that in the case of privatization pre-emptive rights to pasture purchase should be given to locals, such as current lessors, or communities. However, the majority of the respondents in Sagarejo municipality wants pastures to be **preferentially leased out to** *local individuals or communities* (according to their place of residence), thereby some demand as a further condition that these must only be **people who own livestock.**

6. CONCLUSIONS AND RECOMMENDATION

This study has explored pasturelands in Sagarejo municipality in Georgia, a region that is affected by climate change and diverse claims to resources, and hence an increasing demand especially to the scarce winter pastures. This is well reflected in both – the ecological and socio-economic analyses

6.1 CONCLUSIONS DERIVED FROM PASTURE ASSESSMENT

6.1.1 APPLICABLITY OF THE REMOTE SENSING APPROACH

In general, the pasture assessment approach chosen for this study proved to be successful meeting the required needs, despite the fact, that the number of plots assessed was considerably lower than foreseen. Mikeladze & Megvinetukhutsesi (2019) write in their report on p. 12: "Based on our results, pasture assessments in the Sagarejo municipality using remote sensing approaches have shown good results since a good correlation was established between the image reflectance and ecological variables. The final product spatially well described the state of pastures and grasslands although we think that the model still needs to be further developed. The fact is that the field estimation methodology works well in the field, but it is not adapted for creating maps and spatial data. Therefore, in the future, first of all, it will be necessary to pay attention to determining the area of sampling. The steepness of the slope must be taken into account in order to avoid planimetric distortions in the calculations.
It should also be noted that the study area was divided into two parts since the methodology for describing pastures did not make it possible to simultaneously take into account both steppe and mountain vegetation. During spatial analysis and mapping, such fragmentation of the terrain caused a lot of technical problems. In the future, especially for larger areas, it would be useful to standardize the methodology for describing pastures and thereby adapt it for processing using remote sensing methods. In general, we consider the project successful as we were able to combine satellite technology with ground-based data on the assessment of arid and degraded pastures with acceptable accuracy for cartography. These results also demonstrate that the estimation of rangelands using Sentinel-2 imagery is applicable in the Caucasian and other regions."

Besides the other recommendations for improvement, Mikeladze & Megvinetukhutsesi (2019) stress, that a standardized methodology for different pasture ecosystems is advisable. However, within the frame of this study only two already developed, separate protocols could get applied and slightly adapted to local conditions, the approach described in Etzold & Neudert (2013) for highland pastures and its modification for lowland pastures (Etzold et al., 2015). Both approaches were the first time combined on one datasheet, giving the option to choose one of both approaches considering the location of the plot on a "lowland" or "highland" pasture (with an artificial border separating both).

Still we believe that some basic ecological factors differ significantly between both "ecosystems".

A further project could try the required harmonization to one protocol to overcome the fragmentation seen as disturbing. Nonetheless, different pasture ecosystems are used differently due to their different ecosystems' functioning and might therefore also require different manners of management.

Therefore, we recommend not to apply pasture management plans for large heterogeneous administrative units like a municipality encompassing a wide range of ecosystems due to the altitudinal range, but functional ecosystem units, like e.g. the "lowland area used for winter pastures" of Sagarejo.

6.1.2 IMPLICATIONS FOR PASTURE MANAGEMENT

What becomes obvious from the ecological assessment is, exemplarily visible at both maps (Figure 2 and Figure 3), that there are in general certain pasture degradation hotspot areas (reddish and orange colours) – particularly located in the western part of Sagarejo lowland i.e. winter pastures, where a significant reduction of the livestock density is of utmost importance to allow for regenerating the more or less degraded pastures. Goal of any pasture management should be to organize grazing in a manner, that "as much green as possible" appears on equivalent maps in the future, i.e. that the proportion of degraded (reddish and orange) pastureland is as small as possible (in certain situations this is unavoidable, e.g. on transhumance roads, other livestock routes with high frequentation, around camp or drinking sites etc., so called sacrifice zones).

Without further consideration of pasture types or tenure structures in Sagarejo municipality the ecological assessment has come (in Table 8) to the conclusion to reduce the current official stocking rates of 537,457 SU by **345,042 SU up to 393,145 SU** (depending on the recommended stocking rate, c.f. Table 7). This reduction need seems enormous. However, it remains unclear, as mentioned in chapter 4.2.3.1, which amount of livestock remains all year round on Sagarejo's pastures and which part only during the respective (summer- or winter) season. Also, the different definition of sheep units might play a role and requires a closer look at the reported figures. Furthermore, the official statistical livestock information might also be afflicted with certain inaccuracies.

The ELD-study (2018) for example points out the economic impact of de-stocking: "A careful analysis of various pastoral household types shows (…) that (de-stocking) is a costly strategy and that only the very large pastoralists (>2000 sheep units) would be able to continue to earn a positive net-income after de-stocking. In the absence of high land rental costs however, e.g. through collective management schemes, de-stocking, would be more feasible for the household, financially speaking. Thus, de-stocking is not a straightforward policy to implement. It is likely to be unsuccessful in the face of high land lease costs and insecure tenure" (ELD 2018: 62). In light of the different economic functions, but also tenure schemes of livestock keeping for pastoralists, with a) small-scale livestock farming for subsistence basis on common village pastures and b) transhumant pastoralism with large herds migrating between summer- and winter pastures, as well as in view of the hotspots of pasture degradation on or in immediate vicinity of lowland winter pastures used by migrating herds, it is recommended to address de-stocking issues with different strategies. Therein, a main focus should be on state-owned winter pastures leased to migrating large-scale livestock herders.

However, any tangible management recommendations can only be developed when both a proper spatial demarcation of pasture territories actually used by distinct users (i.e. full cadaster information indicating private owners, lessors from the state, communities) is available and the type of pasture use of these very user groups is known with livestock numbers kept on the respective pasture territory, the grazing duration etc.

Also, the small scale (pixel based) SPI polygons derived from remote sensing analyses (in Figure 3) bare any concrete importance for pasture management which ideally is conducted in larger units following natural borders and landmarks. Such units might traditionally exist or are partly fixed in lease contracts,

however often still not registered in respective digital cadastre systems. The latter, a concrete digital pasture border delimitation, however is an essential precondition for making use of management recommendations derived from remote sensing analyses like the presented SPI with its stocking recommendations.

With these still existing cadastre gaps the opportunity may arise to think in new ways including the reallocation of lease agreements. This could include to also focus on larger management units leased out to a user group/association that allows for flexible use and areas being left for resting for a certain time allowing pasture vegetation to recover.

Figure 5 below depicts a schematic proposal for management units leased out to a pasture user group/association. The scheme proposes pasture management units (4 coloured squares) individually used by pasture users (U1-U4) and an additional territory shared by the user-group (white) which can be flexibly used or left resting accordingly. The proposal entails a reallocation of lease agreements including a spare part (unloaded and not individually leased).
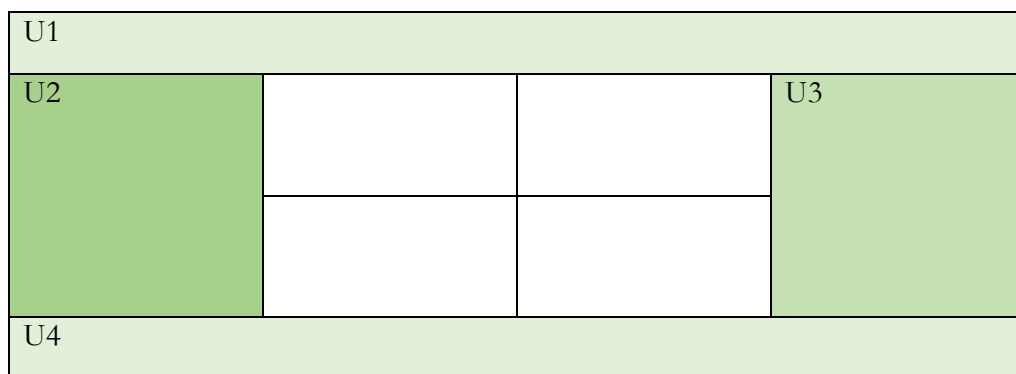
Figure 5: Schematic propsal for individual and shared manangement units leased out to a pasture user group/ association. U=User.

