

**BIODIVERSITY INDICATORS IN AGRICULTURE: A
COMBINATION OF SPECIES AND HABITAT APPROACHES.
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-- Plenary Session 2 --

Linking Wild Species With Their Use of Different Agricultural Habitats

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Biodiversity indicators in agriculture: a combination of species and habitat approaches.

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Abstract

In this paper 20 different documents on "wild" biodiversity of farmland by OECD, CBD, EU, countries and researchers are reviewed. The general picture from these papers is that a combination of habitat and species indicators is supported, while for habitats both quantity and quality (measured by species) count. In the 20 paragraphs of section II of this paper the main findings of the review are presented in *italics* in each paragraph.

In section III the importance of semi-natural grasslands to biodiversity is highlighted, as well as the threats to them and their decline, and hence the relevance to monitor their status (quantity and quality), reasons why they may not miss in the integrated OECD biodiversity-habitats system to be developed in the workshop.

In section IV concrete proposals are made for a combined habitats and species approach, building upon the existing OECD system.

I Introduction

Content of the paper

This paper is meant to contribute to the discussion on agri-environmental indicators from the viewpoint that the current *OECD "biodiversity" and "habitat" indicators indicators of OECD (OECD, 2001) could be put together into one system.* For this purpose information on indicators and general information on habitats is brought together, knowing that information on species (especially birds) will be covered by other authors.

We will first discuss 20 *papers* relevant to the discussion on biodiversity indicators in agriculture. Then a section will deal with semi-natural grasslands, in order to show their relevance in the context of this discussion. Finally a proposal for the next step in OECD work will be made.

Semi-natural grasslands, habitats and species approaches

From a wealth of literature (and any field trip!) it is clear that semi-natural grasslands are of prime importance to biodiversity on farmland. Therefore they should be included in any indicator system, as this is the only way to catch this concentration of species, with more or less common habitat requirements, as a whole, although additional indicators (like sensitive plant and insect species) will be needed to monitor their quality.

Of the species with (often) different requirements than those that are restricted to semi-natural grasslands, birds are obviously very suitable indicators. On birds much information is available, both on status and trends and on habitat requirements. In order to cover semi-natural grasslands and species with other habitat requirements together, either *habitats and species could be combined or birds can be grouped under specific habitats.* Of course additional species approaches to measure and monitor the quality will always be necessary. However, a *species approach alone, is discouraged* by the author.

The reason to advocate the monitoring of semi-natural grasslands as an indicator is not only the concentration of species, but also the good measurability, and, indeed, the alarming decline during the 20th century, which is, alas, still going on. An additional concern is the irreversibility of loss of semi-natural grassland. Once lost, due to intensification of agriculture or land abandonment, it will take many decades to restore the habitat, if this will ever happen. In other words, losses are often *irreversible*. Therefore it is important to follow the development of this indicator closely. Only with such information agri-environmental and related agricultural and trade policies can be shaped in an environmentally adequate way.

For all these reasons, a number of key OECD criteria for agri-environmental indicators (OECD, 2001) are well met by semi-natural grasslands as an indicator: *policy relevant, measurable and easy to interpret*. More details are given in section III.

State, pressure and response indicators

Some main categories of indicators, used in literature, are "state" (e.g. the status of biodiversity), "pressure" or "driving forces" and "response" (e.g. policy responses) indicators. In this paper, like in the whole seminar, the *focus is on "state" indicators*, in other words, on biodiversity itself.

Indicators for local, national, regional or global scale

The papers reviewed below are dealing with biodiversity on a very abstract level. This is unavoidable in international approaches. However, depending on the *objectives* of a monitoring process (for which indicators are needed) and the *scale* (parcel, area, district, country, continent or the world) indicators of a different character are used. It is clear that, in order to monitor the quality of a specific area, species and habitats occurring in that area should be monitored. On a higher geographical scale, however, like in European, OECD or CBD context, we have to select more general indicators if the monitoring process should remain feasible. Of course there are exceptions, like CITES species. *In this paper we are dealing with indicators that can be used on a national and continental (and perhaps OECD-broad) scale, based on experience in Europe.*

The scope of agricultural biodiversity in this paper

Another restriction that was observed in this paper, is, finally, the *scope of agricultural biodiversity* taken into account. In the annex ("the scope of agricultural biodiversity") of the CBD's Programme of Work on agricultural biodiversity (Decision V/5) several "dimensions" of agrobiodiversity are discerned. In the EU's Community Action Plan for Biodiversity in agriculture (2001) these dimensions are summarized in *three "main fields of biodiversity"*: (1) the genetic variety of domesticated plants and animals, (2) "wild biodiversity" (wild flora and fauna related to farmland) and (3) life support systems" (soil organisms, pollinators, predators). This seminar deals explicitly with the mentioned categories (1) and (2). *This paper only deals with category (2); wild flora and fauna or "wildlife and habitats" in CBD terminology.*

II. Key elements of current initiatives and related literature

In this section we shall briefly touch upon the approaches of the OECD, the EU, the CBD as well as the UK and Canada, as well as some related literature.

