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STUDY OF THE DIFFERENT AGRI-ENVIRONMENTAL SCHEMES FOR THE BENEFIT OF THE GREAT BUSTARD (*OTIS TARDA*)

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1. INTRODUCTION

The development of agricultural technologies, the intensification of cultivation and animal husbandry, - next to several other threats - , led to the collapse of the Central European Great Bustard population (article), but at least resulted in a large decline at almost all populations worldwide.

2. THE MAIN RELATIONSHIP BETWEEN THE GREAT BUSTARD AND THE AGRARIAN ENVIRONMENT

2.1. Agrarian habitats as displaying grounds

Description
Great Bustard displaying grounds are generally large, openand undisturbed areas with low vegetation. As the displaying behaviour of the adult males is a visual signal to the females the large open areas and the whitening of the feathers makes the detection of the males for the females much more effective.

Displaying grounds are traditional (article) and more or the less the same spots are used by the birds for mating year by year, which fact makes theplanning of management relatively easy on displaying sites. As the displaying period, from the beginning of March until the end of June, is the most intensive period of the Great Bustards, when both males and females move the most intensively between displaying, breeding and wintering grounds ("exploring movements"), the planning of management and monitoring of this critical period should cover and include almost the whole distribution area of the species.

Displaying areas should be managed in line with the following **criteria**:

- Open area, with minimum interruption of different kind of natural and artificial landscape elements, like trees, tree-lines, forests, canals, wind farms, power lines etc.
- Suitable vegetation structure, with generally low vegetation, with some higher plant mosaics, like different type of crops, or grassland with different height (like uncut stripes or patches)
- No disturbance in the main displaying period between the 15th of March and the 1st of June, and generally low disturbance throughout the year.
- Sufficient food supply

The management of the displaying sites (**arenas**)where severe males are present during the mating season is similar to those places where lower number of males aredisplaying; however the importance of the arenas is higher due to more intensive behaviour of birds. Especially the last criterion, the sufficient food supply is important, as the continuous fight and competition between the males takes a lot of energy and the lack of suitable feeding possibility in the vicinity of the leks can cause exhaustion, or even death by the end of the mating period. These arenas are anyway the most common locations of finding carcasses of adult males, as these 2,5 months are the most intensive period of their life, apart from extreme weather conditions in winter.

Recommendation on management
The displaying grounds are one of the best known Great Bustard habitats, as most of the display grounds are very well mapped inall Range States. The reason of this is the fact, that the display is one of the most visible periods of the species' life. Thanks to this, most of these sites became protected areas inthe first phaseof the Great Bustard protection, and due to their site fidelity this is the first and very often the most important step of conservation.

As very often, but not exclusively these sites are dominated by natural, or semi natural **grasslands**, their maintenance and management arevery often based on extensive grazing activities.

The low grassland vegetation can be reached by **grazingor mowing**, however the regular mowing without the presence of livestock leads to the lack of sufficient invertebrate food supply. The most commonly kept animals on display grounds are sheep, cattle, sometimes horses and water buffalos. As the bigger arenas are located on mosaic grasslands, the best quality grasslands can be maintained by keeping two or more types of grazing animals.
Grazing can be carried out by applying human source (shepherds, stockmen) or by using electric fence.
The followings should be ensured by using **electric fence**:

- The grazing units should be large enough to avoid fragmentation of grassland, usually not less than 100 hectares.
- The line of electric fence should follow "natural" borders, like canals, dams, tree-lines etc. If there is not any, then the use of electric fence should be avoided.
- The density of grazing animals during the display period (15th ofMarch – 1st ofJune) should be very low to avoid disturbance.
- If the display ground is grazed during the displaying period, no veterinary treatment should be applied; therefore only extensive types of animals (typically traditional breeds) should be applied.

If the grazing is carried out by shepherds or stockmen, they should avoid grazing in the heart of the display ground during the displaying period. Grazing should start on the peripheral sites, the central area should be approached gradually by the end of the displaying period. Well-trained dogs and appropriate personnel are required.

For the proper implementation of grassland management on display grounds a well elaborated **management plan** is needed, which should include

- the timing,
- the location and
- the type of management adapted to the local situations.

