

Institute for Soil Conservation  
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# **Indicators to Maintain Biodiversity in Agro-Economy Proposal**

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Environment (DNR)**

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## Introduction

Worldwide a partially dramatic loss of biodiversity can be stated. In the early 1990s, the perception of biodiversity loss led to Convention on Biological Diversity (CBD) and was thus recognised as a global problem. The 4th International Technical Conference of FAO in 1996 in Leipzig, where a "Global Action Plan" was decided, and the adoption of the International Seed Treaty of FAO (International Treaty on Plant Genetic Resources in Food and Agriculture - ITPGRFA) in 2001 have been great steps forward in relation to agricultural biodiversity.

*"With the loss of animal and plant species their physiological and genetic blueprints go lost, which are of great value for medicine and agriculture. The gene and species loss weigh still heavier because of the irreversible process: Lost remains lost, missed opportunities never return again "(WGBU 2000<sup>1</sup>).*

In this description of the WBGU agro biodiversity is explicitly included. Similar diagnoses in relation to agricultural biodiversity are made by the FAO<sup>2</sup>, national authorities<sup>3</sup> and NGOs<sup>4</sup>.

For the nature-conservation, agricultural and food sector, so far primarily is seen their impact on accompanying biodiversity. Nature conservation projects and agro-environment programmes try to minimise this impact<sup>5</sup>. The diversity of crops and livestock and the intensity of agricultural production as a cause for the loss of biodiversity still play a subordinate role and are often not recognized as a potential for influence<sup>6</sup>.

Diversity through human land use can be defined as socio (bio) tope. Animal and crop diversity arises from land use in a variety of environmental conditions, production systems and cultures. This comprehensive understanding of biodiversity is also a part of the recent ecosystem debate<sup>7</sup>. Clear answers or "nature conservation" - guidelines for the management of (agricultural) biodiversity are therefore difficult. If the management-ecosystem approach is applied to biodiversity in the whole agro economic system, political conditions, social factors and their impact on biodiversity as well as the agricultural on farm production have to be taken into account.

In order to maintain biodiversity, the different levels and fields of action which are responsible for the decline have to be identified. Targets for a change towards the conservation of biodiversity and indicators for the assessment of sustainable agro economic models have to be appointed or developed.

In the following the attempt is made to sketch the impact of agro economy on biodiversity and to make proposals for desirable goals to increase biodiversity for different levels of agro economy. Furthermore, possible indicators of the target values are explored and assessed regarding their check- and measurability.



The Organic farming currently is the most sustainable form of agricultural land use. Criteria of biodiversity are anchored in the production system and independently verified. There are international certification standards. Also in processing and trade biodiversity is emphasized. For this reason, the statements in this document refer exclusively to the conventional agro economic sector.



# 1 Agro Economy – Effects on Biodiversity

Biodiversity in the agricultural sector – shortly called: *agro biodiversity* - stretches from the breed over the keeping of animals and the cultivation (including the accompanying flora and fauna), contains the variety of plants and animals in the processing and marketing, in the meal and in other forms of final consumption.

The variety of livestock and plants develops from managing in a variety of environmental conditions, production systems and cultures. The different species, sorts and local populations developed in symbiosis between humans and cultivated species during breeding work lasting for thousands of years. But the spectrum of cultivated plants strongly became smaller - particularly in the industrialized countries. Local conditions and agricultural production in the European Agriculture today are often decoupled. This decoupling was made possible by scientific progress, and above all by the products of the chemical industry such as fertilizers and pesticides and the use of fossil sources of energy. Supported by an agricultural policy which was built in times of food scarceness, these factors promoted a high-powered agriculture. It is characterized by a short term orientation on the yield. At the same time the position of agriculture changed: It developed from a relatively self-sufficient system to a part within the production chain, in which it controls only a small part of the creation of value. Agricultural products ever more became a raw material of food industry. The world nutrition today is based mainly on only ten species of cultivated plants. The majority of the cultivated plants (99.6%) remain underused<sup>8</sup>.

The effects of agro economy on biodiversity can be differentiated into the following levels:

Political Basic Conditions

Social Factors

Economic Factors

On-Farm Factors of Production

On each level there are many action fields, which have influence on biodiversity by their presence or their arrangement. In the following an overview of the most important ones is given.



