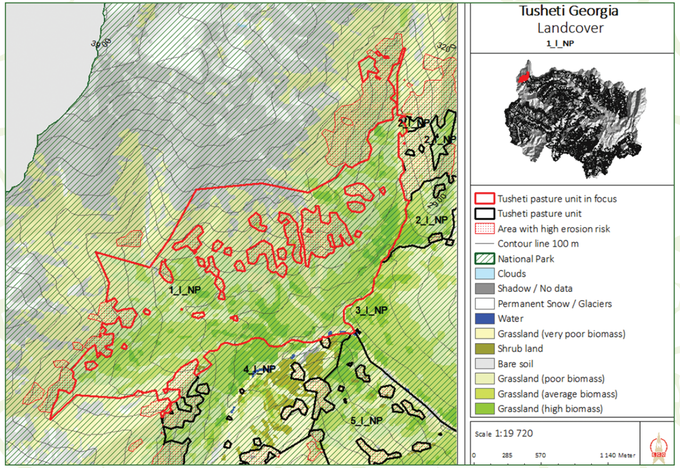
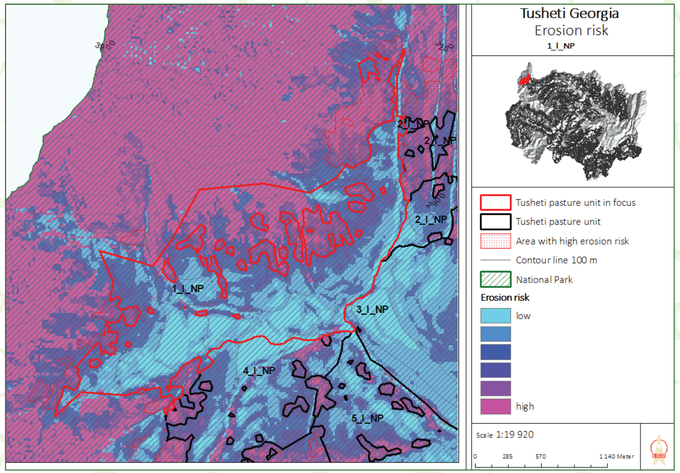
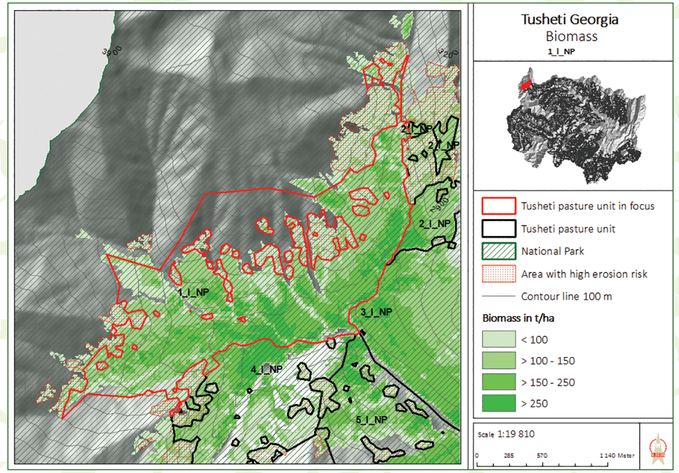


Map 2: Land cover types in a selected pasture unite



Map 3: Soil Erosion Risk Model



Map 4: Biomass of the grassland, available biomass and carrying capacities of pastureland and corresponding table

Available biomass:

Elevation:		ha:	biomass total:	available for cows:	available for sheep:
	2500	6,0	9 t	6 t	9 t
	2600	31,6	75 t	56 t	74 t
	2700	45,5	89 t	50 t	85 t
	2800	64,1	85 t	54 t	83 t
	2900	60,2	65 t	40 t	64 t
	3000	46,1	32 t	15 t	31 t
	3100	31,1	14 t	7 t	14 t
	3200	14,5	0 t	0 t	0 t
total		**299**	**368,8 t**	**227,6 t**	**360 t**
		maximum number:		of cattle	of sheep:
				158	**1.501**
tons of biomass needed for 120 days grazing:				1 cattle (adult)	1 sheep:
				1,44	0,24

