OECD EXPERT MEETING ON AGRI–BIODIVERSITY INDICATORS

SUMMARY AND RECOMMENDATIONS

5-8 NOVEMBER 2001

ZURICH, SWITZERLAND

The Summary and Recommendations from the meeting (also available in French), plus the 33 meeting papers and related web links and country reports, are available on the OECD website at: http://www1.oecd.org/agr/biodiversity/index.htm. To subscribe to further news on OECD agri-environmental indicator work see the OECD website at: http://www.oecd.org/agr/env/indicators.htm or contact:

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PREAMBLE FOR THE REPORT OF THE OECD EXPERT MEETING ON AGRI-BIODIVERSITY INDICATORS, NOVEMBER, 2001

The attached report is a summary of the conclusions and recommendations reached by the experts who participated in the OECD Expert Meeting on Agri-biodiversity Indicators, held in Zurich, Switzerland, 5-8 November, 2001, under the auspices of the OECD Joint Working Party on Agriculture and Environment (JWP). At the JWP's meeting in April 2002 they agreed that the conclusions and recommendations of the experts should be made available to the wider public as a contribution to the development of agri-environmental indicators, and national and international efforts to establish agri-biodiversity indicators.

The conclusions and recommendations are those of the participants and do not necessarily reflect the views of the OECD, the JWP or its Member Countries.

The OECD undertakes analysis of agri-environmental policy issues within the JWP. As part of that work, the JWP is developing a set of agri-environmental indicators to measure the environmental performance of agriculture by:

1. providing information to policy makers and the wider public on the current state and changes in the conditions of the environment in agriculture;

2. assisting policy makers to better understand the linkages between the causes and impacts of agriculture, agricultural policy reform, trade liberalisation and environmental measures on the environment, and help to guide their responses to changes in environmental conditions; and,

3. contributing to monitoring and evaluating the effectiveness of policies addressing agri-environmental concerns and promoting sustainable agriculture and natural resource management.

The JWP has identified a number of criteria which agri-environmental indicators need to meet, including:

- *policy relevance* in addressing the key environmental issues faced by governments and other stakeholders in the agricultural sector;

- *analytical soundness* being based on sound science but recognising that their development is an evolving process;

- *measurability* in terms of data availability and cost effectiveness of data collection; and,

- *interpretation* in that the indicators should communicate essential information to policy makers and the wider public in a way that is clear and easy to understand.

In order to help establish policy relevant indicators, a number of OECD Member countries have hosted Expert Meetings on specific agri-environmental issues, in particular, to further develop two of the criteria: analytical soundness and the measurability of indicators. The Expert Meeting on Agri-biodiversity indicators, hosted by Switzerland, was one of the series of these Expert Meetings, and the meeting papers and other related information (*i.e.* web links and country reports) are available on the OECD website at http://www1.oecd.org/agr/biodiversity/index.htm.

REPORT ON THE OECD EXPERT MEETING ON AGRI-BIODIVERSITY INDICATORS
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SUMMARY AND RECOMMENDATIONS

1. MAIN RECOMMENDATIONS

i) Establish agri-biodiversity indicators within a common, flexible and transparent framework that provides a hierarchy with multiple spatial and temporal scales in which to identify, structure, combine and aggregate indicators. The framework enables countries to identify the strengths and weaknesses in their existing compliment of indicators and takes into account an agro-ecosystem's: *diversity of elements* (*e.g.* flora and fauna); *complexity of interactions* (*i.e.* social, economic and environmental) and the *interaction with other ecosystems* (*e.g.* forests). It also recognises the *hierarchical structure* within the agro-ecosystem, including: the agro-ecosystem base (*i.e.* agricultural land; production species-crops and livestock; and production support species, *e.g.* soil biodiversity); habitat types, their structure and management; and wild species use of agro-ecosystems for different requirements (*e.g.* breeding, feeding).

ii) Member countries should provide the OECD on a regular basis, when available and where relevant, a set of agri-biodiversity indicators that monitor the effects and performance of agriculture on biodiversity (*i.e.* at the genetic, species and ecosystems levels) and which are linked to actions by farmers, the agro-food chain and governments.

iii) Integrate the agri-biodiversity indicators into policy monitoring, evaluation and in predictive scenarios to improve policy effectiveness in promoting sustainable agriculture.

iv) Invest in the scientific understanding and research of the linkages between the genetic, species and ecosystems levels related to agri-biodiversity, and the interactions between farming and biodiversity. This research should help to further develop the associated information and basic data, including in those areas not yet covered by the OECD work, notably indicators of environmental services, such as soil biodiversity, pollinators and natural pest control.

v) Continue to engage a wide range of stakeholders in developing agri-biodiversity indicators, including farmers and food industry representatives, environmental groups, government scientists and policy advisors, by drawing on and sharing their perspectives, expertise and information sources related to monitoring agri-biodiversity for policy purposes.

vi) Contribute and cooperate with other international initiatives related to developing agri-biodiversity indicators, especially those under the Convention on Biological Diversity and in FAO, by conveying the OECD work to these organisations and convening joint meetings with them for the purposes of indicator development and co-ordination, and in order to promote global consistency, similar to indicators in the socio-economic field, and also to share the OECD work with non-Member countries.

2. BACKGROUND

The OECD Expert Meeting on Agri-Biodiversity Indicators (ABIs) was convened to contribute and build on the work in the OECD to develop a set of Agri-Environmental Indicators (AEIs). The meeting, hosted by the Swiss Federal Research Station for Agroecology and Agriculture, Zurich-Reckenholz, Switzerland, was attended by nearly 90 participants, drawn from 24 of the 30 OECD Member countries and involved many international organisations.

This summary and recommendations from the meeting, also includes additional information drawn from the reports of the Rapporteurs and Discussants (Annexes 1–5) and the meeting agenda (Annex 6). ***All 33 papers presented at the meeting, including the list of participants, web links and country reports, are available on the OECD website at*** http://www1.oecd.org/agr/biodiversity/index.htm. A full list of the papers presented at the meeting and available on the OECD website, are provided in Annex 7.

An oral report of the meeting was presented by the OECD Secretariat to the 7th meeting of the Subsidiary Body on Science, Technical and Technological Advice (SBSTTA, held in Montreal, Canada, November 2001) and the Conference of the Parties 6th Meeting (COP-6, held in The Hague, The Netherlands, April 2002) of the ***Convention on Biological Diversity*** (CBD) (see the CBD website at: http://www.biodiv.org/doc/meeting.asp?lg=0&wg=sbstta-07). The results from the Expert Meeting were also provided for information to the ***Pan–European Conference on Agriculture and Biodiversity***, hosted by France, in Paris, 5-7 June, 2002, and organised by the Council of Europe (COE) in cooperation with the UNEP (see the COE website at: http://nature.coe.int/conf_agri_2002/)

3. SUMMARY

There was recognition that the overall objective of the ABIs is to monitor the effects and performance of agriculture related to biodiversity, linked to actions by farmers, the agro-food industry, and governments (Annex 1), in:

i) providing crop and livestock genetic resources, as the basis for food production, and the development of agricultural raw materials, such as renewable energy through biomass;

ii) enriching society through maintaining and enhancing the variety of wildlife habitats and wild species related to agriculture, of value for economic, scientific, recreational, aesthetic, intrinsic, landscape and other amenity purposes; and in,

iii) supporting the functioning of ecosystems and production support systems critical to agriculture, such as soil fertility protection through soil microbial activity, pollination, nutrient cycling, water filtration, and climate influence.

ABIs that can help countries and the international community to monitor progress towards achieving a sustainable agriculture need to reflect both the genetic, species and ecosystem levels in agri-biodiversity relationships and also the socio-economic interactions between farming and biodiversity, as recognised under the Convention on Biological Diversity (CBD). Annex 1 provides the classification and coverage of OECD ABIs, and their compatibility with the CBD.

Experts emphasised ABIs need to be developed within the context of the OECD's objectives for work on agri-environmental indicators, including as a:

i) source of information on the status and trends in biodiversity related to agriculture; and a,

ii) tool in policy monitoring, evaluation and in predictive scenarios, to improve policy effectiveness in promoting sustainable agriculture and management of natural resources.

