

# Valuable Agricultural Landscapes

- the Importance of Romania and Scandinavia for Europe



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# Valuable Agricultural Landscapes

- the Importance of Romania and Scandinavia for Europe

Guest editors

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## Introduction

MARGARETA IHSE, CHAIRMAN, THE KSLA COMMITTEE OF ENVIRONMENT, SWEDEN  
URBAN EMANUELSSON, HEAD OF THE SWEDISH BIODIVERSITY CENTRE

The aim of the seminar was to provide an overview and exchange of knowledge about landscape in Romania and the Nordic countries, as seen in a European perspective. The aim was further to discuss possibilities for research, education and management cooperation between Sweden, Norway and Romania to support the landscape preservation policies.

The Romanian cultural landscapes, in particular those of Transylvania, are unique in Europe in many aspects. The large amount and the extensive distribution of mowed meadows and semi-natural pastures make the region one of the very richest in Europe concerning biodiversity, if not the richest. Besides carrying exceptionally high values for nature conservation, they are also most interesting as concerns cultural heritage, showing a living part of the former European agrarian history. In this region, many traditional methods were conserved during the

socialist regime, when they disappeared in almost all other parts of Europe. These methods and land use with the resulting ecosystem and its biodiversity are similar to those earlier found in the Scandinavian countries, as in many western European countries. The values of such features were not understood until they became rare and almost had disappeared by the transformation of the agricultural landscape. Agricultural intensification has led to marginalisation and abandonment, impairing the biological and cultural qualities of the rural landscapes, especially the rich biodiversity of mowed meadows.

The enter of Romania as a member of EU will drastically and quickly change the conditions for both the people of the rural areas, and for the biodiversity, cultural heritage and recreational landscape qualities.

The Committee of Environment at KSLA has the last years been focusing on questions concerning landscapes. It has involved studying many aspects of the Nordic landscape problems, especially of Sweden and Norway. There are several reasons for focusing on the landscape. The most important is that the landscape is the basic ground for all activities connected to land use. Agriculture, forestry, urbanisation, transportation and recreation all takes place in the landscape. Things that have been taking place in the past will still be able to detect as cultural or natural heritage, and as 'landscape memories'. They



*Hay-cart, field barn and haystacks are cultural elements in a cultural landscape. Volcan, Apuseni mountains, Romania. (Photo: Knut Per Hasund)*

are more or less easy to see and understand, but these biological traces still influence the landscape values today. The Romanian agricultural landscape is especially rich in this respect. The landscape perspective is thus a good platform for understanding many environmental questions.

KSLA has organised several seminars and meetings with focus on land use, agricultural production related to biodiversity and nature conservation, and this seminar should be seen as one of them. These seminars have clearly shown that historic land use and special management methods are the prerequisite for high biodiversity in the present, agricultural landscape. They have also shown that profound changes have occurred in all ecosystems and landscape types. It has affected the biodiversity and the cultural heritage of the agricultural landscapes (especially in the meadows and the pastures), in the forests, in mires and wetlands and in the mountains. The combined landscape effects of changing land use and production system are underestimated. They are not assessed in large enough geographical regions, rarely taken together, or not estimated in a long enough time period. There have been profound changes, especially during the last century – a short period considering the more than 6000 years of human settlement in Sweden.

CBM has worked with the agricultural landscape in many ways. The semi-natural grasslands of Sweden and Europe and their values have been of particular concern. CBM is, for instance, the coordinator of a large research programme, HagmarksMistra. It is focusing on the biodiversity and ecology of semi-natural grasslands, and the economy of managing these lands.

One of the most important issues raised and understood from this research programme, as well as from the CBM and KSLA seminars, is the high importance of continuity in management. The historical land use and management of an area is of crucial importance for its present

biodiversity, and should consequently be decisive for the nature conservation management. Sweden has extraordinary good conditions for studying the historical land use and the management continuity. Here is a large set of historical maps, with much detailed biological information. They are dating back to the beginning of the 17<sup>th</sup> century, with repeated mapping every 50 or 100 years.

From this background, KSLA Committee of Environment and CBM both had many contacts with Romania. CBM has organised courses in co-operation with Romanian partners. Official visits and study tours have also been made, especially to the Transylvanian landscapes. An important aim of the tours was to study and compare the Romanian agricultural landscape and its nature and cultural values with the Nordic and West European situation. We realised the exceptionally high values of these landscapes, with a still living history of European landscapes. We are also aware of the importance of taking into account these values by the rural development programmes, as an important factor besides developing the agricultural production. It is an intricate balance between conventional development of maximising the food production and a holistic rural development. Production and rationalisation have to be optimised considering the landscape amenities so that these values will be kept.

The aim of the seminar was to exchange knowledge between Romanian and Scandinavian researchers in geography, biology, and other scientific fields related to the landscape and try to find or develop landscape knowledge and ways how to connect rural development to nature and cultural heritage conservation. The ultimate aim is to contribute to the preservation of the exceptionally high biological, cultural and social values of the Romanian and Scandinavian rural landscapes – for the new Europe.