Benefits and possibilities

All this information was used in a participatory way together with all relevant stakeholders, including shepherds, herd owners, representatives of the four Tushetian gorges, Tusheti PAs administrations (protected landscape and national park/nature reserve), Akhmeta municipality, local NGOs, and other projects, to develop a detailed sustainable pasture management plan for Tusheti PAs (in progress). The pasture passports themselves contribute to the development of a strategic pasture management concept in Tusheti PAs and can also be used to draw up new lease contracts with shepherds.

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Integrated Biodiversity Management, South Caucasus (IBiS)

BioTopic

Pasture Passports as a Tool for Pasture Management

Tusheti, Georgia

Authors: Hanns Kirchmeir, Anneliese Fuchs, Natia Kobakhidze, Christian Goenner & Albina Muzafarova

Figure 1: Shepherd and his sheep in Tusheti

The Programme “Integrated Biodiversity Management, South Caucasus (IBiS)” was financed by the German Federal Ministry for Economic Cooperation and Development (BMZ). In Georgia, IBiS contributed to the biodiversity conservation through the rehabilitation of degraded areas and the protection of natural resources from human-caused induced erosion processes. Within its broader approach to strategic pasture management, IBiS contributed to the development of pasture passports. This BioTopic introduces a set of suitable tools to prepare sustainable pasture management plans based on the example of Tusheti Protected Areas (PAs), Georgia.

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Project area

The project area comprises the Tusheti PAs on the northern slopes of the Greater Caucasus Mountains. This group of protected areas consists of a strict nature reserve, a national park and a protected landscape with about 40 villages and settlements. Together they form a total protected area of approx. 114,000 ha.

Overgrazing, but locally also undergrazing, resulted in soil erosion and biodiversity loss. Especially the intensive and unsustainable use of summer pastures in Tusheti during the Soviet period led to a severe deterioration of the mountain slopes. So far there are no standards or guidelines in Georgia for the elaboration of sustainable pasture management plans. Pasture passports, as a first step towards a sustainable pasture management, document the actual grazing capacity for each pasture unit and serve as a guiding document for shepherds and local stakeholders.

Figure 2: Cattle on eroded pastures in Tusheti

Implemented measures:

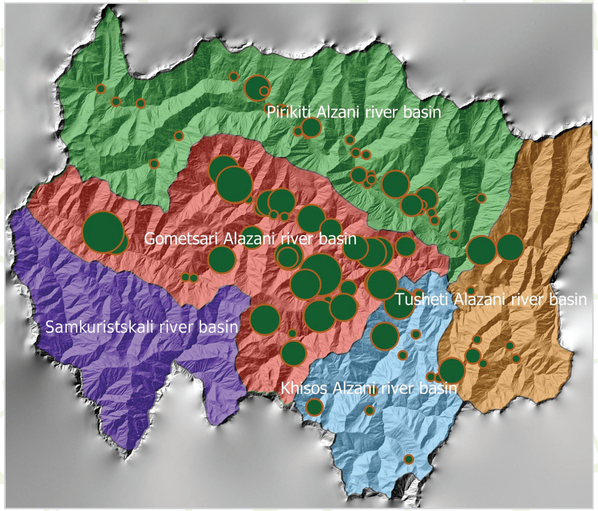
As a prerequisite for the development of pasture passports, the following catalogues were prepared at the beginning of the planning process: number of shepherds/herds located in Tusheti; number of grazing cattle/sheep/goats/horses; areas used; productivity of different types of vegetation (pastures); areas at high risk of erosion due to overgrazing.