The further development of ABIs should build on the solid basis already achieved by OECD (see OECD, 2001, Environmental Indicators for Agriculture – Volume 3: Methods and Results, notably the chapters on Biodiversity and Wildlife Habitats), and be selected on the basis of the OECD criteria of policy relevance, analytical soundness, measurability and ease of interpretation, and the specific guidelines for selecting agri-biodiversity indicators recommended by experts (Annexes 4 and 5). Moreover, to enhance the effectiveness of policy decision making, the indicators should be made available as soon as feasible.

The "sustainability" framework – which encompasses economic, social and environmental dimensions – can be useful to situate ABIs in their broader context. It can also help to avoid that ABIs have too narrow a focus on existing systems by recognising the possibility of change brought about by other sustainability considerations, especially economic and social factors.

The driving force–state–response model can help structure analysis of agri-biodiversity relationships. For example, *driving forces*, such as government agricultural support policies and market conditions (*e.g.* agricultural commodity and input prices) influence on pesticide use and pest management practices. This is causing the *state* of biodiversity in agriculture to change as a result of the impact of pesticide use and pesticide management on wild species, and this may in turn lead to farmer, agro-food industry and government *responses* to promote biodiversity conservation, such as through the adoption of integrated pest management and changes in government crop and pesticide input support policies and pesticide risk reduction regulations.

The importance of developing ABIs for policy monitoring, evaluation and in projection studies was emphasised, not only by experts from OECD Member countries and the EU Commission, but also by representatives of international governmental organisations (European Environment Agency, FAO, Ramsar, UNEP, and the World Bank), and non-governmental organisations representing farmers (International Federation of Agricultural Producers, IFAP), the food industry (Business and Industry Advisory Committee to the OECD, represented by Unilever), and environmental interests (Birdlife International, European Centre for Nature Conservation, World Conservation Union (IUCN), Wetlands International and the World Seed Organisation).

It was recognised that a major challenge for OECD Member and non-Member countries is to reconcile the need to expand agricultural production while meeting national and international objectives and commitments for the conservation and enhancement of biodiversity, given the projected need to increase global food production by over 20% by 2020.

Experts called on OECD Member countries to consider several issues in developing and providing indicators to:

i) reflect a comprehensive view of agriculture and its effects on biodiversity, and not just focus on protected areas and endangered species;

ii) recognise the complexity of agri-biodiversity and hence use a combination of indicators;

iii) develop existing data sets to meet the immediate needs of policy makers and, over the longer term, in recognition of the limitations in the current scientific understanding and data to measure agri-biodiversity, make further effort (in terms of scientific research and data collection) to address these limitations;

iv) establish metadata (*i.e.* descriptive notes) for ABIs that defines and describes genetic, species and ecosystems information;

v) undertake further research to improve understanding of ecosystem services related to agriculture (*e.g.* soil biodiversity, pollinators, natural pest control) and develop relevant indicators;

vi) recognise the consequences of uncertainty on changes in agri-biodiversity linkages, for example, the impact of climate change, genetic mutations and alien invasive species;

vii) provide ABIs and related data and metadata sets to the Secretariat on a regular basis as soon as feasible; and,

viii) integrate the indicators into policy monitoring, evaluation, and projection studies.

To improve interpretation of ABIs experts recommended it is necessary to take into account the:

i) spatial and temporal coverage of indicators, in particular, to take into account not only species presence, but also changes in species abundance and their distribution;

ii) overall trends rather than absolute levels across countries;

iii) baselines if established at the national level (not the OECD level) could help to improve the assessment of the performance of agriculture in achieving identified future goals and targets;

iv) causes of change on biodiversity in agriculture, both negative (*e.g.* excessive farm chemical use) and positive (*e.g.* creating field margins as wildlife corridors), in particular the effects of different farming practices and management systems; and the,

v) linkages with other agri-environmental indicators, such as farm management indicators.

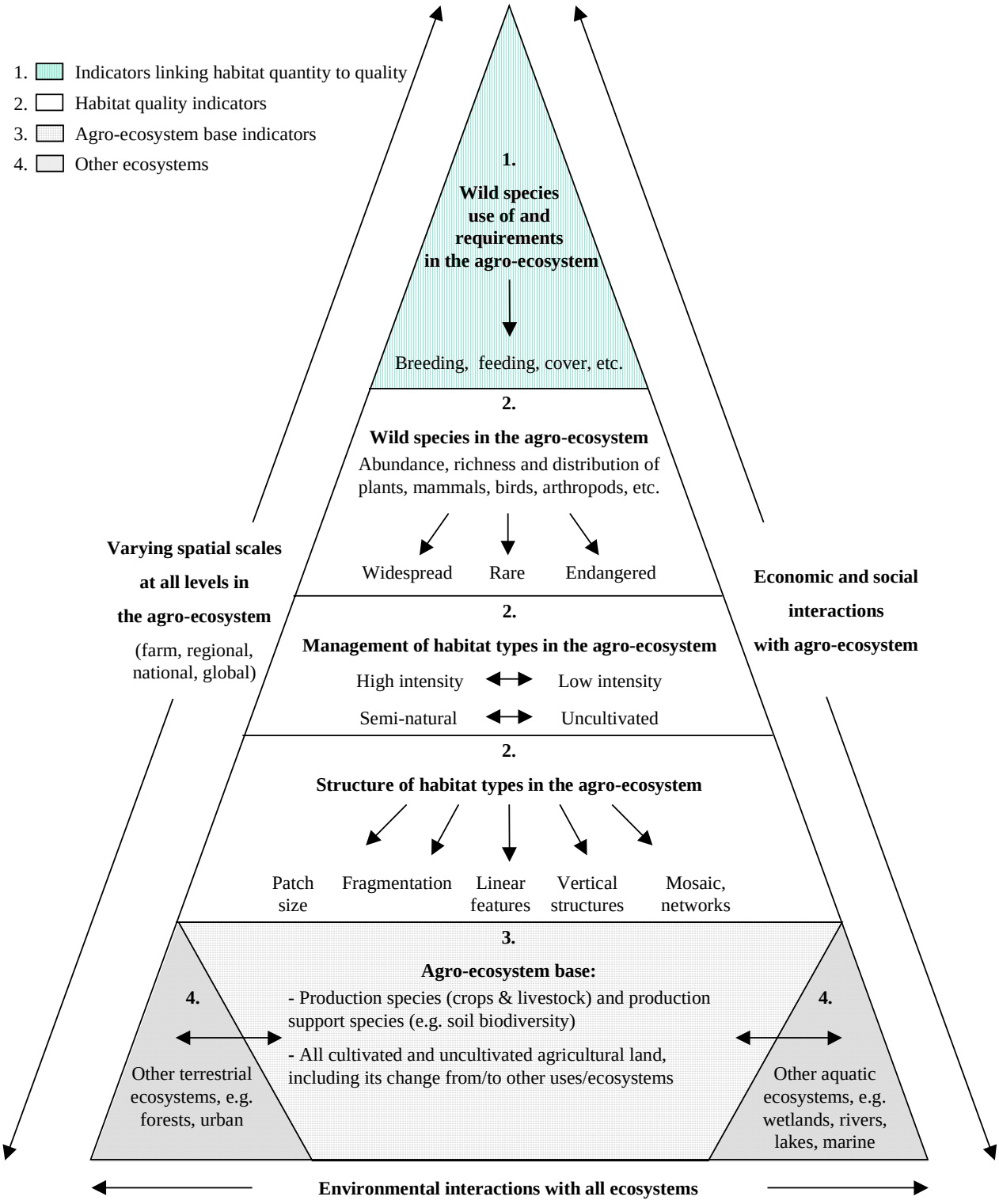
It was observed that the OECD agri-biodiversity indicators are applicable to many non–Member OECD countries. The OECD work could thus provide useful synergies and input into other international efforts to develop ABIs, especially under the CBD and the FAO's work on monitoring trends in global agricultural biodiversity. Experts also noted the need for cooperation in work on ABIs, not only between OECD Member and non-Member countries, but also drawing on the expertise and databases of other international organisations, such as Birdlife International, ECNC, the EEA and its European Topic Centres, FAO, IUCN, Wetlands International and the World Bank. Even so, data drawn from other international organisations would need to be verified in terms of their validity and quality.