6.2 FEASIBILITY OF SUSTAINABLE PASTURE MANAGEMENT – LOCAL PERCEPTION, KNOWLEDGES AND TENURE RIGHTS

The implementation of sustainable pasture management practices is furthermore highly dependent on the willingness and knowledges of pasture users. On a closer examination of the often-frequented reasoning of a low level of awareness and knowledge amongst local pasture users challenging the implementation of sustainable pasture management practices a rather multifaceted picture appears:

The results from the study in Sagarejo municipality revealed that amongst local pasture user considerable knowledge and awareness about seasonal changes of pasture quality, and the changing availability of palatable biomass is given. Hence, local pasture users possess good observation and prediction capacities in terms of assessing the state and quality of pasture lands. Furthermore, there is a clear comprehension of the main sources of environmental problems, in particular local effects of climate change – predominately drought – which is in accordance with the report on climate change by UNDP (2014, e.g. p.24). Also, short term effects of overstocking on pastures (overgrazing) and general degradation problems on pasture are observed by local pasture users. Yet the awareness about livestock

induced long term degradation problems on pasture is rather low and hence, ought to be addressed by awareness raising campaigns or alike.

In addition, and most importantly, there seems to be a high level of readiness and willingness for collaboration and collective action in pasture planning and care amongst local pasture users in Sagarejo municipality. Hence, jointly planned pasture cleansing actions or alike have a high probability to be successfully implemented. Concurrently, the potential for more complex (collective) or innovative action for the sustainable management of pastures and livestock – e.g. by influencing spatial patterns, frequency, duration and intensity of grazing – without additional training measures, knowledge exchange, and/or illustration on pilot sites has to be estimated as fairly low. So far local pasture-users tend to focus on agro-technical measures of pasture improvement that require substantial financial input (which seems to be based on experience knowledge from SU-times). Furthermore, financial incentives and private interest are paramount to local pasture user's readiness or willingness to "invest" in sustainable pasture management practices (and the expectations of state or donor funding are high).

Pasture-users tend to hold local municipalities accountable for overall pasture management and show a rather low degree of readiness to participate in pasture management. Yet, local pasture users are prepared for substantial participation i.e. having a voice in decision making and deciding together.

At the same time sustainable pasture management is conditional on some form of land tenure. This study revealed high levels of insecurity by pasture users in terms of rights to the pasture. Therefore, and in line with the ELD-study (2018) results, a decline in the proportion of sub-leases, would represent an improvement. Since sub-leases are typically insecure, short-term often based on informal arrangements and go along with a low sense of ownership over the pasture, which directly reflects in efforts undertaken for pasture care (which in this case are kept at a minimum). Furthermore, from an economical perspective, pastoralists with "(…) insecure tenure, or no-tenure are most likely to perceive the direct impacts of de-stocking on their household economy and not the potential long-term benefits of reduced stocking densities" (ELD 2018: 62).

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8. APPENDIX A (ECOLOGICAL ASSESSMENT)

8.1 DATASHEET

Data Sheet: Site conditions, vegetation and state of village pastures

Investigator: *Date:*   *Plot No.:* _____

1 Site conditions (within radius = 30 m)

Find a slope that is ± homogeneous within a circle of 30 m radius. If you do not find such a large circle, then please note the shortest radius of a homogeneous circle around you: _____ m

1.1 Location

1.1.1 Description of region (valley, nearest mountain, nearest village): _____

1.1.2 Pasture category: ☐ Highland pasture   ☐ Lowland pasture

1.1.2 GPS-Point (Name): _____ N (latitude): _____ E (longitude): _____

1.1.3 Altitude [m above sea level, from GPS]: _____

1.1.4 Ownership: ☐ Governmental ☐ Private ☐ Village ☐ Other (specify: _____)

1.1.5 Current land use (as visible and/or mentioned by stakeholders):

☐ summer pasture   ☐ hay meadow

☐ winter pasture   ☐ arable land (specify crop: _____)

☐ village pasture   ☐ none (specify fallow land/abandoned pasture etc.: _____)

☐ other pasture (e.g. intermediate; specify: _____)

1.2 Slope

1.2.1 Slope Inclination/ Steepness [°]: _____ (exact figure)

1.2.2 Aspect [°]: _____ (exact figure)

     Aspect category: ☐ N (345-75°) ☐ E (75-165°) ☐ S (165-255°) ☐ W (255-345°)

1.2.3 Topographic position:

☐	Ridge top
☐	Upper slope
☐	Middle slope
☐	Lower slope
☐	Valley bottom
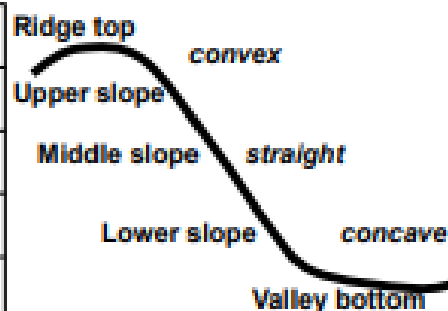
1.2.4 Slope configuration:

☐	Convex
☐	Convex/straight
☐	Straight
☐	Concave/straight
☐	Concave

1

1.3 Underground

1.3.1 Bedrock (visible around):   Type, if known_____

Rock strength: ☐ Solid, not breakable by hand neither when thrown on rock (e.g. granite)

☐ Medium solid, not breakable by hand but when thrown on rock

☐ Soft, breakable by hand (e.g. thin layered clayic slate)

1.3.2 Soil texture of top soil

Skeleton (particle size >2mm) [%]:

1.3.3 Soil texture following USDA "Guide to texture by feel" (see chapter 5.4 Fig. 1)

☐ Clay – Silty Clay   ☐ Sandy Clay   ☐ Sandy Clay Loam

☐ Clay Loam   ☐ Silty Clay Loam   ☐ Silt Loam

☐ Loam   ☐ Silt   ☐ Sandy Loam

☐ Loamy Sand   ☐ Sand   ☐ Coarse Sand

1.3.4 Picture of soil close-up: Picture No.:_____ (file name should later have the site's GPS name with addition "_soil")

2 Erosion/ Degradation

!!! When assessment on **highland pasture** proceed to **2.1**

!!! When assessment on **lowland pasture** proceed to **2.2**

2.1. Ground not covered by vegetation on highland pastures (2.1.1-2.1.3 cross-check with 3.1.2):

Estimated cover [%] on 10x10 m	non visible	1	2-5	6-10	11-25	26-50	> 50
2.1.1 Bare Soil							
2.1.2 Rubble/scree (small stones)							
2.1.3 Rocks (big, stable)							
2.1.4 Livestock tracks (Terracettes)							
2.1.5 Erosion tracks, combination of bare soil, rubble+visible erosion processes							

