Overview on

SHAPING EUROPEAN BIODIVERSITY RESEARCH FOR A SUSTAINABLE EUROPE

Biostrat Project

preparation work for the (German EPBRS meeting, 4-7 May 2007)

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A. Introduction

In May 2006, an Action Plan of the EU Communication from the Commission (2006) 216 on "Halting the loss of biodiversity until 2010 and beyond" was published.

The annexes to this Action Plan provide a framework for actions at EU and member state level. Four policy areas were identified in this Action Plan:

- Biodiversity in the EU
- The EU and global biodiversity
- Biodiversity and Climate Change
- The Biodiversity Knowledge base

During the German EPBRS meeting, as one topic, and as part of the "Biodiversity in the EU" policy area, aspects of sustainable use of biodiversity in the "wider EU countryside" will be discussed.

In this view, Biostrat partners, in support of EPBRS, were invited to prepare a national review focusing on Objective 2 of Annex 1 of the EU COM (2006) 216: "*To conserve and restore biodiversity and ecosystem services in the wider EU countryside*". The headline target of Objective 2 is "*In wider EU countryside (terrestrial, freshwater, brackish water outside Natura 2000 network), biodiversity loss halted by 2010 and showing substantial recovery by 2013*". Concerning Agricultural and Rural Development Policy, the target (A2.1) is that "*Member States have optimized use of opportunities under agricultural, rural development and forest policy to benefit biodiversity 2007-2013*".

The three following actions were priority topics:

- the identification of high value farmland (and forest) areas (Action A2.1.3)
- the influence of national plans of CAP implementation on biodiversity, including aspects of cross-compliance (Action A2.1.4)
- the development of indicators and monitoring schemes (Action A2.1.8)[1]

Participants were also invited to address some additional topics from Objective 2 and Objective 4 ("*To reinforce compatibility of regional and territorial development with biodiversity in the EU*") considered the most relevant to their country.

The main question of the review was "*Which research carried out or currently under way in your country has been supporting major topics of the EU-Communication? What are the main results?*"

In total, 14 country reviews were received[2]. Although the structure of the reviews varied from country to country, most of them addressed Actions A2.1.3, A2.1.4 and A2.1.8 in priority.

Difficulties

The guidelines of the reviews referred to the "development of indicators and monitoring schemes" as Action A2.1.7, when Annex 1 of the EU Action Plan refers to this topic as Action

[1] *NB*: not A2.1.7 as stated in the guidelines

[2] On average, the reviews were 24 pages (8 for the shortest to 40 for the longest), including references. One or several authors compiled the review for each partner.

A2.1.8. Although the large majority of the partners addressed the theme above, this lead to confusion for some partners who addressed in priority Action A2.1.7, ‘ensure future “less favoured areas” regime under Axis 2 enhances its contribution to biodiversity and to “high nature value” farm and forest areas’, and not Action A2.1.8.

Selection criteria of publications and main topics for the review

Different methods were used by the partners to review the different topics. The study was mostly based on literature reviews, including publications retrieved through the ISI Web of Knowledgedatabase. What was considered relevant for the study however varied. In the Spanish review, one of the authors had to be based in Spain and the subject area or keywords had to be related to biodiversity for the publication to be considered in the study. For the British review were considered publications where the research relevant to the sustainable use of biodiversity had been done in the UK or elsewhere by UK scientists. National publications and web sources were also used in the reviews. Belgium and Ireland considered the number of funded projects under each topic as indication of the amount of work done, since 2000 (Belgium) or ‘whether they took place prior to 2007 or will be going on through 2007-2010’ (Ireland).

B. Main findings of the selected studies.

Action A2.1.3. Define criteria and identify high nature value farmland and forest areas (*including Natura 2000 network*) threatened with loss of biodiversity (with particular attention to extensive farming and forest/woodland systems at risk of intensification or abandonment, or already abandoned), and design and implement measures to maintain and/or restore conservation status (2007-onwards)

The first time the concept of High Nature Value (HNV) was addressed at European scale was in the *The Nature of farming* (Beaufoy et al. 1994; Bignal and McCracken 1996, 2000) and concerned 9 countries. It concluded that most HNV farms were located in the more marginal areas and on the poorer lands, including mountain areas, marshlands and the more arid areas of Europe. However HNV areas were not mapped in a consistent way.

Refinement was necessary to clarify what type of indicator may be best to establish where HNV systems occur. Another study was performed in which a first HNV farmland indicator for the whole EU was developed (Andersen et al. 2003). In this study HNV farmland areas were identified using CORINE land cover, farming data from FADN and bird distribution data. High Nature Value farmland was defined as those *areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports, or is associated with, either a high species and habitat diversity, or the presence of species of European conservation concern, or both.*

Based on the Andersen et al. study, the European Environment Agency (EEA) and the United Nations Environment Programme (UNEP) published a Joint Message (EEA 2004), presenting a preliminary map of HNV farmland for the EU (EEA, 2004), and from this the IRENA (Indicator Reporting on the integration of Environmental concerns into Agricultural policy) indicator 26 (High Nature Value (farmland) areas) was also developed (EEA, 2005). In both publications the HNV farmland indicator used was based on the CORINE Land Cover (CLC) data.

In Belgium, high value farmland and forest areas have been identified for the whole territory and it is estimated that there is adequate funding for research in this field. However the Irish review states that research is required to directly target the identification of HNV farmland outside Natura 2000 network, and to develop indicators and monitoring schemes for these areas.

For example, in Portugal, the Nature 2000 Network represents 21% of the mainland territory, and the Natura 2000 network areas, by their very nature and size include the core of the HNV systems identified. According to EEA (2004) 37% of the Utilised Agricutural Area (UAA) in Portugal is HNV farmland.

Most of the newly EU accessed countries have also undertaken the identification of HNV areas. In Latvia, HNV have been identified in 2005-06 and the mapping is underway. These HNV mainly concern grasslands, and the mapping is undertaken by the “Latvian Fund for Nature”. The monitoring of natural forests has also started in 2005. Czech Republic is also identifying its HNV through the Horizontal Rural Development Plan of the Czech Republic (2004-2006).

Lithuania is facing more difficulties. Agri-ecosystems are all particularly insufficiently studied. The identification of Natura 2000 areas is also hindered by limited resources. Methodology was therefore not applied correctly in some cases. In addition, human violations in protected areas are still significant in the country. Concerning HNV forest areas, as Lithuania exports round wood and its products, the forest certification is becoming an important part of Lithuanian forest policy and strategy. However as a result of too intensive and irrational activities, Lithuanian forests are

in critical state and the current legal framework for forest management is in many respects in conflict with biodiversity conservation requirements, and educational work has to be done with different groups of landowners.

For the Polish review, farms on Natura 2000 sites should automatically be classified as HNV farmland, but the question of the best method to for their identification is also asked. Regarding HNV forest areas, a new inventory is currently underway (launched in August 2006) and the results are expected at the end of 2007.

Cyprus, who entered the EU in 2004, is a biodiversity hotspot area. To date, the Agriculture Research Institute of the Republic of Cyprus is conducting several projects on cultivated species, as well as on local domestic livestock, which is expected to help register the diversity among plants and animals and identify HNV farmlands.

Threats to biodiversity are also a concern HNV areas in many countries. In Poland, where 30% of the territory is occupied by forests, acidification, eutrophication and the expansion of alien invasive plant species are threatening HNV farms and forests. Agriculture practices such as agriculture intensification affect individual species or groups of species. According to a Portuguese study (Santos 2006), the most important issue for conservation in 90% of the land area of the Natura 2000 network is how to keep existing low intensity farming system, which deliver the habitat conditions, and how to prevent abandonment, intensification or afforestation of these systems. In Finland it was estimated that the area of traditional biotopes should be tenfold in order to prevent threatened species from extinction (Vainio et al. 2001).

Several propositions were made for possible future research priorities concerning HNV areas. According to the Irish review, in addition to the gaps identified on the detection of HNV farmlands outside Natura 2000, and the development of indicators and monitoring schemes for these areas, further work is needed in the identification of Hot-spots, in long-term studies of habitats within intensively managed anthropogenic environments, and landscape analysis of the impact of the abandonment of traditional patterns of land use and farming systems on biodiversity in economically marginal areas. The Belgium review states that more research should be undertaken on agricultural biodiversity.