4. RECOMMENDATIONS

4.1. The Agri-Biodiversity Framework (ABF)

Experts recommended drawing together different agri-biodiversity indicators of genetic resources, habitats, and wild species within a coherent and comprehensive framework (Figure 1). The agri-biodiversity

Figure 1. OECD Agri-Biodiversity Indicators Framework



Source: OECD Secretariat.

framework (ABF) provides a hierarchical framework with multiple spatial and temporal scales in which to structure and organise national (and sub-national) indicators of agri-biodiversity. The framework takes into account the socio-economic and environmental interactions in an agro-ecosystem which provide both commodities (*i.e.* food and non-food outputs) and environmental services (*e.g.* scientific, recreational, ecological).

The ABF recognises (Figure 1) the:

i) ***Diversity of elements in an agro-ecosystem***, which consists of plant and animal communities (domesticated crops and livestock, and wild species) and their environmental functioning as an ecological unit, strongly influenced, created and/or maintained by agricultural management activities within which are a diversity of different habitats. Each habitat type is defined as including both living and non–living aspects, limited to an area where a certain number of ecological factors and farm management practices are broadly homogenous and stable.

ii) ***Complexity of the interactions among the different elements in the agro-ecosystem***, in particular, between the economic (*e.g.* agricultural commodity prices and support measures), social (*e.g.* farmer education, skills, cultural values), and environmental elements (*e.g.* physical environment, biological elements) interacting on the diversity of habitat types, production species (crops and livestock) and wild species (including production supporting species) within the agro-ecosystem.

iii) ***Interaction between agro-ecosystems and other ecosystems***, both terrestrial (*e.g.* forests) and aquatic (*e.g.* wetlands), especially in terms of the effects of farming practices on other ecosystems (*e.g.* off-farm impacts from nutrient/pesticide run-off into aquatic ecosystems) and land use changes from agricultural land to other land uses (and vice versa). This can have both beneficial and harmful effects on biodiversity depending on the nature of the change in land use, such as a change from semi-natural grassland to commercial forest or a change from a tropical forest to cultivated cropland.

iv) ***Hierarchical structure of different layers within the agro-ecosystem***, including the current state and changes in the: agro-ecosystem base, including production species and production supporting species and the land use stock and changes between agriculture and other ecosystems; structure of habitats within the agro-ecosystem; management of the habitats in agro-ecosystems; wild species in the agro-ecosystem; and the use and requirements by wild species of the habitats within the agro-ecosystem (*e.g.* breeding, feeding).

v) ***Tangible and quantifiable specification of biodiversity*** (*i.e.* genetic resources, habitats and wild species) across the whole agro-ecosystem and the spatial distribution of habitats and wild species related to agriculture.

The ABF offers the possibility to identify and structure a range of indicators for different policy purposes and at varying spatial scales. Indicators can be used, for example, to highlight the risk of genetic erosion of domesticated crop varieties and livestock breeds (indicators of genetic resources); to track the performance of a particular policy measure aimed at reducing wetland loss to agriculture (indicators of habitat quantity); and monitor the progress of a policy measure seeking to increase the population size of rare and endangered wild species associated with agriculture (indicators of habitat quality). Also combining indicators to measure current or future trends concerning the impact on wild species of changes in agricultural land use and cover patterns, habitat structure and farm management practices and systems (indicators linking habitat quantity to quality).

The ABF is recognised by experts as potentially having a number of advantages, in particular because it:

i) establishes a structure and hierarchy in which indicators can be clearly identified, organised, combined and aggregated, providing a classification that can be used to identify the strengthens and weaknesses in the existing compliment of indicators of individual OECD countries;

ii) encompasses all agricultural land, including uncultivated habitats on agricultural land, and all species (production species, production supporting species and wild species) that use farm land or are affected by agricultural activities;

iii) provides flexibility by taking into account the varying policy priorities, agro-ecosystems and farming systems, across OECD countries, for example, from alpine pastures, rangelands, tropical plantations, to rice paddies and arable crops, and different spatial scales necessary to monitor trends in agri-biodiversity at the local, regional, national to international levels;

iv) draws on existing data sets, some of which are already well defined, such as agricultural land census data, and can help identify where data gaps exist;

v) facilitates the use of terminology that avoids value judgements or relies on imprecise definitions of different agricultural habitats by measuring habitat quality through the species use, structure and management of agricultural habitats, supported by quantitative data and clear descriptions of habitat categories and related data;

vi) recognises countries are at different stages in their development of ABIs and provides a coherent structure within which countries can begin to calculate indicators and assemble data sets that are transparent and comparable across countries;

vii) allows for the possibility that the framework could be extended and used to cover not only agro-ecosystems but other ecosystems, such as forests and mountains; and,

viii) offers the potential to integrate some of the indicators into national economic or ecological accounts, for example, changes in the stock of habitats, the habitat–species matrix and the natural capital index.

Further developing the ABF requires more attention to the following points:

i) identify baselines, targets and/or trends which countries are using or developing to assess the performance of policy measures aimed at biodiversity conservation;

ii) analyse the impact of driving forces on biodiversity in agro-ecosystems, in addition to farm management practices, such as the effects of alien invasive species, genetic mutations, changes in water table levels, and climate change on biodiversity in agro-ecosystems;

iii) explore methods that can better express spatial and temporal variations in biodiversity across a country, based on various technical methods, such as remote sensing and stratified sampling;

iv) improve both scientific understanding of the relationships between changes in agricultural genetic resources, habitat quantity, and habitat quality, and the data gaps and data quality that draw a representative picture of biodiversity, in space and time; and,

v) exchange information across OECD countries and with non-Member countries, to start a process of harmonising agro-ecosystem habitat classifications, definitions and related information and indicators (see also Annex 4 in this context).

4.2. Agri-Biodiversity Indicators (ABIs)

There are four groups of indicators within the ABF that form an integrated framework which countries are recommended to develop: ***first,*** agricultural genetic resources (4.2.1); ***second***, habitat quantity (4.2.2); ***third***, habitat quality (4.2.3); and a ***fourth*** group which combines the last two groups, habitat quantity and quality, and expresses the overall loss (gain) of biodiversity (4.2.4). Most of the indicators, highlighted in boxes below, with some small modifications are already included in the current set of OECD agri-environmental indicators, but some indicators are recommended as new additions in order to make the OECD indicator framework more comprehensive.

4.2.1. Indicators of Agricultural Crop and Livestock Genetic Resources

Experts recommended the OECD build on its current set of indicators related to agricultural crop and livestock genetic resources by providing the following indicators:

> i) Total number of crop varieties/livestock breeds for the main crop/livestock categories (*e.g.* wheat, rice, cattle, pigs) that have been registered and certified for marketing, including native and non–native species and landraces.
>
> ii) Share of crop varieties in total production for individual crops (*e.g.* wheat, rice).
>
> iii) Share of livestock breeds in total livestock numbers for respective categories of livestock (*e.g.* cattle, pigs, poultry, sheep).
>
> iv) Number and share of national crop varieties/livestock breeds used in agricultural production that are endangered.
>
> v) Number of available species and accessions (samples) conserved *in situ* and *ex situ* in national programmes.

Indicators i) to iv) are already included in the current set of OECD agri-environmental indicators, although for indicator i) it is recommended 'native and non-native species and landraces' be added to the indicator definition. It is recommended that indicator v), concerning genetic resource conservation is added to the current OECD indicator set, while indicators ii) and iii) could be expressed with use of the biodiversity/evenness index (*e.g.* Shannon index) rather than as a share of major crop varieties/livestock breeds in total crop/livestock production.

In terms of ***genetic erosion*** while it may be useful to know that 90% of the national dairy herd belong to only three breeds, for example, this information does not help to address the questions of what is happening to the other 10% of dairy breeds and are their populations large enough to avoid genetic erosion? Moreover, using the dairy example, in one country the populations of the 10% of "minor" dairy breeds may be large enough to ensure their stability, but in another country a 10% share may involve a much smaller number of individuals and be too few to protect minor dairy breeds from genetic erosion. Hence, the biodiversity/eveness index (*e.g.* Shannon index) can help in solving this problem of minor livestock breeds or crop varieties, although the difficulties of individual population sizes and changes in the status of endangerment are areas for further development (Annex 2).