2.2. Ground not covered by vegetation on lowland pastures (2.2.1-2.2.2 cross-check with 3.1.2):

2.2.1 Bare soil: ☐ 0-5 %   ☐ 6-10 %   ☐ 11-20 %   ☐ 21-30

☐ 31-40 %   ☐ 41-50 %   ☐ 51-75 %   ☐ more than 75 %

2.2.2 Bare stones: ☐ non visible ☐ 1 %   ☐ 2-4 %   ☐ 5-7 %

☐ 8-10 %   ☐ 11-20 %   ☐ more than 20 %

2

2.2.3 Livestock tracks (Terracettes), estimated cover [%] on 10 x 10 m:

☐ non visible ☐ 1-5 % ☐ 6-10 % ☐ 11-20 %
☐ 21-30 % ☐ 31-40 % ☐ 41-50 % ☐ more than 50 %

2.2.4 Erosion tracks, estimated cover [%] on 10 x 10 m in combination of bare soil, little moveable bare stones **AND** visible erosion processes:

☐ non visible ☐ 1 % ☐ 2-4 % ☐ 5-7 %
☐ 8-10 % ☐ 11-25 % ☐ 26-50 % ☐ more than 50 %

2.2.5 Salt crusts, estimated cover [%] on 10 x 10 m:

☐ non visible ☐ 1 % ☐ 2 %
☐ 3-4 % ☐ 5-7 % ☐ 8-10 % ☐ more than 10 %

AND/ OR

2.2.6 Salt indication species (succulent salty leaves, pict. examples see chapter 5.4 Fig. 5-10), estimated cover [%] on 10 x 10 m:

☐ non visible ☐ 1 % ☐ 2-5 % ☐ 6-10 %
☐ 11-25 % ☐ 26-50 % ☐ more than 50 %

3. Vegetation

3.1   State of vegetation cover

3.1.1 Vegetation height, maximum [cm]:   (fill in exact estimate):
  Average height [cm]: ☐ 0-6 ☐ 7-9 ☐ 10-12
  ☐ 13-15 ☐ 16-18 ☐ 19-21 ☐ more than 21

3.1.2 Total vegetation cover, estimated [%] on 10 x 10 m:

☐ 0-20 % ☐ 21-40 % ☐ 41-60 % ☐ 61-70 %
☐ 71-80 % ☐ 81-90 % ☐ more than 90 %

3.1.3 Standing crop: ☐ a lot ☐ medium ☐ few

3.3.1 Browsing tracks, [%] of plants browsed:

☐ 1-5 % ☐ 6-20 % ☐ 21-50 %
☐ 51-80 % ☐ more than 80 %

3.3.2 Dung cover, estimated cover [%] of faeces on 10 x 10 m:

☐ non visible ☐ 1 % ☐ 2 % ☐ 3-4 %
☐ 5-7 % ☐ 8-10 % ☐ more than 10 %

3.1.5 Browsing tracks: ☐ 1-5 % of plants browsed ☐ 6-20 % of plants browsed
  ☐ 21-50 % of plants browsed ☐ 51-80 % of plants browsed
  ☐ more than 80 % of plants browsed

3

3.2   Vegetation composition

!!! When assessment on **lowland pasture** proceed to **3.2.1**

!!! When assessment on **highland pasture** proceed to **3.2.2**

3.2.1 Vegetation composition on lowland pasture

Dominant plant groups: estimated on 10 x 10 m (picture examples see chapter 5.4 Fig. 3-21):

Estimated cover [%] on 10x10 m	non visible	1	2-5	6-10	11-25	26-50	51-80	> 80
3.2.1.1 Total vegetation cover								
3.2.1.2 Taller "sweet grasses" (=perennial Poaceae)								
3.2.1.3 Bothriochloa ischaemum								
3.2.1.4 Stipa spp.								
3.2.1.5 Small "sweet grasses" (=annuals/ ephemerals)								
3.2.1.6 Fen-sedge/Cyperaceae (grass-like with often sharp edges)								
3.2.1.7 Herbs (non-gramineous, not woody plants)								
3.2.1.8 Achillea micrantha								
3.2.1.9 Glycyrrhiza glabra								
3.2.1.10 Small annual halophytes (succulent/ salty leaves)								
3.2.1.11 Legumes (soft herbs with trifoliate leaves (like Trifolium/clover) or pinnate leaves (like Vicia/vetch)								
3.2.1.12 Artemisia spp. (semi-shrubs up to 40 cm height, strong smell, grey-bluish colour)								
3.2.1.13 Salsola spp. (semi-shrubs up to 70 cm height, succulent salty leaves)								
3.2.1.14 Bush cover (shrubs, woody species < 5m height), name/s: _____ _____								

3.2.2 Vegetation composition on highland pasture

Dominant plant groups: estimated on 10 x 10 m (picture examples see chapter 5.4):

Estimated cover [%] on 10x10 m	non visible	1	2-5	6-10	11-25	26-50	51-80	> 80
3.2.2.1 Total vegetation cover								
3.2.2.2 "Sweet Grass"/Poaceae								
3.2.2.3 Fen-sedge/Cyperaceae (grass-like with often sharp edges)								
3.2.2.4 Herbs (non-gramineous, not woody plants)								
3.2.2.5 Centaurea sp. (slender, silver/hairy)								
3.2.2.6 Leucanthemum vulgare ("Ox eye-daisy")								
3.2.2.7 Legumes (soft herbs with trifoliate leaves (like Trifolium/clover) or pinnate leaves (like Vicia/vetch)								
3.2.2.8 Semi-shrubs (chamaephytes, small woody plants with buds borne close to ground)								
3.2.2.9 Bush cover (shrubs, woody species < 5m height), name/s: _____								
3.2.2.10 Broad-leaved bushes (e.g. Paliurus, Prunus, Crataegus, Cotinus > underline dominant species)								
3.2.2.11 Coniferous bushes (e.g. Juniperus)								
3.2.2.12 Tree cover (woody species >5m) name/s: _____								

3.3 Qualitative assessment of pasture vegetation

3.3.1 Grazing indicator species groups and their cover [%] on 10 x 10 m:

Estimated cover [%] on 10x10 m	non visible	1	2-5	6-10	11-25	26-50	> 50
3.3.1.1 Thistles							
3.3.1.2 Thorny herbs							
3.3.1.3 Juniper or other thorny bushes (e.g. Rosa, Berberis, Paliurus)							
3.3.1.4 Strongly hairy plants							
3.3.1.5 Poisonous and other unpalatable plants (e.g. strongly aromatic plants)							
3.3.1.6 ! Cover sum of all recorded grazing indicator species groups !							

!!! Following chapter 3.3.2 is not applicable for highland pastures !!!

