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Ecoagriculture in Dedoplistskaro, Georgia

How to make agriculture more biodiversity-friendly

Pressures on agrobiodiversity in Shiraki Valley

In Dedoplistskaro and especially in Shiraki Valley unsustainable agricultural practices constitute the major pressure on agrobiodiversity.
This includes among others the use of **monocultures**. More than 13,500 ha of the 21,151 ha (64%) of the land cultivated in 2014 were used for wheat and another 3,384 ha were used for barley, while sunflowers were planted on 2,675 ha. These production systems are one of the major causes for the loss of agrobiodiversity as monoculture productions replaced polyculture fields with a high number of (often local) varieties.

The often indiscriminate and non-targeted **use of pesticides and fertilizers** is negatively affecting agrobiodiversity in Dedoplistskaro. Many farmers in the area have no agricultural education and lack knowledge on the proper application of pesticides and fertilizers. This results in an overuse of agrochemicals negatively affecting wild plant species, animals and pollinators. In Kakheti region, 10,300 tons of mineral fertilizers were used, and pesticides were applied on 164,300 ha of agricultural land in 2015.

Agrobiodiversity

Agrobiodiversity includes all components of biological diversity of relevance to food and agriculture and all components of biological diversity that contribute to sustaining the key functions of agro-ecosystems. Agrobiodiversity can be structured into two levels: (1) Genetic resources for food and agriculture: This encompasses all cultivated and domesticated species, including their wild relatives and managed stocks of wild animals and plants. (2) Components of agrobiodiversity that provide ecological services: This includes, for instance, beneficial organisms that control pests, soil organisms that process nutrients for crop plants, pollinators, and plants that contribute to controlling erosion or stabilizing the water balance.
Source: GIZ (2015): Understanding agrobiodiversity. Bonn/Eschborn: GIZ.

L. to r.: Wheat field in Dedoplistskaro, farmer in the field

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Another important factor jeopardizing agrobiodiversity is the **burning of crop residues** in the region. Traditionally, crop residues are burned after harvest. The idea is to burn the straw to free the area from vegetation for the next cultivation period. This burning practice not only negatively affects the soil, as it destroys also other organic material, the ashes are often blown away by wind or washed off by rain, while more minerals are brought into the soil by mulching instead of burning. Agrobiodiversity does not only include the diversity of crops, but also of plants (including hedges, trees, herbs and flowers, etc.) and habitats in and arround agricultural fields. Burning affected more than 79% of the area of Shiraki Valley in July and August 2015 and destroyed large parts of the windbreaks surrounding the crop fields. Besides protecting the fields from wind erosion windbreaks are important habitats for plants and animals which provide important ecosystem services for the agricultural production, including predation on agricultural pests.

One of the underlying causes for the burning practices is the missing **institutional, legal and policy framework**. The protection of agrobiodiversity depends on coordination and cooperation between different sectors, most importantly the Ministry of Environment and Natural Resources Protection and the Ministry of Agriculture, as it is a cross-cutting issue which cannot sufficiently be addressed by one of the actors alone. Such intersectoral coordination regarding the protection of agrobiodiversity, including wild biodiversity surround agricultural production is still insufficient. Therefore, the implementation of ecoagriculture principles can only be successful if the measures are embedded in a well-

coordinated institutional framework at local and national level. The political will towards the development of an institutional framework balancing the interests of the different sectors is already pronounced regarding the protection of windbreaks. These first initiatives for an intersectoral cooperation for agrobiodiversity protection have to be widened and consolidated to enable a sustainable agricultural production in Dedoplistskaro.

Vision and objectives

The vision is to improve the framework conditions for biodiversity in agriculture in Dedoplistskaro. The concept of ecoagriculture creates a good basis for the improvement of framework conditions for biodiversity in the agricultural sector as it combines the conservation of biodiversity with the enhancement of agricultural production and includes the needs for local livelihoods. The protection of agrobiodiversity in ecoagriculture includes the diversity of crops used in agricultural production, as well as the biodiversity constituting the agricultural ecosystems.

For the implementation of the concept in Dedoplistskaro, a municipality that is characterised by intensive agriculture with small nonfarmed spaces in between the fields. The concept focuses on the following measures:

- to develop habitat networks in nonfarmed areas;
- minimize agricultural pollution; and
- modify management of soil, water, and vegetation.

Our approach

For the proposed approach to be sustainable it has to be embedded in an enabling environment, including a clear institutional framework and holistic land management planning, along with forests and pastures.

For the development of habitat networks in nonfarmed areas the following measures can be applied:

Ecoagriculture

Ecoagriculture refers to an approach to managing landscapes specifically to meet three goals simultaneously and sustainably (that is, to be able to continue meeting those goals indefinitely): conserve biodiversity and ecosystem services, provide agricultural products, and support viable livelihoods for local people.

