Nature-friendly grassland management

Summary












In Europe, the production centred agricultural model applied until the recent past has been replaced by the so-called multifunctional agricultural policy. In addition to the agricultural aspects, the ecological, social, cultural, preservation of traditions and recreational aspects appear with an increasing weight in this policy.

In the course of history the primary social demand against grasslands was that it had to serve food production. Lately, however, in addition to these, new aspects have emerged. Non-material products of grasslands have become appreciated since sustainability became the main principle in the use of natural resources. Natural and close to nature habitats of the right proportion in landscapes and their appropriate spatial location can secure the diversity of a region and the ecological services so important for humans being part of it. This is the foundation of the healthy operation and long term sustenance of a landscape.

The European Union established the system of areas worth protection of community significance, the so-called Natura 2000 network for the purpose of protection of habitats reserved in their natural state and the wild animal and plant species. A number of threatened habitats types, animal and plant species occur in Hungary that cannot be found anywhere within the current geographical borders of the European Union, thus Hungary's rich and unique natural values have enriched the European Union with a new, independent bio-geographic region (the Pannon Eco Region). From among these an outstanding value is represented by those open habitats that have developed to become like that due to Hungary's geographic location, climate, natural biosphere, and activities of our predecessors pursued for a thousand years.

Following the change of the political system, the utilisation of open habitats in Hungary has radically changed and traditional management methods have come again to the forefront requiring a totally new type of approach. Since the nature protective methods of traditional approach pursued using modern tools had no experiment proven practice yet in Hungary and international experiences were also rather poor, we considered it necessary to launch research similar to this but amidst the conditions of Hungary and to exchange experiences with those being active in similar conditions.

During the pursuit of nature management activity we have to learn how to adjust day-to-day management tasks to the appearance or permanent occurrence of important individual indicator species. Experiences must be described as a technology to help those coming after us not to start everything afresh.

Our research team has undertaken to examine and experiment a technology free of biases and dogmas on grasslands management, which pays equal attention to domestic experiences based on landscape historic activities as well as to novel, avant-garde type international research conducted on similar topics but yet missing from the current practice in Hungary.
The objective of our research was to create a proper and sustainable grassland management technology whose application serves indeed the preservation of a large part of biosphere instead of being a description of required activities easy to check but having nothing at stake and being futile and superfluous. During our research we managed to provide data to prove that a large part of the applied nature protection measures were right while at the same time it became clear about some "bird friendly" measures handed down earlier by oral tradition that in certain cases they are an ecological trap. Our major findings are summarised as follows.

Nature Protective Mowing

When determining the optimal time of nature protective mowing we ascertained that one of the best ways of protecting fauna is carrying out mowing at a late time (end of June – July). With this method we create a favourable situation for species having special ecological needs or breeding, reproducing late.
The potential time for mowing has been determined as mid-June to early July with attention to bird catching and other data. During this period birds still keep their territories and as a result all vital activities of birds breeding here can be observed, that is, we got a picture not only of nestling and the state of development of the young birds, but also of the number of the birds of a territory. The proportion of old and young birds caught during the time of the camp shows that the bulk of the stock has not had its young birds flying off yet. Since the nest of insessorial birds mostly contains 4-5 eggs, if they had flown off in large numbers, the number of young birds should well exceed that of the old ones.
On the basis of the above we may declare that the smaller the number of caught young birds tied to habitats on meadows and reeds compared to that of the old ones by the end of the main breeding period (end of June, middle of July) on a given area, the less nests have been left by young birds, that is, habitats management planned to be carried out there will destroy masses of birds living there. The mowing and management of the area poses no longer a threat to masses of birds when the proportion of young birds caught permanently and significantly exceeds that of the old ones.
In the course of management of grasslands rich in natural values, the knowledge held by the staff carrying out the work and their attitude to the biosphere there is of decisive importance, as this is the starting point of almost all measures.