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8.2 FIELDMAPS FOR ECOLOGICAL ASSESSMENT (EXAMPLES)
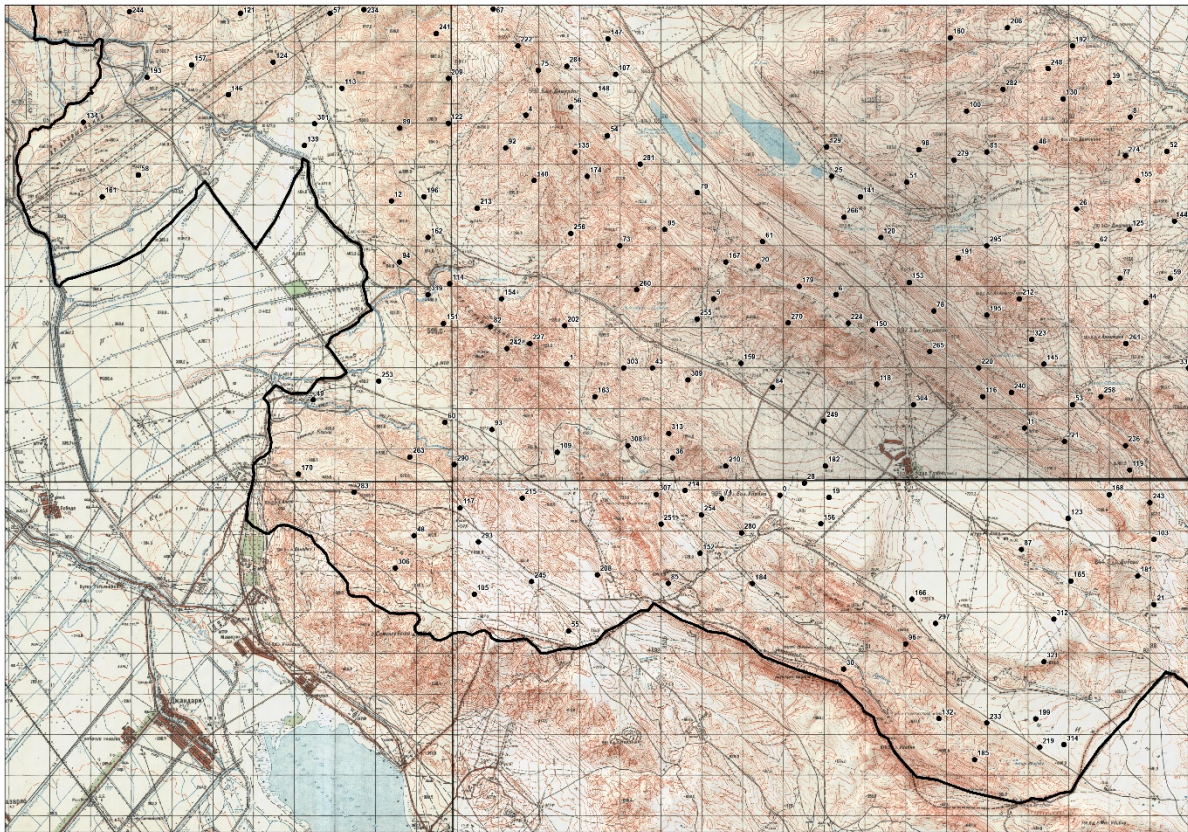
*Figure 6:* Tile Udabno 1:50,000 topographical map with random-sampling plots.

*Figure 7:* Tile Udabno high resolution satellite image with random-sampling plots.
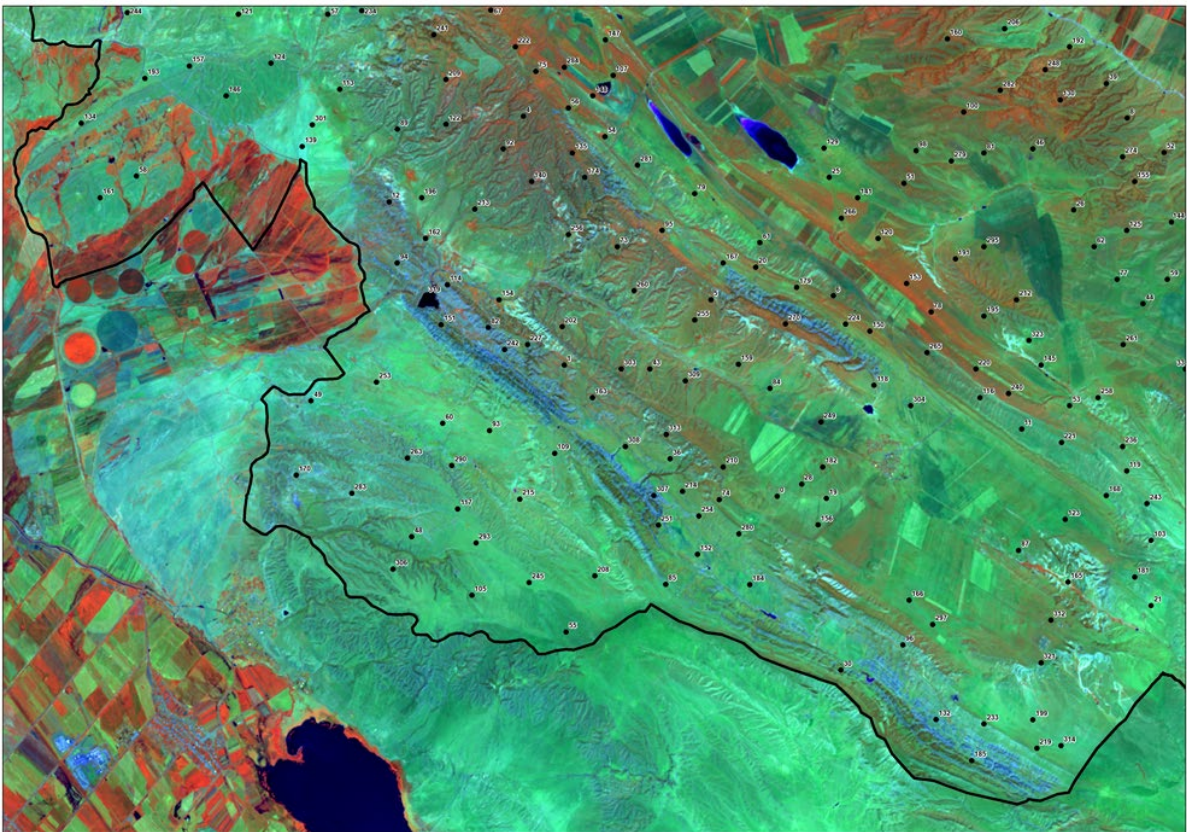
Figure 8: Tile Udabno Multi-spectral satellite Infrared map with random-sampling plots.