## Biological and cultural values in the agricultural landscapes in Romania and the Nordic countries

VICTORIA POPESCU, AMBASSADOR OF ROMANIA IN SWEDEN

I wish to express my deep satisfaction with the very important topic of this seminar and to congratulate the organisers for this initiative. I believe that this exchange of experience between academics of Romania and Sweden represents an excellent opportunity for developing the cooperation between our countries in the area of biodiversity, cultural landscapes and environment protection. Even if I am not an expert myself, I very much appreciate the Swedish experience in this field and consider that Romania has a lot to learn from it. Furthermore the European perspective given to this subject is particularly important for my country. Allow me to briefly share with you some thoughts.

Currently Romania is deeply engaged in the ultimate phase of its preparation for the integration into the European Union. Many EU states have already ratified the Accession Treaty of Romania and Bulgaria to the EU and both

countries have great chances to become EU full-fledged members in January 2007. In a symbolical way, the Swedish Parliament will ratify this Accession Treaty on 9 May, that is as you know the Day of Europe. It is a testimony of the constant support Sweden has extended to Romania's European integration. Moreover, it is a guarantee for increased future opportunities for the bilateral cooperation between Romania and Sweden.

During the process of European integration, sustainable development and environment protection have become top priorities of the Romanian governments, alongside justice reform and eradication of corruption. Under the monitoring and with the assistance of the European Commission, significant progress has been achieved in raising awareness on environment protection and biodiversity, on incorporating European environment law into national legislation and designing specific strategies and



*Romania's landscape of connected grasslands are a unique treasure for the European biodiversity. Maramures, Romania. (Photo: Knut Per Hasund)*

policies, as well as setting an appropriate institutional framework. But implementation still remains a challenge for us. While EU accession will mark the end of a long and difficult process of preparation, it will also mark the beginning of a new era, when Romania is expected to maintain compliance with its EU obligations on an ongoing basis. And here, I believe, the expertise and good practices of Sweden can be of great help for us.

On the other hand, it is also important to mention something that many European specialists have emphasised with respect to the contribution which Romania will bring to the EU. And I am quoting the European Commissioner for Environment, Mr. Stavros Dimas, who pointed out during his recent visit to Romania that the 'natural assets of Romania will enrich the environmental capital of the EU immensely'.

Romania will bring to the EU patrimony its wild and rather unspoiled nature and an extremely interesting biodiversity. The vast territory of the Danube Delta, the large number of big carnivores, like the wolf and the lynx, the large bear population are significant assets in this respect. Natural and semi-natural ecosystems stand for about 47% of Romania's area. It has biosphere reserves, nature parks and national parks amounting to over 1 million hectares. Likewise, as certified by the European Commissioner for Environment, Romania has accelerated its work to identify the sites that will become part of the Natura 2000 network of protected areas.

Before concluding my brief intervention, I wish to emphasise the importance of developing the Romanian – Swedish partnership in the preservation of biodiversity and environment in

general. I highly value the Swedish 'philosophy' concerning the care for nature and I strongly believe that Romania has a lot to gain from it, especially now, when we already suffer from the dramatic impact of climatic changes, when we have been confronted with devastating flooding. In this context, urgent measures for preserving the biodiversity and the environment at large are a must for our future development. And we need the support and cooperation of our Swedish friends in tackling these problems.

An interesting project developed with Swedish support that could serve as a model for our cooperation deals with the elaboration of a master plan for the Danube Delta and its future development. As you know this area is a unique habitat with over 300 species of birds and a varied fauna and flora. It is a living laboratory showing exceptional dynamics at the level of its natural components.



*Meadows that have been mowed for centuries are the species richest terrestrial habitats of Europe. Apuseni mountains, Romania. (Photo: Knut Per Hasund)*



# The social and ecological state and the development degree of the rural space in Romania

VASILE SURD, BABEȘ-BOLYAI UNIVERSITY, CLUJ-NAPOCA, ROMANIA

CRINA DACINIA PETRESCU, DIMITRIE CANTEMIR UNIVERSITY, CLUJ-NAPOCA, ROMANIA

The rural population of Romania is in a growing stage, from 45% in 1992 to 47.25% in 2002. This is generated by the decay of the industry in the cities and by the high cost of life in the urban areas. As a consequence, we witness an urban-rural migration process that tends to amplify in the near future. The villages became repopulated by a new social class, the urban workers, which did not share the knowledge and habits related to the management and the practice necessary for an efficient agriculture. In many cases they are not the best example of a good morality, as they have a major negative behaviour acquired in the cities, where they lived by the rule 'we pretend to work, they pretend to pay us' (in this case, 'they' were the political leaders). In the numerous factories that manufactured goods like clothes, glass products, ceramics etc the workers usually stole a part of these products and sold them on their own. This 'social product' of the communist epoch, the peasant-worker reconverted to peasant after the collapse of the old system, did not have the chance of a real and good qualification, as his qualification as an industrial worker was generally accomplished at the workplace and not within an organised training system. Nowadays people do not have the skills to work the land or to breed the animals according to scientific standards. Those who inherited the land from their parents and still live in the cities practice weekend agriculture; at the end of the week the whole family or a group of friends or neighbours go to the countryside and do the agricultural

works mainly with their bare hands.

We can often find a dualism in the way of living: during the summer the urban families, many with a high economic level, go to the villages, where they work their inherited land in the traditional way. From the administrative point of view, they belong to the urban population and in their ID cards no residence change is made.