Experts recognised that in the ***future development of agricultural genetic diversity indicators*** OECD Member countries need to:

i) clarify definitions, in particular, through strengthening cooperation with FAO's work on agricultural genetic diversity, and to harmonise with the definitions already established by the CBD and FAO for: native and non–native species/breeds and, endangered species/breeds;

ii) quantify within species diversity and genetic difference, by using molecular markers, etc., which improves upon monitoring only numbers of varieties and breeds; and,

iii) establish a national registration process for landraces, *i.e.* identify species/types in production.

Annex 2 provides further detail on the agricultural genetic diversity indicator characteristics and areas proposed by experts for further development. Annex 3, identifies the conclusions of experts on the driving forces, state and responses to the conservation and management of agricultural genetic diversity.

4.2.2 Indicators of Habitat Quantity

These indicators provide information on the stock and flows of habitat types across all agricultural land including intensively and extensively farmed land, semi-natural areas, and uncultivated land, and changes in land use between agro-ecosystems and other ecosystems (*i.e.* terrestrial and aquatic ecosystems).

i) The current area and share (stock) of different habitat types across all agricultural land, including intensively or extensively farmed land (*e.g.* arable crops, rangeland, rice paddies), semi-natural areas (*e.g.* certain grasslands, heather moorland) and uncultivated land (*e.g.* fallow, areas of remnant native vegetation, ponds).

ii) Changes in the area and shares of habitats (flows) both within agriculture (*e.g.* less arable land, more pasture) and between different land uses (*e.g.* from agricultural use to forestry or change from wetlands to agricultural use).

All agricultural land and the full range of habitat types should be covered by these indicators, including those areas of uncultivated habitat (*e.g.* ponds, woodlands) within farming areas, while flexibility needs to be exercised in categorising habitat types in agro-ecosystems by recognising the:

i) historical time series data already developed in OECD countries; and the,

ii) diversity of agro-ecosystems and farm management systems across OECD countries.

At present two main systems of agricultural land categorisation and data time series are evident in OECD countries, including habitats defined in terms of:

i) agricultural land use and cover types, mainly drawing on data collected through regularly updated agricultural census, for example, arable land, permanent crops and managed pasture;

ii) biological and ecological characteristics, for example, mires and heathland, semi-natural grasslands, wild prairies, rangelands, and broader ecozones.

In some cases these two types of habitat data are supplemented with additional information/data to describe variations in their quality, characteristics and systems of management, increasingly complemented with sample-based surveys and remote sensing observation techniques of land cover mapping. ***To move toward***

consistency across OECD countries, experts recommended a set of guidelines to select habitat indicators related to agriculture, elaborated in Annex 4, which recognise the need for countries to:

i) include all agricultural land that comprises the agro-ecosystem;

ii) provide the criteria used to select each habitat type within the agro-ecosystem;

iii) define the characteristics of each habitat type through metadata (*i.e.* descriptive notes);

iv) develop a comprehensive list of the different habitat types selected for an agro-ecosystem; and

v) identify the regularity with which data on the current area (stock) and changes (flows) in habitats across agro-ecosystems are collected and describe the methods used to collect the data.

As more information becomes available from OECD countries as to how habitats on agricultural land are classified and defined, it will be necessary for the OECD to ***establish a harmonised and comparable system of habitat classification and definitions across OECD countries***. This will require more structured and regular expert exchange between countries, and include drawing on existing cross national systems for habitat and land cover classification, such as in Europe under the EUNIS and CORINE systems (for further details of EUNIS and CORINE see the European Environment Agency website at: http://reports.eea.eu.int/topic_report_2001_06/en/Topic_6_2001.pdf).

4.2.3. Indicators of Habitat Quality

These indicators provide information on the ***quality of different habitats types*** across agro-ecosystems in terms of their:

i) structure (indirect measure of habitat quality);

ii) management (indirect measure of habitat quality); and their,

iii) use and requirement by wild species (direct measure of habitat quality).

In general, the quality of agricultural land from a biodiversity perspective is higher the greater the number of wild species and their corresponding abundance and diversity, and the greater the diversity of habitat structures and the less intensive the management of the land (this may vary according to local conditions, *e.g.* soil types, climate). While the availability of these three indicators will depend on the resources, databases and monitoring systems of a country. If no data is available on wild species, then indirect measures of habitat quality (*i.e.* structure and management) could be used instead.

Habitat Structure Indicator: Trends in the quality and quantity of habitat features and their spatial composition across agricultural land.

Indicators of habitat structure in terms of the quality and quantity of habitat features (*e.g.* extent of alpine meadows, area of field margins, area and fragmentation of remnant native vegetation patches on agricultural land) and their spatial composition across agro-ecosystems (*e.g.* patch size and patch mosaic, fragmentation of habitats, linear features and networks), are an indirect measure of habitat quality.

Taking into account the implications of different habitat structures and patterns for wild species in agro-ecosystems, further work is required to define indicators that measure:

i) ***patch size***: the size of habitat patches is important for some species;

ii) ***fragmentation***: the extent to which a given habitat type is divided into separate patches;

iii) ***linear features and networks***: for example, the length, age, quality and connectivity of hedges;

iv) ***vertical structures***: habitat structures in terms of vertical layers (*e.g.* bushes and tress), which are especially important to bird and invertebrate communities; and,

v) ***mosaic*** of different habitats in an agro-ecosystem: for example, habitat diversity, location, juxtaposition and heterogeneity of land cover, and linkages to indicators of agricultural landscape in countries where this is important.

Habitat Management Indicator: Trends in farm management practices and systems which affect biodiversity.

Changes in farming practices and management systems are a key driving force affecting habitat quality. ***Habitat management indicators***, which provide an indirect measure of habitat quality, are included under the OECD overall core set of agri-environmental indicators concerning farm management covering the effects on biodiversity from farming practices (*e.g.* timing of grass cutting, nutrient and pesticide management, stocking densities), and different farm management systems (*e.g.* integrated land management systems, organic farming).

It is important to ***clearly define different farming practices and management systems***. To avoid the difficulties and ambiguities in defining terms such as 'intensive', 'extensive', 'traditional' and 'industrial' agricultural production systems, it is necessary to know in terms of wild species impacts information on farming practices, such as the use of farm inputs (*e.g.* fertilisers, pesticides, water); livestock husbandry practices, (*e.g.* livestock stocking densities); and farming systems, such as the number of farms under environmental whole farm management plans and the area of organic farming.

Wild Species Indicator: Trends in the abundance (*i.e.* the number), richness (*i.e.* diversity) and ecologically indicative value (*i.e.* species associated with specific habitats such as prairie grazing land) of wild species using agricultural habitats or affected by farming activities.

While ***indicators of wild species*** provide a direct measure of habitat quality, they are also useful indicators in their own right to reveal the current stock and trends in wild species, including wild relatives of domesticated crop and livestock species, and widespread, rare and endangered species. Many species, particularly fauna, use a variety of farmed habitats and cannot be easily associated with a single habitat type. Because many species use a variety of farmland habitats and cannot be associated with a single habitat type, they may consequently be better indicators of agro-ecosystems. The Chough (*Phyrrocorax phyrrocorax)* is an example of this as it is a bird that moves between using different farmland habitats throughout the year. Trends in alien invasive species are also of importance to a number of OECD countries, but are currently not part of the OECD work on agri-biodiversity indicators (Annex 1).

To move toward consistency across OECD countries***, experts recognised the need for guidelines to select indicators of wild species related to agriculture***, elaborated in Annex 5, including selecting:

i) a minimum set of wild species collectively representing a wide range of habitat types across agricultural land;

ii) a range of wild species that require different types of agricultural land and from various species groups (*e.g.* birds, mammals, arthropods, plants, etc.);

iii) rare, endangered and widespread species; and, selecting;

iv) wild species relevant to policy issues at different scales from the local to global level.