For several partners, the method for the identification of HNV should be revisited. Even though CLC is the best EU wide source of land cover data, Andersen et al. (2003) highlighted the many limitations of using such an approach. For example, the minimal unit with the CLC is 25 ha which means that many small scale feature of HNV are not recognised or identified. In addition, CLC provides no indication as to the condition of any of the farmland habitats recognised nor indeed as to whether those habitats are still under any form of farmland management.

The same observation is made in the Finnish review, where it is stated that CORINE (satellite-based land cover data approach) to create a map of potential HNV farmlands is indicative only, and that national field surveys should be used alongside land cover data in other countries to identify HNV farmland areas, since they take into account local expertise (SYKE 2005).

Given the potential difficulties of operationalising the HNV approach across Member States, DG Agriculture is currently (February 2007) funding a study of HNV indicators with a view to provide clearer guidance to member states as to what is meant by HNV, how they can go about recognising HNV areas, features and farms and how they could consider evaluating whether HNV farms (and forests) are receiving appropriate support under the new Rural Development Plans. This DG Agriculture study is led by the Institute of European Environmental Policy and involves input from a range of European experts.

Action A2.1.4. Ensure effective implementation of cross-compliance (which provides a baseline for most of the measures of Axis 2 of the Rural Development Regulation) in ways that benefit biodiversity (2007-2013)

One of the objectives of the European Community is to reach the right balance between competitive agricultural production and the respect of nature and the environment. The integration process refers to the introduction of measures seeking environmental protection into different Community policy areas. It implies an active pursuit of coherence between agricultural and environmental policy.

Since Agenda 2000, the Common Agricultural Policy has two pillars: the market and income policy ('first pillar'), and the sustainable development of rural areas ('second pillar'). The 2003 CAP reform brings greater quality to environmental integration, with new or amended measures to promote the protection of the farmed environment in both pillars.

The principle of cross-compliance[3] refers to the statement that farmers should comply with environmental protection requirements as a condition for benefiting from market support. The 2003 CAP reform put greater emphasis on cross-compliance which has become compulsory since 2005. Nineteen legislative acts applying directly at the farm level in the fields of environment, public, animal and plant health and animal welfare have been established and farmers are sanctioned in case of non-compliance (partial or entire reduction of direct support). Beneficiaries of direct payments are also obliged to keep land in good agricultural and environmental conditions. These conditions are defined by Member States, and should include standards related to soil protection, maintenance of soil organic matter and soil structure, and maintenance of habitats and landscape, including the protection of permanent pasture. In addition, Member States must also ensure that there is no significant decrease in their total permanent pasture area, if necessary by prohibiting its conversion to arable land.

The Agenda 2000 CAP reform also introduced the requirement for Member States to take the environmental measures they consider appropriate in view of the situation of the agricultural land used or the production concerned. This requirement was incorporated in the "Horizontal Regulation", which provides the common rules in relation to all payments granted directly to farmers.

Member States had three options for fulfilling this obligation: giving support for agri-environmental commitments, fixing general mandatory environmental requirements (based on environmental legislation), and setting out specific environmental standards. Where farmers do not respect the environmental requirements, appropriate sanctions are to be applied, which may include the reduction or even the withdrawal of direct aids. Examples of environmental conditions are adherence to maximum stocking rates for cattle or sheep, compliance with specific conditions for the cultivation of sloping land, respect of maximum permitted volumes of fertilizers per hectare, and compliance with specific rules concerning the use of plant protection products.

National plans of CAP implementation were applied at different moments, depending on the country.

The research effort to evaluate the impact of CAP reform on biodiversity varies a lot between the countries. In Belgium for example, very limited research efforts are made to evaluate national plans of CAP implementation on biodiversity, including aspects of cross-compliance. It is stated

[3] http://ec.europa.eu/agriculture/envir/index_en.htm#crosscom

that this can partly be explained by the time gap there always is between new policies, funding research towards the effectiveness of those policies and the availability of the results. In Ireland as well a small number of projects contribute to this action.

In the UK, despite the concern about the implementation of agri-environment schemes, many researchers conclude that the development of such schemes can benefit biodiversity (Bradbury et al. 2000, Vickery et al. 2004). It has also been argued that schemes designed to encompass large congruent areas are more likely to be successful than a series of smaller habitat patches (Whittingham 2007).

The Spanish review states that the EU CAP and the consequent changes in land use have negatively affected many European bird species through habitat fragmentation or loss. According to a study by Suarez-Seoane et al. (2002) land use have taken two opposite directions: agricultural intensification or land abandonment. While in the Mediterranean region land abandonment is a main cause of avian diversity decline, in northern Europe species diversity often increases. The same study concludes that the introduction of agricultural policies to geo-political units that do not coincide with ecological zones cannot be assumed to bring uniform conservation benefits. Concerning forest areas, recent analyses of the total economic value of Mediterranean forests emphasize that non-commercial economic values such as recreation, conservation and carbon fixation can be more important than commercial values such as timber production, grazing or hunting. In fact, multiple uses (including conservation) rather than intensification of timber production or hunting appear to be the only way of maintaining the economic sustainability of Mediterranean forests. It is estimated that this economic reality would justify CAP reforms aimed at subsidizing the proposed management measures.

In Portugal, the CAP reform applied in January 2005 and lead to new challenges and opportunities, which take into account the protection of the soil against erosion, water quality and forest fire prevention. In the past, Portugal has suffered many consequences with the implementation of CAP. In 1993 many farmers where encouraged high productivity and made massive investments in order to compete in the European market. There was a substantial increase in conversion of abandoned land into farming land with cereal crops reaching marginal land and low productivity of soils along with an increase of olive groves, vineyards, tomato leading to a decrease of forest, shrub and pasture land. This led to soil erosion, water resource depletion, water quality problems and most importantly biodiversity loss.

Since the CAP reform, efforts were therefore made towards the production of high quality products, decreasing the application of pesticides and promoting the good use of greenhouses. The aim of the National Strategy Plan of Agricultural and Rural Development 2007-2013 is to improve the competitiveness of the agricultural and forestry sectors in the countryside in a sustainable way. Of significant importance are the less-favoured areas in mountain regions. In mainland Portugal, compensatory payments together with cross-compliance requirements will evolve towards increasing support to smaller-size farms (the largest number). The aim of these measures is to maintain populations in areas at risk of abandonment and desertification and to contribute to territorial cohesion.

Overall, although it is still fairly early for Portugal to evaluate the impact of the CAP reform on biodiversity it is clear that Portugal faces a major production difficulties due to poor sector organization and qualification, particularly in terms of production, extreme supply fragmentation and lack of dimension, inadequate integration with marketing, processing and exports. Most non supported agricultural sectors such as fruit, vegetables and wine as well as modern olive oil production have a significant competitive potential in Portugal. They have experienced low levels of CAP support and border protection and therefore should not suffer from CAP reform.

However, 80% of the current agricultural area is occupied by strongly supported sectors such as extensive livestock and cereal systems, traditional olive groves and the *montado* agro-forestry system. These sectors occupy marginal areas dominated by mountains in the North and Centre or dry poor soils, in the South. These areas will suffer direct effects of recent and further CAP reforms. Although these areas are not economically very significant they are in someway facing extinction due to land abandonment and the disappearing of traditional management practices. This can lead to serious problems such as an increase in forest fires due to farmland abandonment. Therefore the conservation of these practices is vital in order to prevent biodiversity loss and farming needs to be implemented in land management goals.

In Finland, the rural development policy of Finland is part of the Common Agricultural Policy (CAP). The Horizontal Rural Development Plan of Continental Finland (2000-2006) includes two co-financed accompanying measures: the scheme for less favoured areas (LFA) and the agri-environment scheme. The impacts of the agri-environmental scheme on biodiversity have been monitored since 1995 through MYTVAS (Follow-up Study on Effects of the Finnish Agri-environmental Scheme). According to the intermediate report based on the period 2000-2003 three of the basic measures are considered to have positive effects on biodiversity: *headlands and filter strips*[4], *maintaining biodiversity and landscape*[5] as well as *environmental planning and monitoring in farming*[6]. Of the voluntary special support forms only two are considered significantly to biodiversity: *traditional biotopes*[7] and *other measures to enhance biodiversity* (although this one was found to be poorly carried out with no likely positive effects on biodiversity by a subsequent study) [8]. However it is not clear what is the effect of *organic production.*

In the evaluation of the Finnish National Programme of Biodiversity (1997-2005), attention has been paid on profitability and cost efficiency of the agri-environmental scheme. The study highlights that the agri-environment support lacks maintenance commitments, greatly weakening its effectiveness. The study also recognizes that the measures do not take into account that agricultural productivity and environmental sensibility vary largely from region to region.