The Law for Land No. 18/1991 created the juridical ways to dissolve the old APCs (Agricultural Production Cooperatives) (Cândea et al. 2004, p. 217). This led to the allotment of 6 million people with agricultural land, summing up to 9 millions hectares. At a national level the average size of a land property is 1.87 ha; this extent is larger in the central part of Câmpia Română (3.87 ha) and in Podișul Moldovei (2.35 ha) (Floarea Bordânc 1996, in Cândea et al. 2004). The agriculture sector that does not belong to the cooperative system has about 10% of the land and is mainly situated in the mountain areas, with semi-natural pastures and meadows, and is specialised in traditional animal breeding.

Another feature of the Romanian agriculture that has to be mentioned is the high level of division of the land property (figure 1). The average Romanian land property is split in 10-20 parcels (plots), situated in different parts of the village. This causes a high energetic consumption in the exploitation of the property (the fuel needed to move the machines from one parcel to another is equivalent to the fuel quantity used for the work of the land).

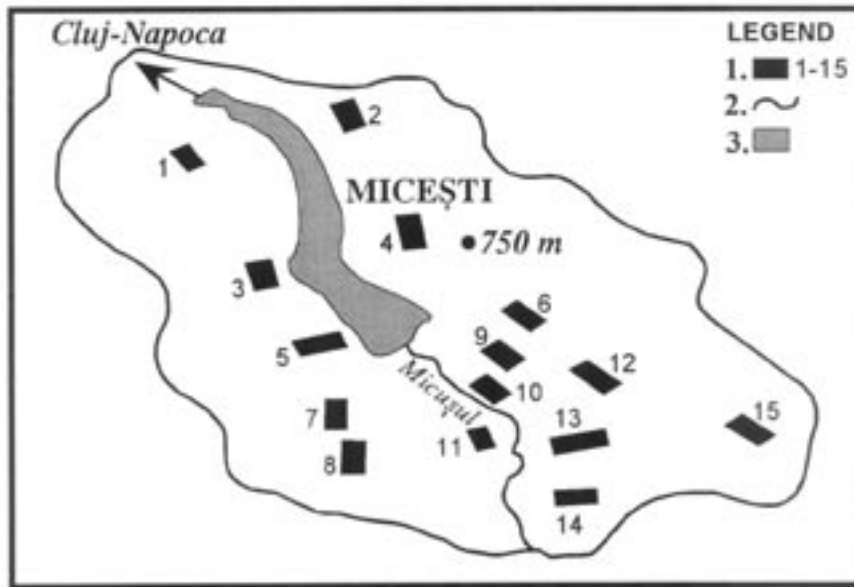


Figure 1. Dispersion of land property, with an example from the village of Micești, Cluj County, Romania. The 15 parcels of agricultural land (black squares) have a total surface of 2.48 ha. The grey area denotes the built area of the village.

It is difficult to comment on the degree of the use of machines and chemicals in agriculture because of the private acquisitions of tractors after 1990, which were not always officially registered. The estimations of the year 2000, 57 ha of arable land corresponded to one tractor, which is very different from the 10 ha in the countries of Western Europe. In the same year the use of chemical fertilisers (active substance) was 36 kg/ha of arable land. This quantity compared to the 270 kg/ha of arable land in the countries of Western Europe shows a positive situation from the ecological point of view. The private rural exploitations almost exclusively use organic fertilisers. The most used insecticide is that for the potatoes (against the Colorado bug).

At a national level, the ecological situation is evaluated using four specific indicators:

- The surface of land/inhabitant;
- The surface of agricultural land/

inhabitant;

- The surface of arable land/inhabitant;
- The surface of forest/inhabitant.

The land surface per inhabitant in Romania is of 1.05 ha, from which 0.67 ha is agriculture land (0.44 ha is arable land) and 0.26 ha is forest area (table 1). At European level, Romania has a good position and it is outrun only by the Scandinavian countries, which have less inhabitants and a larger forest surface.

The total agricultural area of Romania is 147 802 km<sup>2</sup>, which represents 62% of the territory (238 391 km<sup>2</sup>). The structure of the agricultural area is divided as follows:

- 64% arable land;
- 32% meadows and pastures;
- 4% orchards and vineyards.

With this structure of the land, with a temperate-continental climate and with a state-cooperative agriculture almost alike the situa-

RUNNING NO.	COUNTRY	SURFACE OF LAND/INHABITANT (HA)	SURFACE OF AGRICULTURAL LAND/INHABITANT (HA)	SURFACE OF ARABLE LAND/INHABITANT (HA)	SURFACE OF FOREST/INHABITANT (HA)
1	Austria	0.85	0.46	0.20	0.41
2	Bulgaria	1.24	0.70	0.47	0.43
3	France	0.96	0.54	0.32	0.25
4	Germany	0.44	0.22	0.15	0.18
5	Italy	0.53	0.30	0.21	0.11
6	Norway	7.61	0.21	0.19	1.92
7	Holland	0.27	0.14	0.06	0.02
8	Poland	0.81	0.49	0.38	0.22
9	Portugal	0.87	0.41	0.36	0.37
10	UK	0.42	0.31	0.11	0.03
<b>11</b>	<b>Romania</b>	<b>1.05</b>	<b>0.67</b>	<b>0.44</b>	<b>0.26</b>
12	Spain	1.28	0.78	0.51	0.39
13	Sweden	4.59	0.35	0.30	2.54

Table 1. Agri-ecological indicators in Romania and in 12 other European countries

tion in 1985, Romania should produce enough food for 80 million people (Surd and Mac 1988). With 0.44 ha of arable land per person, Romania is situated between states that import food and states that have a surplus of food production.

