

Semi-natural grassland as a source of biodiversity

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Abstract

Biodiversity has become a special concern of agrarian- and environmental policy and of general public. Extensively managed semi-natural grasslands are the most important type of High Nature Value Farmland (HNVF) and can be regarded as an important source of biodiversity. Most semi-natural grasslands are rich of native species and for this reason can be harvested to obtain valuable propagation material for ecological restoration projects. In recent years, a large number of different harvesting methods and application techniques have been developed for exploitation and application of site specific seed or plant material. Within the INTERREG project SALVERE ("Semi-natural grassland as a source of biodiversity improvement) important questions are worked on to develop seed harvesting methods for semi-natural grasslands and use appropriate near-natural re-vegetation methods for creating new HNV areas.

Keywords: High Nature Value Farmland, floristic diversity, seed production, restoration

Introduction

Grasslands cover more than 40 % of the earth's surface and are found in nearly every region of the world (FAO, 2005). In EU-27 there are various types of grasslands covering 56 million hectares, which is more than a third of the agricultural area. The most important types of grasslands in Europe are a) natural grasslands, b) semi-natural dry grasslands and scrubland, c) sclerophyllous grazed forests, d) semi-natural tall-herb humid meadows and e) mesophilous grasslands. Total grassland area in the EU declined by nearly 13 % from 1990 to 2003. There is an increasing pressure on more productive grassland by conversion to arable land driven by higher profitability of arable farming and by the rising production of biofuels. On the other hand, extensively used grasslands are endangered both by abandonment and reforestation. The use of semi-natural grasslands as an important source of biodiversity for ecological restoration projects can therefore be seen as an additional option both to maintain and preserve these valuable areas.

Functionality, development and use of semi-natural grassland

Although semi-natural grasslands are human-influenced habitats, they provide cultural, aesthetical, functional, economical and biological values (EMANUELSSON, 2008). When semi-natural grasslands are managed with traditional farming methods they support more diverse plant and animal communities and are also important for birds and invertebrates. The preservation and monitoring of semi-natural grasslands has therefore a high priority in conservation in the European Union.

Extensively managed semi-natural grasslands are the most important type of HNVF that has been nominated an objective-related baseline indicator according to the EU Common Monitoring and Evaluation Framework for the rural development programmes of the EC. The estimation of HNVF distribution in Europe on the basis of CORINE land cover makes clear that they occur mostly in less productive areas, for example in southern Europe and mountain regions. HNVF is unevenly distributed and makes up about 15-25 % of the utilised agricultural area (UAA) in Europe (EEA, 2004).

In most European countries a dramatic decrease in the number of farms with grazing animals could be noticed in recent decades as the traditional agricultural use of semi-natural grasslands seems to be no longer competitive. Milk and meat production, the traditional and productive land-use systems for many generations, are increasingly given up and grassland abandonment is occurring in many mountainous regions (PEETERS, 2008). In alpine and mountain regions of Europe the increasing loss of semi-natural grasslands is a very serious threat to rural development resulting in negative consequences for ecology, economy and society. Alternative land use concepts must be tested and developed in future to counteract this trend. There are different options including productive agricultural land use and new forms of cooperative management. Productive, non-agricultural land-use systems (e.g. grassland-based biogas production, hay) can also contribute to keep the landscape open and to avoid the development of forest (PÖTSCH *et al.*, 2009).

The use of semi-natural grasslands as a source of biodiversity can be an additional option both maintaining and conserving HNVF and fulfilling the requirements of ecological restoration by providing valuable plant and seed material (KRAUTZER and PÖTSCH, 2009).

Semi-natural grassland as donor sites for restoration

All over Europe thousands of hectares are restored each year following infrastructural intervention such as road building, flood protection, construction of torrent- and avalanche barriers or as a part of compensation measures (CIPRA, 2001; KIRMER and TISCHEW, 2006; KRAUTZER and WITTMANN, 2006). But also other areas like roughs on golf courses (BURGIN and WOTHERSPOON 2008), sporting fields, brown fields, railway reserves and educational facilities would be interesting open space that could be used to provide offsets for biodiversity.

Even if the requirements for restoration and/or reforestation in the affected countries are different, it is still common to use seed- or plant materials for restoration that are composed of cultivated varieties used in agriculture or also those of non-local provenance. The result is that in practice restoration measures are very often undertaken to adapt the given site conditions to the needs of the species being contained in the restoration mixture. This leads, in road building for example, to the spreading of massive layers of humus on roadside banks, which results in an unwanted intensive growth of biomass with high costs for the following cultivation measures.

