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New Approaches for Mechanising Landscape Conservation Measures

Gradual growing scrubs, like on lean turf and on heath land, are a constant threat to the typical vegetation structures of adapted flora and fauna in these extensively managed areas. Current methods of landscape conservation can usually only combat the woody vegetation at high costs. Within the framework of a cooperative project, an innovative conservation concept will be developed that will make low-cost mechanical clearing of bushy vegetation in these highly sensitive biotopes possible, based on further developing of a bush chopper.

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Keywords

Landscape conservation, procedures of maintaining open landscape, bush-chopper, mechanisation

The extensive use, particularly of pasture and neglected grassland with low yield potential or military training areas has promoted the development of plant and animal societies worthy of protection [10, 14]. With the ceasing or refraining of use of these biotopes a vegetation development has to be expected, which replaces this biocoenosis [7, 9] and leads to an impoverishment of biodiversity. Ideally, the dominance of woody plant species is already stopped by permanent care measures in the phase of succession.

Due to the current situation of farming on marginal revenue locations and in view of future profound land reforms, an augmentation in unused agricultural land is to be expected. Potentially, these areas have the same degree of biodiversity and are therefore subject to the same directives (e.g. EU's FFH-directives). That makes efficient and sustainable landscape conservation measures indispensable.

Present landscape conservation techniques

The conservation of open landscape biotopes demands the steady clearing of the areas from woody vegetation. Depending on the requirements of the areas to be treated, different techniques are used for the oppression of the woody species. The technique applied for the respective area is mostly determined by ecological and economical requirements. The usual techniques are controlled burning, mechanical mulching, manual removal and grazing as one of the most frequent procedures.

However, all these measures have their technological weaknesses.

- Burning and mulching endanger the fauna in the herb layer [8, 15].
- Repression of weed trees by robust domestic animal breeds is of limited success. Therefore, further measures for subsequent cleaning have to be taken [9, 13, 15].
- Mulching with heavy agricultural machines is possible in vegetation of stem diameters of up to approx. 3 cm [15].

Fig. 1: Gradual growing up of scrubs on a lean turf in the FFH-area „Kerstlingeröder Feld"

- In terms of desired removal of nutrients, especially in habitats like heath and lean turf, grazing, burning and mulching (incl. forestry mulchers) generally cannot contribute substantially, because the plant material, respectively the manure, cannot be removed from the area. Directed nutrient depletion is therefore impossible [13, 15].
- Manual removal can ensure a nutrient withdrawal by the following clearing of the plant material, but, however, in denser copse it is linked to high costs [7, 11].

All of these measures generally are associated with costs, that usually are not or not significantly compensated by the yields from the respective areas [7, 12, 13].

Due to the estimated increase of neglected areas, economical and efficient techniques are of a special significance. Landscape conservation measures that permit a high degree of mechanisation seem to have economic advantages over manually or partially mechanised techniques.

New strategy for the fully mechanized landscape management

An innovative concept for fully mechanised, economical landscape management must provide the fully mechanised restoration and care of areas in any state of succession. Especially in highly sensitive areas, such as in lean turfs, heath or bog areas, protection of the biocoenosis is an outstanding task.

Ideally, the woody vegetation is cut close to the ground without interference with the

the soil's surface. The influence to the ground structure should be kept as low as possible. However, for the purpose of nutrient withdrawal, the plant material should be loaded directly.

In the Institute of Agricultural Engineering of the University of Göttingen, a bush chopper was developed [3], that was designed for the harvesting of short rotation poplar plantations [5, 6] as well as for the processing of tropical fallow vegetation [4].

The so called „Tritucap" bush chopper should be applicable for the purposes of landscape conservation, too, and by this expand the possibilities of present techniques to even stronger vegetation.

The chopper is equipped with two circular saw blades and mounted to the three-point hitch of a conventional agricultural tractor. It is characterised by its light-weighted and robust construction [1], cuts the vegetation with the saw blades and the cut plant material is subsequently chopped by two rotor drums, equipped with conical knives.

Despite the relatively small and compact construction, poplar trees of a stem diameter up to 15 cm could be processed during the passage in the plantation and in the tropical secondary vegetation.

For the harvesting of short rotation plantations a prototype was used with only one rotor. The machine was equipped with a spout by which the loading of the chopped material was made possible [5, 6].

The prototype designed for tropical fallow vegetation had to be able to work independently from plantation rows. It had to cover the hole tractor width and the chopped material had to be spread over the field's surface homogeneously [3].

To meet the requirements of an innovative landscape conservation technique, the two different machine concepts were to be united and thus offer the possibility to remove the bushy vegetation from the respective areas.

Main challenges of this strategy are the adaptation of the machine to the local vegetational conditions and the combination of the two-rotor machine with an overloading facility (*Fig. 2*). An appropriate machine for these purposes is to be designed and tested, the ecological and economic effects of its application have to be examined. This is carried out within the research project „Fully mechanised landscape conservation in nature reserves and FFH- areas", funded by the German Federal Environmental Foundation. The research includes the development of an optimised concept for landscape conservation in different areas. Essential part is the inquiry of possible ways to use the harvested material, e.g. thermal utilisation, which could lower the costs of the machine's application.

Fig. 2: First prototype of Göttingen's bush chopper „Tritucap" with a spout

A group of several specialists from science, of trade and industry and authorities has been formed to meet the demands of this research.

Outlook

Even an economical possibility of mechanised landscape conservation must consider the given other measures to form a reasonable concept. A fully mechanised technique cannot replace present procedures, but complement them. However, it would give the opportunity to enlarge the possibilities of landscape conservation management practices and thus meet the demands of ecology and economy on these areas. Areas with a high amount of bushy vegetation could be made reaccessible again by the application of appropriate machinery. In some cases, prolongation of the regular care intervals, allowing a certain amount of copse vegetation might be an option to minimise costs, without endangering the sensible biocoenosis. A following fully mechanised measure then could recurringly establish the status quo of the area.

However, first results of this project will allow more differentiated statements.

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