52
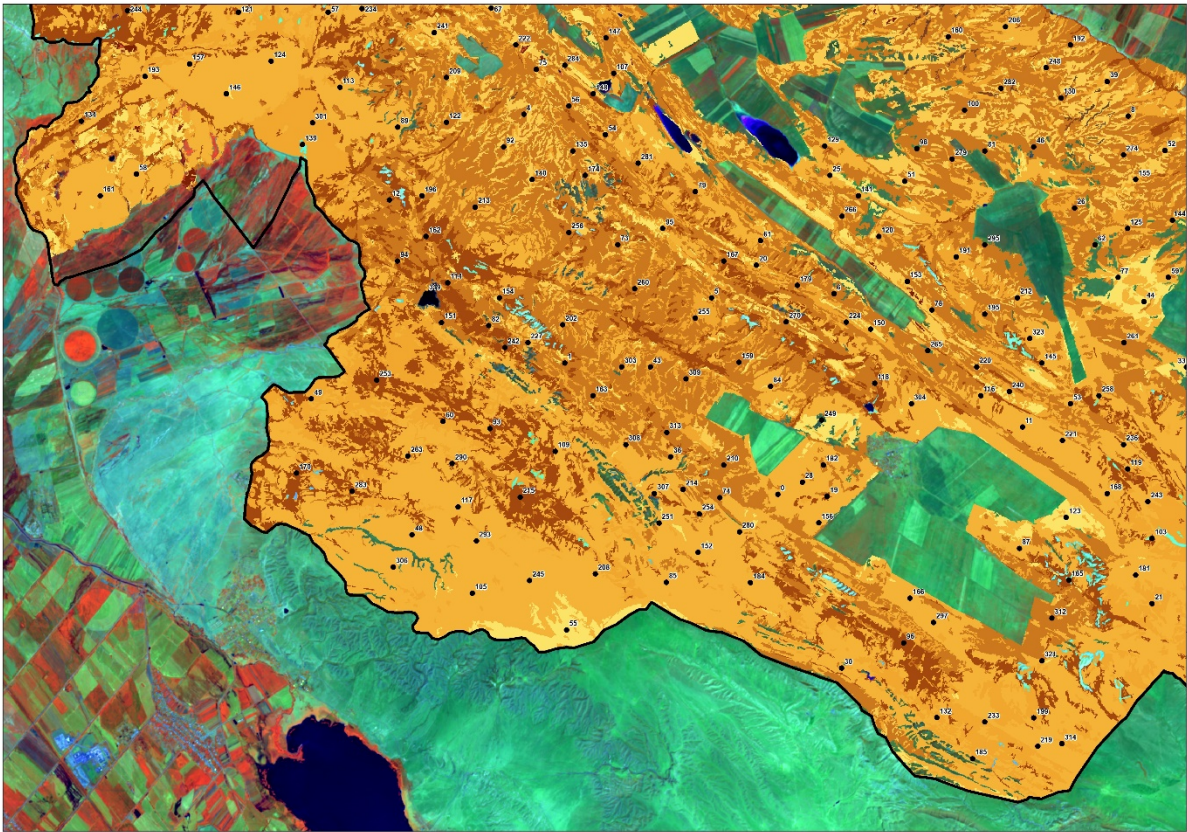
Figure 9: Tile Udabno Unsupervised Classification Map with random-sampling plots.
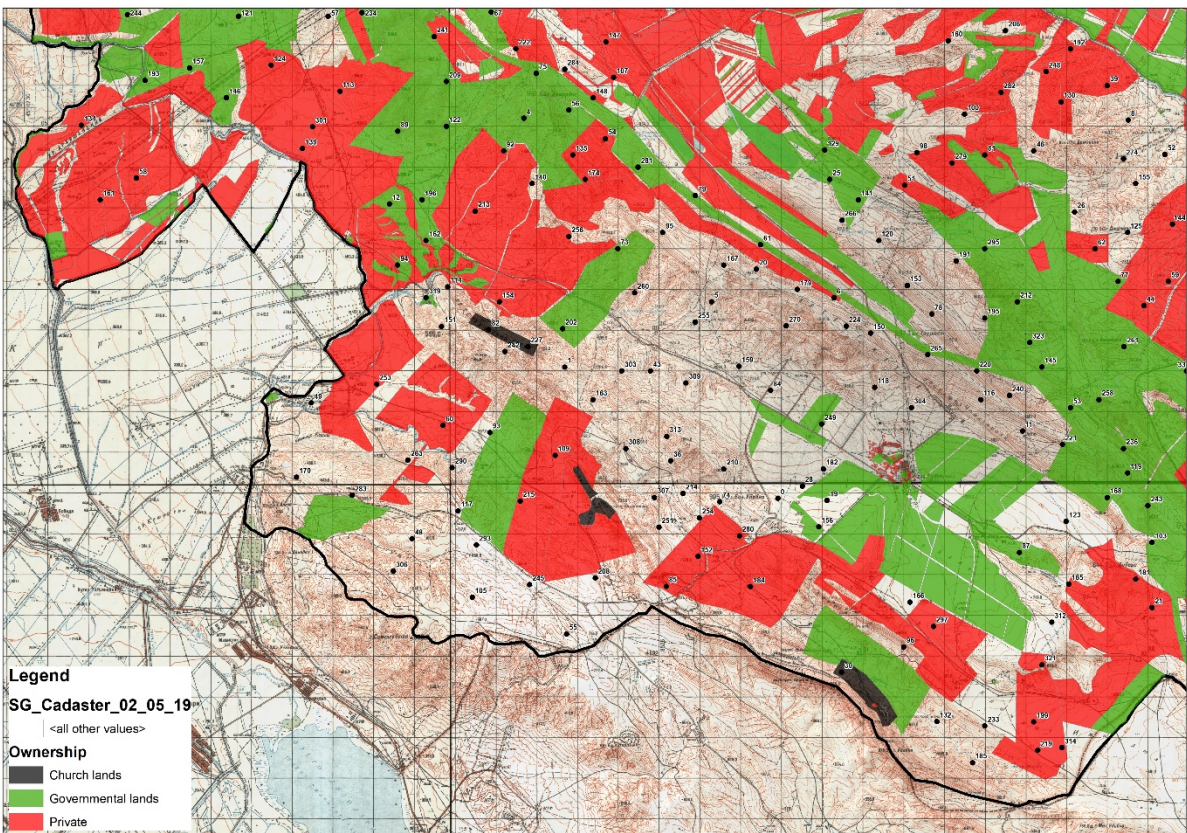
Figure 10: Tile Udabno Landownership maps with random-sampling plots.

8.3 ATTEMPT TO DIFFERENTIATE STOCKING RECOMMENDATIONS TO LANDOWNERSHIP CATEGORIES

Table 10: Differentiation of SPI derived calculations by the three landownership categories retrieved from official cadastre data and processed in remote sensing analyses.

Sagarejo municipality	Lowlands																		Lowlands sum total grass-lands	
	Lowlands church land						Lowlands governmental land						Lowlands private land							
SPI value	SPI 10	SPI 7.5	SPI 5	SPI 2.5	SPI 0	Sum	SPI 10	SPI 7.5	SPI 5	SPI 2.5	SPI 0	Sum	SPI 10	SPI 7.5	SPI 5	SPI 2.5	SPI 0	Sum	Land ownership of pas-tureland according to cadastre	Grass-lands/recommendations according to RS analyses
SPI value grassland areas (ha) upscaled by Remote sensing-analyses	9.4	72.1	68.3	2.2	41	**193**	1,015	6,257	6,131	356	7,848	21,607	1,618	9,693	8,166	587	23,578	43,642	65,442	55,004
Recommended stocking rate (Sheep Units (SU)/ha) according to Azerbaijani law (Cabinet of Ministers, 2000)	4	3	2	1	0		4	3	2	1	0		4	3	2	1	0			
Recommended SU calculated from recommended Azerbaijani stocking rates (Cabinet of Ministers, 2000) and respective grassland territory	38	216	137	2	0	**393**	4,061	18,772	12,261	356	0	**35,450**	6,474	29,079	16,331	587	0	**52,471**	88,314	146,401
Recommended stocking rate (Sheep Units (SU)/ha) derived accordingly from Soviet time recommendations for **Georgia** (Kruashvili, 1984)	3	2.25	1.5	0.75	0		3	2.25	1.5	0.75	0		3	2.25	1.5	0.75	0			
Recommended SU derived accordingly from Soviet time recommendations for Georgia (Kruashvili, 1984) and respective territory	28	162	102	2	0	**295**	3,046	14,079	9,196	267	0	**26,588**	4855	21809	12248	440	0	**39,353**	66,235	109,801