The mid-term evaluation of the "Horizontal Rural Development Programme of Continental Finland" reveals that only 2-3 % of the payments are used for measures and that the voluntary special measures are considered to be more efficient in maintaining biodiversity. The most important single measure in terms of biodiversity is considered to be the special measure for the management of traditional biotopes.

Ongoing research projects include the study about the "Effects of the Finnish agri-environmental Scheme 2000-2006" (MYTVAS II), and the Finnish Environmental Institute is running a research project (MYTVANA) to analyse the cost-efficiency of different measures: preliminary results indicate that the overall effect on biodiversity has been modest. The study suggests creating an effective and extensive basic measure and setting up concrete objectives.

A preliminary study on the impacts of the CAP reform (2003) on biodiversity found that decoupling CAP-support from production will make fallowing more lucrative than cultivating

[4] This basic measure requires that a headland of one meters width must be left along river sides and a filter strip of three meters width along other bodies of water.
[5] This basic measure requires the farmer to keep the landscape open and the surroundings of the buildings managed.
[6] The third basic measure considered important for biodiversity directs farmers to make a cultivation plan, fertility analyses and follow-up. It also includes training of farmers.
[7] This is a voluntary special support form that is considered to be the most important measure for biodiversity conservation. Traditional biotopes are managed by mowing and cattle grazing, and are extremely rare.
[8] This special support form enables the protection of special biotopes considered valuable for biodiversity.

grain in submarginal areas, hence the amount of fallow land is expected to increase threefold by 2015. Another preliminary study found that decoupling CAP-support from arable crops is predicted to increase efficiency of grain production and make it easier for farmers to give up less profitable grain production. However, it is estimated that the CAP reform will most likely bring down small cattle farms, therefore diminish the amount of traditional biotopes, and decrease biodiversity.

Countries that accessed the EU in 2004 do not have the obligation to apply cross-compliance legislation before 2009 (Dimopoulos et al., 2006). In Latvia, a Rural development plan of Latvia was developed for 2004-06 and a new one for 2007-13, but no direct research about the influence of national plans of CAP implementation on biodiversity, including aspects of cross-compliance was carried out.

In Lithuania, the main general objective of Lithuania's Agriculture and Rural Development Strategy is the implementation of the principles and measures of the EU CAP (Uosyte, Ciapaite 2005). Currently Lithuania has established some Good Agricultural and Environmental Condition (GAEC) standards but no Statutory Management Requirements measures. EU pre-accession support through the Special Accession Programme for Agriculture and Rural Development (SAPARD) and further access to the EU funds from the European Agricultural Guidance and Guarantee Fund (EAGGF) has led to significant advance in developing and upgrading agriculture, forestry and fishery sectors through e.g. modernisation of farms, processing industries and other economic operations within these sectors. The implementation of the CAP is taking place through the following actions: good agricultural and environmental condition, human resource development and modernization and technology. In Poland as well, the small family farms pattern is being strongly influenced and changed by the implementation of the CAP. Farms cannot be treated as separate independent units as they create integrated farming system connected by many socio-economic relations (Lizinska 2000). Development of the modern agriculture is causing an increased pressure on the environment and the reduction of this negative influence is a very important topic in CAP implementation in Poland. It was proposed that it could be done by (i) extensification of production, (ii) modernization and/or (iii) optimization. In Polish economic system only modernization is justified as the cost of the others are higher than income generated by changes and losses in traditional way of agriproduction (Machnacki 2001, 2002; Piekut et al. 2002).

Since the CAP implementation, Polish agriculture had to enter a period of quick modernization with simultaneous limiting of the production. Were observed a decrease in the number of people employed, in the cultivated areas and in the number of farms. At the same time, a concentration of the production and capital and a mechanization of the processes were noticed. If the situation improved after Poland accession to EU in 2004 (farmers receiving subsidies), problems still exist, not linked to the small size of the farms but to the high percentage of people working in the sector. Globalisation (understood here also as integration with EU) is the main factor causing and influencing process of the small farms restructurisation in Poland.

Under the influence of the CAP in Polish agrisystem, a very quick differentiation is developing, leading to polarization of farms: those adjusting to the free market and those which are being or going to be marginalized [(Gilarek 1998, 2001; Gorlach 2000a, 2000b, 2001).

In Hungary, even if the the National Agri-Environmental Programme is considered to be a success, little is known on the effects of certain management techniques, carried out in the scope of agri-environmental schemes on the biodiversity of the particular area. In Czech Republic also, the lack methodologies hinders the control of some of the requirements.

All the reviews seem to agree that further work is needed to evaluate the implementation of CAP national plans on biodiversity. According to the UK review, future directions should include research on the wider economic (Boardman et al. 2003, Evans et l. 2003), social (Hounsome et al 2006, Pretty & Smith 2004, Siebert et al 2006) and policy implications (Winter 2000) of agri-environment schemes. The Irish review also states that further research would enhance the effectiveness of these measures, e.g. the development of predictive tools for evaluating the likely impact of CAP, CFP etc.; studies to evaluate the impacts, compatibilities and conflicts between government policies and biodiversity objectives and economic practice; further identification of policy blind spots and methods that might be used to resolve policy conflicts.

Action 2.1.8. Implement the common monitoring and evaluation framework and Strategic Environmental Assessment (SEA) Directive requirements where applicable for Rural Development Programme, including the definition of indicators in a way that impact of measures on biodiversity is assessed (2006 onwards)

As stated in the UK review, previous EPBRS meeting have already considered monitoring and indicators in detail (cf Greece 2003 and the Recommendations of the working group on the Design of National and European Biodiversity Indicators). One of these 16 recommendations particularly insist on the "validation and assessment of the policy relevance of existing indicator systems for the Acceeding and Candidate Countries, and, where necessary, the development of new indicators for the enlarged European Union."

The national reviews received however prove that this is still far from being the case. In Belgium, while all three regions have developed indicator schemes as a response to the CBD en the EC, no unified monitoring scheme exists. This is the case as well at the national and the regional level. The Irish review also states that there is a paucity of monitoring schemes designed or being implemented outside the Natura 2000 network and it is unlikely that this situation will change in the foreseeable future, despite the number of projects focusing on the development of indicators as part of wider basic biodiversity studies, and specific to certain areas.

In the Spanish review for example, is put forward the use of butterflies assemblages as a tool for monitoring schemes, butterflies being a useful bioindicators of habitat quality and of climate change. Portugal as well has a number of indicators for national level monitoring of biodiversity but high-quality databases are still lacking, creating major limitations for the analysis of current global changes. The *InBio* project is trying to provide solutions by creating multi-scale biodiversity databases for a number of taxonomic groups. Portugal is also one of the main countries involved in defining criteria and indicators for monitoring the sustainable management and exploration of forest systems, mainly in *montados* (Human-created ecosystem, agro/forest/pasture production system characteristic of the south of the Iberian Peninsula). However, despite the extensive inventory on birds, reptile and amphibian distribution, and although Portugal has been actively involved in monitoring its forests and identifying important indicators of biodiversity, no efforts have been made to identify indicators or monitoring programmes of protected areas and Natura 2000 network. This information would be important given that 21% of Portugal's mainland is represented by Natura 2000 Network. There is also a lack of information concerning the national distribution of habitats and species.

Comprehensive data are also needed in Finland. Farmland biodiversity monitoring has not been planned to encompass all components of biodiversity, thus monitoring is in many manners lacking. Data obtained through monitoring enables to make some rough estimates of the state of biodiversity, but it is inadequate for comprehensive illustrations or summations. Also farmland biodiversity indicators have been developed fairly little.

The key research results so far include a study funded by the Finnish Research Programme for Biodiversity entitled "Farmland biodiversity indicators and monitoring in Finland", which identifies four national farmland biodiversity indicators: 1) the trend in the amount of semi-natural grasslands, 2) the trend in the number of threatened species, 3) threatened species in various farmland habitats, and 4) population trends in farmland butterflies. All four indicators show that Finnish farmland biodiversity is declining.

