Policy brief – February 2024

Sustainable Land Management in Central Asia and Carbon Benefits

The importance of sustainable land management

The fertility of soil is depending on the minerals available, the structure of soil, organic matter in soil, water availability and micro organisms living in the soil. Together they determine most of the productivity of land.

Figure 1 Process of sustainable land management (FAO Climate Smart Agriculture Sourcebook)

Traditionally, the focus is more on the surface and the ground production than on the underground, while underground rooting decides the availability of nutrients and water for the vegetation.

Sustainable land management is based on the principle that soil resources should be stable or improving and the conditions for root development should be optimal. This shifts the focus from soil surface management to underground soil management.

Key indicators of soil quality are the organic matter in soil, the soil structure, the rooting depth, the soil moisture, and the salt content. Driver in this process of land degradation is - besides water - the soil cover. The organic matter in the soil is not only important for the structure and rooting depth, but also for the water binding capacity of soil. Soil cover is an indicator for the production of organic matter in the soil and the natural resistance to natural hazards like mudflows, flash floods, floods, and landslides.

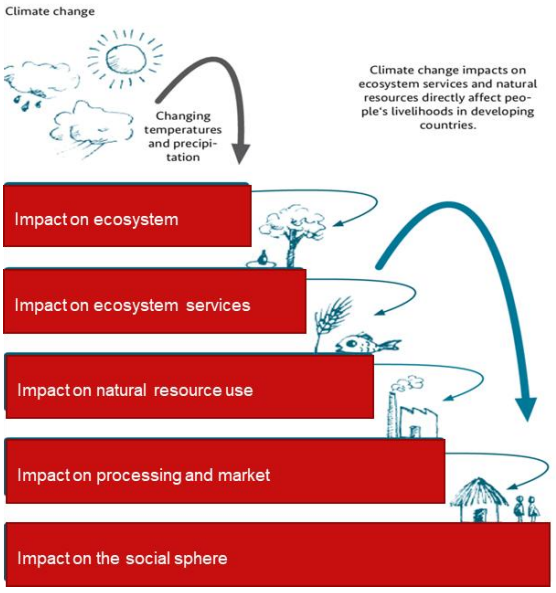

Figure 2 natural impact chain of climate

Sustainable land management is part of the natural impact chain and supply chains. The

impacts of not sustainable land management therefore have not only economic effects, but also ecological and social consequences, such as the risk of natural hazard risk or poverty.

Main causes of degradation

To identify the main causes of land degradation, land use has to be considered, as each type of land use brings its own risks for degradation.

Main types of land uses related to land degradation are arable farming, livestock and pasture management, forestry and nature conservation. Main part of the impacts is human, increased by climate change.

Increased maximum temperatures and longer periods of droughts lead to increased evaporation and thus stimulate the oxidation of organic matter or carbon in soil. The increase of heavy precipitation reduces effective infiltration and increases the runoff and surface erosion. However, it should be noted that the effects of land degradation caused by arable farming and pasture management can be many times greater than land degradation caused by climate change.

Figure 3 Relations map of soil degradation

Figure 4 gives a good impression of the increase of land degradation in Central Asia. The map documenting NDVI tendency was derived from time series of satellite images.

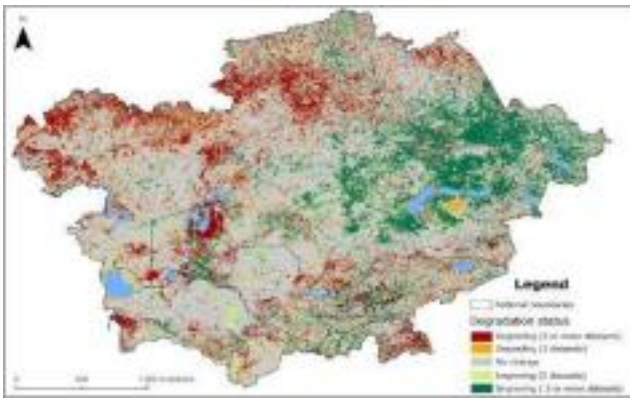

Figure 4 Land degradation status of Central Asia (Source: https://doi.org/10.1016/j.ecolind.2023.110529

Arable farming

A key factor of land degradation in arable farming is ploughing, increasing the exposure to sunlight and to oxygen, and the stimulation of oxidation of organic matter (up to 0,1% humus content loss per year). In addition, the lack of soil cover has to be mentioned. Lack of soil cover results in lack of new organic matter in soil and also to decreased infiltration of water in soil.

Salinization is disturbing the fertility of soils and the capacity to absorb minerals and water. As a high salt content of the subsoils is common in Central Asia, additional salt is accumulated into the topsoil by over-irrigation or irrigation with brackish water.

Another factor, which disturbs the soil structure, is the compaction by machinery.

Livestock and pasture management

As result of non-sustainable grazing, pastures are degrading. The reduction of soil cover exposes the soil to sun and rain, reduces both the accumulation of organic matter in the soil, the capacity for infiltration of water into soil and increases surface erosion. With it, the most fertile part of the topsoil is reduced.

Main cause of degradation is over-grazing and the lack of a rest period during which the plants can recover from the destruction of their roots after grazing (the root capacity is used to grow new leaves). Another cause is early grazing in spring, before growth begins. In this case, the vegetation

has no chance to recover from winter rest.

Nature protected areas

In steppe ecosystems, seeds need manure and tramping to germinate. Lack of wild grazers like Saiga, Tulan or wild horses reduces the germination of new plants and soil cover. This is recognizable in central Kazakh steppe.

Forestry

Deforestation is another major cause of land degradation. It is as a result of the human use of woods for heating and cooking, but also for building purposes. The Eco shift from forests to higher altitude as result of climate change is another factor.