In developing these guidelines it will be important to ***recognise the scientific uncertainty about the current and future links between biodiversity and agriculture***, and to also reveal the criteria used and rationale for wild species chosen within a country. To improve consistency of wild species indicators across countries, will also require in the future improved data availability and comparability, and the exchange between countries of their practice in cost effective data collection. Also the need for further examination of the function of baselines is recognised as an important issue in the future.

4.2.4. Indicators Linking Habitat Quantity to Quality

These indicators integrate habitat quantity and quality indicators to provide information on how land use and land cover changes are affecting wild species (flora and fauna) in their use and requirements of habitats in agro-ecosystems.

Habitat–Species Matrix: Changes in the area and management of all agricultural habitat types and the identification, explicitly (*i.e.* direct observations) or implicitly (*i.e.* indirect information such as expert knowledge), of the impact of these changes on wild species (flora and fauna).

Natural Capital Index: The product of the *quantity* of agricultural habitat types and their *quality* in terms of wild species abundance, richness, habitat structure and management, measured between the current state of the agro-ecosystem and a baseline state.

By ***combining indicators of habitat quantity and quality*** these two indicators allow the effects and changes in agriculture on biodiversity to be summarised more succinctly. The indicators also provide the possibility to project the implications for wild species related to future changes in agricultural land use and cover. However, both these indicators have a number of areas where methodological improvements could be made to further improve them, including the science and methods used in projection studies of agri-biodiversity which requires more work.

The *natural capital index*, has been previously discussed in OECD expert meetings/workshops related to agri-environmental indicators, including within the OECD Working Party on the Economic Aspects of Biodiversity. The index has also been developed as a contribution to the implementation of the Convention on Biological Diversity, together with other indicators described in this paper.

Annex 1. Classification and Coverage of OECD Agri-Biodiversity Indicators and Their Compatibility with the Convention on Biological Diversity

Convention on Biological Diversity (CBD)[1]

Biodiversity (all living organisms)		
Genetic Diversity	Species Diversity	Ecosystem Diversity

Notes:
1. The CBD is developing its work under the ecosystem approach, which it has defined as meaning "*a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit". (Article 2 of the Convention).* The CBD Conference of the Parties, at its Fifth Meeting (Nairobi, Kenya, May 2000), endorsed the description of the ecosystem approach and operational guidance and recommended the application of the principles and other guidance on the Ecosystem Approach (decision V/6). (see full text at: http://www.biodiv.org/doc/decisions/cop-05-dec-en.pdf).

OECD Agri-biodiversity Indicator Coverage and Compatibility with the CBD

	Biodiversity Related to Agriculture		
	Genetic Diversity	Species Diversity	Ecosystem Diversity
i. Commercial crops, pasture and livestock	X	X	1
ii. Habitat and wild species	2	X	X
iii. Alien invasive species	3	3	3

Notes: X denotes the areas covered by OECD ABIs.
1. There are important links between genetic diversity of certain crops and livestock and the ecosystem (*i.e.* natural conditions and production system) within which they are produced. OECD has not yet developed indicators to cover this aspect of agri-biodiversity, see also Annex 2.

2. Genetic diversity of, in particular, wild relatives of commercial crops (and to a lesser extent wild animals) provides an important resource base for improvements in crop/livestock breeding. OECD has not, yet, developed indicators to cover this aspect of agri-biodiversity. There is at present little data on genetic erosion within wild species populations, which over the long term may be more important than only species loss. This is an area of indicator development which requires consideration over the long term.

3. Work on indicators related to the impacts of alien invasive species on agricultural genetic resources, native wild species and ecosystem diversity, is being undertaken in some OECD Member countries, where the problem is especially acute (*e.g.* Australia, New Zealand, United States) but are not part of the current set of agri-environmental indicators.

Source: OECD Expert Meeting on Agri-biodiversity Indicators, Zürich, Switzerland, November, 2001 (see http://www1.oecd.org/agr/biodiversity/index.htm)

Annex 2. Agricultural Genetic Resources: Indicator Characteristics

Indicators proposed:	Indicator Characteristics					
	Refers to diversity level at which indicator can provide useful information: Genetic (G) Species (S)	Applicability of indicator to different farming systems	Availability and quality of information	Reliability of information	Value from point of view of:	
					Science	Policy
1. Number of crop varieties and livestock breeds in use	S	All	Good	Good	Low	Good
2. Share of crop varieties in total production (for each crop)	G	All	Good (most countries)	Good	Good	Good
3. Share of breeds in livestock numbers	G	All	Good (most countries)	Good	Good	Good
4. Number of crop varieties and livestock breeds endangered	S	Stronger pressure in intensive systems	Relatively good	Depends on definition	High	High
5. Number of species and accessions conserved – *in situ* and *ex situ*	G S	All (*ex situ* only)	Relatively good	Good	Good to Low	High

Annex 2 (continued). Agricultural Genetic Resources: Areas for Further Development of Indicators

<table>
<tr><th>Indicators proposed</th><th>Possible areas for further development</th><th>Complementary information needed</th></tr>
<tr><td>1. Number of crop varieties and livestock breeds in use</td><td>- Per country, per area (and which area-arable land, grassland, etc….)
- Number of varieties/breeds x diversity among varieties/breeds</td><td>- Number of crops in use
- Number of breeds in use</td></tr>
<tr><td>2. Share of crop varieties in total production (for each crop)</td><td rowspan="2">Biodiversity/eveness index (e.g. Shannon index). For crops and livestock these indicators need to be developed to address the questions of what is happening to other minor varieties/breeds and are their populations large enough to avoid genetic erosion? Also in one country the populations of “minor” varieties/breeds may be large enough to ensure their stability, but in another country minor populations may involve a much smaller number of individuals and be too few to avoid genetic erosion. While the biodiversity/eveness index can help solve the problem of minor varieties/breeds, the difficulties of individual population sizes and changes in status of endangerment are areas for further development.</td><td>Number of crop varieties covering
x…y % production</td></tr>
<tr><td>3. Share of breeds in livestock numbers</td><td>Number of breeds</td></tr>
<tr><td>4. Number of crop varieties and livestock breeds endangered</td><td>- How endangered:
-- use in production
-- use in conservation

- What type of danger (effective population size):
-- extinction
-- genetic erosion</td><td>- Life time of cultivars
- Number of breeding companies
- FAO Early Warning System on Plant Genetic Resources For Agriculture (PGRFA)</td></tr>
<tr><td>5. Number of species and accessions conserved in situ and ex situ</td><td>- Per country, per area for landraces
- Number of accessions and diversity among accessions
- Unique accession collections and possible duplicates

- In situ :
-- on farm
-- ecosystem (wild relatives)</td><td>-Available
- Evaluation/character data
- Core collections

-FAO indicators</td></tr>
</table>

Source: OECD Expert Meeting on Agri-biodiversity Indicators, Zürich, Switzerland, November, 2001 (see http://www1.oecd.org/agr/biodiversity/index.htm)

Annex 3. Driving Forces, State, and Responses Related to Agricultural Genetic Diversity

The expert meeting discussed the general driving forces, state and responses to the conservation and management of agricultural genetic resources and recognised a number of commonalities across most OECD countries, described below.

1. Driving Forces and Processes Affecting Agricultural Genetic Resources

- Impact of artificial insemination on the maintenance of diversity for animal genetic resources.
- Upgrading of indigenous (native) populations with non-domestic (non-native) genetic material.
- Role of farming at different scales and the influence of home gardens on conservation efforts.
- Intensification of agro-ecosystems and the conversion to agricultural use of some ecosystems (*e.g.* wetlands).
- General concern for cross pollinated crop species, where there is concern for the potential of a lack of seed or fruit set due to the loss of effective pollinators and their populations.