If the dominant vegetation is **not grassland** on the display ground, the proper crop rotation, the proportion of favourable crops and their management are essential. The choice of crops grown can predict their management, so the planning in this case is also determining. Some of the crops cannot be managed economically and on a Great Bustard friendly way, but some can (see more under chapter 2.5.). The main principle is to prefer winter crops (sown in the autumn), and crops which donot need any treatment during springtime, to avoid disturbance during the displaying period. The omissionor very low level of chemical use, and the suitable proportion of perennial crops (like alfalfa, grass, set-aside fields and fallow-lands) can guarantee the sufficient food supply.

Altogether the main task is to keep the disturbance at a very low level, or exclude it if possible. If any management is needed, so the disturbance cannot be excluded entirely, it should be planned during the daytime between 10 am and 16 pm, as the activity of the Great Bustards is the lowest in this period.

2.2. Agrarian habitats as breeding sites

Description
The breeding sites are probably the Great Bustard habitats, which are mostly effected by agriculture. The reason is probably not just because these sites are also traditional andGreat Bustards show strong site fidelity, but the breeding is the most immovable period of species' life, which lasts relatively long.

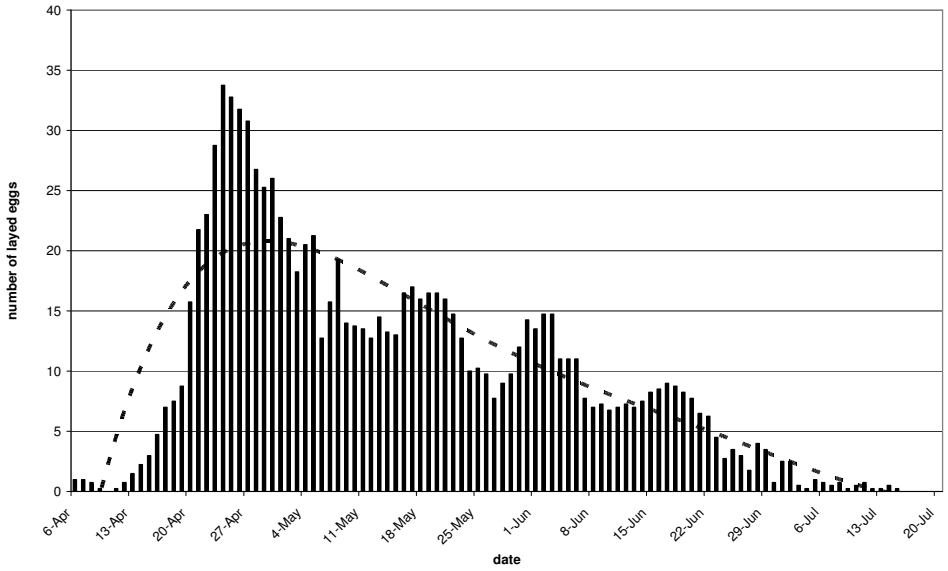
The incubation period takes about 28 days (article), after which the hatchlings are completely flightless, what more their movements are very limited in the first few weeks. The chick(s) at the age of 6-8 weeks are able to fly smaller distances, but prefer to walk as far as possible. It means the hen and her nestling(s) have to spend 2,5-3,0 months being "flightless" in the agrarian environment. It is obvious, that this fact and the nowadays commonly widespread farming technology, the generally intensive use of land are not reconcilable.

Breeding sites should be managed in line with the following **criteria**:

- Relatively large open areas, with suitable vegetation structure, which means the offer of possibilities for the birds to select best location within the region by having various type and height of vegetation.
- Vegetation should be high enough to be able to hide the incubating hen, but not too dense to allow the smaller chicks to walk around the nest at the first few weeks.
- Sufficient invertebrate food supply for the hens and the growing chicks as well, which can be provided by larger plots of favourable crops, or smaller ones providing a variety of habitats.
- Low number of predators.
- No disturbance before laying eggs and no direct threatening or even disturbance during incubation and the chick-raising period.

According to the facts mentioned above, first of all the mapping of breeding sites should be implemented at each Great Bustard habitat, and on these sites the farming in a Great Bustard friendly way should be introduced, with the growing of favourable crop rotation, the best choice of crops and their management.

