1. Wild species biodiversity in EU25 agricultural landscapes

1.1 Conclusions

- **Biodiversity in agro-ecosystems depends on production intensity**
- **Production intensity is unevenly distributed in EU25**
- **Average ecosystem quality in arable production systems is 10% and 26% in grazing area (add two maps for 25 countries)**
- **Production intensity did not change from 1990-2000 in EU15**
- **Scenarios for 2030 showed divergent impact on biodiversity in the agricultural landscape**
- **Conversion to organic farming can mitigate negative effect of intensification**
- **Small increases of ecosystem quality in agro-ecosystems have significant impact on their appearance and landscape beauty.**

1.2 Introduction

This chapter assesses the current state and future change in wild species in agro-ecosystems in de EU-25. The state of biodiversity is expressed as ecosystem quality. Ecosystem quality is defined here as *the average abundance of a core set of wild species living in agricultural ecosystems, as a percentage of the original natural ecosystem*. The diviation from the original state may result from various anthropogenetic factors such as conversion into agriculture, exploitation, eutrophication, water management, pollution, climate change, fragmentation and introduced species (Ten Brink, 2000; Ten Brink et al., 2002). This indicator is derived from the indicator selected under the Convention of Biological Diversity (UNEP, 2004). It should be stressed that the ecosystem quality figures in this document are not directly measured from field monitoring (as it should, but a regular monitoringsystem is still lacking) but are proxies, derived from the pressures on agro-ecosystems[1]. See section 1.5 Methodology. Next to the current state projections are made for the year 2030 for 4 scenarios.

1.3 Current state of wild species agro-biodiversity

In *arable farming* (including permanent crops*)* current ecosystem quality is on average 10% of the original pristine, with a min-max range of 6-22%. The remaining biodiversity in *grazing systems* is much higher: 26% on average with a range from 15% to 82%. The lower value is for intensively fertilised and/or re-seeded permanent grassland. Extensive grazing in (semi) natural areas has the highest ecosystem quality.
The average ecosystem quality of cropland in 2000 is among the highest in the new ten countries: e.g. 22,3% and 24% for cropland in respectively Slovenia and Poland.

The production intensity (based on the use of agricultural inputs on arable land) did not change on average between 1990 and 2000. As a result the average ecosystem quality increased from 9,5 to 9,6% for the whole area of EU 15. The process of intensification in this area already took place in the previous decades.

[1] Pressure-quality relationships are established for various pressures

The production intensity is unevenly distributed in Europe. In Eastern EU, the Mediterranean and in mountain areas one can find extensive systems. The most intensive systems can be found either in rich soils in low-lands (for example in the Netherlands) or in irrigated systems e.g.Greece (see maps 2000).

1.4 Scenario results

In arable farming the impact on biodiversity is the highest in the scenario A1, with in the middle A2 and B1, and lowest in B2. A1 results for many countries in half of remaining ecosystem quality in cropland compared to B2 scenario in 2030. Differences between countries are considerable, depending from the production intensity in 2000 (see tables). In all scenarios ecosystem quality in arable land decreased between 2000 and 2030, because of intensification of production and accompanying higher yields, except for 9 countries in the B2 scenario.

For grazing systems, differences between scenarios are relatively smaller, but in absolute terms more biodiversity is left compared to arable land. Biodiversity gain by 2030 is expected in most countries in the B2 scenario, except the Czech Republic, Slovenia and Slovakia in Eastern Europe. The A1 scenario resulted in biodiversity loss in all countries.

Organic farming

Land use conversion into organic farming showed a differentiation between scenarios. Because it is expected that organic conversion will be highest in the B2 scenario, positive impact will be highest also. In absolute terms the increment is on average for the EU25: maximum 2% ecosystem quality gain in 30 years. The positive effect from organic farming was nullified by the negative effect of intensification in the A1 and A2 scenarios.

Small increases of ecosystem quality in agro-ecosystems have great impact on landscape appearance

Wild species diversity is generally low in intensive agricultural landscapes. If the average production intensity will not change so much, biodiversity in absolute terms of ecosystem quality will not change too. One would possibly conclude that the overall comparison between scenarios is a grey mass of more of the same, rather than significant differences. However, the translation in terms of wild species, the gap between 5-10% on the one hand and 20-25% ecosystem quality on the other makes the difference in grassland from a “uniform green baize” into a flower bouquet. It is also the difference of mono-cropping and production specialisation in a uniform landscape in comparison to the highly diversified production systems before the “green revolution” of the 1850 pre-industrial era.

Agricultural landscapes are designed to maintain the provision of specific ecosystem services and traditional agricultural landscapes. Semi natural grasslands are highly valued also from biodiversity and landscape reasons. An increase of the overall agro-biodiversity of –for example- around 5% by 2030 will not be reached in none of the four scenarios under study, in contrary. For such a goal additional policy measures would be needed that slow down and invert the increasing production intensity, that promote organic farming and that guide strictly the process of land use change.

1.5 Methodology

The remaining wild species biodiversity in agricultural landscapes depends highly on the intensity of the production system (Wilson et al 2003; Hoffmann et al. 2001; Zechmaister and Moser 2001 in Haberl et al 2003). Intensity of the production can be calculated based on:

- the input (technology investments) for production: applications of external inputs (fertilisers and pesticides), Livestock Units per ha., long-term water and soil improvements, or
- the output (productivity) of crops and grassland (Haberl et al 2003).

The production intensity maps 2000 for crop and grassland area per country (EU25) are calculated based on input (differences on production technology – investments) and scenario calculations were carried out with estimation of output (expected changes on the productivity by the IMAGE model).

The Farm Accountancy Data Network (FADN) for EU15 and data from FAO, IFOAM and Eurostat for the New Ten EU countries (except Cyprus) were used to estimate production intensity for cropland and grassland in the year 2000. We recommend to calculate production intensity in the New Ten countries based on sub-national farming account data rather than on National statistics.

Future impact on biodiversity in the four scenarios was assessed based on three complementary pathways of analysis:

1. different scenario story lines with divergence in estimates based on 30-year changes in productivity of agricultural – grassland production;
2. Land use change per production system (analysis on the conversions; in-out analysis) and;
3. different estimations of expected rates of conversion into organic farming or other types of sustainable farming per scenario

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