Special studies (Puia and Soran 1979) have demonstrated that the countries where the arable land per inhabitant is smaller than the global average (0.27 ha) become importers of food products. Even if in Romania this surface is twice as large, Romania imports great quantities of food products from the EU and Latin America. At the same time, the Romanian

agricultural land is not properly used and the population, including the rural one, has a minimum quantity of food.

From an ecological and economical point of view, the Romanian forest suffered the wildest attack in the contemporary history of Romania. During a situation of political uncertainty, starting with 1990, thousands of hectares of forest were cut and most of the raw timber was exported. The Romanian wood mob conquered all the levels, from the simple workers to the government. The most extended and wild deforestations were done in Maramureş, Trotuş Basin and Vrancea Mountains (figure 2). The forest



Figure 2. The main areas with massive deforestations in Romania after 1989. 1) Maramureș, 2) Southern Bucovina, 3) Upper Olt and Mureș Valley, 4) Trotuș Basin, 5) Vrancea Mountains, 6) Apuseni Mountains, 7) Sadova, Dăbuleni.

from Oltenia Plain (Sadova, Dăbuleni) that fixed the sandy soils were finished by the peasants who gained their property rights during the incredible short period of one month. Today, these surfaces are classified as 'bad-lands' and the local authorities ask for government help to reforest the land.

The forest surface is officially declared to be 26% of the national territory, but in fact a big part of the forest surface is not replanted. A similar situation occurs and it is maintained in the neighbourhoods of the big cities. At city borders, inside the areas that generally have an ecological, social and aesthetic role, many houses were built. 'Forest movements' happened as a consequence of the price rise for the forest land situated next to the cities. Members of the political class that inherited forest land

from their families situated far away from the city, handed them over to the local forest administration, which in return gave them an equal surface of forest next to the city. Subsequently, these were parcelled and sold for buildings at very high prices.

Two 'technical innovations' changed the destiny of the Romanian forests for the worse:

- The chain saw (known in Romania by the Russian word 'drujba'); and
- the tractor.

Many peasants in mountain areas now have chain saws, and trading of these machines has become very active. At the same time, rural tractors were changed into systemic carriages of wood mass. Following the destruction of the forest of the villages, with chaotic trails created through the woods, shortly will come large areas

## EVALUATION OF THE DEVELOPMENT OF THE RURAL SPACE

CRITERIA	SUB-CRITERIA	INDICATORS
1. PHYSICAL - GEOGRAPHICAL	1. Forms of relief	1. Main forms of relief
	2. Natural protected areas	1. Main categories of protected areas
	3. Natural risk factors	1. Main areas affected by natural risk factors
2. DEMOGRAPHIC	1. Number of population	1. Number of inhabitants Jan 1 1997
	2. Density of population	1. Inhabitants/km <sup>2</sup>
	3. Evolution of population number	1. Evolution of population number from 1956 to 1997
		2. Evolution of population number from 1992 to 1997
	4. Factors for growing the number of population	1. Medium average of births/birth rate – 1991-1996
		2. Medium average of deaths/death rate – 1991-1996
3. Medium average of net migration – 1991-1996		
5. Demographical ageing	1. Ageing population indicator (60+ /0-14 years old)	
6. Renewal of the workforce	1. Renewal of workforce indicator (15-29/30-44 years old)	
3. ECONOMIC	1. Agricultural potential	1. Agricultural land/inhabitant
		2. Structure of the land usage
		3. Number of animals on 100 ha
	2. Forestry potential	1. Forest surface/inhabitant
		1. Level of tourist attraction
	3. Tourism potential	1. Complexity range of industrial farm
		2. Agri-food processing industry
	5. Agricultural exploitation potential	1. Medium surface for individual exploitation
2. Medium surface for an exploitation of legal association type		
3. Medium surface for an exploitation of familial association type		
4. Level of association in land exploitation		
6. Property structures	1. Number of private agricultural surface from the total agricultural surface (%)	
	1. Active employed population/1000 inhabitants	
7. Level of population occupation	2. Active population in agriculture/100 ha agricultural land	
	1. Number of active population in non-agricultural activities from the total active population.	
8. Diversifying the economic activities	1. Number of active population in non-agricultural activities from the total active population.	