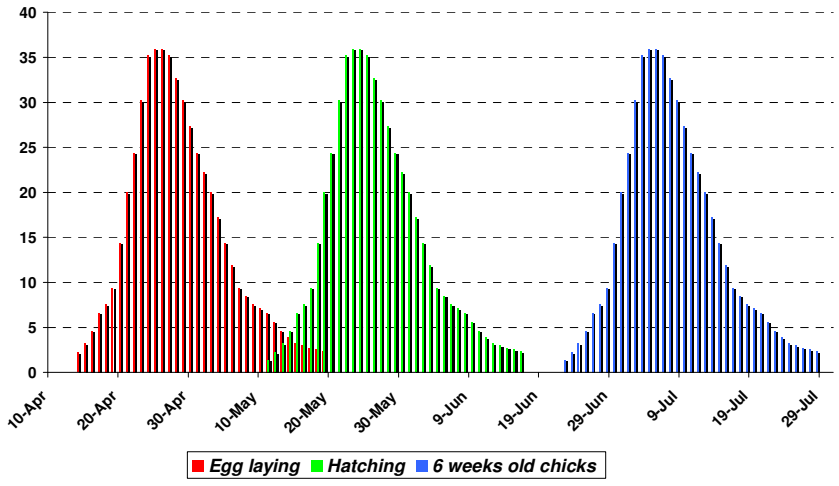
Recommendation on management
The management of Great Bustard breeding sites should take into consideration the **breeding period** of the local Great Bustard population. The Pannonian population according to the examination of eggs originating from natural Great Bustard breeding sites in Hungary shows the following pattern on the timing of laying eggs:



As it can be seen on the graph, the egg laying period in the natural environment is markedly asynchronous and covers a long period from the 6th of April until the 13th of July. As it covers almost 3 months it is obvious, that in the graphs above the first clutches and the eggs originating from replacement breeding are also involved, which indicates a high proportion of unsuccessful broods leading to replacement clutches.

If the **management regulations** focused on protecting all breeding birds, it should regulate agriculture between the beginning of April (when the first eggs are laid) and the end of August (when the last chicks are 6 weeks old). In practice it would mean an absolute ban on farming activity.

To deal with this problem the suggestion is to focus on the first clutches, and by giving the full protection to these birds the number of replacement caused by unfavourable agricultural activity can be minimized. The practical graph showing the **breeding activitiesofthe first clutches** of the Pannonian Great Bustard population givesthe following **sensitive periods for the individuals**:



It gives a "sensitive period" between the 15th of April and the 15th of July.
The recommendation on management of Great Bustard breeding sites is to avoid any farming activity, especially seeding, mowing, spraying, cultivating and even harvesting in the mentioned period.
According to this principle the following **crop production and basic management** are recommended with the adaptation of local characteristics:

***Grassland*:** natural, or semi natural habitats managed by grazing and/or mowing. Grazing is not allowed between 15th of March and 15th of June. Mowing can be done not earlier than 15th of July, the later the better. Preferably mowing first and grazinglater in autumn and winter. Grasslands are planted mostly at lower elevations.

***Set-aside fields and fallow lands*:** created by sowing/seeding or just naturally grown vegetation on ploughlands. Mowed or cut as late as possible, but not earlier than 1st of August. It can be grazed after mowing, but not necessarily.

***Alfalfa and other perennial crops**:* a compulsory element of crop rotation, mowed not earlier than 1st of July, preferably after the 15th of July. Due to the late harvesting the mixture of alfalfa and grass is recommended for seeding, pure alfalfa overgrows and gets easily rotten by this time of the year. The first cut is normally used for making hay or silage for sheep or beef cattle as part of the extensive animal husbandry.

***Cereals*:** seeding mostly in the autumn time, but not later than the 1st of April. No spraying or other treatmentof crops during the breeding period. To avoid the overgrowth of weeds applying a higher density at seeding is recommended instead of the use of weed-killers, or other chemicals. Early harvested cereals, like barley is not recommended.

***Winter pea and other annual crops*:** seeding mostly in the autumn but not later than the 1st of April. No spraying or other treatmentof crops during the breeding period, harvesting earliest 1st of July.

2.3. Agrarian habitats as moulting areas

Description
Large moulting areas cannot be identified so distinctlylike it can be in the Iberian Peninsula (article), but obvious aggregation of moulting birds can be observed year by year at almost all Great Bustard populations in Central Europe as well. This topic is probably the most under-watched, and although the largemovements (up to a few hundred kilometres) of the Central European birds to the moulting areas might be excluded, seasonal "vanishing" of Great Bustards can be detected by the end of the summer and early autumn. On the other hand this is the least active period of the species' life, due to the limited flight ability, thanks to the moulting of flight feathers.

The sites nominated as moulting areas - according to our little information about them- , match the following **criteria**:

- Large open areas, with continuous and undulating landscape, often at lower elevations with the mosaic of wetland patches (smaller reed beds), which gives the opportunity to hide even larger flocks.