- through the MYTVAS project: National level biodiversity indicators (described above) were considered too crude for detecting changes in biodiversity at smaller spatial scale. Landscape-level indicators were therefore developed.
- indicators were designed for the evaluation of the Finnish Biodiversity Programme (1997-2005) using the DPSIR framework (DPSIR, Driving Forces - Pressures - State - Impacts - Responses). According to the results, diversity of farmland landscapes is declining and species diversity is becoming poorer, although during the period 1997-2005 the rate of biodiversity loss was becoming slower.
- since 2003, the development of efficient national farmland biodiversity indicators is underway. New indicators under development go one step forward and enable to make ecological interpretations of changes. The indicators will be extremely useful for monitoring the realization of the goal on halting the loss of biodiversity until 2010.

In the newly accessed EU countries, although efforts are being made in the development of monitoring programmes for the evaluation of the respective Rural Development Plans, it is still too early for results in many cases. Limited support also hinders the development of the work.
Based on the information provided in Biodiversity Strategy and Action Plan (BDSAP) and the First National Report to CBD, Lithuania has notable achievements in inventories and identification of components of biological diversity. However due to restricted financial resources the Environmental Monitoring Program and Inventories of range of species groups and habitats cannot be finished at this time.

Purposive monitoring of biological diversity is not performed in Lithuania (Žalakevicius, 2002) although some kind of ecological monitoring (insufficient because of financial deficiency) of flora and fauna is carried out in some stations (Augustaitis et al., 2006).

In Hungary, the early development of the Hungarian Biodiversity Monitoring Programme (HBMS) at the European level is notable. This national programme for the observation of the state of biological diversity started in 1995, and protocols were developed with the participation of a large community of experts. However at present an important drawback is the lack of staff to coordinate the programme and handle the data. Currently, the harmonisation of HBMS and Natura 2000 monitoring schemes in underway.

Of particular interest for the harmonisation of monitoring schemes in the EU is maybe the EuMon project. EuMon, is a specific targeted research project (STREP) supported by the European Commission under the 6th Framework Programme, which aims at being the platform for steering monitoring efforts in Europe. It is coordinated by the UFZ – Centre for Environmental Research, Leipzig.

The EuMon project attempts to provide a European framework that standardizes, focuses and coordinates existing monitoring programs by comparing and integrating existing methods and monitoring schemes of species and habitats of community interests. The most successful methods in terms of cost effectiveness, regional robustness will be selected and tested for their European wide applicability. EuMon will pay special attention that existing monitoring programs

can incorporate these methods and will give recommendations how new and successful monitoring programs can be established. Special consideration for implementing monitoring programs will be paid by studying the social effects of monitoring regimes, because the relationship between amateurs and professionals are meant to be most important for implementing a successful monitoring regime.
The establishing of the NATURA 2000 network is one of the main actions on a European level to halt biodiversity loss. Therefore it is a prerequisite to evaluate its ability to maintain biodiversity. Additionally EuMon will develop methods to name the responsibility of EU Member states for the species and habitats of Community interests living under their protection.

A comprehensive database on monitoring schemes and recommended methods will be established and made accessible via an Internet portal. The EuMon consortium combines the expertise of 16 partners from 11 countries, including several newly EU accessed countries such as Estonia, Lithuania, Poland, Hungary and Slovenia.

More particularly, EuMon has so far also achieved to elaborate a list on methods to analyse monitoring data, essential to continue on the work of standardizing methodology and for recommendations.

Future research priorities are proposed by the partners. For the Irish review, further research is needed to develop indicators of biodiversity and ecosystem health, develop early warning systems for the identification and detection of non-native species, implement and continue to develop standardized methodologies for monitoring and evaluating biodiversity trends as CAP reform takes place

An interesting and recent study by Yli-Viikari et al. (2007) was cited in the Finnish review. Should biodiversity indicators be created at an international level to increase comparability between countries is discussed in detail from the Finnish point of view in a study recently published in *Ecological Indicators*. International institutes, among others the European Environmental Agency (EEA) have been involved in creating common agri-environmental indicators (including biodiversity indicators) for all EU member countries. The first proposal of EU-indicators was introduced in 2000 and since then, they have been constantly improved in order to reach concise methodologies for international comparisons. Although agri-environmental indicators are able to provide plenty of meaningful data about the agri-environmental policy issues, they are unable to recognize the specific properties of each case study. For example, farmland bird species abundance and distribution is widely recognized as a good indicator for farmland biodiversity, but in the Finnish case birds do not reflect the change in traditional biotopes, which are the most species rich agricultural habitats in Finland. Therefore, special caution is needed when results are compared between regions with different climatic and natural conditions, and with different traditions of land use. The study concludes that international indicators are able to provide environmental statistics, but are not the appropriate tool for policy assessment.

Other interesting ongoing research projects are being developed in Finland, one of them being the development of indicators using the DPSIR framework. Preliminary work on indicators efforts have been made to identify best practices in other countries. It is recommended that the examples of Great Britain and the Netherlands should be followed, where participation has been efficiently promoted by publishing monitoring results visibly.

Other themes addresses by the partners

Most of the partners that replied and provided a national review addressed at least one more theme, in addition to the three priority topics presented in the first part of this compilation.

From Objective 2
Actions A2.1.5, A2.1.6, A2.1.7, A4.6.1. Mainstreaming biodiversity aspects into different strategies and plans: Rural development plans (A2.1.5), Less favoured area regime (A2.1.6), Strategic Environmental Assessment (A2.1.7, A4.6.1)

Several British studies tackle the above themes, e.g. declines in grassland biodiversity are being addressed through rural policies (Marriott et al. 2004).

Management of pine forest and wild herbivores is also of particular interest for biodiversity. The impact of road development is also considered in the Strategic Environment Assessment.

In Spain, Carrera-Gómez et al. (2006) studied the ecological footprint as a macroindicator of sustainability applicable to companies and corporations. It accounts for the consumption of natural resources by converting them into hectares of "nature" or consumed productive land. Until now, these issues were not on the agenda of companies, but they are indispensable in achieving real sustainability.

Diaz *et al.* (2001) developed a methodology for biodiversity evaluations within the process of Strategic Environmental Assessment and applied it to the estimation of the effect of two Regional Development Plans on all bird species inhabiting the Castilla y Leon region (northwestern Spain). They concluded that the proposed methodology fulfills the requirements for its use within the Strategic Environmental Assessment (SEA) process as it allows for the assessment of cumulative impacts on every species, highlighting the development directions and the habitat types with major impacts, and ascertaining whether impacts affect species with either low or high conservation and/or economic value.

Onate *et al.* (2003) analyzed the Strategic Environmental Assessments as an instrument for nongovernmental organizations (NGOs) to carry out independent assessment of public development initiatives. In the light of the results, a set of complementary mitigation measures are proposed for inclusion in tiered stages of the planning process. Measures to avoid, reduce, remedy and monitor the major types of impact are proposed, including provisions for public participation.

In Latvia, experience shows that although the concept of sustainable development is included in planning documents, it is rarely put in practice, and the principles of environmental protection are often disregarded. However, formally, the Rural Development Plan of Latvia for 2007-2013 complies with environmental legislation and in particular with the Bird and Habitats Directives. Although identified, no biodiversity research is carried out in less favoured agricultural areas, and no specific research was performed about the impact of SEA Directive requirements for rural development programmes on biodiversity.

The analysis of National Programme on Biological Diversity, National Tourism Strategy, Forest Policy Plan, Agriculture Development Plan, existing legal system in the field of biodiversity, indicate that implementation of CBD requirements in various are satisfactory (at least formally).

In Poland, the indispensable environmental dataset for the planning and the implementation of the sustainable development and spatial management planning has been defined. However,

further analyses should be made, taking into account spatial diversity of the life standards observed in the society (Gawronski 2000). Other important and interesting fields of research include the study of the consequences of the lack of connectivity of ecosystems, the biodiversity of threatened habitats and plant communities of anthropogenic origin, pollinators, alien species, adaptation and mitigation strategies.

Action A2.1.11. Strengthen measures to ensure conservation, and availability for use, of genetic diversity of crop varieties, livestock breeds and races, and of commercial tree species in the EU, and promote in particular their *in situ* conservation (2006 onwards).

Many partners addressed the topic of genetic diversity.

According to a British study, at a global scale, current approaches to on-farm conservation are thought to be inadequate (Wood & Lenne 1997).