II.1. OECD: " Environmental Indicators for Agriculture: Methods and results" (2001)

Several of the agri-environmental indicators in this publication are relevant to biodiversity. However, as said before, only " *state indicators*" are taken into consideration here: "biodiversity" and " wildlife habitats". The OECD " landscape" indicator also covers elements that are relevant to biodiversity. These will be taken into account in this paper and can easily be combined with the " wildlife habitat" approach.

Under " **Biodiversity**" the relevant indicator for wild flora and fauna is " *Trends in population distributions and numbers of wild species related to (dependent on or affected by) agriculture*" and " *Trends...of non-native species threatening agricultural production and agro-ecosystems*". In this paper we will pay attention only to the first component, being by far the most important feature in Europe..

Under " future challenges" the development of a standardized methodology in the form of a *Natural Capital Index* is mentioned as a possibility.

Regarding *baselines* it is said that these can be important for valuing the state and trends in biodiversity. It is also said that in many cases the only practical baseline will be the first year from the beginning of monitoring programmes. In the section on the work in CBD-SBSTTA we will see that in that framework a pre-industrial agricultural baseline was recommended. The advantage is, that the whole decline of biodiversity is made visible, while in the case of a baseline in the starting year declining trends are invisible if they have already taken place. OECD says that it may be more useful for policy makers to measure progress towards agreed *targets in stead of baselines*.

In addition it is judged useful to improve the understanding of the *spatial distribution* of biodiversity.

Under " **Wildlife habitats**" (state and trends of) three habitats are discerned: " *Intensively farmed agricultural habitats*", " *Semi-natural agricultural habitats*", " *Uncultivated natural habitats*" and, in addition, the " *Habitat matrix*".

The *intensively farmed habitats* certainly hold some biodiversity, but as a broad category it does not give much information. The importance to migratory birds (e.g. geese) e.g. depends greatly on the *location* of the habitat.

Therefore the "*share of each crop*" to be calculated under this indicator does not seem to be very relevant. It could be considered to *abolish* this indicator and to *replace* it by a species approach.

The "*share of organic agriculture*" is of more, though very general, relevance (and certainly no state indicator) and it is doubtful if all organic agriculture should fall under "intensive" agriculture.

Summarizing, it would be better to look for *other indicators* for intensively farmed land, e.g. certain *bird species (or groups of species or their habitats)*.

The *semi-natural habitats* are indeed of key importance. In Europe they represent many hundreds if not thousands of plant species that are almost confined to this habitat (see section on semi-natural grasslands furtheron) as well as great numbers of associated invertebrate species.

The *uncultivated habitats* are now *restricted* to "net area of aquatic ecosystems converted to agricultural use" and " area of "natural" forest converted to agricultural use". It would be better to measure not only the change but *also the status*. By

monitoring the status, the change will be shown automatically. *These habitats should be broadened with landscape features as hedges, ditches and other linear and small features.*

Some care must be observed in the use of *uncultivated habitats*. Small habitats (woodland/forest of a few hectares) and linear elements have an important "edge effect", e.g. for birds, mammals and insects and can therefore count as habitats relevant to biodiversity of farmland. However, if forest areas are larger, and real forest species would make up a great part of the total number of species, this would trouble the picture. These species can rely on large areas of forest area, while the species restricted to farmland have no alternative and should therefore have a higher priority.

Summarising, the OECD's "biodiversity" (in practice: species) and "habitats" indicators are a good basis for an integrated system, though the relationship between the two needs clarification and the habitats indicator needs some improvements. We come back to that in section IV.

II.2. The CBD-SBSTTA paper "Recommendations for a core set of indicators of biological diversity", UNEP/CBD/SBSTTA/3/9 and SBSTTA Recommendation III/5
CBD-COP 4 endorsed SBSTTA Recommendation III/5, which in turn said the paper SBSTTA/3/9 as well as SBSTTA/3/Inf.13 provide a good basis for the development of further work on indicators, noting also that further work on indicators should take account of the ecosystem approach (Decision IV/1A, para 3,4)

SBSTTA/3/9 proposes four categories of state indicators:

- *Ecosystem quantity*, split out in "self regenerating" and "man-made" area as % of total area.
- *Ecosystem quality* in terms of *species* abundance relative to a postulated baseline
- *Ecosystem quality* in terms of *ecosystem structure* (easily obtained information over large areas)
- *Threatened or extinct species and habitat types*.