2. State of Agricultural Genetic Resources

- Each country should be responsible for maintaining their own plant/animal genetic resource programmes and for delivery of information (passport, characterisation, diversity indicators) on their own crop and livestock genetic resources.
- The number of registered cultivars within national programmes have been increasing across all OECD countries and throughout the rest of the world.
- Genetic erosion is taking place at an accelerated level with the number of landraces and endangered breeds being particularly affected. The effective population size for threatened plants or animals remains a contentious issue in need of scientific input as differences in estimates exist among species from a theoretical population genetic level and at a practical level.
- Recently registered, modern cultivars are much more genetically similar than those registered 10-20 years ago. Less genetic diversity exists in the modern cultivars making them potentially more susceptible to biotic and abiotic stresses. However, detailed scientific data in this area is lacking.
- Across OECD countries there is heterogeneity of natural conditions for farming and different production systems resulting in a diversity of different demands for livestock and crop genetic resources. Description of agro-ecosystems and farm management systems in which genetic resources are cultivated/reared are required.

3. Responses To Conserve Agricultural Genetic Diversity

- Most national genetic resource programmes continue to suffer from lack of adequate financial resources to meet their mandates.

- Evaluation, documentation, and monitoring are essential elements of all national programmes.

- Collections and *in situ* and *ex situ* conservation are complementary for effective conservation of national resources, but rarely exist in harmony. Efforts tend to be fragmentary. *In situ* conservation has long been the conservation method of choice for wild species and ecosystems, while *ex situ* approaches have generally been preferred by plant breeders and other scientist concerned with plant genetic resources for food and agriculture.

- Necessary and effective systems for seed multiplication are required to distribute the benefits of modern plant breeding and registered cultivars.

- Raise awareness of the cultural value of genetic resources linked to ethnobotany. Ethnobotany involves knowledge that develops in a particular area and accumulates over time through being handed down from generation to generation. Better linkages are required between ethnobotanists and plant conservationists, as both can lead to the same result.

- Define thresholds and targets for agricultural genetic conservation across countries to target current and future needs.

Source: OECD Expert Meeting on Agri-biodiversity Indicators, Zürich, Switzerland, November, 2001 (see http://www1.oecd.org/agr/biodiversity/index.htm)

Annex 4. Broad Guidelines for Categorising, Defining and Selecting Habitat Types in Agro-Ecosystems

To move toward consistency across OECD countries, experts recognised the need for guidelines as to how habitat types in agro-ecosystems are classified, including the criteria used in their selection and the characteristics that provide their definition. These guidelines provide the basis of a system to harmonise a system of habitat classification and definitions for agro-ecosystems across OECD countries. The key guidelines for countries to take into account include:

1. Include all agricultural land that comprise the agro-ecosystem, and not just the protected areas in agro-ecosystems or those areas that are subject to specific conditions and restraints in terms of how they are managed for farming purposes.

2. Provide the criteria used to select each habitat type within the agro-ecosystem, in particular, clearly establishing whether the criteria are based largely on how the land is managed (*e.g.* the intensity of input use and animal stocking rates), or if mainly ecological/biological criteria are used to classify different habitats (*e.g.* wetlands, heathlands, wild prairie) or some combination of both ecological/biological and management criteria are employed (e.g. semi-natural grassland).

3. Define the characteristics of each habitat type through metadata (*i.e.* annotated descriptive notes), such as the intensity of input use for a given habitat type, the animal stocking density, and the time of the year when the grass is mown.

4. Develop a comprehensive list of the different habitats types selected for an agro-ecosystem, supported by appropriate metadata and other relevant information.

5. Identify the regularity with which data on the current area (stock) and changes (flows) in habitats across agro-ecosystems are collected, and describe the methods used to collect the data (*e.g.* census, sampling, remote sensing).

Source: OECD Expert Meeting on Agri-biodiversity Indicators, Zürich, Switzerland, November, 2001 (see http://www1.oecd.org/agr/biodiversity/index.htm)

Annex 5. Proposed Guidelines for Selecting Indicators of Wild Species Related To Agriculture

To move toward consistency across OECD countries, experts recognised the need for guidelines to select indicators of wild species related to agriculture, as outlined below.

1. Select a minimum set of wild species collectively representing a wide range of habitat types across agricultural land.

Species indicators should be capable of reflecting changes across all agricultural habitats, as well as particular biodiversity rich habitats. The minimum coverage of wild species should include plants, birds, mammals and at least one invertebrate group. The wild species selected should be well known to biologists, preferably with a stable taxonomy, and with a good knowledge of their habitat preferences, including an understanding of the use and requirements wild species make of habitats in agro-ecosystems, for example, for breeding, feeding, and cover.

2. Select a range of wild species that require different types of agricultural land and from various species groups.

A range of species should be chosen with a variety of requirements, to ensure that the indicators are capable of reflecting changes in different agricultural habitats and across different species groups (*e.g.* birds, mammals, arthropods, plants, etc). Indicators based on single species, with particular requirements, are unlikely to detect all of the changes affecting agricultural habitats. For example, farmland birds have a variety of requirements in terms of nesting sites, winter and summer food, and thus, different species are affected by various agricultural changes.

3. Select rare, endangered and widespread species.

Biodiversity conservation is concerned not only with rare and endangered species, but also with trends in widespread species in the agro-ecosystem. Indicators based on rare/endangered species are likely to reflect progress in conserving priority species and habitats, while indicators of widespread species are likely to be more representative of trends in the health of biodiversity in the wider countryside.

4. Select wild species relevant to policy issues at different scales from the local to global level.

Indicators need to reflect the effects on species of agricultural policy and practice at the national and international level, as well as being able to measure the impact of specific agri-environment policies, at local and regional levels. The choice of species, and the scale at which indicators are developed, need to be appropriate for the policy issues being considered. For example, it may be appropriate to use indicators based on populations of breeding wading birds to evaluate the performance of a particular wetland agri-environment scheme, but this may not be a good indicator of national trends in wild species in agriculture, which would require inclusion of species more representative of more widespread agricultural habitats.

In developing these guidelines it will be important to:

i. **Recognise the scientific uncertainty about current and future biodiversity issues in agriculture.**

Current understanding of trends in wild species, and the reasons for these trends, is incomplete. Furthermore, it is difficult to predict future trends, and the choice of species indicators needs to be flexible to reflect this uncertainty. For example, the United Kingdom wild birds indicator is based on data collected since 1970, before it was known that farmland birds would decline, but has since proved to be a valuable agri-environmental policy tool (the UK bird indicator is included in the national set of sustainable development headline indicators, see http://www.sustainable-development.gov.uk/indicators/index.htm)

ii. **Reveal the criteria used and rationale for the wild species chosen within a country**

Debate about the development and interpretation of wild species indicators will be greatly facilitated if countries publish information about the criteria they have used in developing indicators and the rationale for their choice of species. Regular publication and discussion of the indicators themselves will also help in this respect.

Source: OECD Expert Meeting on Agri-biodiversity Indicators, Zürich, Switzerland, November, 2001 (see http://www1.oecd.org/agr/biodiversity/index.htm)

Annex 6. Agenda OECD Expert Meeting On Agri–Biodiversity Indicators

5–8 November 2001 FAL (Swiss Federal Research Station for Agroecology and Agriculture)
Reckenholzstrasse 191, CH-8046 Zurich, Switzerland

Monday, 5 November 2001

08.30 – 09.30 **Registration of participants**

09.30 – 10.30 **PLENARY SESSION 1** (1 hour)

***Chair*:** Wilfrid Legg, Head of Policies and Environment Division, Agriculture Directorate, OECD

Introduction and Objectives for the Meeting

- Welcome introduction from the Swiss authorities:
  Dr. Paul Steffen, Director for the Federal Agro-Ecological and Zurich – Reckenholz Research Station, Zurich, Switzerland.

- OECD Secretariat to define the overall meeting objectives, on the basis of a background document, presented by Kevin Parris, Senior Analyst, Policies and Environment Division, Agriculture Directorate.

10.30 – 11.00 Break

11.00 – 18.00 **PARALLEL SESSIONS** (5 hours)

Group 1: Plant and Animal Genetic Resources for Food and Agriculture

Chair: Ton Breure, National Institute of Public Health and the Environment (RIVM), Netherlands

Rapporteur: Ken Richards, Agriculture and Agri-Food Canada

11.00 – 13.00 **Group 1-A. Overview of Agricultural Genetic Resource Diversity**

11.00 – 12.00 **Presentations**

- Indicators of Agricultural Genetic Resources: FAO's Contribution to Monitoring Agricultural Biodiversity — Linda Collette, FAO, Italy.