The conservation of livestock breeds is critical for the provision of resources for the future of agriculture, especially in the developing world (Hall & Bradley 1995). Recent years have seen advances in the methods used to investigate genetic diversity in livestock breeds (Freeman *et al.* 2006), to assess the risk of extinction of particular breeds (Gandini *et al.* 2004) and to use naturally-occurring genetic variation in breeding programmes (Bishop & Woolliams 2004). An assessment of the extinction risk of local breeds of pig, for example, identified priorities for cryopreservation (Ollivier *et al.* 2005). This study was also cited in the Spanish review.

Related socio-economic research includes the development of methods for economic valuation of farm animal genetic resources (Drucker *et al.* 2001). The number of livestock breeds in an area has been found to be related to the size of the human population and its genetic diversity (Hall 1996).

Research on genetic diversity in Spain in relation to crops, tree species, and livestock breeds includes studies on beans, sunflowers and prunes, several species of *Quercus*, holm, black poplar, and pigs and goats. Among the results, in addition to the study by Ollivier et al. (2005) on the importance of cryopreservation already cited in the British review; another study by Canon et al. (2006) suggest that breed differentiation and molecular diversity are independent criteria for conservation.

In Portugal, most of the work so far has been done by various institutions which will join forces under the *InBio* network. Ongoing studies are attempting to determine the risks and the thematics of transgenics in Portugal's agriculture, primarily on corn and chestnuts, but also on the genetic variability of oak. Further studies are done on the genetic improvement of bovines, the genetic conservation of donkey populations and pony breeds. The genetic diversity of olive cultivars is also ongoing. In Portugal, several germ banks exist, oriented towards agricultural plants. In addition, in Madeira 94% of the endemic threatened species, under the World Conservation Union, are conserved in a seed bank in the Madeira Botanical Garden and 12.7% have recovery programmes. In Azores, under the 2010 Plant Conservation target, the Botanical Garden of Faial has been gathering and maintaining a collection seeds of the Azores Flora (germplasm bank) that presently comprises 1/3 of the existing species.

In Latvia, the protection of crop varieties and livestock breeds are regulated by the Plant Varieties Protection Law and Animal Protection Law, and regulations of the Cabinet of Ministers. Assessment of the local genetic diversity of crop varieties, livestock breeds is performed by the Ministry of Agriculture, Latvian University of Agriculture and associated institutions, and association of geneticians and selectionists. The main research is concentrated

on the collection of varieties and breeds, and the development of databases. As a measure to maintain genetic diversity, compensation has been developed to support maintaining of local breeds.

In Lithuania too, studies are ongoing on the genetic diversity of local livestock breeds and races, under the Rare Breeds Scheme of the national Rural Development Plan (RDP, (2004-2006)). Agricultural plants, fruits and vegetables are particularly addressed through the Plant Gene Bank, established in 2004. Many studies also concern forest trees, and other plants.
In Poland old varieties of crop plants are considered as part of the cultural heritage; however genetic diversity is decreasing not only in traditional crops but also in those cultivated since a relatively short time (e.g. clover). Many studies on forest tree species also reveal their important economic role for the country.

The Czech National programme on Plant Genetic Resources (NP) was launched in 1993 and substantially updated in 2004. The Czech Republic ratified the International Treaty on Plant Genetic Resources for Food and Agriculture in 2004. All the institutions participating to the NP have close partnerships with users within the country and abroad. International collaborations have been set up particularly within the European Cooperative Programme. Intensive characterization and evaluation of genetic resources are carried out to strengthen their use in breeding and in agricultural practice. *In situ* and "*On farm*" surveys contribute to the preservation and evaluation of local resources. However, the majority of the assessments are conducted *ex situ* and do not address the consequences of agri-biodiversity on the ecosystem.

In Cyprus, several project address the conservation *ex situ* of plant biodiversity, and National Genebank has been set up. To date, more than 12,000 records of cultivated species and local varieties as well as endemic, rare and threatened plant species of the Cyprus flora are conserved.

Actions A2.2.1/2. Identify geographical risk areas for factors affecting soil biodiversity (soil sealing, loss of organic matter, soil erosion, etc.) (by 2009)/Minimise soil sealing, sustain soil organic matter and prevent soil erosion through timely implementation of key measures identified in the forthcoming Thematic Strategy for Soil Protection (2010-onwards)

As presented in the UK review, there are many sources of risk to soil biodiversity and its functioning, but also many methods to measure these risks. In Portugal, this topic is of high concern, 69% of Portugal's rural areas being at high risk of erosion, according to the National Programme of Desertification. At present time the National Action Plan for Combating Desertification (PANCD 1999) is being applied, aiming at the conservation of soil and water and the restoration of degraded areas, encouraging settlement in less populated regions and public awareness of the desertification problem. Erosion risk also increases with a destruction of plant cover which in Portugal is primarily due to fires. Reforestation therefore is vital as well as forest sustainability and should be a priority action in order to restore biodiversity. At the European level, Portugal is part of the DESERTLINK project, whose aim is to fight against desertification in Mediterranean Europe by identifying economic indicators related to soil biodiversity. In addition, there is in Portugal ongoing concern for Portugal's coastal zone, where urban development and economic activities on the coastal areas lead to important erosion problems.

In Poland, the risks for soil biodiversity mainly concern hydrogenic soils, especially peatbogs. These areas have become a popular subject of study for the scientific community, being particularly threatened by climate change and the increased use of water resources by the society. The agricultural risk areas in Latvia were identified through GIS modelling (Jansons et al. 2003). This evaluation is purely based on soil quality, ground and surface water flows agricultural practices etc. but no research or assessment of biodiversity in these soil risk areas has been

performed.

Target A2.4. Principal pollutants pressures on terrestrial and freshwater biodiversity substantially reduced by 2010 and again by 2013.

The UK review cites various studies that discuss the major sources of pollution to terrestrial and freshwater ecosystems, and point out the fact that other factors may influence their impact on biodiversity, e.g. climate change (Britton et al. 2001).

Interestingly, the Spanish review cites a study by Viladrich-Grau (2003) which states that policy regimes based on joint agreements between regulatory agencies and firms are more likely to prevent the potentially negative impact of industrial innovations on the environment than regimes based on economic incentives. Another study by Angeler & Moreno (2006) stresses the impact of fire retardants on water quality, which contamination has a slow recovery. Key toxics in European river basin were reviewed by Brack et al. (2007). This study is expected to help the implementation of the Water Framework Directive by providing evidence on the main stressors and the possible mitigation measures to improve the ecological status of a river ecosystem.

Pollution is also recognized as a major concern for biodiversity in Portugal. Water pollution is one of the main threats to Portugal fish. Many river basins do not comply with the objectives of minimal quality for surface waters prescribed by the Portuguese legislation. Agriculture is also a main source of pollution particularly through nitrates concentration in surface and ground waters. Concerning water uses, a National Programme for an Efficient Use of Water is being prepared, agriculture being one of the main consumers, and an evaluation is being made to target policies defined within the framework of the National Strategic Plan for Agriculture and Livestock Effluents in a coordinated way.

No direct studies of impact of pollution on biodiversity are conducted in Latvia but such studies will be needed in the near future, as a consequence of the intensification of agriculture and industry. It is also recognized that special research has to be planned to study the mechanisms of impact of pollutants on living organisms and that wider research on the effects on aquatic and terrestrial biodiversity is lacking.

In Poland since 1980s exists a monitoring system for SO_2 and NO_x, and a decrease of pollutant level has been observed. Several studies are undertaken since the last decade on the influence of the high level of ozone on vegetation, but the local attempts to decrease this pollution are difficult to disentangle from the global processes controlling its incidence.

In the Czech Republic, biodiversity of mountain forests and freshwaters has been significantly reduced as a consequence of high acidification and eutrophication since 1950s. The current studies show that although these risks to soil biodiversity are now limited, soil restoration will be very slow (Fanta 1997). Modern agriculture, through the use of pesticides, industrial fertilizers and heavy machinery is responsible for a significant reduction of agricultural soil biodiversity (Rusek *in* Vackár 2005). Further studies also showed that organic farming practices relying on natural processes and manure can restore soil biodiversity.

Target A2.5. Flood risk management plans in place and designed in such a way as to prevent and minimize biodiversity loss and optimize biodiversity gains by 2015.

According to the UK review, flood risk management and river restoration have been given a new impetus from the Water Framework and Habitats Directives (Newson & Large, 2006) and it is becoming increasingly apparent that flood risk management and biodiversity are closely linked.