Source: Ecoagriculture.org

Rehabilitation of windbreaks

The measures regarding the rehabilitation of windbreaks will concentrate on the support of the Ministry of Agriculture and the Ministry of Environment and Natural Resources Protection in the development of a suitable political, legal and institutional framework for the rehabilitation of windbreaks. The legal framework shall comprise a stronger involvement of municipalities and the creation of a local steering group on windbreaks. [1]

[1] For further information see Gönner, Christian/ Weigel, Olga/ Kolbin Giorgi (2014b): Concept on "Rehabilitation of Windbreaks in East Georgia". Tbilisi: Sustainable Management of Biodiversity, South Caucasus/GIZ.

Usage of flowering stripes

Flowering stripes or sown wildflower stripes are a conservation management measure to reduce the negative effects of intensive agriculture on biodiversity. Their goals include the promotion of biodiversity, pest control and pollination services.

In Dedoplistskaro flowering stripes should be used to combine the increase of wild biodiversity in the agricultural area with benefits regarding pollination and pest control. The application of flowering stripes in Dedoplistskaro should be tested using different seed mixtures. In the selection of seeds it has to be ensured that no wild herbs are used which could spread to the crop fields and might affect the harvest.

The establishment of small habitats

In agricultural landscapes, patches of natural or semi-natural habitats are crucial for the survival of plant and animal populations, which in turn are essential to maintain ecosystem services. Uncultivated stripes within crop fields can be used as habitats for wild relatives of crop plants or for animals.

In Dedoplistskaro, possible areas for small habitats have to be identified, and the establishment of the habitats have to be supported considering local conditions and participatory planning with farmers. Furthermore, the condition of already existing habitats should be assessed and, if necessary, in cooperation with the farmers and local government rehabilitated.

To minimize agricultural pollution, the following can be applied:

Targeted utilization of fertilizers and pesticides and integrated pest management

The excessive and non-targeted use of chemical fertilizers and pesticides has major negative effects on biodiversity and the ecosystem services in the pilot region. The overuse of agrochemicals is especially affecting wild species, animals and pollinators. Therefore, the aim of the concept is to evaluate and improve the usage of fertilizers and pesticides in Dedoplistskaro. In order to minimise negative side-effects of mineral fertilizers, proper analysis of the soil is needed prior to fertilising. Considering the results of the soils analysis, alternative sources of fertilisation (e.g. organic manure) can be tested. Furthermore, alternatives to pesticides in pest control shall be promoted. One option could be the use of biological predator populations. Possible measures could be the support of birds-of-prey hunting rodents by providing sitting poles for migratory birds, while rose-coloured starlings or shrikes feeding on locusts could be supported by protecting and replanting windbreaks or establishing woody islands within the agricultural landscape.

Moreover, **integrated pest control** (IPM) is an alternative to the extensive use of pesticides. It allows farmers to focus on existing pests and apply pesticides strategically when necessary (only when a certain number of pests occur per plant or per area) to prevent major losses, instead of following a strict schedule. An immediate benefit is the reduction of costs for pesticides.

Mechanical soil treatment

The constant treatment of the soil is one option to keep down wild herbs on the crop fields and thereby reduce the demand for herbicides. At the same time, mechanical soil treatment with

rollers and harrows helps against rodents. Therefore, a higher frequency of soil treatment can help reduce the demand for using pesticides. However, care needs to be taken to avoid further compacting of the soil (see minimum tillage).

Promotion of wider crop rotation

Crop rotation can be used to control weeds, pests, and diseases. Moreover, it improves soil fertility, soil structure and organic matter content. This is an important measure to maintain soil fertility in Dedoplistskaro. Especially, crop rotation or intercropping with legumes improves the availability of nitrogen in the soil. As water is the limiting factor in Shiraki Valley, suitable crops need to be resistant to drought and heat. Yet, most farmers will only plant additional crops if they can use them economically.

In the current system the farmers plant wheat in the first two years and barley or sunflowers in the third year. This traditional rotation system should be amended to increase the positive effects on soil fertility and pest control. Therefore, rapeseed, alfalfa and sainfoin (*Onobrychis*) should be tested as further varieties for the crop cycle.

Measures to modify the management of soil, water and vegetation resources are:

Promotion of minimum tillage

The fertile soils of Shiraki Valley technically allow for high agricultural yields. However, due to inappropriate cultivation techniques over the past decades, the formerly loose and well aerated black soil is highly compacted. Wind erosion and decomposition have significantly reduced the humus layer on top and led to a loss of nutrients. Frequent tillage not only damages the soil structure, but also significantly harms soil biodiversity with major effects on the soil physical structure and water- and nutrient-holding capacity.