- Biological Diversity of Livestock and Crops: Useful Classification and Appropriate Agri-environmental Indicators — Frank Wetterich, Institute for Organic Agriculture, Germany.

- Agri-biodiversity Indicators used in Poland — Anna Liro (Ministry of Agriculture), Elzbieta Martyniuk (National Animal Breeding Centre), Tadeusz Oleksiak and Wieslaw Podyma (Plant Breeding and Acclimatization Institute), Poland.

Group 1-B. Animal Genetic Resource Diversity

- Animal Genetic Resources Indicators in Germany — Eildert Groeneveld (Institute for Animal Science) and Jörg Bremond (Information Centre for Genetic Resources), Germany.

12.00 – 13.00 **Discussion of Papers**

Discussant: Andreas Georgoudis, Aristotle University of Thessaloniki, Greece

13.00 – 14.30 Lunch

14.30 – 15.30 **Presentations**

Group 1-B (continued). Animal Genetic Resource Diversity

- Developing Biodiversity Indicators for the Livestock in Greece — A. Georgoudis (University of Thessaloniki), A. Baltas (Ministry of Agriculture), Ch. Tsafaras (Ministry of Agriculture), Ch. Ligda (National Agricultural Research Foundation), E. Danou (Ministry of Agriculture), and K. Fragos (Ministry of Agriculture), Greece.

Group 1-C. Plant Genetic Resource Diversity

- Plant Genetic Resources and Agri-biodiversity in Czech Republic — Ladislav Dotlacil, Zdenek Stehno, Anna Michalova and Iva Faberova, Research Institute of Crop Production, Czech Republic.

- Assessment of Crop Diversity in Hungary: Possible Indicators for Genetic Variation — Laszlo Holly and Bertalan Szekely, Ministry of Agriculture, Hungary.

- Agricultural Plant Diversity in Turkey — Ayfer Tan, Aegean Agricultural Research Institute, Turkey.

15.30 – 16.30 **Discussion of Papers**

Discussant: Frank Wetterich, Institute for Organic Agriculture, Germany

16.30 – 17.00 Break

17.00 – 18.00 **Finalise Discussion of Group 1 papers for Report to Plenary Session 3**.

Discussant: Anna Liro, Ministry of Agriculture, Poland

PARALLEL SESSION (continued Group 2)

Group 2: Wild Species Dependent or Impacted by Agricultural Activities and Analytical Tools for Measuring Trends in Biodiversity

Chair: Dominique Dron, Institut National de la Recherche Agronomique (INRA), France

***Rapporteur*:** Jan-Erik Petersen, European Environment Agency, Denmark

11.00 – 13.00 **Group 2-A. Wild Species Dependent or Impacted by Agricultural Activities**

11.00 – 12.00 **Presentations**

- A Perspective on Indicators for Species Diversity in Denmark — Rasmus Ejrnæs, National Environmental Research Institute, Denmark.

- Wild Flora and Fauna in Irish Agro-ecosystems: A Practical Perspective on Indicator Selection — Jane Feehan, Trinity College and TEAGASC, Ireland.

- Agro-biodiversity Indicators for Policy Evaluation: The Experience of Emilia Romagna — Gianfranco De Geronimo, Franco Marchesi and Roberto Tinarelli, Emilia Romagna Administrative Region, Italy.

- An Agricultural Habitat Indicator for Wildlife — Jin-Han Kim, Byung-Ho Yoo, Changman Won, Jin-Young Park and Jeong-Yeon Yi, National Institute of Environmental Research, Korea.

- Using Bird Data to Develop Biodiversity Indicators for Agriculture — Melanie Heath and Matthew Rayment, Birdlife International, United Kingdom.

12.00 – 13.00 **Discussion of Papers** ***Discussant:*** Gerard van Dijk, UNEP, Switzerland

13.00 – 14.30 Lunch

14.30 – 16.30 **Group 2-B. Analytical Tools for Measuring Trends in Biodiversity**

14.30 – 15.30 Presentations

- Overview of Biodiversity Indicators Related to Agriculture in Belgium — Visi Garcia Cidad (Catholic University of Louvain), Jean-François Maljean and Alan Peeters (Institute of Nature Conservation), Geert De Blust (Institute of Nature Conservation), Belgium.

- Automated Classification of Habitats — Rasmus Ejrnæs, National Environmental Research Institute, Denmark.

- Eco-Fauna Database: A Tool for Both Selecting Indicator Species for Land Use and Estimating Impacts of Land Use on Animal Species — Thomas Walter and Karin Schneider, Swiss Federal Research Station for Agroecology and Agriculture, FAL, Switzerland.

- New Opportunities for Habitat Monitoring: Linking Plant Species and Remote Sensing Techniques — Andreas Grünig and Erich Szerencsits, Swiss Federal Research Station for Agro-ecology and Agriculture, FAL, Switzerland.

- From Scientific Analysis to Agri-environmental Measures — Riccardo Simoncini, University of Florence, Italy, representing IUCN.

15.30 – 16.30 **Discussion of Papers**

Discussant: Ben ten Brink, RIVM (National Institute for Public Health and the Environment), The Netherlands.

16.30 – 17.00 Break

17.00 – 18.00 **Finalise Discussion of Group 2 papers for Report to Plenary Session 3.**

Discussant: Dominique Richard, EEA Topic Centre on Nature Protection and Biodiversity, France.

19.30 – 20.30 Cocktail Party hosted by Swiss authorities at the Uto Kulm Hotel, Uetliberg, Zürich.

Tuesday, 6 November 2001

09.30 – 18.00 **PLENARY SESSION 2** (6 hours) — **Ecosystem/Habitats Impacted by Agricultural Activities and Linking Wild Species Use of Agricultural Habitats**

Chair: Jim McCuaig, Wetlands International

***Rapporteur*:** Daniel Zürcher, Forest, Nature and Landscape Protection Service, Geneva Canton, Switzerland

09.30 – 13.00 **Ecosystem/Habitats Impacted by Agricultural Activities**

09.30 – 10.15 Presentations

- Estimating Wildlife Habitat Trends on Agricultural Ecosystems in the United States — Stephen J. Brady and Curtis H. Flather, US Department of Agriculture, United States. *[This paper was not presented as the authors were unable to attend the meeting]*

- Monitoring Habitat Change in Japanese Agricultural Systems — David Sprague, National Institute for Agro-Environmental Sciences, Japan.

- Agriculture and Biodiversity: Reporting on Trends at European Level — Dominique Richard, European Topic Centre on Nature Protection and Biodiversity (EEA), France.

- Constraints in Land Use by Agriculture, Nature Protection Issues, Rural Development and Biodiversity in Various Regions of Austria — An Analytical Approach Based on Spatial Information Techniques — Peter Aubrecht, Bettina Götz and Gerhard Zethner, Federal Environmental Agency, Austria.

- How to Measure the Ecological Value of Conventional Agricultural Landscape? — Reija Hietala-Koivu (MTT Agrifood Research), Tiia Jokinen (Helsinki University of Technology) and Juha Helenius (University of Helsinki), Finland.

10.15 – 11.00 **Discussion of Papers**

Discussant: Gail Smith, Unilever, United Kingdom (representing BIAC)

11.00 – 11.30 Break

11.30 – 12.15 **Presentations**

- National and Regional Level Farmland Biodiversity Indicators in Finland — Mikko Kuussaari and Janne Heliölä, Finish Environment Institute, Finland.

- Environmental Indicators for Farmland Habitats: The Situation in Italy — Marco Genghini, National Institute of Wild Fauna, Italy.

- Measuring the Impact of Norwegian Agriculture on Habitats — Wendy Fjellstad, Institute of Land Inventory, Norway.

- Developing Habitat Accounts: An Application of the UK Countryside Surveys — Andrew Stott, Department for Environment, Food and Rural Affairs, United Kingdom.

- Agri-biodiversity Indicators: A View from Unilever Sustainable Agriculture Initiative — Gail Smith (Unilever, UK), Jamie McMasters (Outsourced Environment, Australia), and David Pendlington (Unilever, United Kingdom), representing BIAC.