Sagarejo municipality	Highlands																
	Highlands church land					Highlands governmental land					Highlands private land					Highlands total grass-lands	
SPI value	SPI 10	SPI 7.5	SPI 5	SPI 2.5 + 0 *	Sum	SPI 10	SPI 7.5	SPI 5	SPI 2.5 + 0 *	Sum	SPI 10	SPI 7.5	SPI 5	SPI 2.5 + 0 *	Sum	Land ownership of pas-tureland according to cadastre	Grass-lands/recommendations according to RS analyses
SPI value grassland areas (ha) upscaled by Remote sensing-analyses	0.55	0.5	0	2.05	**3.1**	195.2	221.4	433.3	232.8	**1,083**	280.4	249.8	319.7	2237.4	**3087.3**	**4,173**	**8175.3**
Recommended stocking rate (Sheep Units (SU)/ha) according to Azerbaijani law (Cabinet of Ministers, 2000)	8	6	4	1		8	6	4	1		8	6	4	1			
Recommended SU calculated from rec-ommended **Azerbaija-ni** stocking rates (Cabinet of Ministers, 2000) and respective grassland territory	4	3	0	2	**9.5**	1,562	1,328	1,733	232.8	**4,856**	2243	1499	1279	2	**5022.9**	**9,888**	**46,014**
Recommended stocking rate (Sheep Units (SU)/ha) derived accordingly from Soviet time recom-mendations for **Geor-gia** (Kruashvili, 1984)	6	4.5	3	0.75		6	4.5	3	0.75		6	4.5	3	0.75			
Recommended SU derived accordingly from Soviet time recommendations for **Georgia** (Kruashvili, 1984) and respective grassland territory	3	2	0	1.5	**7.1**	1,171	996	1,300	174.6	**3,642**	1682	1124	959	1678.1	**5443.7**	**9,093**	**34,511**
* average of recommended values taken																	

9. APPENDIX B (SOCIO-ECONOMIC ASSESSMENT)

9.1 DATASHEETS: QUESTIONNAIRE FOR SOCIO-ECONOMIC SURVEY AND FOCUS GROUPS DISCUSSION METHODOLOGY

9.1.1 FOCUS GROUP DISCUSSION: ASSESSING KNOWLEDGE, USE AND MANAGEMENT OF PASTURES IN SAGAREJO DISTRICT

1. **Introduction round:**

1.1 *Introduction of yourself and the project (potential introductory text see below)*

Sagarejo Municipality has been chosen as pilot area to assess the condition of the entire pasture land in Sagarejo area and understanding preconditions for keeping pastures in good conditions in future (sustainable pasture management). Therein, your knowledge, insights and experience with the pastures you´re using is extremely important and valuable to us! Therefore, we would like to discuss and learn from you what experiences you have with your pastures and your livestock (i.e. fodder availability), how you organize pasture use, and what needs you have and possibilities you see in terms of organizing pasture use and management in future**.** In the end of the discussion we will provide you with a short questionnaire and jointly fill it.

The information you provide will be used to advise government policy. You are free to take part in the study if you wish to, and are able to withdraw at any time - there is no adverse effect from doing so. The information you give us will remain confidential, and your personal data will be unknown to anyone other than the research team.

1.2 So, first of all please introduce yourselves with your **name and involvement in pastoral activities** (i.e. sedentary farmer using village pastures; livestock owner owning mobile flock; (mobile/ sedentary) shepherd, etc.)

➔ *Make a note on number of participants and*

➔ *Additionally, in case the joint use of one pasture is not a selection criterium for the formation of the respective focus group, please ask whether participants are all using the same pasture OR are having/herding livestock together on one pasture.*

    o *If YES: you can proceed to the mapping task*

    o *If NO: ask how many different pastures they are involved with and whether they are in immediate vicinity to each other. -> in this case you have to decide whether it makes sense to map or draw more than one "model" pasture on different flipchart sheet/maps and compare them with each other during the discussion.*

2. **MAPPING - Pasture features and condition and spatial organization of pasture use**
Note: Space for drawing a mental map is provided on the last page of the data sheet. Alternatively, you can use a flipchart sheet (especially for bigger focus groups).
If your interview partner(s) can show you the map belonging to his lease contract, or a a map of the region (provided by RECC) you can use it as the basis for filling in details of the mental map.

2.1 Can you draw a simple map of your pasture (at the center of the paper)? OR: can you outline it on the map?
    ➔ If not, no problem. Let's use this "model pasture drawn on the flipchart for discussing your knowledge and experience with your pasture! (At a later stage you can probably show us the location of your pasture?)

➔ Please imagine this is your pasture ….

➔ *Show drawing of "model" pasture area on flipchart (c.f. below)*

2.2 Do you have…

   a) Access to a river/stream or pond/well or lake there? (ELD 52): Yes No.

   b) Have you noticed the water level changed over time? (ELD 53): Yes – Increase. Yes – Decrease, No – Has not increased or decreased over time, No - Only seasonal changes/or haven't been here long.

   c) A camp there?

   d) An access road? (dirt road, asphalted)

   e) A staple there? If not, how far is the pasture from the staple(s)?

   f) Some inaccessible areas? Like rocky areas, canyon, ridges?

   g) What is the approximate area this (entire) pasture is covering (in ha)?

➔ *Visualize/make sketches of every item mentioned by participants on the "model" pasture on flip chart. I.e. please show the location of streams/valleys and ridges. Show the location of the camp and access roads.*

2.3 Are there differences in pasture quality on your pasture? Are there….

   a) … areas in which your animals find much fodder? OR are there areas in which the quality of the pasture is particularly good?
➔ *Ask for estimated share of good area from the total area (e.g. in percentage or ha) and outline it on the "model" pasture*
   b) …areas where the fodder is scarce? OR: Are there areas in which the pasture quality is particularly bad?
➔ *Ask for estimated share of fodder scarce areas from the total area (e.g. in percentage or ha) and outline it on the "model" pasture*
   c) … seasonal differences in fodder availability on different "patches"/parts of your pasture? If, so please indicate for which months/season
   d) … places that are particularly liked by livestock? If, so why?
   e) … places, where the livestock does not go/goes only infrequently? If so, why?

2.4 Do you use a spatial and/or temporal pattern of herding?
➔ *Ask participants whether they are willing to explain it by using your map/model pasture, alternatively you can write down answers.*

2.5 How do you appraise the condition of this/your pasture/What is your perception of the pasture quality on the land you use? (ELD 65)
➔ *Note number of participants with respective answer, or tick answer-box if mutual decision amongst participants could be reached.*

Highly productive	Moderately productive	Little productive	Not productive	Don't know

➔ *Note number of participants with respective answer, or tick answer-box if mutual decision amongst participants could be reached.*

☐ If the pasture condition/productivity is productive or moderately productive, could you please explain why? – Chose up to 2 options (ELD 66)

Crop and pasture rotations
Wind breaks Fallowing Mulching
Fertiliser 'Nature' Grazing control Water availability
Other (please specify

67. If little productive or not productive, what do you think caused it? Choose up to 2 options.

Lack of wind breaks
Burning
No fallowing
The weather
'Nature'
Lack of grazing control
Lack of water/irrigation
Other (please specify)

2.6 Did the condition of this pasture change during the last 10 years?

Better	Same	Worse	Don't know
➔ *Note number of participants with respective answer, or tick answer-box if mutual decision amongst participants was reached.*			

2.7 Do you witness influences of climate change? If so, what is changing?
……
………………………………………………………………………………………………

2.8 Is the pasture area enough for the livestock kept here?

More than enough	Just enough	Not enough	Don't know
➔ *Note number of participants with respective answer, or tick answer-box if mutual decision amongst participants was be reached.*			

2.9 Do you use additional fodder for winter?

hay	cereal	concentrated feed	other:……………..,………..………	none

yes	no

2.10 Do you employ specific measures to improve the condition of this pasture or reduce erosion (ELD 68)?

ELD 69: What measures have you used to improve pasture quality or reduce erosion on winter or village pastures? Tick all that apply

Rotation of use
Fencing
Pile walls
Tree planting
Sowing different grass De-stocking
Fertiliser
Mulching
Other
No improvements made

2.11 Which measures would be useful, to prevent the pastures from being harmed in future or to improve pasture quality/ fodder availability? ………………………………..

yes   no

2.12 In general: Are there degradation problems on pastures in this region?

Not at all   Few problems   Severe problems   Don't know

ELD 70: What do you think is the main source for environmental problem is in the area of winter or village pastures?