In addition it was suggested that each CBD party could develop a "national index of natural capital (NCI)", as a single figure to express an aggregation of multiple state indicators, expressed as a percentage.

In other words, these papers recommend a combined use of indicators on quantity and quality of ecosystems, species and an index.

In addition the paper considers four options for *baselines* and recommends the "pre-industrial agricultural baseline". In Europe that would be the situation around 1900, or, say, before 1930, when semi-natural ecosystems were still in a good condition. In recent years more attention is being given to the restoration of *natural ecosystems* in Europe as they occurred before the great reclamations in and around the middle ages. By some authors these ecosystems are believed to have included both forest and open land, in complex ecosystems, largely influenced by wild herbivores (Vera, 1999). Although used for setting targets, such references are not used for the monitoring of biodiversity of (centuries old) farmland.

N.B. An *additional relevant CBD paper*, not reviewed for the Zürich seminar however, is: "Recommendations for a core set of indicators of biological diversity- Background paper by the liaison group on indicators of biological diversity".
UNEP/CBD/SBSTTA/3/Inf.13.

II.3. The recent CBD-SBSTTA paper " Indicators and environmental impact assessment", UNEP/CBD/SBSTTA/7/12, September 2001: Annex I.

In Annex I to this paper five principles are given for developing national-level monitoring programmes and indicators. The principles are:

- 1) Relevance to the objectives of the Convention: applicability to status and trends of biodiversity; to direct and underlying causes of biodiversity loss and degradation and to the effectiveness of measures taken.
- 2) Management and policy relevance: the indicators should show to policy makers when policy interventions are necessary and to managers the need to sustain appropriate action, to take remedial action or to change management techniques.
- 3) User-driven nature: the choice of indicators should be a cooperative exercise between policy-makers and scientists.
- 4) Relevance to target audience: indicators should summarize (and simplify) data on complex environmental issues to indicate the overall status and trends of biodiversity.
- 5) Technical features: indicators should (a) be scientifically sound, (b) rely on achievable and affordable data, (c) address key properties of biodiversity and be compatible with the ecosystem approach, (d) be accessible to accurate and affordable monitoring, (e) be sensitive to pressures, (f) where possible, be stable and have natural fluctuations distinguishable from anthropogenic factors, (g) be useful as an indicator for some decades and (h) be part of a monitoring system using determinable baselines for the assessment of improvements and declines in biodiversity, and targets.

The above-mentioned criteria are well in line with the existing four main OECD criteria for agri-environmental indicators (OECD, 2001): policy-relevant, analytically sound, measurable and easy to interpret. Both certain species and habitat indicators can meet these criteria. The point of compatibility with the ecosystem approach / ecosystem-relevant character could be an argument not to rely on species alone as the presence and abundance of species does not always indicate the size and integrity of ecosystems and habitats.

II.4. SBSTTA paper " Indicators and environmental impact assessment", UNEP/CBD/SBSTTA/7/12, September 2001: Annex III

In the annex III to the above-mentioned SBSTTA document the outcome is given of an enquiry on *national level indicators* among CBD parties. The enquiry itself contained a set of standard questions, subdivided in state, pressure and response indicators. The state indicators contained questions on i.a. " the current state of biodiversity", on changes therein, on " species abundance and/or distribution, species-richness and ecosystem structure and complexity" .

However, *most responding countries use only pressure indicators* (by indicator; 36-61), and *only a minority* (4-18 by indicator) *used some kind of species approach*, on the national level.

II.5. The Communication from the European Commission to the Council and the European Parliament " Indicators for the Integration of Environmental Concerns into the Common Agricultural Policy" (COM(2000)20final).

In this paper five levels of indicators are discerned. State indicators appear under "Global impact" (" Habitats and biodiversity", " definition of operational indicators remains a major challenge"), " Site specific state" (" Species richness/birdlife

richness) and "Harmful and beneficial processes of agriculture" ("area of high nature value grassland etc"). Although the system of categorization could be discussed, it is important to note that " *high nature value grasslands*" (also to be further developed; in practice largely coinciding with semi-natural grasslands and valuable bird areas) and " *species richness*" are included.