CRITERIA	SUB-CRITERIA	INDICATORS
4. HOUSING	1. Inhabiting area	1. Living floor/person (m <sup>2</sup> )
	2. Construction materials	1. Share of houses built-up of durable materials (as % in total)
	3. Age of buildings	1. Share of houses built-up after 1970 (as % in total)
	4. New dwellings	1. Dwellings built-up in the period 1993-1996/1000 inhabitants (as % in total dwellings)
	5. Dwellings with indoor water supply	1. Dwellings with indoor water supply (as % in total dwellings)
5. TECHNICAL INFRASTRUCTURE	1. Drinking water supply	1. Drinking water supplied to consumers per capita/year (m <sup>3</sup> )
	2. Electric power supply	1. Percentage of households electrification (in the communal territory)
	3. Natural gas supply	1. Communes with natural gas supply
	4. Telephone service to the community	1. Percentage of villages connection to the telephone network
	5. Access to transportation network	1. Access to main road and rail networks
6. SOCIAL	1. Health	1. Inhabitants/physician
	2. Education	1. Complexity range of education system
	3. Communication	1. TV subscription/1000 inhabitants
	4. Infant death	1. Infant death/1000 life births
7. ECOLOGICAL	1. Air	1. Air quality (the frequency of overcoming MAL - Maximum Admitted Limit with polluting substances)
	2. Water	1. Water quality (the frequency of overcoming MAL with polluting substances)
	3. Soil	1. Soils affected by factors of quality limitation
	4. Forest	1. Forest land non-affected/affected by pollution

Table 2. Criteria, sub-criteria and indicators used to evaluate the level of development of the rural space (Government of Romania 1998).

affected by rain-washes and gully erosions.

It must be emphasised that only in Trotuş basin, to a forest land of 20 000 ha are used 300 saw mills. Unfortunately the same warning was made by E. Pop even earlier, in 1943, in the article *The Forests and Our National Destiny*; he wrote that 'we are famous for the sad fact to have the most numerous number of saw mills

reported per unit of coniferous forest land' and he was referring to the Sadului and Cibinului forest basin from central part of the southern Carpathians, Sibiu county.

In rural areas the habit of controlled storage and neutralisation of domestic waste is missing. This is why in the last 10 years the peripheral areas of the villages and the rivers were inva-

ded by plastic bags and cans, which turned into a national ecological disease. Between the two world wars and before the communist period, each community had the duty to make so-called dry pits where they put the dead animals and neutralised them with limestone. This good practice is now abandoned and the dead animals are dumped next to the rivers so they should be carried away by the waters. The local authorities have little power in controlling these actions. One reason for this is that by legal constraints the political power is weakened. The mayor and the councillors that apply fines and other punishments, requested by the law in relation to the environment, will not obtain the votes of the rural community at the next elections. This situation leads us to the conclusion that it would be more efficient to have as mayors the public officials, selected by contest, rather than politicians.

In 1998 the Green Paper The Rural Development in Romania was elaborated, under the aegis of the Romanian Government and financed by PHARE Programme of the European Union (Government of Romania 1998). In order to evaluate the level of rural development, seven groups of criteria, divided in sub-criteria and indicators, were established and used (table 2).

Using a method of aggregation index by criterion, we established the degree of development for each territorial unit (in this case, commune) (figure 3). Higher values denote better conditions and low values denote major difficulties. The average of the synthetic index of development at the national level is 35.6 (unfortunately this analysis was made at the level of communes; therefore no census data at village level are available; for the same reason the resolution of the analysis is not very high).

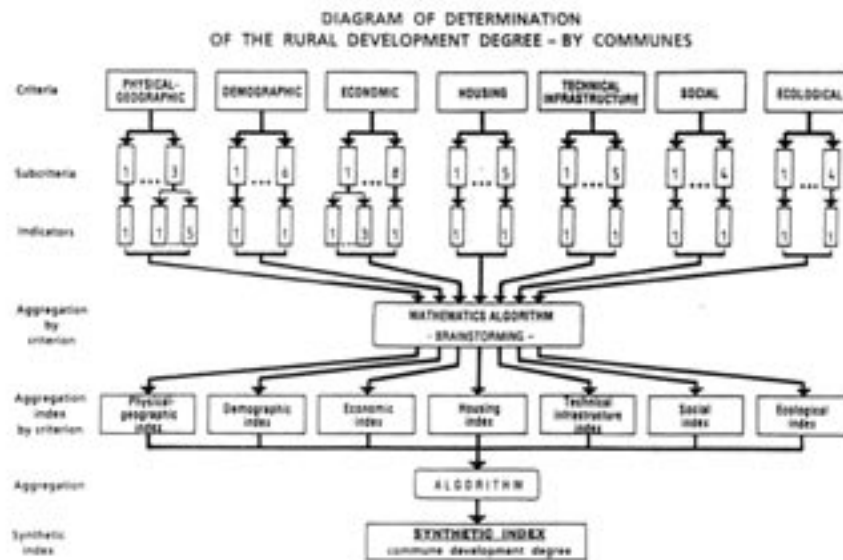


Figure 3. Diagram of determination of the rural development degree-by communes (1998).

For drawing a full picture of each commune, all information was tied together, thereby obtaining a synthetic and integrated picture of the actual level of development. The five levels of communal development are presented in figure 4.

The presence of similar actions in some areas allowed portraying zones with relatively alike features (figure 5). Having the fact that there are many problems to be solved in the rural space, three main categories of areas were identified, according to the predominance of factors that condition endogenous development and according to which prior interventions will be established (necessary or possible ones):

- areas in which favourable factors for development dominate (being able to become, through relatively small efforts, attraction forces of the rural regional development);
- areas in which restrictive factors for deve-

lopment dominate (needing support and urgent interventions for avoiding irreversible deterioration of their state); and

- areas with medium conditions.