- Most commonly continuous stubble-fields of cereals, or oil-seed rape, but often grasslands or alfalfa plots with sufficient food supply.
- No or minimal human disturbance in August and September.

The moulting areas are first visited by the adult males, right after the mating season (by this time the leks are completely deserted), and are followed by the females with unsuccessful or failed breeding, and by the young males. The females with first year juveniles join to flocks mostly at the wintering grounds.

Recommendation on management
There is relatively little information about the proper management of the moulting areas, but in general the low disturbance and the sufficient food supply must be ensured. Regardingperennial crops (like alfalfa or grass) the timing of mowing should be in late July, early August or in September. Smaller plots or numerous land users within the moulting areas are normally not wanted, due to unsynchronized visits on fields causing regular disturbance.
On cultivated lands - after the harvesting ofcereals or the oil-seed rape, the cultivation of stubble-fields, or the remowing (often by the use of chemicals) - the weeds can reduce the food supply. As moulting takes an extra amount of energy, easily accessible food and the minimization of disturbance causing extra losses of energy are the main principles at the management of moulting areas.

2.4. Agrarian habitats as wintering grounds

Description
The main winter food of the Central European Great Bustards is the leaves of the oil-seed rape, sown in the autumn, alternative feeding sites can be the alfalfa or the Savoy cabbage plots.

Wintering grounds, - which are normally traditional regions, but the choice of certain plots are influenced by the yearly conditions and crop rotation of the site - should be managed in line with the following **criteria** (see more in the ***"Guidelines on measures to secure the successful wintering of Great Bustards"*** - CMS/GB/MoS3/Doc.7.4.5.):

- Large open areas with undulating landscape, where suitable feeding sites, like oil-seed rape fields are available, where human disturbance is low enough (principle wintering ground).
- Alternative feeding plots are also present in the vicinity in case of disturbance, like hunting, travelling or agricultural activities (secondary and tertiary wintering ground).
- Suitable, undisturbed roosting site can be found in the vicinity with low vegetation, from where approaching the feeding sites is easy.

In the wintertime the movements and behaviour of Great Bustards, apart from thecase of extreme weather conditions, are relatively well predictable. A regular and more or less simple daily routine for the birds is the visit to the feeding sites (if not roosting on it) in the morning, spending the whole day with feeding and in late afternoon flying (or sometimes just walking) back to the roosting sites. Due to these predictable movements and normally well-known stamping grounds,**winter counts** mostly are carried out at feeding or at roosting sites, however it is much easier to count while birds are feeding, especially if the vegetation is covered with snow.

On **mild days** the Great Bustards regularly visit the plots of perennial crops, especially grasslands and alfalfa fields for resting around mid-day, which often are the roosting sites as well. One of the reasons that the birds like to "have a rest" on these sites, is the fact that when the temperature gets higher, their feet can get stuck in mud, which makes walking difficult. The other reason is the different and various food supplies offered by these habitats, as there is a good opportunity for hunting on insects or smaller rodentson warmer days during the winter months.

On **harsh winters**, when the leaves of the oil-seed rape have thick snow cover, or when the snow is frozen on the surface, it is difficult for the birds to get the food. In these cases, especially if these conditions last for several days or weeks, the birds can easily move to longer distances, where the weather conditions are milder. In case of the Central European Great Bustards, as they are not obligatory, but partialmigrants, it can result in movements even to the Mediterranean. During this long migration the losses can have an impact on the entire population, as it happened several times in the past.

Recommendation on management
The management of wintering groundsshould cover the management of feeding sites, roosting sites (which are commonly display or nesting sites as well) and also the regular monitoring of the wintering flocks.

The **management of feeding sites** normally is based on establishing one or more oil-seed rape plots within or in the vicinity of the traditional wintering grounds. As the seeds of the oil-seed rape are small, the optimal preparation of the soil before sowing is the first and very important step. Also the timing of seeding haseffect on the quality of the leaves. In Central Europe, the oil-seed rape is sown late August or early September. If it is seeded in time, the plants can spring forth and have time to grow big enough being able to last all winter and offer suitable nutrition for the Great Bustards.The overgrowth of the weeds often causes problems by reducing the viability of the oil-seed rape plants. To avoid this weed-killer might be needed in autumn.