12.15 – 13.00 **Discussion of Papers**

Discussant: Riccardo Simoncini, University of Florence (representing IUCN), Italy

13.00 – 14.30 Lunch

14.30 – 16.30 **Linking Wild Species With Their Use of Different Agricultural Habitats**

14.30 – 15.30 **Presentations**

- Indicators of Agri-biodiversity: Australia's Experience — James Walcott, Jean Chesson and Peter O'Brien, Bureau of Rural Sciences, Australia.

- Using Biological and Land Use Information to Develop Indicators of Habitat Availability on Farmland — Terence McRae and Ted Weins, Agriculture and Agri--Food Canada.

- Assessing Biodiversity in Agricultural Ecosystems — Michael J. Mac, US Geological Survey, United States.
  [*This paper was not presented as the author was unable to attend the meeting*]

- The State of Agro-biodiversity in The Netherlands: Integrating Habitat and Species Indicators — Ben ten Brink, RIVM (National Institute of Public Health and the Environment), The Netherlands.

- Biodiversity Indicators in Agriculture: A Combination of Species and Habitat Approaches — Gerard van Dijk, UNEP — Regional Office for Europe, Switzerland.

15.30 – 16.30 **Discussion of Papers**

Discussant: Ben Delbaere, European Centre for Nature Conservation (ECNC), The Netherlands.

16.30 – 17.00 Break

17.00 – 18.00 **Finalise Discussion of Plenary Session 2 papers for Report to Plenary Session 3.**

Discussant: Jane Feehan, Trinity College, Ireland

18.00 – 18.15 **Introduction to the field trip.**

Wednesday, 7 November 2001

One day field trip

Thursday, 8 November 2001

09.30 – 16.30 **PLENARY SESSION 3 (**5 hours) — **Discussion of Rapporteurs Reports and Meeting's Recommendations for Future Work**

***Chair*:** Peter O'Brien, Bureau of Rural Sciences, Australia

The main objective of this plenary session was to examine the conclusions from previous Parallel and Plenary Session discussions, as a basis to prepare the key recommendations for future OECD work on agri-biodiversity indicators included in this paper.

09.30 – 13.00 **1. Reports by Rapporteurs and Plenary Discussion**

09.30 – 10.10 **Parallel Group 1 — Agricultural Genetic Diversity**

09.30 – 09.45 Rapporteurs' Report — Ken Richards, Agriculture and Agri-Food Canada.

09.45 – 09.50 Discussant — Ladislav Dotlacil, Research Institute of Crop Production, Czech Republic

09.50 – 10.10 Plenary Discussion

10.10 – 11.50 **Parallel Group 2 — Wild Species and Analytical Tools for Biodiversity Monitoring**

10.10 – 10.30 Rapporteurs' Report — Jan-Erik Petersen, European Environment Agency, Denmark

10.30 – 11.00 Break

11.00 – 11.10 Discussant — Wild Species — Matthew Rayment, Birdlife International.

11.10 – 11.20 Discussant — Analytical Tools — Ben Ten Brink, RIVM (National Institute for Public Health and the Environment), The Netherlands.

11.20 – 11.50 Plenary Discussion

11.50 – 13.00 **Plenary Session 2 — Ecosystem Impacts by Agriculture and Linking Wild Species Use of Agricultural Habitats**

11.50 – 12.10 Rapporteurs' Report — Daniel Zürcher, Switzerland

12.10 – 12.20 Discussant — Habitats — David Sprague, National Institute of Agro-Environmental Sciences, Japan.

12.20 – 12.30 Discussant — Linkages **—** Ben Ten Brink, RIVM (National Institute for Public Health and the Environment), The Netherlands, and Andrew Stott, Department for Environment, Food and Rural Affairs, United Kingdom.

12.30 – 13.00 Plenary Discussion

13.00 – 14.30 Lunch

14.30 – 15.00 **1. Key Conclusions and Future Challenges — OECD Secretariat**

15.00 – 16.30 **2. Plenary Discussion of OECD Secretariat Conclusions and Close of Meeting**

Annex 7. List of Documents presented by Experts at the Meeting and available on the OECD website at: http://www1.oecd.org/agr/biodiversity/index.htm.

Plant and Animal Genetic Resources for Food and Agriculture

- Indicators of Agricultural Genetic Resources: FAO's Contribution to Monitoring Agricultural Biodiversity — Linda Collette, FAO, Italy.

- Biological Diversity of Livestock and Crops: Useful Classification and Appropriate Agri-environmental Indicators — Frank Wetterich, Institute for Organic Agriculture, Germany.

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- Animal Genetic Resources Indicators in Germany — Eildert Groeneveld (Institute for Animal Science) and Jörg Bremond (Information Centre for Genetic Resources), Germany.

- Developing Biodiversity Indicators for Livestock in Greece — A. Georgoudis (University of Thessaloniki), A. Baltas (Ministry of Agriculture), Ch. Tsafaras (Ministry of Agriculture), Ch. Ligda (National Agricultural Research Foundation), E. Danou (Ministry of Agriculture), and K. Fragos (Ministry of Agriculture), Greece.

- Plant Genetic Resources and Agri-biodiversity in the Czech Republic — Ladislav Dotlacil, Zdenek Stehno, Anna Michalova and Iva Faberova, Research Institute of Crop Production, Czech Republic.

- Assessment of Crop Diversity in Hungary: Possible Indicators for Genetic Variation — Laszlo Holly and Bertalan Szekely, Ministry of Agriculture, Hungary.

- Agricultural Plant Diversity in Turkey — Ayfer Tan, Aegean Agricultural Research Institute, Turkey.

Wild Species Dependent or Impacted by Agricultural Activities

- A Perspective on Indicators for Species Diversity in Denmark — Rasmus Ejrnæs, National Environmental Research Institute, Denmark.

- Wild Flora and Fauna in Irish Agro-ecosystems: A Practical Perspective on Indicator Selection — Jane Feehan, Trinity College and TEAGASC, Ireland.

- Agro-biodiversity Indicators for Policy Evaluation: The Experience of Emilia Romagna — Gianfranco De Geronimo, Franco Marchesi and Roberto Tinarelli, Emilia Romagna Administrative Region, Italy.

- An Agricultural Habitat Indicator for Wildlife — Jin-Han Kim, Byung-Ho Yoo, Changman Won, Jin-Young Park and Jeong-Yeon Yi, National Institute of Environmental Research, Korea.

- Using Bird Data to Develop Biodiversity Indicators for Agriculture — Melanie Heath and Matthew Rayment, Birdlife International, United Kingdom.

Analytical Tools for Measuring Trends in Biodiversity

- Overview of Biodiversity Indicators Related to Agriculture in Belgium — Visi Garcia Cidad (Catholic University of Louvain), Jean-François Maljean and Alan Peeters (Institute of Nature Conservation), Geert De Blust (Institute of Nature Conservation), Belgium.

- Automated Classification of Habitats — Rasmus Ejrnæs, National Environmental Research Institute, Denmark.

- Eco-Fauna Database: A Tool for Both Selecting Indicator Species for Land Use and Estimating Impacts of Land Use on Animal Species — Thomas Walter and Karin Schneider, Swiss Federal Research Station for Agroecology and Agriculture, FAL, Switzerland.

- New Opportunities for Habitat Monitoring: Linking Plant Species and Remote Sensing Techniques — Andreas Grünig and Erich Szerencsits, Swiss Federal Research Station for Agro-ecology and Agriculture, FAL, Switzerland.

- From Scientific Analysis to Agri-environmental Measures — Riccardo Simoncini, University of Florence, Italy, representing IUCN.

Ecosystem/Habitats Impacted by Agricultural Activities

- Estimating Wildlife Habitat Trends on Agricultural Ecosystems in the United States — Stephen J. Brady and Curtis H. Flather, US Department of Agriculture, United States.

- Monitoring Habitat Change in Japanese Agricultural Systems — David Sprague, National Institute for Agro-Environmental Sciences, Japan.

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Linking Wild Species with their Use of Different Agricultural Habitats

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