The programme on Integrated Biodiversity Management, South Caucasus (IBiS) and its predecessor project already piloted the shift from mouldboard ploughing to low-tillage disc-cultivation. Through the use of minimum tillage organic matter is conserved in the topsoil and moisture is retained. The knowledge on the use of disc harrows has to be further shared with other farmers in the pilot area to have a far-reaching effect on agriculture in the region.

Farmers on their fields in Dedoplistskaro

Landscape in Dedoplistskaro

Use of cover crops

The usage of cover crops is highly connected to the establishment of an alternative crop rotation in Dedoplistskaro. Cover crops are high-biomass crops, such as alfalfa, that are grown after the main crop is harvested. They are used to protect soil from water and wind erosion by maintaining effective ground cover. Cover crops can either be harvested and processed, used as fodder for livestock, or used as greens tilled into the soil to enrich soil organic matter and nutrient content before the cropping season.

As already described, rapeseed, alfalfa and sainfoins will be tested as further varieties for the crop cycle in the pilot region and can act as cover crops.

Promotion of the use of fallows

Leaving fields fallow for a year is a suitable measure to maintain soil fertility. Furthermore, fallows using trees, shrubs, or herbaceous plants can support wild biodiversity as there will be no application of agrochemicals and soil life can recover. Moreover, fallows provide habitats.

The benefits of fallow for the soil and biodiversity are undisputable. Nevertheless, most farmers in Dedoplistskaro regard a year of fallow as a lost year. Therefore, the measures on the promotion of fallow will concentrate on convincing farmers to leave their fields fallow as part of the crop rotation.
The use of fallows could be difficult in Dedoplistskaro as farmers are already facing problems regarding the large amounts of biomass on their fields, which are currently burned. The testing of safe ways to remove biomass therefore has to be part of measures regarding the use of fallows. Experiments could include the controlled burning of areas or one-time ploughing.

Alternative use of crop residues

There are large amounts of biomass available on the fields, especially after harvest, or after a fallow year, which are mostly not used by farmers. Many farmers tend to burn the crop residues at the cost of soil quality and biodiversity. Therefore, alternative ways to use the crop residues have to be found to prevent burning.

One promising option is to use a combi-harvester and a disc cultivator for better incorporation of residues into the soil. Another option is to collect the straw and use it in livestock production, sell it on the market or process it into straw pellets for animal bedding, feed for animals, or for fuel for heating for home and industry use.

Introduction of integrated fire management

In Dedoplistskaro, the burning of crop residues is a common measure to clear the field after harvest. These fires can often not be controlled and spread to other fields and to the windbreaks which has major negative effects on wild biodiversity. Careful fire management can ensure that timing and scale of fires (also considering wind) are appropriate to the ecosystem and can improve the agricultural system.

The institutionalisation of an integrated fire management approach is currently under development in the pilot area. Integrated fire management should comprise legal regulations including sanctions, information and education of the public, especially farmers, collective responsibility and action for fire prevention and safer burning (where unavoidable), as well as granting private ownership of windbreaks. In order to address the persistent fire danger, the "Working Group on Biodiversity Protection and Crisis Management in Agriculture in Dedoplistskaro Municipality" has been established. In 2016 it successfully coordinated and organised fire prevention measures throughout Shiraki Valley.

Support of the utilization of local (adapted) varieties

Most of the agricultural areas in Shiraki Valley are planted with wheat. The strict focus on only few crops and the planting of monocultures is negatively affecting the crop diversity in the region. Local varieties face the risk of extinction.

The use of local wheat varieties, for example, would protect these varieties from disappearing. Moreover, the use of local and adapted varieties can work as an insurance crop in case of natural disasters. Additionally, a more diverse farming system with a wide range of crop species and cultivars can result in much greater wild biodiversity as various forms of wildlife move in to occupy the expanded ecological nice.

Possible measures regarding the conservation of local varieties could be the promotion of the usage of local wheat varieties like red doli. Therefore, awareness regarding the benefits of this variety has to be created and possible markets for the crops have to be identified or established.

Needed institutional framework

For the ecoagriculture measures to be effective a clear institutional framework is needed, including:

- Strong and enforced environmental and agriculturual **legislation** ensuring the restoration and sustainable use of biodiversity and agroecosystems;
- **A political negotiation process** has to be initiated to create a common understanding on agrobiodiversity. All political stakeholders including the Ministry of Environment and Resources Protection and the Ministry of Agriculture have to demonstrate the political will to come to an agreement on the future direction in agrobiodiversity protection.
- A closer cooperation among the **different political levels** is needed. Well-coordinated action is necessary at national, as well as regional, and local level to ensure an enabling institutional environment.
- **Incentive mechanisms** for improved biodiversity protection (including markets for biodiversity friendly products and support of organic farming) have to be developed.

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Download the full concept on ecoagriculture here:
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