The largest part of the territory is characterised by medium development conditions and factors. The necessary actions to be taken in these areas are, generally typical to both two areas, being like a combination of the different elements of those. We studied the rural space through seven criteria of analysis: physical-geographic, demographic, economic, housing, infrastructure, social and environment. The seven criteria on rural development level succeeded in identifying the major problems of the rural space, both on national and regional scale.

The main problems which the rural areas are facing are given below:

According to the *physical-geographic* criterion:

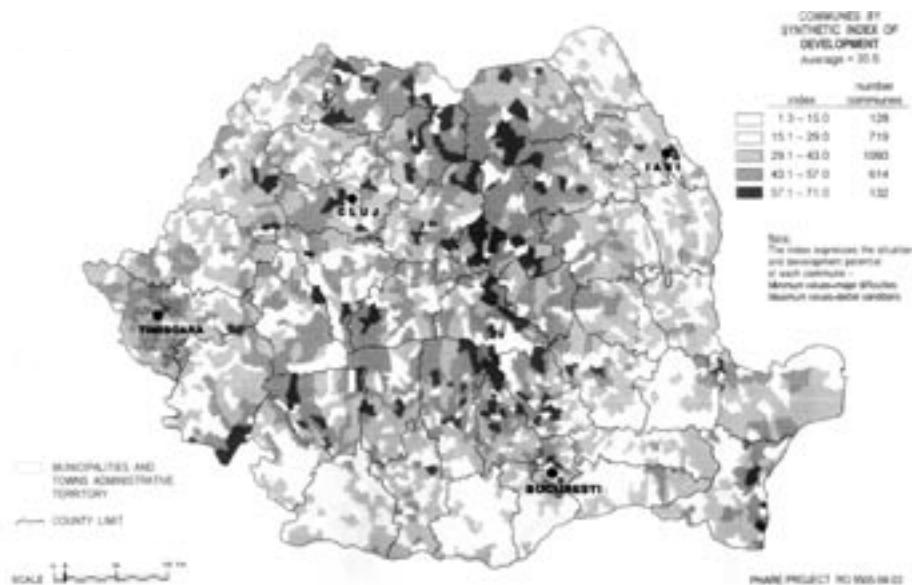


Figure 4. Degree of rural development (1998).



- The existence of one or more risk factors, for example: floods<sup>1</sup>, landslides, high seismic activity, low rainfalls and low quantity of water resources. Even though these risks are found frequently, only about 1/5 of the entire surface of the country is exposed to serious situations from this point of view.

According to the *demographic* criterion:

- Continuous tendency of decreasing population;
- Larger demographic disequilibrium – the level of aged population continues to increase (the mean age reaching 38.5 years in 1997), which generates high general mortality.

From the *economic* point of view:

- Low diversity of the economical activities – almost all localities are economically based exclusively on agriculture, the other activities

being regularly industrial, especially the exploitation of natural resources;

- Subsistence agriculture – mainly small size exploitations, lacking necessary endowments, which can only sustain a family survival;

- Small number of workplaces and lack of attraction for the young people – the offer of workplaces decreasing, especially as a result of the decrease of the industrial and building activities in cities;

- The tendency of temporary emigration of the labour-force towards other cities or countries;

- Small incomes for the rural population (most of the incomes come from the agricultural activities and the difficult conditions which characterise agriculture practices make these incomes very modest).



Figure 5. Rural area zoning (1998).

**Areas with advantaging factors for development:** A) Maramures, B) Rodna-Bargau-Calimani, C) Ciuc depression-Bistrita valley, D) South-eastern Dobrogea, E) Bucharest suburban zone, F) Brasov depression, Prahova valley and Subcarpatii Getici, G) Sibiu-Lotru, H) Portile de Fier-Cerna valley-Tismana, I) Campia Banatului, J) Culoarul Cris-Somes.

**Areas with disadvantaging factors for development:** 1) Northeastern Moldova, 2) Central Moldova, 3) Danube delta, 4) Central and southwestern Dobrogea, 5) Campia Baraganului, 6) Subcarpatii de Curbura, 7) Campia Teleormanului, 8) Southern Oltenia, 9) Southern Banat, 10) Apusen Mountains, 11) Podisul Somesan.

**Development regions:** 1) North-East, 2) South-East, 3) South, 4) South-West, 5) West, 6) North-West, 7) Center, 8) Bucharest.

1) The lack of real and complete information at communal level did not allow us to provide all data concerning floods.

From the *housing* point of view:

- A low standard of living for about 38% of the population;
- Lack of endowments with indoors water networks, in 84% of the houses;
- High percent of the buildings built with non-lasting materials (62% of the total);
- Ageing of the dwelling stock (about 75% of the total dwellings are over 30 years old).

According to the *infrastructure* criterion:

- Precarious situation roads (the large majority of the communal roads are not modernised and over 61% of the rural population has no direct access to the major road and railroad networks);
- Insufficient and inadequate water supply (57% of the communes has no public water networks and where there are plumbing, these are, of course, in the communal residence village, and the quantity of distributed water is insufficient).

According to the *social infrastructure and appropriate services*:

- Insufficient number of physicians – the number of persons per physician is three times higher than in the urban area;
- Less developed school network, improper quality of the buildings, low endowment with specialised equipment;
- High infant death rate, as a direct result of the low living standard and of precarious sanitary assistance;
- Population pauperisation, between 62% and 65% of total persons in Romania living under the poverty standard are found in the rural area.