Overgrazing
Roaming livestock
Pollution
No trees
Drought
Other, specify…………

3   Livestock

3.1 How much livestock is kept on the pasture? (35)

Please, fill in total number of….	
Sheep - ewes	
Sheep - lamb	
Goats	
Cattle (older than 6 months):	
Horses	
Pigs	

3.2 How did the number of livestock develop in the last years?

Became more	Stayed the same	Became less	Insecure

3.3 When you keep too much livestock on a pasture...

        a.) ...what happens to the livestock?...
        b.)...what happens to the pasture?..

4   Collective Action and Change

4.1 Would you like to change something regarding the pastures (winter; summer; or the ones surrounding your village)? If so, what would you change? …………………………………………………………………………………................
………………………………………………………………………………………………………

4.2 Would you be willing to engage in pasture care and management activities in future?

4.3 What would motivate you to regularly participate in pasture related activities?…………………………………………………………………………………………

…………………………………………………………………………

4.4 Is there something that would support you in doing so? …………………..

5. Access to pasture(s)
-> if this is too complicated to discuss in a big group, let's make it part of the questionnaire!

5.1 Which form of agreement secures the access of your livestock to the pasture(s)?

	Village pasture	Winter pasture	Summer pasture	Intermediary pasture
1. Written lease agreement with administration				
2. Oral lease agreement with administration				
3. Written sublease contract with original leaseholder				
4. Oral sublease agreement with original leaseholder				
5. Oral agreement with ……………………..				
6. No regulation				
7. Contract of purchase (private pasture)				
8. Other. *Please specify!*	…………………… ……………………	……………. ……………..	……………. ……………	……………… ………………

5.2 Which kind of needs and wishes for your pasture arrangement(s) do you have?

I wish …			OR:	OR:	OR: Other
	a)	Pastureland would be leased out to…	actual, current users.	locals, preferentially (according to their place of residence)	to the one with the highest bid	………………
	b)	Pastureland could be subleased by….	anybody	nobody		…………………..
	c)	Leasehold contracts would be issued by ….	the local municipality	the Agency of State Property (ASP)	the user-groups directly	…………………..
	d)	Leasehold agreements would be issued for ….	individuals	collective pasture user cooperatives)	collective pasture user communities) (ELD 78)	
		Regulations for private owners/ or cooperatives would be issued by…	the local municipality	a national state agency	the user or user-groups directly	…… …………….
		The auction process would be…	offline/ face-to-face.	online/internet based.	NO auction at all.	………………
		All pastures would be privatized				

	(ELD 77)				
	I have no wishes. (f)				

5.3 Who should be responsible for…?

a)	The management of pastures	the local mu-nicipality	a national state agency	the users-groups directly	Other: ………………..
b)	The implementa-tion if regulations for pasture use (for private owners; cooperatives or other groups)	the local mu-nicipality	a national state agency	the user or user-groups directly	Other: ………………….
c)	Monitoring of compliance with regulations for pastures	the local mu-nicipality	a national state agency	the user or user-groups directly	Other: ………………….
d)	Ownership of pas-turelands	the local mu-nicipality	the national state	the users-or user-groups directly	Other: ………………….

➔ *Please make sure that all aspects of the discussion are recorded on the map/flipchart*

9.1.2 FOCUS GROUP DISCUSSION: ASSESSING KNOWLEDGE, USE AND MANAGEMENT OF PASTURES IN SAGAREJO DISTRICT

Interviewer: _____

Name of village or pasture: _____   **Code (sheet Nr.):** _____

Date: _____/_____/2019

GPS-Point (Name):   N (Latitude):   E (Longitude):

Altitude [m above sea level, from GPS]:

5   General information

1.1 Name, Surname:
……………………………………………………………………………..
1.2 Age: ……………………………………………… Female Male
1.3 Street or neighbourhood name: ……………………………………………………………..
1.4 Phone number /E-mail-Address ……………………………………………………………..

5   Household members

5.2 How many people live in your household?

➔ *Please indicate the number of household members living in your house for more than 3 months per year and are helping in your household:*

5.3 Relationship of respondent to household head?
➔ *You can insert one of the numbers from below, if appropriate:*

1 Head of family	5 Son	9 Brother/Sister
2 Husband	6 Daughter/son in law	10_Other paternal relatives
3 Wife	7 Grandparent	11_Other maternal relatives
4 Daughter	8 Grandchild	

5   Profession and occupation

5.2 Profession: ....

a)   Mainly in livestock farming
b)   Mainly other work

5.3 Current occupation:

ELD: 11 What proportion of household income is generated by farming activities?

| More than half |
| Half or less |

5.4 What level of importance do you particularly attribute to animal husbandry as a source of income for your household?

| 1. Most important source of income |
| 2nd most important source of income |
| 3rd most important source of income |
| marginal importance |

6   Use of pastures

| Yes | No Please continue with Nr. 4.3 |

      6.2 Do you have livestock grazing in the pastures of your village?

| |

      6.3 How many animals do you have there?

ELD 28. During which months is grazing the main activity on the pastures you use near your farm or household? Tick all that apply.

| All year round |
| January |
| February |
| March |
| April |
| May |
| June |
| July |
| August |
| September |
| October |
| November |
| December |

| Yes, on winter-pastures. Yes, on summer pastures. Yes, elsewhere. (Please indicate where):……………………….... | No Please continue with Nr. 4.5 |

4.3 Do you have livestock grazing elsewhere?
    ➔ C.f. mobility question ELD 2)

4.4 How many animals do you have there?

| |

ELD 29. During which months do you graze in summer pastures? Tick all that apply.

All year round
January
February
March
April
May
June
July
August
September
October
November
December

yes   no

ELD 34. Are there other areas that you use for grazing in spring or autumn, other than the ones you've told us about?

yes   no

4.5 Are you planning to have livestock in future?

5   Farm organization

Yes	No
5.2 If so, since how many years?	Please continue with Nr. 5.5
years.	
5.3 How many other people are involved?	

5.1 Do you herd your livestock together with others?

yes   no

yes   no

5.4 Are you planning to cooperate with other in joint herding?

5.5 What are your responsibilities on the pasture(s) you keep your livestock? ; Who else is involved and what are their responsibilities?
- ➔ *Please, fill in the names in the table and mark the different task per person*
- ➔ *Note: We assure you and the persons named by you full anonymity. However, we need the names to be able to check whether we ourselves have spoken or will speak to persons you name. This is to avoid duplications in the data analysis.*

No.	1	2	3	4	5	6	7	8	9
Name	*myself*								
a. Herding tasks									
b. Pasture care									
c. Management tasks									

d.	Livestock ownership								
5.6	Who decides about the following issues? ➔ *In case other persons are responsible, please add them to the table*								
e.	Daily organization of herding								
f.	Veterinary care for livestock								
g.	Number of livestock on the pasture (stocking rate)								
h.	Time and organization of seasonal migration								
For summer / winter pastures:									
i.	Is the persons staying at a camp on the pasture at least one month each year?	yes	yes	yes	yes				

5.7 Who are the three most important livestock owners on this pasture?
  ➔ *Please, mark the most important livestock owner with "1", the second most important with "2" and the third most important with "3".*
  ➔ *In case the persons were not mentioned yet, fill in additional names and other information in the table as described above*

5.8 Who holds the contract/agreement?

Name: ……………………………

  ➔ *If applicable use the No. from table 5.5 Else:* Relationship to persons involved in the farm: ……………………………….