**Political Basic Conditions - Examples**

Field of Action	Description	Effects on Biodiversity	Possibility for a better Arrangement
Subsidies	Financial support depends on hectares. So, mainly big streamlined farms with simple crop rotations profit. Consequence: Small and middle sized farms with higher diversification grade are underprivileged.	↓	yes
Investment incentives	Diversification of farms often is not part of support programmes. Minimum values of support are too high. Consequence: Small and middle sized farms with higher diversification grade are underprivileged.	↓	yes
Food security e.g.: EU-Hygienic standards for processing	Inhibition of companies which process handicraft high quality food with traditional techniques. Consequence: Scarcely takers for small charges of uncommonly or regional products.	↓	yes
Agro-environmental programmes	Differ, depending on Nation or Federal State (in Germany). e.g.: Diversified crop rotations are not criteria of financial support. e.g.: Installation of hedges is a criterion of financial support.	⇒	yes
Special incentives e.g.: Renewable Energy Law (EEG)	Financial support is given to production of biomass for energy use. Consequence: Monocultures of maize for biogas production and rape and wheat for fuel production.	↓	yes
Export subsidies	Species for high-yield production are produced preferred for the world market. Competition is distorted. In development countries food production for the own population is forestalled.  Consequence: Small and middle sized farms with higher diversification grade are underprivileged.	↓	yes



**Social Factors- Examples**

Field of Action	Description	Effects on Bio-diversity	Possibility for a better Arrangement
Access to Land	Property conditions are social unbalanced and often unsettled in many development countries. Consequence: Small and middle sized farms with higher diversification grade (subsistence farming with local adapted species) disappear.	↓	difficult
Education	Awareness of biodiversity scarcely exists in practical farming. The subject is not brought round in education.  The subject of diversified crop rotations, sustainable manure management or the possibilities of diversification of farming systems is unattended in education and training in general.	↓	yes
The awareness of consumers for fair prices	„Food has to be cheap“ is a basically belief of consumers. Consequence: Diversity of quality food has a limited market value.	↓	limited





**Economic Factors- Examples**

Field of Action	Description	Effects on Bio-diversity	Possibility for a better Arrangement
Strong concentration of companies in the food market. Uniformity of supply.	Regional purchase is not common. Consequence: Scarcely chances for small charges of uncommon or regional products.	↓	yes
Strong demand for convenience-products.	Uniform low-cost raw material is needed for the processing. Consequence: Uniform cultivation of exchangeable high-yield raw material.	↓	difficult
Strong demand for low price (meat-) products. Pressure of dairies on low-cost raw material.	Breeding focuses on high power animal species. Diversity of species declines. Breeding focuses on high power species. Diversity of species declines.	↓	yes
Understated food prices in relationship to the efforts of production (e.g.: milk)	Often with high quality products which are effortful in production and marketing no farm-profit can be made. So farmers prefer the uniform conditions of high-yield production and common marketing ways.	↓	yes
Concentration of economic power in the breeding area leads to a strong control of genetic resources in private companies.	Result: Patents and genetic engineering shall ensure property rights of private companies about genetic resources. Consequence: Threat of natural genetic pools through artificial genetic creations. No support for the use of local adapted species.	↓	yes



**On-Farm Factors of Production- Examples**

Field of Action	Description	Effects on Bio-diversity	Possibility for a better Arrangement
Species	<p>Well known high-yield varieties are easier in the growing and more profitable per hectare.</p> <p>High-performance breeds must compensate the low-prices.</p>	↓	yes
Feeding	<p>The overwhelming use of power feed leads to a decline in the (green-) fodder production. Growing diversity on the field, in soil (roots/organisms) and within the rotation is lost.</p>	↓	yes
Crop rotation	<p>Low prices lead to an achieved maximum output per hectare.</p> <p>Wide crop rotation (with fruits of difficult marketing) or intercropping (which is ploughed in and therefore not directly contributes to income) does not pay in short term view.</p>	↓	yes
Manure	<p>The prevailing use of N-intensive fertilizers with low reproduction potential for soil organic matter (mineral fertilizers, slurry) reduces the soil live drastically since its task (biodegradation of organic matter) is largely lost. Remaining crop residues can provide the need for organic matter not adequately.</p>	↓	yes
Plant protection	<p>In addition to the direct reduction of biodiversity the use of biocides reinforces long-term instability of agro ecosystems (less robust crops, resistance to pests).</p>	↓	yes