In other words, *a combination of habitats and species approaches seems to fit well in the objectives of this paper.*

II.6. The Communication from the Commission to the Council and the European Parliament " Statistical Information needed for Indicators to monitor the Integration of Environmental Concerns into the Common Agricultural Policy" (COM(2001)144final).

Here the relevant indicators of the above paper come back, but in a different form:

Indicator 26: " *Area of high nature value*", but as a subset of indicator 4, "area under nature protection". This is a mixing up of state and response indicators which is probably based on an error, as many HNV grasslands are not (yet) under protection at all.

Indicator 28 " *species richness*" is in line with the former paper, while " *density of linear elements*" was added.

As could be expected, this paper also advocates, in line with the former paper, a combination of habitat and species approaches.

II.7. The European Community Biodiversity Action Plan for Agriculture (2001)

In the annex to this paper 40 " Tentative indicators (subject to further investigation)" are listed, in relation to a number of priority actions. They include state, pressure and response indicators. State indicators (biodiversity or biodiversity-related) are: removal of extensive pastures , evolution of different livestock systems, evolution of key species of birds and plants, land cover changes, area of High Nature Value under specific conservation, landscape indicators, area of wetlands adequately managed, evolution of "species" or " ecosystems" indices, length by type of landscape feature and evolution of species diversity of hedges.

As could be expected again, in line with the former EC papers, a combination of habitats and species as indicators is advocated here for (biodiversity) state indicators.

II.8. The EU Birds Directive (79/409) and the Habitats Directive (92/43).

In a European context it is logical to monitor the development of the habitats and species of community interest mentioned in the annexes of these directives. This gives information of high conservation interest. Although this is certainly a necessity within the Natura 2000 areas, these species and habitats are less suitable as indicators for the wider countryside, as a) the grassland types and grassland species listed in the annexes shows some shortcomings and b) governments seem to rather reluctant to designate Natura 2000 areas on farmland, so that we would have to monitor these habitats and species well beyond the borders of the Natura 2000 network.

Nevertheless it goes without saying that a detailed subdivision of e.g. semi-natural grasslands is very important tool for conservation policies on national and regional scale. However, in practice there will always be different levels of monitoring, like on the scale of sites, countries, continents, OECD scale and global scale. In other words one approach does not exclude the other.

Summarising the habitats and species of the annexes of the two directives are important, though not perfect, indicators, on a national and regional scale, but for OECD level we need less detailed indicators.

II.9. The UK paper " Towards Sustainable Agriculture: a pilot set of indicators", MAFF, 2000.

This report contains information on 35 indicators, 27 of which can be regarded as agri-environmental indicators. Three of them are directly linked to the state of biodiversity: " *Characteristic features of farmland*" (i.a. *length of hedges*), " *Area of semi-natural grassland*" and " *Populations of (20) key farmland birds*" .

The paper gives a figure of around 2 million hectares of remaining semi-natural grassland in Great Britain, while 97% of the lowland semi-natural grassland has been lost since the 1930s.

The paper also shows that the length of hedges fell from over 550,000 km in 1984 to less than 400,000 km in 1993.

Regarding birds it shows a sharp decline (numbers more than halved) of 12 species of farmland specialists since the mid 1970s.

This paper shows that a combination of semi natural habitats (semi-natural grasslands and linear features) and bird species (whether in or outside these areas) gives a lot of relevant information.

II.10. The report " Environmental Sustainability of Canadian Agriculture" -" Report of the Agri-Environmental Project" (McRae et al, 2000).

The report gives a detailed description of the " habitat matrix" approach, also described in the above-mentioned OECD publication. The basis of the approach is not the number of species but the use of different habitats in the course of the year. By thus analyzing the requirements of a great number of fauna species, a number of " habitat units" is allotted to different habitat types. The higher the number, the greater the importance to fauna is. Varying by ecozone 59-75% of the units were attached to " *All other land*" (5-39% of the area, by zone) and 12-19% to " *Natural Land for Pasture*" (10-62% of the farmland, by zone). Cropland (7-17% of the habitat units; 16-75% of the land) was the third in importance, while Summer fallow and Tame or Seeded Pasture were of little importance.

It cannot be excluded that the importance of "natural land for pasture" would further rise if flora had been taken into account and if typical forest species had been left out from "all other land".