Overgrazing, for example, has a negative impact on both flood risk and biodiversity (Sansom, 1999). Tree shelter belts may influence flood risk, providing opportunities for the conservation and restoration of biodiversity (Carroll et al., 2004).

In Latvia, several LIFE-Nature projects were completely or partly implemented in flood areas, however, no management plan has been approved yet. The concept of flood management developed for the largest Latvian river, the Dauvaga, is facing strong protest from environmental organisations, based on previous studies indicating the high biological value of the overflowed areas. A directive on the assessment and management of floods is currently under adoption.

Concerning Czech republic, it has been proved that water quality has improved since the last 10 years but the number of wetlands is gradually decreasing.

Increased risks of flood and drought are affecting the country, due to global changes but also to the decrease of the retention capacity of river basins, although a number of projects are to be funded to reverse this trend. Different administrative and executive authorities are responsible for the management of forest mountain river basins, small agricultural streams, and large rivers and their floodplains. It is however widely accepted that the restoration of the river continuum is beneficial for biodiversity (Matthaei et al. 2005).

Objective 4
Action A4.1.6. Ensure full participation of civil society in development of National Strategic Reference Framworks (NSRF) and National Operational Programmes and in SEA/EIA and ensure biodiversity interest fully represented (2006 onwards)

The UK reviews states that there is an increasing participation of civil society in the management of marine protected areas (Jones & Burgess, 2005), monitoring of biodiversity (Danielsen et al., 2005), and other conservation-related initiatives (Wood, 2005). Research on this topic has included studies on attitudes towards participation (Davos et al., 2002), the implications of local participation for national strategy (Gillingham & Lee, 1999) and its effectiveness (Goodwin, 1998; Goodwin, 1999). The latter has included research on participation in Environmental Impact Assessment (EIA) (Hartley & Wood, 2005; Snell & Cowell, 2006) and the use of multicriteria analysis in EIA (Balasubramaniam & Voulvoulis, 2005). There have also been studies on specific aspects of conservation (Twyman, 2000), stakeholder analysis on particular conflicts (Redpath et al., 2004) and conflicts generally (Young et al., 2005). The issue of farmers' involvement in agri-environment schemes is discussed above.

UK researchers have also been active in research or on projects on the participation of local communities in initiatives related to the conservation and/or sustainable use of biodiversity or EIA in, for example, Ghana (Wiggins et al., 2004), Nepal (Bajracharya et al., 2006), Nicaragua (Hawkesworth & Perez, 2003), Cameroon (Malleson, 2002; Sharpe, 1998), Botswana (Davies, 2001), Belize (Oreszczyn & Lane, 2000), Tanzania (Few, 2000) Nigeria and the Niger Delta (Adomokai & Sheate, 2004).

In Finland, the participation of civil society has been studied from the early stages of the EIA Act. Altogether seven projects were studied from the period between 1995-1996. It was found out that the EIA had significantly increased access to project information and promoted public discussion. The possibilities to give feedback had improved although the threshold to give feedback had remained high. Most noteworthy is that the possibilities of civil society to affect planning were found to be insignificant if planning was made to fulfill formal requirements and get approval for desired solutions. But then again if the intention of the EIA was to get a comprehensive picture of the effects of the project and different views, and to weigh one plan

against another the possibilities to affect planning was considerably higher. The attitude of the project manager was also found to be a significant factor in the outcome of participation (Karvinen 1997).

The effectiveness of written addresses and arguments made in the EIA process has been evaluated in a study made by the Central Finland Environment Centre. The research consists of two EIA case-studies: a comparatively small road project and a large nuclear waste final placement project. In both cases social impacts were emphasized in the citizens' arguments. Interest based arguments were most prevalent, although value based arguments were almost equally popular. From the viewpoint of effectiveness of public participation the evaluated cases diverged from each other. In the road case public participation obviously had an effect on planning and decision-making. The planners and authorities saw the EIA as a value based planning and interaction process. Instead, the effectiveness of public participation was low in the nuclear waste case. The EIA was mainly used as a tool to manage and control the opinion of the civil society. In both cases the interest based arguments came into the EIA agenda, unlike the value based arguments, which were not allowed to be included in the EIA agenda. (Hokkanen & Ruuskanen 2005).

The treatment of biodiversity issues in Finnish environmental impact assessment between 1995–2001 was evaluated in 38 projects by the Finnish Environment Institute using qualitative document analysis and an ecological biodiversity index. All reviewed projects represented types that usually cause the most severe impacts on biodiversity. The results demonstrate a number of shortcomings in ecological impact assessment practices in Finland. The most severe shortcoming was a weak connection between the base-line surveys and impact prediction, which arose primarily from a lack of an adequate scoping stage. The consideration of biodiversity components was only partial, since in most cases only effects on most obvious components of biodiversity (plants and large animals) were evaluated. In addition it was found that the majority of the assessment reports did not present the results of the assessment explicitly and adequately, which implies their use in decision making to be constantly disregarded. It was concluded that raising awareness of the authorities, developers, consultants and their ecologists who are involved in the EIA should result in better treatment of biodiversity in the assessment process. Detailed guidelines for that purpose are now being prepared by the Finnish Environment Institute. (Söderman 2005).

The Latvia review points out that civil society is invited to participate in EIA or SEA, but no research has been undertaken on the effects of participation on biodiversity. In Cyprus, in order to increase public awareness and interest for the protection, conservation and sustainable utilization of the indigenous flora, promotion is carried out through all mass media including radio and television.

Action A4.3.1. Develop and implement spatial and programmatic plans that support the coherence of the Natura 2000 network (in line with the requirements of the nature directives to ensure such coherence) and maintain and/or restore the ecological quality of wider landscape (2006-onwards)

This is currently a particularly active area for research in the UK. Several national agencies have research programmes focusing on ecological connectivity, and developing tools to support planning decisions, e.g. Forest Research's habitat network programme (Watts et al., 2005b), collaboration with the Countryside Council for Wales (Watts et al, 2005a) to develop a woodland habitat network for Wales in support of the Wales Woodland Strategy; and work within Natural England (Catchpole, 2006).

The Bioforum project included a major consideration of ecological (social and economic) aspects relevant to spatial planning (Nowicki *et al.*, 2005). The placement of coastal defence structures, for example, can have a profound impact on biodiversity (Airoldi *et al.*, 2005).

In the Czech Republic, the ecosystem approach principles as developed by the CBD have not been explicitly tested yet, however, there are many ongoing projects on the subject. Mapping of Natura 2000 sites, of Specially protected Areas, is ongoing, and overall, in spite of the variable quality of the individual work, database and maps of the Natura 2000 so far provide a valuable base for identification and monitoring.

In Hungary, the implementation of wildlife mitigation measures on roads is becoming a routine task. As a result, different mitigation measure types exist in the country, mostly along motorways, but also on lower roads. The regular monitoring and feedback, the maintenance and, where necessary, improvement of mitigation measures are still missing elements of a well-functioning linear infrastructure mitigation system. The improvement of public relation activities on fauna passages is also necessary for the effective protection of wildlife on roads.

Actions A2.1.13-14-15. Forest policy

Interestingly, the Czech review is the only one to have specifically addressed Forest policy (Actions A2.1.13-14-15).

Forests cover 34% of the Czech Republic territory, but are in poor condition. Production and technical activities are dominant, and low attention is given to biodiversity, environmental, ecological and social issues. Topics related to forestry and promoted by the EU have to date hardly been investigated in the Czech Rep, and lack of research on the assessment of current forestry policy is manifest.

There is no comprehensive methodology for monitoring changes in species diversity in forests that would include assessment of adverse impacts.

Some clauses in the Rural Development Plan may be in conflict with the European Agricultural Fund for Rural Development (EAFRD) goals and objectives, and those of the EU Sustainable Development Strategy and other documents (Bláha & Kotecký 2006a,b). Without clear environmental eligibility criteria, several proposed measures risk undermining some of the Union's, and EAFRD's own, goals and objectives. Vague definition of some measures undermines possible synergies and leads to unnecessary loss of the potential to achieve EAFRD environmental and biodiversity objectives. Some of the crucial measures are worryingly under-funded.

Conclusions

Below are the conclusions each partner made on the research undertaken in his own country on biodiversity research addressing Objectives 2 and 4 of the COM (2006) 216. Some of these conclusions can be applied at the EU level.