According to *environmental factors* quality:

- Soil degradation, as a result of the anthropogenic actions; almost 50% of the communes have strong and very strong degradations of the soils and 37% of the communes have a medium degradation;
- Degradation of the forestry, mainly through uncontrolled deforestation, pollution and pests. These phenomena and processes act diffe-



Afternoon chat at the veranda  
– The Transylvanian villages  
are large and have a developed  
social life. Maramures, Romania.  
(Photo: Knut Per Hasund)

rently over the territory in accordance to the natural environment, historical evolution, and relationships to urban centres.

### The main characteristics of the rural space in Romania<sup>2</sup>

Rural space is the shareholder of the great majority of economical resources: raw materials for industry, agricultural resources, forestry, touristic and balneary resources. The agriculture, along with silviculture and forestry exploitation – the main economic activities in rural space – has an important contribution to GDP (19.1% in 1997). The population employed in these economic sectors represents over 1/3 of total employed population in the country.

The study highlights the existence of several valuable elements of human potential (large labour force, partly qualified in other activities than agriculture, youth reserve that provide its regeneration), of land potential (agricultural land with high yielding qualities, that allows crop diversification and outstanding yields; a rich wood stock; reserves and natural monuments, areas with special landscape values), and of historical heritage (cultural, architecture and ethnographical).

Even with all these potential elements, the major disturbances which happened in the rural space in the last decade affected all of the economic and social life components: economic relations, system of values, individual behaviour, the basic elements of rural community life. In these conditions, the rural space has experienced a regressive process.

Thus, the entire Romanian rural space is characterised by a low development level, deepening the gap between it and the urban areas, unlike the West-European rural space.

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2) Government of Romania, 1998

# Priority sites for plant conservation in Romania

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## Introduction

Romania covers almost 238.000 km<sup>2</sup> in South-Eastern Europe. It has a significant diversity of plant species and habitats, according to its five bio-geographic zones: Continental, Pannonian, Alpine, Steppe and Black Sea. The country is characterised by a temperate climate, a variety of relief forms and a remarkable diversity of vegetation (Săvulescu, 1952–1976; Ciocârlan, 2000). The main zones of natural and semi-natural vegetation are correlated with latitude and altitude as follow: (1) latitudinal units (steppe zone, forest-steppe zone and oak tree forest zone), (2) altitudinal units (nemorose level, boreal level, sub-alpine and alpine levels). Unfortunately, Romania does not have up-da-

ted information on flora and habitat types, and has no centralised information data base.

## The IPA project to identify valuable flora sites

As a new member of EU, Romania needs to identify the Natura 2000 sites up to 2007. In this general frame a special programme – Identifying Important Plant Areas (IPAs) – was developed by the Plantlife International<sup>1</sup>. Its aim was to identify and propose for protection a comprehensive network of the best sites for plants, fungi, lichens and their habitats conservation. Between 2002 and 2005 the project was also developed in Romania, under the coordination of the Association of the Romanian

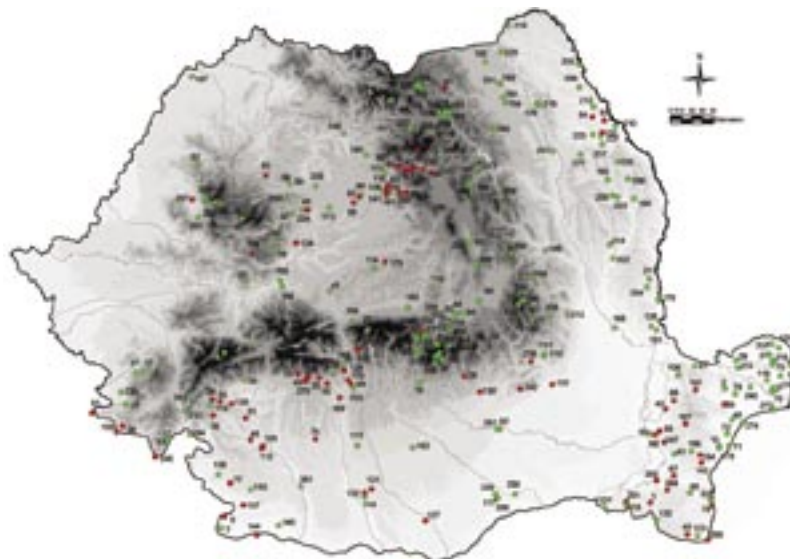


Figure 1. Priority sites (IPA) for plant conservation in Romania.

1) The programme had financial support of PIN/MATRA funds of the Ministry of Foreign Affairs of the Netherlands.



*Campanula romanica* - globally threatened (*Habitat Directive - Annex IIb*). (Photo: Anca Sârbu)

Botanical Gardens (AGBR). The project team consisted on 35 botanical and mycological specialists, conservationists, data and policy experts from 16 state organisations<sup>2</sup>. The project co-ordinator was the present author.