Forests have a key role in soil stabilization, water infiltration in soil, but they also reduce risks of natural hazards, like avalanches, mudflows, flash floods, landslides.

Opportunities towards sustainable land management

Understanding natural processes offers good opportunities to use them for sustainable land management. Increased land cover and the avoidance of soil changes are important measures to mitigate land degradation.

A number of key measures are listed below, broken down by sector.

Arable farming

As mentioned before, there is a need to shift the attention in farming from above ground productivity to underground management.

Increase of organic matter in soil, and related improvement of the soil structure are key approaches. This can be achieved by crop rotation, no-tilt or low tilt cultivation, permanent soil cover (intermediary crops for green manure), perennial crops, anti-erosion belt with grasses, shrubs or trees offer solutions. Re-use of abandoned arable land by rotational livestock management is another approach.

Also, the use of technical solutions make sense. Fungi / mycorrhiza preparations and hydrogel increase the root development, water and mineral absorption.

Separation of irrigation water from saline ground water using water-saving techniques in combination with lowering the groundwater offers good perspectives. Other opportunity is the growth of saline dryland vegetation suitable for husbandry.

In some cases, agroforestry offers solutions for more stable productivity, by providing shade and increasing water content in soil.

Pasture management

Rotational grazing, imitating seasonal migration, as a substitute for free herding allows the vegetation to recover from grazing, to limit the grazing pressure and to extend rest periods. Later spring grazing offers higher productivity, but this requires in parallel better management of winter pastures. In case of artificial seeding, mixed grass/herb mixtures offer better climate resilience and infiltration of water.

Agro-forestry offers good opportunities for more sustainable pasturing.

Natural areas and forestry

Building on old steppe traditions, the promotion of agricultural management of nature protection, and in particular the use of livestock management to imitate wild herbivores, can have a significant positive impact on the natural soil cover and biodiversity.

The replanting of desert areas such as the former Aral Sea or abandoned arable land with Saxaul and Tamarisk and other primary vegetation can stop the desertification and stimulate the re-emergence of other vegetation. These measures also enable income generation for the local population and renewed economic use of the deserted territories. In addition, reforestation in more temperate zones will increase sustainable land use, decrease the runoff, increase the feeding of the aquifer.

> In order to mitigate the shift of forests to higher altitudes due to climate change, reforestation can be systematically planned and the necessary measures prepared. Especially in mountain areas, agro-forestry offers good opportunities to decrease soil degradation.

> In general, forestation for disaster risk

reduction is a low cost and suitable tool.

Financing

As usual, financing is a key issue, also for sustainable land management. The basic principle is that the financing should be economical, unless the other benefits are so important that co-financing is raised for them.

The financing should cover the initial investment to enable sustainable land management and to guarantee also follow-up sustainable management. Striving towards sustainable investment, self-financing is first goal.

Sustainable land management is supposed to increase the productivity and the overall sustainability. From this, additional income or side income e.g. from livestock, can be created as source of financing. Additional business models may need to be developed in order to achieve this goal.

One of the pillars of sustainable land management is the increase of the organic matter in soil. These so-called carbon sequestration can be used for carbon credits on the voluntary or compliance carbon market. However, in Central Asia the carbon sequestration is at relative low level, but the large areas available are still interesting for sell. As the Central Asian countries do not have their carbon administration, the voluntary market is the only option. With a carbon price of 10 euros per ton, CO2 will generate sufficient funds for investments in carbon sequestration, e.g. by Saxaul planting, reforestation or by re-use of abandoned land or livestock management for nature protection. This year, the first large scale carbon financed project will be set up in Kazakhstan.

However, financing for climate projects and demonstration projects in the region is also feasible through international financial Institutions, development partners and climate funds (of which 128 registered by OECD).

The main challenge is the initial investment needed to reverse the process of land degradation into sustainable land management.

Supporting measures at higher level

Although the measures are mainly carried out at local level, support is required at a higher level.

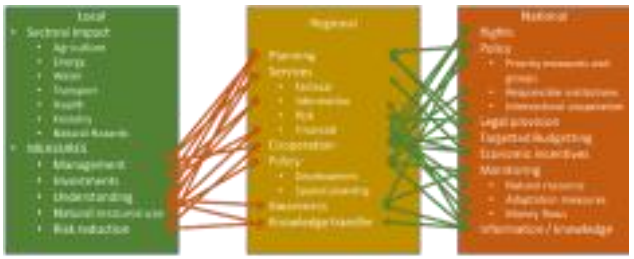

Figure 5 multi-level support needed for local adaptation

Planning, services, cooperation, awareness-raising and knowledge transfer must take place at regional level.

On national level, it is about incentives, rights, legal provisions, policy, information and knowledge building, and, last but not least, monitoring adaptation, in this case to sustainable land management.

This prioritizes the role of national authorities in sustainable development and adaptation. As formulated in the Central Asia common Climate Adaptation Agreement, signed during COP28, the following functionalities were adopted:

Figure 6 National functionalities to be in place for successful local adaptation and sustainable development

Key policy measures to be taken are:

Recommendations of the session

- Subsidies for low tilt and no tilt cultivation
- Tax facilities for re-use of abandoned land
- Capacity building on options for sustainable land management
- Inclusion of land neutrality conditions in land use contracts
- Stimulation the financing of carbon credit for voluntary and compliance markets and develop a common plan
- Approval of agricultural management as a tool for nature protection
- Long term planning of reforestation
- Establishment of Carbon management

Open questions

1. How to motivate local authorities and private land users in reducing the land degradation?
2. How to move nature protection towards agricultural management?
3. How to get the carbon credit benefits for state land back to land management, instead of ministry of Finance?
4. How in cooperation to open the carbon market for Central Asia?

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