The Canadian approach is an even refined example of a habitat approach, taking species needs well into account. A strong point is, that it covers all habitats. Weaker points could be that the quality of the habitats is not directly monitored, that the focus is on fauna while flora often has different requirements and that forest species in uncultivated habitats may be over valued. Another point is that the real differences in biodiversity value within habitats may be even more variable than the already important differences within habitats among the six ecozones. In other words, the value of a habitat for fauna also depends on its location, but that is reflected only at the level of the (huge) ecozones.

II.11. The report " Status and Trends of the Nation's Biological Resources" of the U.S. Department of the Interior & the U.S. Geological Survey (Mac et al, 1998)

The status of biodiversity is described by region. One of the 15 regions is the former range of natural grasslands. Therefore the report holds very comprehensive and

accessible information on this habitat type in the USA and Canada together. It shows that the decline in Tall grass prairie is over 99% in most states, but "only" 83 and 90% in Kansas and Texas respectively. The decline in Mixed grass prairie is 30-99.9%, varying by state and for Short grass prairie these figures are 20-86%. In addition qualitative information on species and plant communities (quality of the habitat) is given, showing the importance of this habitat.

Although not "semi-natural" like in Europe but rather "natural", though perhaps depending on livestock as substitutes of bison, it seems that "area of (semi-)natural grasslands" would be a relevant indicator of biodiversity in North America also, although additional quality indicators should be added.

II.12. Report of the High Level Conference on EU Enlargement " The Relation between Agriculture and Nature Management", Wassenaar, the Netherlands, 22/24 January 2001.

The report gives an overview of estimated share of *semi-natural grasslands* as % of the total agricultural area in the 10 EU candidate countries in CEE. The average was 12 % with Slovenia as the richest country in semi-natural grasslands with 54%. In addition some qualitative information on "*valuable bird areas*" is given (based on information from Birdlife International), comprising the " Important Birds Areas" (IBA's) of Birdlife International (Heath & Evans, 2001) as well as certain other areas. According to the paper more areas than the IBA's alone qualify for policy intervention (related to biodiversity).

In preparing this report the decision was made to concentrate on semi-natural grasslands and birds. Areas rich in landscape features, as far as still present after the collectivisations, were taken into account but there were indications that in these countries these coincided largely with semi-natural areas (which is not always the case in other countries!). The information on semi-natural grasslands in several of these countries is still being improved constantly by national mapping projects, financially supported by the Dutch government.

II.13. The report " Agri-environmental indicators for sustainable agriculture in Europe" by ECNC (Wascher, 2000)

Although it is impossible to quote this very comprehensive report in a few words, some points will be mentioned. In this report the *quantity of characteristic habitat types* is recommended as an indicator, but also *different species approaches* to monitor the *quality of habitats*. In addition *spatial complexity* and *corridors/linkages* between habitats are recommended.

Wascher lists 37 European bird species which could be suitable indicators. Apart from some wide ranging or less clear species, many of them could be grouped to a few habitat types.

In this report not only a combination of quantity and quality of habitats is recommended as indicators, but also some additional features.

II.14. The report " The status of biodiversity on farmland in Europe (Birds) by Birdlife International (Nagy, 2001) ; one of the background papers for the Pan European conference on agriculture and biodiversity, hosted by France, organized by the Council of Europe in cooperation with UNEP (June 2002).

The report, like some other BLI publications (Tucker&Heath, 1994, Tucker&Evans, 1997, Heath&Evans, 2000), makes clear that birds are an important species group on farmland, with many species of conservation concern (173). So, whether birds are

good indicators for other groups of organisms or not, at least bird indicators for birds should be used!

The report splits Europe's farmland up into 7 habitat types: (1) Arable and improved grassland, (2) Steppic habitat, (3) Montane grasslands, (4) Wet grasslands, (5) Rice cultivation, (6) Perennial crops and (7) Pastoral woodland.

The report gives insight not only in status and trends of bird populations, but also in links between birds and habitats. In this context it may be useful to recall that the BLI paper presented to this workshop (Heath & Rayment, 2001) advocates the combination of habitats and species indicators, the latter split up in widespread and common species and threatened species.

II.15. Important Bird Areas in Europe (Heath & Evans, 2000).

This report gives a wealth of information on the " Important Bird Areas" of the title. There is not much doubt about the need to monitor both the quantity and the quality of these areas. For the purpose of developing biodiversity indicators on farmland, however, it should be considered to take a somewhat wider approach for birds areas than the IBA's alone. In certain countries, a rather great area of bird areas is not covered by IBA's, due to the criteria used, while there may be a concrete need to apply specific agri-environmental and/or hunting policies in such areas and while there is hence the need to monitor the bird populations here. In the Netherlands e.g., many of the wintering areas of water birds of international importance are not covered by IBA's and the same goes for breeding areas of so called "meadow birds" (i.a. waders and ducks). A preliminary check of some Central and Eastern European countries gave a similar picture, although this problem does not exist everywhere.