Potential future research concerning Actions A2.1.3, A2.1.4 and A2.1.7 were addressed at the end of their respective section.

More particularly, there is a broad consensus on the need for a unified monitoring system of the Natura 2000 network and High Nature Value areas.

Belgium

Gaps of knowledge and need for further research – in a national as well as European context

- While Belgium has a clear tradition of forest biodiversity related research there is an urgent need for more research related to agricultural biodiversity. Especially policy oriented research in function of recent EU initiatives (CAP) is rarely a topic of interest for universities and research organisations.
- In the field of forestry and agriculture Belgium has a long standing tradition of research in tropical areas, especially Central Africa. However, in more recent biodiversity related research topics, such as indicators and monitoring, Belgium could do more efforts.
- While indicators seem to be well developed there is an urgent need for a unified monitoring scheme as well on the national as on the regional level.
- While there is a lot of debate about the relation between the CAP, national agricultural policies and their relation to Natura 2000, almost no research is carried out on the impact of Natura 2000 on agricultural policies and vice versa.

UK

- Despite the research done on the topics covered by this review, much more research is needed. We need to know much more, in particular, to be able to make accurate predictions. Most research (although not all) is small scale and limited in the factors it considers. We need much more broad based, process oriented research so that we understand whole systems. Very little research undertaken incorporates social and economic analysis. Land managers respond to a wide variety of factors in coming to their decisions. Our research needs to reflect this integrated, interdisciplinary context.

Ireland

- Irish researchers have in many cases pre-empted the communication and identified the same priority actions as worthy of research
- A number of gaps still exist in relation to addressing the three priority areas of the communication. Specifically, research is required to directly target the identification of High Nature Value farmland outside of the NATURA 2000 network and to develop measures to address threats to these areas. Research to develop indicators and monitoring schemes for these areas is also required. Further research to enhance and better develop the REPs scheme as a real contribution to biodiversity loss is also required.

Spain

- Spanish scientists are carrying out a considerable amount of research on biodiversity
- Limited research however on Objective 4 of the COM 216, to reinforce compatibility of regional and territorial development with biodiversity in the EU

Portugal

- Portugal has an important degree of biodiversity and natural values, high above the EU average
- One of the main problems facing Portugal is the abandonment of farmland especially in the Northern part of the country
- Forest fires are one of the major risks to Portugal's forests
- Although Portugal has been actively involved in monitoring forests and identifying important indicators of biodiversity, no efforts have been made to identify indicators or monitoring programmes of protected and Natura 2000 network. There is also a lack of information concerning the national distribution of habitats and species

Finland

At European level:

- Further research is needed to find internationally congruent indicators, follow-up measures and methods to identify HNV farmlands
- agri-environmental schemes should be compared between countries to identify best practices
- Without monitoring and more exact research on the Environmental Impact Assessment it will be difficult to evaluate the role of participation in planning and decision making

Poland

- Most of the research topics until recently only have theoretical value (assessment of state and evaluation of biodiversity); very few research was done e.g. about the threats to biodiversity. No central database of research.
- Genetic knowledge is concentrated on groups with commercial value.
- Biologists understand the problems caused by ecosystem fragmentation but are unable to pass the message to politicians and develop frameworks for legal acts.
- Very weak attention paid for the identification of high value farmlands and forests
- Not possible now to determine the changes and disturbances caused by the implementation of EU regulations including CAP. Good monitoring system necessary.

Latvia

- Current biodiversity research activities are fragmented. Research or assessment of effects of nature conservation measures to the state of biodiversity is not carried out.
- At the European scale, National Biodiversity Monitoring should be completely supported, and cooperation on specific fields among member states should be more active

Lithuania

1. During the last few years, activities related biodiversity protection and landscape conservation in Lithuania have considerably increased. Public agriculture and rural development policy is being set out in strategic agricultural and rural development documents including SPR. The main general objective of SPR is the implementation of the principles and measures of the EU CAP. More specifically, the two environmental

Directives, Dir.79/409/EEC on the conservation of wild birds and Dir. 92/43/EEC on the conservation of natural habitats and of wild flora and fauna, form the legal basis for a network Natura 2000. Since almost all sites of the network have been selected on the basis of scientific data, these are most important Lithuanian' biodiversity research that directly contribute to sustainable use of biodiversity in Europe.

2. Important step to sustainable use of biodiversity is the implementation of the programme on Woodland Key Habitat Inventories (WKHI) of state, private and reserved for privatisation forests in Lithuania (2002-2005). As mapping of Woodland Key Habitats is required for forest certification schemes they provide a tool for maintaining a large share of forest biodiversity in a cost-effective way.
3. Investigations of genetic diversity of crop varieties, livestock breeds and races, and of commercial tree species and promotion their in situ conservation have created a good theoretical and empirical basis that can play an important role in the protection of nature and biodiversity.
4. Important limitations for Lithuania concerning the sustainable use of biodiversity still exist:
   – insufficient co-operation between agriculture and environmental administration;
   – insufficient political will to realize a higher priority of biodiversity conservation;
   – low level of environmental awareness leading to threats to biodiversity as land-reclamation, intensification of forest felling, loss of meadows due to abandonment or change of agricultural activities

Czech Republic

1. It is necessary to integrate new methods of evaluation of the carrying capacity and vulnerability of the ecosystems and their services in land-use planning.
2. There are various systems of monitoring some biodiversity components, which are not integrated or mutually complementary in the framework of evaluation of the condition of forest ecosystems, the impact of agri-environmental measures and monitoring of the ecological condition of water bodies. Hence, the integration and harmonisation of monitoring systems is needed.
3. Although the indicator-based assessment of biodiversity changes was completed (Vackár 2005), there are still significant gaps in our knowledge of long-term biodiversity trends and its causes. There is a visible lack of studies on the impact of the use of biodiversity on ecosystems and studies on evaluation of biodiversity values an on evaluation of mechanisms and sources of changes revealed. This is a task for scientific community and should be studied on genetic, species, population, ecosystem, and landscape levels. We recommend focusing research on priorities as they were formulated in several recommendations of the European Platform for Biodiversity Research Strategy (http://www.epbrs.org) or in other strategic documents (EEA 2006a,b) and projects (e.g. Life Watch – http://www.lifewatch.eu; The European Strategic Forum for Research Infrastructures ESFRI – http://cordis.europa.eu/esfri).
4. There is no training system in education for biodiversity of priority target groups (employees of the State Administration, representatives of local governments, managers and decision-makers in agricultural, forestry and water management companies, staff members and activists in NGOs and project planners). The decrease of specialists in taxonomy knowledge and need for higher standard of education has been widely recognized in the present (see, e.g., the Global Taxonomic Initiative on http://www.biodiv.org/programmes/cross-cutting/taxonomy/default.shtml). In the Czech Republic, there is an urgent need for establishment of a centre for taxonomic knowledge and identification of organisms. The centre should serve for post-doc studies and officials

involved in nature conservation[9]. Therefore, the Ministry of the Environment in cooperation with GBIF should coordinate data accessibility and form some data platform.

5. There is a lack of individual capacities in the exchange of information. Only two national coordinators are responsible for establishing and up-dating of the CBD Clearing House Mechanism and the Biosafety CHM. However, this work frequently consists of single actions and does not ensure regular up-dating and maintenance of the systems.
6. There is a need for developing of methodologies for better understanding of evolutionary relationships and trajectories of species, the adaptive variation within them and methods to analyse the data produced.
7. We need analyse and develop methods for conservation and sustainable use of genetic biodiversity through area-approaches in management (e.g. Natura 2000).
8. We urgently need to explore the role of genetic diversity in the productivity, stability and health of agri-ecosystems and their resistance under changing climatic, environmental etc. conditions in interdisciplinary research.
9. There is a need for monitoring the effectiveness of management methods in nature conservation and landscape protection (see http://www.wsl.ch/event_07/monitoring/) and call for evidence-based nature conservation (see Centre for Evidence-Based Conservation and http://www.cebc.bham.ac.uk). In the Czech Republic, sectoral programmes fund the main research addressing these issues. However, such research should be independent of any interest (particularly of the economical one) and should be inter-sectoral. Conservation in sectoral policies in the sense of sustainable development should not be limited only to the area of the sector of Ministry of the Environment only.
10. There are several research projects dealing with biodiversity in the Czech Republic (http://aplikace.isvav.cvut.cz). The central role of concerted action has the **Biodiversity Research Center** (a network of research institutions involved in biodiversity studies and international projects or centers of excellence with aim to educate young researchers in the field involved in).