Due to the application of the chain curtain game alert equipped to tractors during mowing, in the six years investigated, of the 5171 specimens observed 4901 (94,8%) have fled, 236 specimens (4,6%) were rescued by the tractor drivers, and only 54 (1%) got injured or perished.
From among the methods applied in mowing conducted on wide areas and during daytime exclusively, from the aspect of spatial progress and organisation of work, research has identified the advantages of the continuous ousting method (causing continuous disturbance), with a number of machines working at the same time, on the same place, while also applying the ultimately left hiding lanes of planned spatial patterns.
With regard to the examination of the types of mowers we can declare that mowers used on a nature protection area can be maximum 3 m long, and it is prohibited to use a stem crushing mower as in that case none of the statements made during the examination will be true. The stem crushing mowers crush all kinds of fauna together with the flora captured by the mower.
A comparison of the types of mowers during the examination has shown that a double blade and disc mower produces better stubble height than a drum mower, both with regard to marginal and average values, and its application significantly increases the chances for survival of certain animals choosing a hiding strategy. The most favourable results were produced by the application of double blade and lift control disc mowers.
Mowing carried out without the measures described above, by applying traditional methods at the wrong time during the night, without using a game alert and carrying it out inattentively, with improper organisation of work, by a wrongly adjusted mower may extremely damage the biosphere of rich grasslands. From that aspect, largest damages can be caused a wrongly adjusted drum mower, where, in the interest of faster drying, mowed rows are even scattered when mowing is finished.
Finally we give a summary of the measures whereby a farmer committed to nature protection may contribute to the biodiversity of his land and the sustenance of symbioses:

- Mowing carried at a later time, in early July and only at daytime, and collection of hay possibly when it is still green, as senage
- Mower equipped with a chain curtain game alert (of 5-7 cm distance between links), properly adjusted at the three points in order to leave proper stubble height, of a width of maximum 3 m, without a stem crusher appliance
- Slow progress of work of a speed of maximum 4-5 km
- Proper progress of mowing in space, leaving a coherent pattern of 10% of the space for the hiding strips.




Possibilities of restoration of natural or seminatural grasslands
Summary







The number of natural grassland restoration projects increased in the last decade in Hungary, and probably the area of restored grasslands will be significantly extended in the next years due to New National Rural Development Program. To contribute to the success of this activity, in this paper we review the most important theoretical and practical aspects of natural grassland restoration methods.
In the course of grassland restoration, habitats dominated by grasses and/or sedges have been restored in place of arable lands. In order to perform "natural" restoration, we should consider the ecological conditions of the landscape, and reconstruct natural or seminatural grasslands including of native plant species.
Essentially, rehabilitation of natural landscape is supported also by creating new seminatural grassland patches. The basic principles of the natural grassland restoration are:

1. When a spontaneous secondary succession starts to proceed on an abandoned field without invasion of any alien plant species, the re-ploughing of the abandoned field has to be ignored.
2. Generally, the old fields surrounded by species-rich natural or seminatural grassland pathes can succesfully be restorated. Then, as a consequence of newly restored vegetation patches the recovery of the whole landscape can be accelerated. Furthermore, by restoring isolated grassland patches surrounded by arable lands a more diverse landscape pattern could be developed.
3. Spontaneous secondary succession of grasslands should be assisted.
4. The development of typical species composition of a seminatural grassland can be promoted by methods of spreaded hay. For successful process the hay has to be cut in a habitat type similar to ones that will be restored.

5. Applying seed-mix for sowing can be useful to prevent spreading weeds drastically in the early stages of succession.
6. Ideally, the seed-mix is originated from own harvesting or gathering from similar (or the same) habitats. If it is not possible, commercially available seed-mix can be applied, in which the dominant species is the same as in the restored habitat, with similar proportion.
7. Seed-mix consists of alien species has to be avoided.
8. If the composition or structure of the restored grassland is not appropriate after some years, the renewal of the grassland could be necessary. During the improvement process the re-ploughing of the restored grassland is avoided, but spreading seeds or hay, and direct sowing can be applied.
9. The loading of nutrient is not necessary in any stages of grassland restoration.
10. Applying chemicals is avoided; any herbicides can be used only when extensive invasion of alien plant species occurs.
11. The mechanical intrusions on soil are also avoided.
12. The restored grasslands is required regular or continuous management, which could be a preserving mowing or moderate grazing. The aspects of nature conservation should be considered.

Prevention of Aggressive Weeds Proliferation

Summary










The number of plant species occurring in Hungary exceeds 2,700, of these only about 100 species can be considered non-indigenous. And only a fraction of these can be classified as aggressive, invasive species. Their occurrence and explosion like proliferation is accompanied by tangible damages in agriculture or in health care alike. These species exercise a significant impact of transformation also on nature protected areas posing a threat to their values. What is more, slowly we get to the point where a decisive proportion of the nature protection activities, interventions will be taken up by the prevention of and fight against the proliferation of aggressive weeds.
In the course of researches, we examined the suppression and elimination of the stock of 2 golden rod species, 3 Japanese knotweed species, the Ailanthus, the Amorpha Fruticosa, the Black Locust (Robinia pseudoacacia), the Salix Cinerea and the Calamagrostis Epigeios. At the same time, on three model areas selected in advance, the experts made a comparison of the efficiency and effectiveness of interventions carried out for nature protection purposes.
We have carried out the examination of the parallel effects of grazing and mowing, the effects of selective shrub clearing and mowing in late summer and the effects of stem crushing during autumn and winter on protected areas in North Hungary in function of the hatching of the corncrake nesting on the ground.
On protected areas along the Tisza River we studied the suppression of high growing dry stalk and shrubs, while at the end of summer and in winter we applied different types of stem crushing machines and mowers.
On the protected areas of Szatmár-Bereg, we examined the impacts and results of selective shrub clearing carried out manually and mowing carried out by a manual appliance during the autumn period. Sprouting free destruction of acacia specimen has also been developed in this part of Hungary.
Following the assessment of the series of systematic examination lasting for years we can identify the following experiences:

General principles:
- It is not advisable to start a treatment when we are not certain that we can complete all its steps. Due to the disturbance caused, the aggressive weed species start a sudden and massive (vegetative) occupation of the area.
- When starting the treatment, the plant's expansion strategy must be considered, and the spatial order of the treatment must be arranged accordingly.
- Suppression should be preferably based on mechanical methods.
- Use of chemicals:
- The amount of chemicals used should be of the smallest dose possible and of the smallest number of repeated application.
- The chemical used should carry the smallest possible environmental and health risk.

Treatment of Golden Rod species (Solidago spp.):
- The practice of mechanical clearing shows that only mechanical clearing involving the ploughing of the grassland can bring about significant results.
- As a result of using stem crushing, the "infected condition" of the surface is significantly decreased in 3-4 years, and the size of the specimens is decreased by about one-third.
- The combined experiment of using stem crushing and grazing by sheep shows that the number of plants intended to be suppressed on the treated area has drastically decreased, and instead of larger "bushes" only single specimens are sprouting.

Treatment of Japanese knotweed (Fallopia spp.)
- Exhaustion by mowing without the application of chemical treatment is out of question. As a result of mowing even specimens that hardly proliferate in a vegetative manner launch an aggressive occupation of the area.
Treatment of the Ailanthus (Ailanthus altissima)
- Considering the mechanical methods, the clearing of the Ailanthus tree, or the removal of the bark produce the opposite effect as these will stimulate a vigorous sprouting of the tree.
- The chemical method has proved to be most efficient, which has to be carried out by using a glyphosate based chemical. Young shoots growing up from the roots must be expected in that case as well.

Treatment of Amorpha fruticosa
- After stem crushing, cover by Amorpha fruticosa is drastically decreased. The natural character of the spots also began to increase, but it was still far behind the former values.

Treatment of Salix cinerea
- The cover by Salix cinerea and its height has drastically decreased following stem crushing. Sprouts were much less vigorous and during the second year they almost blended into grassland level.
- After clearing of shrubs, sedges and meadow species got implanted surprisingly fast and the total number of species began to grow rather quickly.

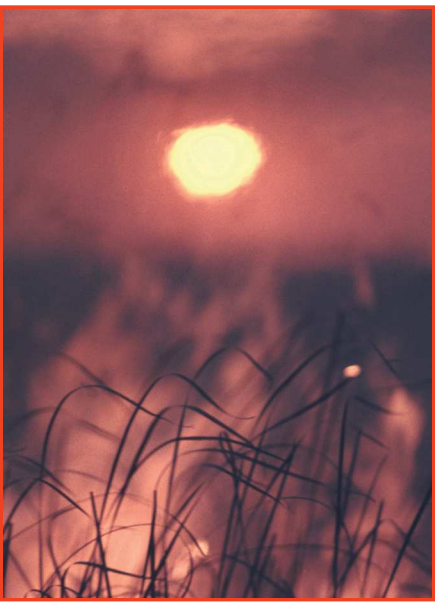
The treatment of Calamagrostis epigeios
- As a result of mowing, the quantity of Calamagrostis epigeios decreased to one-third.
- Leaf-litter cover (and width) has significantly decreased and as a result, the competitive effect of Calamagrostis epigeios has presumably also decreased.

Treatment of Black Locust (Robinia pseudoacacia)
- Treatment of different acacia stocks in large masses by Medallon was started after many years' experimenting. Up to now a total of almost 5000 specimens have been treated and dried out.
- More than 90% of the acacia specimens treated with Medallon did not come into leaf the next spring. 10% began to come into leaf at various levels of, but drastically decreased intensity.
- During the autumn of the year following the year of chemical treatment, no root or shoot generation was observed after the harvest of the dried acacia.