The location of the plots should be on open and, if possible, a bit undulating area, where birds can overwinter with minimum human disturbance to avoid extra wasting of energy. The various relief-elements can offer shelter to the birds against strong wind, and in case of snowing the thickness of snow can vary at different plots. Especially, if the snow fallsin wind, thanks to the relief, there will be always snowless, bare patches, where the Great Bustards can find the leaves of the oil-seed rape.

Once the plots are created and occupied by the birds, the regular **monitoring** of wintering flocks and weather conditions is needed. In case of **harsh winters** with thick snow cover the "cleaning of feeding sites" is needed to avoid movements of the birds and keep them in a well-watched and safe location. If the access for leaves is not ensured the unpredictable movements might cause unpredictable losses to the Central European Great Bustard population.

Cleaning can be done by the use of snow-plough connected to a tractor, or simply by pulling 2 or 3 larger tires by a tractor or even by a 4-wheel drive car. Normally 1 or 2 hectares are enough to clean for a while, but it depends on the size of the flock and the weather conditions. According to the monitoring results this activity might need to be repeated, as long as the weather conditions turn better.

According to the experiences, by the **end of the winter** (January or February), when the moustache of the adult males starts to grow as a result of the body moult and an obvious sign of the beginning of mating season, the motivation for larger movements become lower and lower. The birds normally stay sedentary even if the end of the winter or the early spring weather turns severe, but there are some exceptions, as it happened in the past.
As these occasional movements are pretty unknown, followingour best practice, regularly monitoring and carrying out further research are the principles of management activities.

2.5. Expectation of the agri-environmental schemes on Great Bustard sites

As the modern technologies and the intensive way of agrarian production often are not reconcilable with the ecological needs of the Great Bustard, the elaboration and introduction of agri-environmental schemes was necessary for the protection of the Central-European populations of the species.

The use of agri-environmental schemes means a general extensification in the use of land, makes restrictions in management practices, has effect on the selection of crops grown and type of animals kept, and sometimes even leads to the transformation of the whole farming structure. The shortfall resulted by the regulations of the agri-environmental schemes obviously should be compensated, especially right after its introduction, but the program finally should result a sustainable and "self-propelling" system.

As the Great Bustard is a bird species with special ecological needs(first of all its ontogenesis takes several months) and with a large territory, all **restrictions** have a serious economical aspect, due to their large spatial and temporal extension.

A well developed agri-environmental scheme established for the benefit of the Great Bustard should **increase the breeding success and reduce the mortality rate** at the distribution area of the species by proper **management** of the agricultural environment.

The three main **principles** are:

1. To reduce disturbance of birds all around the year, but especially during the reproductive season and in the wintertime.
2. To offer suitable breeding sites by creating optimal vegetation structure and by growing favourable crops and to avoid endangering nests and chicks by agricultural activities.
3. To ensure the sufficient food supply all around the year, butespecially during the reproductive season and in the wintertime.

Due to the special requirements related to the Great Bustard conservation measures, the **spatial distribution** of the agri-environmental scheme is essential in order to make the program effective and successful as well as to determine the most effective **conservation measures**.

For this reason a comprehensive **monitoring system** needs to be elaborated and maintained to identify the current and potential locations of the Great Bustard protection program, which should be part of the scheme. The monitoring should cover the effect of the different kind of measures as well, and time to time revision of these regulations is needed by the regular analysis of monitoring results.

In the next chapter a few examples will be introduced regarding the structure and the development of different kinds of agri-environmental schemes within the range of the Central-European Great Bustard populations.

3. RANGE STATES WITH APPLIED AGRI-ENVIRONMENTAL SCHEMES FOCUSING ON GREAT BUSTARD CONSERVATION

3.1. AUSTRIA

3.2. HUNGARY

3.2.1. Antecedents (the years 2002 and 2003)

The National Agri-Environmental Program (NAKP) as the agri-environmental scheme, was introduced for the first time in 2002 at 11 model sites, so called "Environmentally Sensitive Areas" (ÉTT). The effects of the scheme on the land use and on the conservation of natural values were monitored on 4 sites; on the "Dunavölgyi-sík", the "Hevesi-sík", the "Borsodi Mezőség" and the "Észak-Cserehát" sensitive areas, out of which 3 are nominated as Great Bustard habitats.

3.2.2. Period between 01.09.2004 and 31.08.2009

3.2.3. Period between 01.09.2009 and 31.08.2014 (present regulation)

3.2.4. Recommendations for the period after 31.08.2014

3.3. GERMANY

3.4. SLOVAKIA

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