Hungary

The conclusions include:

- socio-economic issues largely determine land race diversity of crops
- first attempts to evaluate ecosystem services help to develop methodology and provide basis for further analyses
- important steps to describe and conserve forest genetic resources have been made
- a map of the natural vegetation heritage has been produced for the whole territory
- the Pro Silva programme has achieved good results in developing ecologically and economically sustainable forest management practices
- the Hungarian Biodiversity Monitoring System is a remarkable programme to collect data on species, community and landscape diversity and trends, completed by the Breeding Birds Monitoring

Gaps of knowledge include:

- estimation of ecosystem services over large areas;
- habitat change modelling at large scale;

[9] For example, despite a long tradition of floristic and phytogeographical research in the Czech Republic, no complete national distribution dataset based on an up-to-date systematic field survey is available. This fact is in contradiction with assignment of the CR to the Memorandum of Understanding for the Global Biodiversity Information Facility (GBIF) in 2002. Nevertheless, the Memorandum of Understanding has not been recently re-signed by the Government of the Czech Republic.

- the link between land management and biodiversity for other habitat types and communities;
- influence of organic farming on biodiversity;
- the relation between arable field management type and biodiversity;
- the role of public perceptions and activities in attaining sustainable use of biodiversity

Further research should particularly support:

- measures to help conserve agro-biodiversity (crop varieties, breeds and races);
- institutional support and state funding for the conservation of forest genetic resources;
- research on biodiversity and its links to socio-economic processes;
- commitment to continue successful biodiversity monitoring programmes.

Cyprus

- The designation of a number of sensitive areas and important habitats in Cyprus in the Natura 2000 network, among others, in an indication of the great benefit to the Cypriot wildlife and biodiversity from joining the European Community and the Natura 2000 network.
- Taxonomic reference collections are needed for the study and conservation of Cyprus biodiversity

Additional reviews

Russia

- Very diverse country
- Existence of a more than 80-y old system of protected areas (2% of the territory)
- 2003-2005 programme “Scientific base of biodiversity conservation in Russia”, including inventories, development of ecological monitoring methods and historical analysis of biodiversity changes.
- Russia is at the beginning of a complicated process of nature conservation and halting biodiversity loss.
- One of the main tasks is the preparation of new biological cadastres of the main Russian regions with the use of modern taxonomy methods.
- Also: development of standards, formats and methodologies of united national database on biodiversity of all taxa
- Importance of the information on species and their distribution, including Red Book
- Genetic resources to be investigated
- Biological invasions
- Forest preservation through various measures and action plan including the programme “Development of methodological bases for the monitoring of forest biodiversity”
- Russia is at the third place (after the USA and China) for the rejection of CO_2 and other greenhouse gas therefore research on climate change is very important.
- Study of Russian forests (genetics)
- “Russian government lost control of biological resources of the country” (Altukhov et al., 2004).
- Wetlands programme under the supervision of WWF
- “Investigation of Russian experience (positive and negative) can be useful for EU because of it scale”
- Russian seas
- Genetic biodiversity of agricultural plants is also endangered
- Problem of the radioactive pollution
- Urban ecology
- Low interest of the population for biodiversity

Estonia

- Few studies on the impacts of different policies on biodiversity.
- Wooded meadows: a short natural history
- The factors of species richness
- Protection, restoration and the contemporary management of wooded meadows
- Support to traditional uses in necessary (eg. Mowing and grazing for wooded meadows)
- Ecosemiotic remarks
- Bumblebees in the agricultural landscape of Estonia
- Diversity of bumble bees on ecological and conventional farms
- Diversity of bumblebee diet on ecological and conventional farms
- Landscape structure and bumble-bee communities
- Monitoring of the Estonian Agri-Environmental Programme at landscape level
- “Bumble bee approach” could be used as a biodiversity indicator at landscape level”
- Forests

Conclusions:

- Sustainable management
- Organic farming

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Additional websites:

EUROPA - Agriculture and Environment:

http://ec.europa.eu/agriculture/envir/index_en.htm#crosscom

Additional information from the reviews

Belgium
Study based on BioBel. Five research themes were selected: forestry, agriculture, CAP-related, indicators, monitoring research.
Many projects on Forestry, far less on agriculture and only 3 related to CAP.
Results are presented separately for each of the 3 regions: Flanders, Walloon region and Brussels capital.

Ireland
- *Biodiversity Knowledge Programme for Ireland*
Listing of all the research projects under each of the three actions.

Spain
Methods: use of ISI. Selection of the papers for which at least one author was based in Spain. This first database was considered to represent the total productivity of biodiversity research. A second database was built, adding the publications including at least one of the set of selected keywords.
- strong increase in the number of paper related to biodiversity in the last 6 years. Environmental science, aquatic sciences and biodiversity of conservation are the most represented in this increase.
- keywords database: high number of studies related to policy.

Finland
Intro
- importance of interdisciplinary and social science- related research in supporting sustainable use of biodiversity
- development of biodiversity indicators and appropriate monitoring schemes: however taxonomic research should be considered a prerequisite for effective follow-up measures
- the development molecular biological methods to protect and monitor genetic diversity should be seen as a prerequisite for sustainable development
- there is a lack of co-operation between scientists and decision makers
- Biodiversity platforms should be promoted

- Finnish Biodiversity Research Programme[10] 1997-2002 (FIBRE), including a project called Biodiversity Implications of Agricultural Policies: an Integrated Approach (BIAPIA)
- The three fields of Objective 2 were reviewed but only the field about the participation of civil society in Environmental Impact Assessment was reviewed for Objective 4 due to lack of time.

Lithuania
- The National Biodiversity Strategy and Action Plan (BDSAP) was approved in 1996
- The international obligations that Lithuania has a responsibility to fulfill as well as initiatives in relation to the environment, have been taken into consideration in the preparation process of the Rural Development Plan (2004-2006) (RDP)
- The main general objective of Lithuania's Agriculture and Rural Development Strategy is the implementation of the principles and measures of the EU Common Agricultural Policy. Since all territory of Lithuania is classified as an Objective 1 country in transition, the RDP contains four accompanying measures that are co-financed by the Guarantee section of EAGGF: Early

[10] List of all publications and summaries of research results can be found from the homepage of the Finnish Biodiversity Research Programme: http://fibre.utu.fi/

Retirement, Less-Favoured Areas and Areas with Environmental restrictions, Agri-Environment (the only mandatory measure), Afforestation of Agricultural Land (RDP 2004-2006)
- The environment protection system of Lithuania
- The Lithuanian Law on the Protected Areas sets out a detailed system of protected areas that distinguishes different protection priorities

Czech Republic
- Long-term Priority Research Orientation (basic strategic research document)
- Projects can be under the framework of the Research & Development of Technologies Programme, the National Research Programme for 2004-2009 (which stresses the importance of the link between the scientific community and the general public) and the Agricultural Research (Animal and Plant Production and Forestry).

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- Millennium Ecosystem Assessment : launched by the UN Secretary General
- Biodiversity objectives are integrated in the Sustainable Development Strategy (SDS) and the Lisbon partnership for growth and jobs
- An EC Biodiversity Strategy was adopted in 1998 and related Action Plans in 2001.
- two particular threats to EU biodiversity: a) ill-considered land use and development; and b) increasing impact of climate change on biodiversity.
- Integration of biodiversity into agricultural and development policy: "the CAP has since 1992 been adapted to better integrate biodiversity needs". […] "The new (2005) Rural Development Regulation provides *inter alia* for enhanced support for Natura 2000, maintains agri-environmental measures and payments for areas with handicaps and provides for a set of measures in support of sustainable forest management (…) such as forest-environment payments."
- Integration into regional and territorial development policy: "the nature directives and the Environmental Impact Assessment (EIA) Directive require the consideration of potential impacts of certain regional and territorial developments". […] "the recent introduction of Strategic Environmental Assessments (SEA) which apply to certain plans and programmes, should better reconcile conservation and development needs by ensuring consideration of impacts much earlier in the planning process."
- Monitoring and reporting: "progress is being made on the development and streamlining of indicators, monitoring and reporting. […] The Commission is developing a headline set of biodiversity indicators with the European Environment Agency, based on those adopted by the CBD. Work is in progress to develop monitoring approaches and tools, and to streamline reporting under the nature directives."