Site-specific ecotypes are well adapted to local conditions. With the proper selection of species, erosion-stable and often high-quality nature-conservation plant stands can be performed even under extreme site conditions. The positive ecological and economic effects of such site-specific restoration could already be proved in the course of a great number of trials (SCOTTON *et al.* 2005; KIEHL *et al.* 2006; DONATH *et al.* 2007; JONGEPIEROVA *et al.* 2007; KRAUTZER and KLUG, 2009; SCHMIEDE *et al.* 2009).

Exploitation of site specific seed and plant material

Several methods to collect seed- and plant material for site-specific restoration processes have developed above all in the English- and German-speaking world recently.

The following methods for the recovery of restoration material **from donor sites** are regularly used in practice:

hand collection, fresh cutting, hay mulching, threshing, mulch mowing and extraction by suction (vacuum harvesting), seed stripping, seed brushing, salvaging donor soil and plants from a native plant community

Restoration material can also derive from **local/regional production** of local plants or regional seeds from seed growers:

a method that is meanwhile practiced in several countries is the cultivation of seed of suitable species with the aid of agricultural techniques. Above all, species used often and in larger amounts can be produced at comparatively reasonable costs and used on appropriately large project areas (KRAUTZER *et al.*, 2006).

Restoration of semi-natural grassland

The stability and durability of restoration is most likely to be achieved when the similarity of the site origin and the sowing site of the plants are as large as possible (e.g. adaptation to climate, special site characteristics). Essential parameters to be observed in planning are the substrate and, if necessary, the instructions for cultivation.

With respect to site types, possible types of target vegetation and possible erosion risk, the suitable restoration methods can be very different. However, every planning of ecological restoration measures has to follow some important steps that guarantee the selection of the most suitable method under the given conditions (time span, area, site conditions, availability of site specific seed and plant material, risk of immigration of neophytes, costs, budget etc.).

The most suitable restoration methods for the most common vegetation types are:

simple dry seeding, wet seeding or hydro-seeding, slot seeding, harrowing and over-sowing, hay-mulch seeding, hay transfer, threshed-hay seeding, topsoil transfer, restoration with plant material, combined seed-sward process, Planting of individual species or pre-cultivated plant elements

Varieties of wild plants changed through cultivation should not be used. The plant species set out must have no negative influences on the plant stands in the vicinity and not confuse the 'natural' distribution pattern of a small variety of plants. The compilation of the mixtures should be taken from the succession procedures in nature, which lead from short-lived plant species to the establishment of enduring species.

In respect of the prevailing regulations of nature conservation, the use of seed for site-specific restoration is to be controlled by the individual countries. Thus in most nature-conservation laws the implementation of plants of non-local provenance into open terrain without permission given by the nature-conservation authorities is forbidden, whereby there are usually rules of exception for normal agriculture and forestry.

A problem in the use of site-specific seed material for nature-conservation improvement of existing grassland areas or the new construction of HNMF is given by the limitations of the national seed laws as an EU skeleton law. Accordingly, within the sphere of the agricultural use of areas, with seeding the use of varieties of the species is prescribed and laid down in seed law. The use of threshed materials from a donor area for the construction of new HNMF areas is in most cases not permitted.

Conclusions

Twenty years ago, restoration identical to nature was considered impossible but in the meantime several excellent examples of ecological restoration from wetlands to opencast mining areas up to high zones have been realized.

The only available resource of seed- or plant material, which can fulfil the demands of nature conservation, regional aspects and site-specificity, is semi-natural grassland. In recent years a large number of methods for the winning and reproduction and use of this valuable material have been developed. To guarantee the use of site specific plant or seed material, approved certification procedures for such material have to be developed.

Unfortunately the latest technological developments for site-specific restoration are defined very differently in various European countries and the knowledge of special restoration methods is insufficiently available. The legal sphere dedicated to extensive restoration methods also lacks uniformity. What is common in some countries is strictly forbidden in others. Although in almost all of the affected countries nature-protection permission for building projects are obligatory, realisation of the laws are not or less than strictly controlled. From an overall European perspective it would be urgently necessary to work on a uniform definition of terms and an efficient distribution of the latest technological developments in site-specific restoration processes.

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