## 2 Goals and Indicators for the Promotion of Biodiversity in Agro Economy - Proposals

From the levels and fields of action above targets for the maintenance or the increase of biodiversity in the agricultural sector can be assumed. Again, in accordance with the aforementioned levels is separated in:

Political Basic Conditions

Social Factors

Economic Factors

On-Farm Factors of Production

### Political Basic Conditions

Field of Action	Supporting Biodiversity through...	Possible Indicators	Check- or Measurability
Subsidies	No under priviligation of small and middle sized farms with higher diversification grade.	Linkage of subsidies to the amount of agricultural workers/ha, minimum indicators for crop rotation and maximum levels for N-manure- and biocide-application.	yes
Investment incentives	Support of a great diversity of farming systems. Facilitating of diversification.	Low minimum values. Flexible eligibility criteria.	yes
Food security e.g.: EU-Hygienic standards	No under priviligation of small and middle sized farms with higher diversification grade and traditional on-farm or off-farm production and processing.	Hygienic and quality standards adapted at different farm sizes and operating processes.	yes
Agro-environmental programmes	Promoting diverse production systems and crop rotations.	Rotation at least 4-crops (without intercrops). Promoting of livestock and cultivation of old species. Limitation of N-manure and biocide application.	yes
Special incentives. e.g.: Renewable Energy Law (EEG)	Avoidance of monocultures on regional and farm level.	Definition of a "good practice" of biomass production. Integration in Cross-Compliance.	yes
Export subsidies	Elimination.		./.
Taxes	Tax on N-manure.		yes
Regulation of best practice.	Definition of concrete indicators for best practice.		yes



### Social Factors

Field of Action	Supporting Biodiversity through...	Possible Indicators	Check- or Measurability
Access to Land	Variety of farm sizes and farming systems.  Difficulty: Not feasible without land reform.	Ratio of agricultural proprietors to the number of farms in a region.	yes
Education	Evaluation and incorporation of environmental basic knowledge and the possibilities of farming diversification in education and training modules.	Developing quality standards for the training. Minimum range of ecological topics provided by public and private training and consulting companies.	yes
The awareness of consumers for fair prices	Mediation of ecological linkages between farming and manufactured foods. Different quality levels must be differentiated.	Support of the theme of "sustainable agriculture" as a topic in environmental education.  Quality labels on the products.	limited



**Economic Factors**

Field of Action	Supporting Biodiversity through...	Possible Indicators	Check- or Measurability
Strong concentration of companies in the food market. Uniformity of supply.	Support of producers for small charges of uncommon or regional products.	Quota of regional products in the supply. Example: <i>Tegut</i> .	yes
Strong demand for convenience-products.	Change in nutrition habits.	Support of the theme of "sustainable agriculture and nutrition" as a topic in environmental education.	difficult
Strong demand for low price (meat-) products.	Increase the willingness of the customer to pay for quality.	Support of the theme of "sustainable agriculture and nutrition" as a topic in environmental education.	difficult
	Breeding for strength, taste and health.	Financial support of breeding programmes for sustainable farming and livestock.	yes
Pressure of dairies on low-cost raw material. Understated food prices in relationship to the efforts of production (e.g.: milk)	Reasonable prices for sustainable (milk-) production.	Calculation of minimum prices of certain products and production processes as a benchmark for negotiating a fair payment.	yes
Concentration of economic power in the breeding area leads to a strong control of genetic resources in private companies.	Limiting the control of genetic resources by the private sector.	Developing of appropriate laws.	yes
		No patents on "life".	
		No release of genetically modified organisms in agriculture.	<b>Difficulty: A social discussion process is essential.</b>



**On-Farm Factors of Production**

Field of Action	Supporting Biodiversity through...	Possible Indicators	Check- or Measurability
Species	Research and consultancy in diversification of farming systems, diversity in livestock systems and crop rotations.	<p>Evaluation of re-search programmes.</p> <p>Financial support of extended crop rotations in the agro-environmental programmes.</p> <p>Definition of a minimum crop diversity for different crop systems in Cross Compliance.</p> <p>Percentage of natural habitats of the whole production area.</p>	yes
Feeding	Decrease in power feed use, increase of (green-) fodder production and grazing.	Financial support of a minimum percentage of own green fodder production in the agro-environmental programmes.	yes
Crop rotation	Research and consultancy in diversification of farming systems, and diversity in crop rotations.	<p>Evaluation of re-search programmes.</p> <p>Rotation at least 4-crops (without inter-crops).</p> <p>Financial support of extended crop rotations in the agro-environmental programmes.</p> <p>Definition of a minimum crop diversity for different crop systems in Cross Compliance.</p>	yes