II.16. The report " Biodiversity indicators for the OECD Environmental Outlook and Strategy" - a feasibility study (Ten Brink, 2000).

In this report the *Natural Capital Index* is described (also mentioned in OECD, 2001 and in one of the quoted CBD-SBSTTA papers). This index includes a product of ecosystem quantity and ecosystem quality, based on species abundance. For this method a *baseline* is necessary.

If the selected habitats cover all relevant categories of farmland biodiversity sufficiently, the method seems to be well in line with most other approaches, using a *combination of habitats and species*. The method is compatible with the variability of national monitoring systems, which is a strong point, as in this way different datasets could be compared. The challenge is, however, to describe habitat types that cover relevant species groups which are not linked to (semi-)natural habitats, in order to cover the totality of biodiversity in a satisfying way. In Europe this would mean that e.g. breeding areas of birds of wet grasslands and of steppe birds would have to be discerned, as well as staging and wintering areas of migratory water birds.

The study shows a balanced approach of quantity and quality indicators, based on information on habitats and species. However, it should be recommended strongly to apply the method to different main categories of farmland habitats in stead of to all farmland as a whole, as the latter approach would not give clear information on the state of key habitats (semi-natural grasslands, various bird habitats, hedges, etc.). On European farmland it could work well if both semi-natural habitats and (other) habitats of fauna outside the latter could be categorized by habitat, like by Nagy (above).

If the baseline, an essential element in this approach, would pose problems, other ways could be sought to use the idea of a joint quantity-quality approach. If a

baseline would be chosen after a great decline that has already taken place, the situation before the decline could be described in qualitative terms.

II.17. The report " Nature conservation and new directions in the Common Agricultural Policy" (Baldock et al, 1993).

This report introduced the term " *High Nature Value areas*" (HNV areas) , later included in the EU Rural Development Regulation 1257/99 and in the three EC papers quoted above. The report discerned the following categories of " HNV areas": (1) semi-natural grasslands, (2) lowland wet grasslands, (3) moorland and heathland, (4) mountain pastures, (5) dehesa/montado, (6)Mediterranean scrub, (7) coastal marshes, (8) grazed forests, (9) perennial crops, (10) bocage landscapes and (11) low intensity arable land.

The OECD indicator " semi-natural habitats" would cover (1), (3), (4), (6),(7), (8). In addition (2), (5) and (11) could be covered by a new habitat category for bird areas. Another category would be necessary for areas rich in vertical elements (9, 10, 5). Note that not all HNV areas are low intensity farming systems (2 is not, in many cases), though most are.

II.18. The report " The Nature of Farming" (Baldock et al, 1994).

The report classifies low intensity farming systems in four main categories: (1) Low intensity livestock systems (with 3 sub categories), low intensity arable systems (with 3), low intensity permanent crop systems (with 2) and low intensity mixed systems. Compared with the former report the *mixed systems* are a new category, with certainly biodiversity relevance.

The paper gives insight in the farming systems related to HNV areas under extensive exploitation.

II.19. The paper " Land use policy and plant conservation, especially regarding grasslands", part of the Planta Europa proceedings 1995 (Van Dijk, 1995).

In this paper (and a few similar papers of later dates) 6 main European categories of "farmland with high nature conservation value" are discerned. They can be considered "habitats", although they are partly based on the requirements of a limited number of species (birds). The quantity and quality of these " habitats" could be indicators for biodiversity on European farmland.

The categories are: (1) semi-natural grasslands, (2) important breeding areas for birds (wet grasslands for water birds and dry arable/grassland areas with steppe birds), (3) important areas for migratory birds (often water birds), (4) areas with many " natural" features like hedges etc, (5) polders rich in ditches/field margins and (6) dehesa' s /montado' s. This could be *simplified* to: (1) semi-natural grasslands, (2) (other) bird areas and (3) areas rich in (semi-) natural features. Dehesa's might become invisible but they could be under (2) as well as (3).

The paper shows a simple sub division of areas of high natural value, which could further be simplified in a combined habitat- species or quantity-quality approach.

II.20. A comparison: the work on Pan-European Indicators for Sustainable Forest Management (Ministerial Conference on the Protection of Forests in Europe; underway).