The ***pilot measures*** included:

- Assessment of available grasslands, fodder biomass and erosion risk
- Digitisation of old pasture units
- Separation of village management areas from potential lease areas
- Integration and alignment of the protected area categories and zonation
- Preparation of maps and tables for each pasture unit in a standardised format (“pasture passports”)

Tools and steps towards the creation of the pasture passports

The data from the ***remote sensing and field surveys*** are stored in a GIS system and database. The project team used raster datasets for the land cover types, biomass and inclination (slope). Erosion risk and the pasture units were also converted to a raster dataset to improve performance. All raster sets were combined into one (all information comprised in the raster attribute value) with a raster size of 10x10m. In GIS, the maps of each of the 168 pasture units were created using a map book or map atlas functionality. The reports (pasture passports) were exported as pdf files.



Map 1. Map shows Tusheti PAs territory’s division by river basins to identify location of farm camps (green dots). The size of the dots indicates the number of livestock per farm (largest dot = 500 cows/3000 sheep, smallest dot = 50 cows/300 sheep).

Current distribution of shepherd farms

From 2016-2018 all gorges were assessed by field experts and interviews were conducted with shepherds. The collected data show the location of the shepherd summer camps (“farms”) and the number of livestock bred by them.

At the time of the assessment, one third of the former Soviet pasture units were in use. From these units (“numbers”), several parts were excluded which were neither to be grazed nor used for leases:

- All strictly protected areas and zones: the strict nature reserve, and the strict protection zones of the national park and the protected landscape area.
- all areas covered by forest.
- all areas classified as highly erosion-prone by remote sensing (steep slopes with low vegetation cover) and
- village areas and parts that had previously been used for other agricultural activities (e.g. ploughing), were removed from the grazable area.

Quality and quantity of fodder biomass

A chemical analysis was conducted from 23 biomass samples to describe the average fodder quality by raw protein, fibre, fat and ash content. The chemical analysis shows similar quality of fodder biomass as in other mountain pastures (e.g. in the Alps).

Remote sensing

For the assessment of land cover, soil erosion risk and pasture biomass, remote sensing tools were used in combination with data collected in the field for calibration. Satellite images from SENTINEL 2 were used to derive land cover and fodder biomass.

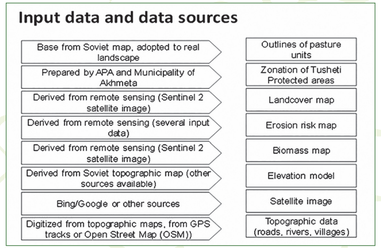
In order to evaluate sites with high erosion risk, precipitation data were derived from the CHELSEA project website (1x1km grid of monthly mean precipitation). The digital elevation model was derived from the old Soviet topographic map and soil data from the soil map 1:200,000 was used.

The remote sensing results were verified from more than 200 field samples. The pasture quality approach from Etzold (2013) was used for ground truthing. The evaluation results showed a statistically significant correlation between field data and remote sensing results.

While the field sample provides more detailed information on each sample plot (e.g. number of plant species), the advantage of the remote sensing approach is that it covers the entire area of the Tusheti PAs and provides statistically sound figures for the available fodder biomass.

Preparing maps for pasture units

The old Soviet map of pasture units with Soviet numbers was digitised and corrected using topographical information from NACRES – Centre for Biodiversity Conservation & Research. The boundaries of the map were aligned with the natural boundaries, such as rivers or ridges, and the boundaries of the protected areas.



As part of the spatial planning process of the municipality of Akhmeta, an assessment of the areas managed by the villagers was carried out. The purpose of this planning process was to separate pasture lands that can be leased to shepherds from those which are used as hay meadows, arable lands or village pastures. The resulting map showed lands available to the village and lands available for lease.

Figure 4: Input and data sources

Content of the Pasture passport

Every pasture unit is described in the pasture passport on four pages. The content consists of:

- The header line with the pasture unit (code) and the total area
- An overview map of the pasture units on a satellite image
- A map of the land cover types (Map 2)
- A map of the results of the erosion risk model (Map 3)
- A map of the biomass of the grassland, available biomass and carrying capacity for pastureland (Map 4)
- The name of farmers / shepherds and their livestock numbers using the pasture unit