**On-Farm Factors of Production**

Field of Action	Supporting Biodiversity through...	Possible Indicators	Check- or Measurability
Manure	<p>Advice in/sustainable use of fertilizer.</p> <p>Development of a special soil conservation training in agro-consultance.</p> <p>Regular presentation of a humus balance sheet.</p>	<p>Uniform evaluation of criteria of sustainability for all manure materials.</p> <p>Humus balance has to be positive (in Germany class C or D).</p> <p>Definition of maximum-levels of N-manure application (depending on crop systems and soil texture) in Cross Compliance.</p>	yes
Plant protection	<p>Biocide-reduction programmes.</p> <p>Research and consultancy in diversification of farming systems, and diversity in crop rotations.</p>	<p>Financial support of biocide-reduction in the agro-environmental programmes.</p> <p>Definition of maximum-levels of biocide application and standards for biologic plant protection for each crop in Cross Compliance.</p>	yes



### 3 Summary

The standardization in crops and livestock will not only increase the risks of production in agriculture. It requires as a supposition usually a high use of fossil fuels, fertilizers and pesticides, power feed, antibiotics and intensive technology. These 'high input' procedures are not sustainable and, because of the concentration on a few high-yield genetic resources not viable for the future. Already now breeds and varieties are missing worldwide for a sustainable, locally adapted agriculture<sup>9</sup>.

The logic of economic activity is focused primarily on the market and the saleable products and services for the industrial market. The re-productive side of human land use plays only a neglected role in this economic context. The re-productive activities include the protection of important viable systems such as soil fertility, purity of water and agro biodiversity. Such aspects will only be drawn into the economic calculus, when with the help of regulatory complying framework, conditions are created.

The promotion of agricultural biodiversity needs diverse economies along the entire value chain, „from farm to fork“. It also requires a policy that emphasises multifunctionality and regional development. A diverse farming requires a reorientation towards locally robust plant varieties and animal breeds.

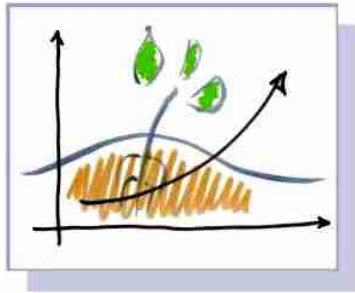
It is the rule of thumb: The more intense and more streamlined a production system is the more counterproductive it is for biodiversity. Therefore, small and medium-sized farms have to be promoted because of their greater diversity. As they generate a larger percentage of profits themselves compared to large businesses they are usually even more competitive.

In the agricultural policy, activities of regional development and ecological development are to strengthen. Model for sustainability should be the concept of a multifunctional agriculture with a lot of opportunities to diversify. This should also be found in the education and training of trade and agriculture. Agriculture in addition to the production of food and other industrial raw products implies further social and ecological functions. If these additional benefits are not included in the price, then it must be given through compensation payments back to the farmer. This compensation payment has to be linked on ambitious standards for a "good agricultural practice" (instruments: agro-environment programmes, cross-compliance). To reach the full potential in multifunctionality of agriculture there is to aim at more diversity in the development of rural areas<sup>10</sup>.

On the level of manufacturing industry and trade the major challenge is to stimulate a demand for a larger food quality based on a larger animal and plant diversity - despite the economic benefits of large, homogeneous lots. More diversity in trade and processing needs, not least, the development of a varied food culture in which the regional specialties from many different animal breeds and plant varieties are relished.







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<sup>2</sup> [www.fao.org/ag/cgrfa/docs.htm](http://www.fao.org/ag/cgrfa/docs.htm)

<sup>3</sup> BMVEL (Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft) (2002): Nationales Fachprogramm zur Erhaltung und nachhaltigen Nutzung pflanzengenetischer Ressourcen landwirtschaftlicher und gartenbaulicher Kulturpflanzen. Bonn.

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<sup>4</sup> [www.grain.org](http://www.grain.org); [www.etcgroup.org](http://www.etcgroup.org); [www.iucn.org](http://www.iucn.org)

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<sup>8</sup> Verbundprojekt „Agrobiodiversität entwickeln“ (2004)

<sup>9</sup> Verbundprojekt „Agrobiodiversität entwickeln“ (2004)

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