In this project the indicators of SFM, adopted by the MCPFE conference in Lisbon in 1998 are subject to improvement. Under the biodiversity indicator a combination of species and structural (e.g. mixed character of forest, mix of age classes)

characteristics is made, though in a different way than on farmland. On farmland, without the vertical dimension (except for bocage and dehesa), this would not be possible in the same way but the habitat approach could be compared with it. In this process the choice was made to use only "vulnerable, rare and endangered species". In the report " Indicators for the sustainable management of French forests" an interesting example is found. Of the 706 species of vascular plants only 2% belongs to this category, though more birds (13%) and mammals (25%). The example of plants shows that a restriction to the rare species may limit the practical use of an indicator. In the case of forests this is partly compensated by the use of characteristics of forest structure, indicative of species richness.

The work on forest biodiversity indicators shows an interesting example of a combination of structural features and species. Structural features are, to some extent, a compensation (substitute of non covered species) for the limited availability of information on species. In addition it gives relevant ecosystem information. The work on forest biodiversity indicators also shows that a restriction of species approaches to rare species can limit the information.

III. Biodiversity, status and trends of semi-natural grasslands in Europe.

In the introduction we already gave some information on semi-natural grasslands. Information on the botanical importance, the status and distribution of semi-natural grasslands in Europe was brought together by Van Dijk (1991) in the framework of a seminar on birds of European grasslands (Goriup, 1991). Today much more information is available (e.g. Veen in Brouwer et al, 2001) and an attempt is underway to update the information of the status of semi-natural grasslands in Europe in the framework of the preparation of the Pan European Conference on Agriculture and Biodiversity, hosted by France and organized by the Council of Europe in cooperation with UNEP (June 2002). This work will be undertaken by the European Environmental Agency in cooperation with UNEP.

Biodiversity of semi-natural grasslands.

Semi-natural grasslands are the most biodiversity-rich habitat on European farmland, although there are quite a number of species with different requirements, so that semi-natural habitats alone could not support all relevant biodiversity.

Today many species of plants and animals depend on semi-natural grasslands. Therefore they can be regarded as substitutes of natural habitats that have now become rare or that have disappeared, like open spaces in the natural landscape as described by Vera (1999).

In Sweden 70% of the threatened vascular plants are associated with the farmed landscape (Beaumont&Barnett, 1996, quoting the Swedish Environmental Protection Agency).

On West European calcareous grasslands Willems (1990) found ca 500 vascular plant species and 200 mosses and lichens.

Korneck & Sukopp (1988) list 588 species of higher plants for dry grasslands and 297 for wet grasslands in former West-Germany.

According Holzner et al (1986) 1041 species of insects depend on Austria's dry grasslands, of which 85 % are Red List species, while the area of remaining dry grasslands is today quite restricted.

In the Dutch province of Friesland just 1.5% of the area is unfertilised semi-natural grassland. Yet 60% of the terrestrial plants are more or less confined to this habitat (Schotsman, 1988).

France has 1122 grassland plant species and 450 grassland associations. France's grasslands hold 291 of its rare and endangered higher plants (Delpech, 1999).

This information shows that semi-natural grasslands are a key-habitat for biodiversity.

Status and decline of semi-natural grasslands.

In the EU-15 almost 50% of the land is permanent pasture (or grassland) (OECD, 2001). If that would have been the same in 1900, we can assume that almost half of the farmland was semi-natural grassland, of course of different degrees of fertility and species richness. In a number of countries the figure is just a few % today. In the UK (MAFF, 2000) 97 % of the lowland semi-natural grasslands was lost since 1930. In former West Germany only 3% of permanent grassland was considered "extensive" by Lübbe (1988). In Northern Ireland over 95% of the species-rich grasslands have been lost since 1945 (Department of Agriculture for Northern Ireland, 1999).

Bakker et al (1989) estimated that 1.7 % of the Dutch permanent grasslands were semi-natural grassland but the authors say this is probably too optimistic. Semi-natural grasslands hardly occur outside nature reserves and roadsides today.

In the 10 EU candidate countries in Central and Eastern Europe an average of 12% of the farmland is still semi-natural grassland (Veen in Brouwer et al, 2001), with Slovenia as the best of all with over 50%.

Although no precise figures are available, scattered information (Van Dijk, 1991) shows that in mountain areas and also in large parts of France and in the British uplands semi-natural grasslands are still much more abundant.

Data from North America as quoted above show that the status of (semi) natural grasslands in the USA and Canada is as much endangered, if not more, as the status of semi-natural grasslands in Europe.

These data show that semi-natural grasslands are still an important indicator for biodiversity on a European scale, although in the lowlands around the North Sea they have almost disappeared.