Treatment of cover by shrubs generated as a result of succession
- Harvest of ligneous plants on soil level is necessary by using a manually operated, engine driven shrub clearing equipment.
- Collection of the harvested organic substance and removing it from the area is advised to be done manually, by using manual tools in the interest of preserving the conditions of the treated area.
- The harvested and removed ligneous organic substance is advised to be chopped up by a twig chopping machine. That makes transportation and later use easier.

The effects of fires

Summary



When examining the nature protection effects of fires, we have concluded that burnings carried out during the winter period exercise favourable impacts on the wet habitats of steppe-like areas and grasslands while in the case of grasslands of high grass, they are mostly unfavourable. Fires in the vegetation period are clearly detrimental to the associations of forests and hill slope grasslands. With regard to the latter, it is important to note that stocks of a number of protected butterfly species may have collapsed due to grassland burning. Following very effective burnings, however, the regeneration of decimated stocks can be assisted by coordinating mowing with butterflies' reproduction rhythm and leaving areas without mowing.

Our studies support the idea that the joint application of mowing and burning may be efficient in the treatment of grassland habitats as long as separate patches are treated by burning.

The effects of fires were examined by two methods. On the one hand we have processed the nature protection effects of planned and unplanned burnings of the recent years with special attention to stocks of protected plant, insect, amphibian, reptile, and bird species. On the other hand, we tried to gather information on the nature protection effects of fires by conducting well organised, experimental burning affecting smaller areas during the winter period. The experiences gathered by the two methods were concordant from which the conclusions explained below can be drawn.

When burning is planned on wet habitats of plain areas, attention must be paid to the fact that proper feeding places must be created to the egret and heron species, and the reeds that serve as nesting places should not be burned down. Former experiences show that heron colonies are on the move, so when one colony is abandoned, former sites can be involved in the treatment by fire. As a result it may be expected that the vegetation of the marshes destroyed by the herons becomes regenerated and the heron species may return to the former sites. In contrast with that, on forest habitats, treatment by fire is recommended only if the suppression of non-desirable, adventive, ligneous plant species is not feasible by other methods. A combination of burning and grazing can be recommended in some cases also on areas like that. The opening of corn-crane habitats by burning that are becoming increasingly overwhelmed by Amorpha Fruticosa would be especially important, as the proliferation of this "rush" plant has already led to a significant repression of the wet meadows on the flood plains. Burning of the shore zones of marshes on plain areas in winter time gives rise to good habitats for birds of the shores as the barren shores offer excellent nesting places, and the sludge rich in humus offers feeding area rich in invertebrates to a number of bird species diminishing in number, like the avocet, the lapwing, the godwit and the redshank.

A characteristic feature of mountainous and hilly habitats is that after very effective burnings, the regeneration of collapsed butterfly populations can be promoted by mowing coordinated with the course of life of protected butterflies having special ecological needs and by leaving areas without mowing in appropriate arrangement. For that reason, during dry, drought-stricken years, in the interest of preventing burnings, lane mowing is suggested to be carried out in a network pattern. In contrast with that, in years of more rain and higher grass yield, mowing is advised to be carried out by leaving patches in a mosaic arrangement on 20-30% of the area without mowing. With this method the damages caused during the burning of untreated grasslands covered with a thick layer of grass litter can be prevented. The lane mowing in a network pattern for fire prevention purposes and the mowing in mosaic arrangement carried out during the autumn or early spring period where the location of the parts and the size of the area left without mowing change every year contribute to the preservation of biodiversity on the dry grasslands of hillsides.

Considering the timing of burnings it became clear that the winter fires, the so-called cold fires exercise much smaller effect on the communities living there than summer burnings. In contrast with that, if dry plant material is let to get accumulated on not grazed areas, the potential of catching fire – which may also be caused by lightning - is extremely increased. These fires may cause much longer lasting effects in the living organisms as, depending on the temperature of the fire, soil will get burned out in deeper layers, the reserve seed stock and a large number of ovules and case-worms also become destroyed. For that reason we definitely recommend the treatment by burning smaller patches, carried out during the winter period, which will prevent the generation of devastating summer fires, and through this it also significantly decreases air pollution rates.
Finally we give a summary of the measures through which, by carrying out planned burnings in cooperation with the fire service and the nature protection authorities, we may contribute to the increase of biodiversity of the grasslands on the plain areas in particular, or on areas as well that are infected by invasive species:

- The burning should affect, at most, patches of a couple of hectares
- Prior to burning it is recommended that circular mowing around the planned area should be carried out, and in the inside mowed lanes should be arranged in a network of 50 m
- Burning should be carried out after obtaining the necessary permits, in the presence of the fire service and the nature protection authority
- Burning should be carried out during the winter period (between 30 November and 31 January) preferably on a day free from winds.