5.9 Which administrational issued the original contract/agreement?

a) Municipality	**b)** National Agency of State Property	**c)** Agency of Protected Areas	**d)** Other: ………………………....

  ➔ *Leaseholders please proceed with question number 5.10*

  ➔ *Landowners, please proceed with question 5.13*

a) ………years.	**b)** only for this year.	➔ When did you first lease? ....

5.10 LEASEHOLDERS ONLY: For how many years is the contract/agreement valid?

Total (ha):	
Fertile land (ha):	

5.11 According to the lease contract how many hectares do you use?

5.12 How do you estimate the security of your rights to this pasture?

Secure	Medium	Low	Don't know

ELD 25: LANDOWNERS ONLY: Is there a cadastral book record for the pastures you own or rent, showing the extent, value, and ownership of land?

yes	no	Don't know

5.13　What is your land registration status?

a)	Land parcels were precisely measured and registered in the Public Registry
b)	Land parcels were registered in the Public Registry, but need correction
c)	Land parcels have not been registered in the Public Registry, but I/we have documents certifying the ownership rights

ELD 26. Which governmental body is it registered with?

e) Municipality	f) Ministry of Economics	g) National Agency of State Property	h) Other: ………………………...

Yes If so, for how many years is the sublease?..............	No

5.14　Landowners ONLY: Do you sublease your land?

ELD 27. If you don't own or rent land, how many hectares of land does your household use for pastures or grazing? ………………………..

5.15For ALL: How do you assess your current arrangement of use and access to the pasture?

Optimal	Sufficient	Fair	Insufficient	Don't know

5　Collective Action and Change

Yes If so, what was it about? ……………………………………… …………………………………	No

5.2　Were you engaged in joint (voluntary) work during the past years?

Yes	No

5.3　Were you engaged in collective pasture related action during the past years?

5.4　How much influence do you think people like yourself can have in making your community/ village a better place to live?

A lot	A little bit	None

Yes	No

5.5　Would you like to collaborate more with your fellow villagers regarding the pastures you are using?

5.6　Would you like to get more involved in:

		Yes	No
a)	….planning processes regarding pasturelands		

b) ….management processes regarding pasturelands	Yes	No
c) ….pasture care activities	Yes	No

5.7 How would you like to be involved in future pasture related activities and projects?

I would like to be…
□ not involved
□ informed (1)
□ asked for consultation, feedback or help (2)
□ having a voice in decision making (we were deciding together) (3)
□ actively in the entire process and could make decisions (4)
□ supported in drafting and executing own ideas and projects (5)
□ other, please specify_____

5.8 Is there something that holds you back from participation or makes it difficult to participate in pasture related activities?

□ Personal time constraints,   □ My workload,   □ The timing of the meetings/activities,   □ The accessibility of meeting place/the location where the activity takes place,   □ My interests are not met (i.e. meeting or activity does not meet my interests),   □ My health condition,   □ My age,   □ My gender,   □ I fear my voice won´t be heard   □ Other, please specify ………………………………………………………………………………   □ Nothing.

6   ELD 71. Would you be willing to carry out activities to improve (winter or village) pastures if they were economically viable?

ELD 74. Would you be willing to receive an incentive for taking care of transhumant routes near your farm?

Yes - help manage
Yes - construction/ put up public fencing
Yes - cleaning or pick up litter
Yes - other (please specify)
No
Don't know

yes   no

ELD 75. What would be the minimum required compensation for taking care of the transhumant route?

yes   no

ELD 72. Would you accept a subsidy for respecting a maximum stocking density per hectare?

9.2 STAKEHOLDER ANALYSIS SAGAREJO MUNICIPALITY

	Immediate pasture users (primary stakeholders)						
Stakeholder	**Organizational form and degree**	**Pasture resources**	**Access to resource/ legal background**	**Target/claim/ strategy**	**Impact on resource and its use**	**Contact**	
	Local and permanent						
Farming cooper-atives	Cooperative form of dairy farming/ meat production/ wool production	May use common village pastures OR private pasture lands Additionally, in autumn and winter hay meadows (private) and agricultural land	"Private" use of common village pasture OR Lease of community or state pasture land	Pasture use to increase milk/ meat/ wool yield	On village pasture: grazing system (GS) most likely in consultation with other land users Depending on size of herd		-
Individual farm owners	Individual (often family-based) form of dairy farming /meat production	May use common village pastures, or private pasture lands (additionally, in autumn and winter hay meadows (private) and agricultural land	Private use of common village pasture Lease of community or state pasture land	Pasture use to increase milk/ meat/ wool yield	Individually decided GS most likely in consultation with other land users	?	
Individual Smallholders	Community-based animal husbandry → organized common herding (frequency	Common village pastures Additionally: potato fields (rented) hay meadows (private) in autumn and winter	Collective use of common village pasture	High (milk) yield through optimal utilization of energy-rich pastures			
	Community-based animal husbandry → jointly hired herdsmen (payment by number of cattle);	Common village pastures Additionally: potato fields (rented) hay meadows (private) in autumn and winter	Delegated use of village´s common pasture	High (milk) yield through optimal utilization of energy-rich pastures → responsibility assigned to herdsmen			

	Community-based animal husbandry → free roaming cattle	Common village pastures Additionally: potato fields (rented) hay meadows (private), forests, etc.		High (milk) yield through optimal utilization of energy-rich pastures → responsibility assigned to herdsmen			
	Temporary/seasonal						
Semi stationary livestock keeping - Alp	Outsourced dairy farming / meat / wool production	Depending on geographic location and type of organization Common village pastures OR State lands (mostly summer pastures) OR private lands	Delegated use of village´s common pastures OR Lease of pasture areas	Increase of milk yield through short distances for suckler cows	BS is independently decided by herdsmen → but under pressure of the clients to keep milk yield up		
Trans-humant	Hired shepherds (family based; partly own sheep)	Summer and winter pastures with different ownership status State lands OR private lands	Delegated use of pastures with diff. access regimes	Mainly sheep production → focused on 1. meat (2. cheese, 3. wool)	BS is decided independently shepherds or by flock owner BS is decided independently shepherds or by flock owner		
	Hired shepherds (unaccompanied persons, Georgian)	Summer and winter pastures with different ownership status State lands OR private lands	Delegated use of pastures with diff. access regimes	Income generation → 2 types of motivation: a) unemployment, b)traditionally rooted practice	BS is decided independently shepherds or by flock owner		
	Flock owner	Summer and winter pastures with different ownership status State lands OR private lands	Private use of pastures with diff. ownership	Sheep production → focused on 1. Meat (2. cheese, 3. Wool)	BS is decided independently shepherds or by flock owner		

	External stakeholders:					
	Regional					
Municipal Council ("*Sakrebulo*")	Municipal legislative body (with elected representatives)	-	-	-		
Agricultural Information-Consultative Center ("Extension Service") (central government body at municipal level)						
Agricultural research center (central government body)						