Causes of the decline.

There are a range of influences that have led to the sharp decline of semi-natural grasslands in the 20th century, like fertilisation, drainage, conversion of permanent grasslands to arable land, etc.(Van Dijk, 1991). Usually these developments are summarized as "intensification" of which fertilisation alone is likely to be the most far reaching of all. Beyond the level of 50 kg N/ha/year, and perhaps a lower threshold, the species richness collapses (Oomes, 1983, Delpech, 1975). Although it is a pity that there is not much more literature on this, this information is important because it shows that the decline is not a gradual one but a quite sudden one and happening in the early stages of intensification, while bird species are often more resistant.

Therefore *combined information on fertilisation and the distribution of (at least many decades) old grasslands* could give a valuable set of substitute data as long as vegetation mappings are not available. It should be investigated if Land Cover projects could be extended in such a way.

Already in the early and mid nineties indications existed that land abandonment would become a similarly great problem to semi-natural grasslands (and other high nature value areas) as intensification (Bignal et al, 1994; Baldock et al, 1996). Today the phenomenon is very visible already in the CEE countries. An example is Estonia, where 25% of the land is currently abandoned (information Estonian ministry of agriculture), while this is even 70% in semi-natural grasslands of medium and high quality (Mägi and Lutsar, 2001).

This information shows that the area of semi-natural grasslands is highly policy-relevant. It also shows that, in the absence of biological information, combined information on the distribution of old grasslands and nitrogen inputs can give valuable information.

IV Proposal

Building on the existing OECD work and the needs, expressed in the quoted EU papers, taking account of the CBD-SBSTTA recommendations, as well as using the expertise contained in the various other mentioned papers, the simplest improvement of the existing OECD system could result in the following indicators for biodiversity (habitats included):

A. A combination of quantity and quality

Quantitative aspects

1. Area of (semi-) natural habitats:

a. *semi-natural (and natural) grasslands* (including heath and moorland)

b. *uncultivated habitats*, in particular vertical elements (hedges, small woodlands) and water bodies, above thresholds (quantity/ha) to be defined, and/or total quantity of features by country or region..

2. Area of agricultural habitat not covered by 1, or overlapping with 1 (to be decided), important to fauna

- area important to breeding birds, by category

- area important to migratory birds,

- area important to other species (other fauna, arable weeds etc) of conservation concern

In addition the *quality* of these areas should be monitored. Therefore the following indicators could be used:

Qualitative aspects

1. Quality of (semi-) natural habitat according to presence of plant communities (e.g. alliances) and/or abundance of key flora/ fauna species
2. Quality of other habitat, according to status and trends in indicator species (especially birds, but also e.g. arable weeds)

Quantity and quality should be used in combination. One should start with quantity, in order to have information on the area and location of sites in need of conservation and special management.

B. Alternative habitat approach

An adapted proposal for habitat quantity was made to OECD in reaction to the draft report of the Zürich seminar:

- I. *(Semi)-natural agricultural habitats*
(“(semi-) natural” includes *natural* grazing land at high altitudes and *semi-natural* grassland, scrub, heathland and rice paddy, and furthermore pastoral woodland/ dehesa/montado)
- II. *Uncultivated habitats*, broken down by forest, wetland and other uncultivated habitats
- III. *Other farmland*:
- III.a. *Other farmland habitats with high biodiversity value*, like birds areas, as far as quantifiable *(if not quantifiable., take a+b together)
- III.b. *Other (intensively used) farmland habitats*, broken down by grassland, annual crops and permanent crops.
 - Bird breeding areas, (migratory) bird staging areas, low-input traditional permanent crops (olives, nuts, orchards etc), broken down

by category. *If no area information is available, these values can be covered by species information, like in the MAFF document (II.9) and under C below.*

C. A simpler alternative option: a combination of habitats and species

1. Area of semi natural habitats, to be split up like under A
2. Status and trends in populations of key species in the wider countryside, both within and outside (1) and (2)

D. Use of the Natural Capital Index (NCI, Ten Brink, 2000) or Quantity-Quality approach (Ten Brink, 2001)

Seeing the advantages of this approach, described in II.16, there are arguments for a *combined* use of one of the above approaches (A+B or C) with the NCI. Regarding the NCI itself, this means that the agricultural area should not be treated as one habitat but it should be split up in some main categories, like under A. Then the NCI would give adequate information for use both in a national and regional context and in CBD context. If the NCI is used, it can be recommended to use the A+B or C approaches as well, especially for policy purposes on national and regional level.

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