Three scientific criteria were used:

- Criterion A – threatened species:
  - threatened globally and in Europe (*Global Red List & Habitat Directive – Annex IIb and IVb & Bern Convention*),
  - threatened endemic (*National Red List*), and
  - threatened near endemic (*National Red List*).
- Criterion B – richness of flora in relation to its bio-geographical zone.
- Criterion C – threatened habitats (*Habitat Directive and Bern Convention*)

The selection criteria above applied jointly

with the IPA definition (*natural or semi-natural sites with exceptional botanical richness and/or supporting an outstanding assemblage of rare, threatened or endemic species and/or vegetation of high botanic value*) can be a most important tool for identifying the strategic reserve of vegetal diversity in Europe (Sârbu, 2003). This approach may become a way to reduce the decline of plant diversity. It would be a scientific tool for governments to implement Target 5 of the Global Strategy for Plant Conservation, GSPC, and a scientific support for the Natura 2000 Network development.

By this method, 276 priority sites (IPA) for plant conservation in Romania were identified (figure 1). They carry:

- 226 threatened species (34 globally threatened, 99 threatened in Europe, 59 endemic and threatened, and 34 near-endemic and threatened),



*Centaurea jankae* - globally threatened (*Habitat Directive - Annex IIb*). (Photo: Anca Sârbu)

<sup>2</sup> The organizations were: Ministry of Environment and Water Management, Botanical Gardens of Bucharest, Cluj-Napoca, Iași, Craiova, Târgu-Mureș, University "Al. I. Cuza" Iași, University "Babeș-Bolyai" Cluj-Napoca, University of Bucharest, University of Craiova, Faculty of Medicine and Pharmacy from Târgu-Mureș, Mureș Museum, Institute of Biological Research from Cluj-Napoca, Danube Delta Research and Desing Institute from Tulcea, Institute of Grassland Cultivation and Protection from Brașov, and National Park Piatra Craiului.

Habitat Directive - Annex Iib	
Vascular plants	
1. <i>Adenophora lilifolia</i> (L.) Ledeb. ex A.DC.	35. <i>Potentilla emilii-popii</i> Nyár.
2. <i>Agrimonia pilosa</i> Ledeb.	36. <i>Pulsatilla patens</i> (L.) Mill.
3. <i>Aldrovanda vesiculosa</i> L.	37. <i>Pulsatilla pratensis</i> (L.) Mill. ssp. <i>hungarica</i> Soó
4. <i>Angelica palustris</i> (Besser) Hoffm.	38. <i>Pulsatilla. Grandis</i> Wenderoth
5. <i>Apium repens</i> (Jacq.) Lag.	39. <i>Salicornia veneta</i> Pignatti & Lausi
6. <i>Asplenium adulterinum</i> Milde	40. <i>Saxifraga hirculus</i> L.
7. <i>Astragalus peterfi</i> Jáv.	41. <i>Serratula lycopifolia</i> (Vill.) A.Kern.
8. <i>Caldesia parnassifolia</i> (L.) Parl.	42. <i>Stipa danubialis</i> Dihoru & Roman
9. <i>Campanula romanica</i> Sävul.	43. <i>Syringa josikaea</i> Jacq.f.
10. <i>Campanula serrata</i> (Kit.) Hendrych	44. <i>Thesium ebracteatum</i> Hayne
11. <i>Centaurea jankae</i> D.Brândză	45. <b><i>Thlaspi jankae</i></b> A.Kern.
12. <i>Centaurea pontica</i> Prodan & Nyár.	46. <i>Tozzia carpathica</i> Woł. ( <i>Tozzia alpina</i> L. ssp. <i>carpathica</i> (Woł.) Dostál)
13. <i>Cirsium brachycephalum</i> Juratzka	47. <i>Tulipa hungarica</i> Borbás
14. <i>Colchicum arenarium</i> Waldst. & Kit	
15. <i>Crambe tataria</i> Sebeók	<b>Bryophyte</b>
16. <i>Cypripedium calceolus</i> L.	48. <i>Drepanocladus vernicosus</i> (Mitt.) Varnst.
17. <b><i>Dianthus diutinus</i></b> Kit.	49. <i>Meesia longiseta</i> Hedw.
18. <i>Draba dorneri</i> Heuff.	50. <i>Sphagnum pylaisii</i> Brid.
19. <i>Dracocephalum austriacum</i> L.	
20. <i>Echium russicum</i> J.F.Gmel.	<b>Habitat Directive – Annex Ivb</b>
21. <i>Eleocharis carniolica</i> Koch	51. <i>Lycopodium</i> spp.
22. <i>Ferula sadleriana</i> Ledeb.	52. <i>Lindernia procumbens</i> (Krocker) Philcox
23. <i>Galium moldavicum</i> (Dobrescu) Franco	53. <i>Leucobryum glaucum</i> (Hedw.) Aangstr.
24. <i>Gladiolus palustris</i> Gaud.	54. <i>Spagnum</i> spp.
25. <b><i>Himantoglossum caprinum</i></b> (Bieb.) V. Koch	
26. <i>Iris aphylla</i> L. ssp. <i>hungarica</i> Hegi	<b>Habitat Directive – Annex Vb</b>
27. <i>Iris humilis</i> Georgi ssp. <i>arenaria</i> (Waldst. & Kit.) A. & D. Love	55. <i>Arnica montana</i> L.
28. <i>Ligularia sibirica</i> (L.) Cass.	56. <b><i>Artemisia eriantha</i></b> Ten.
29. <i>Liparis loeselii</i> (L.) Rich.	57. <i>Galanthus nivalis</i> L.
30. <i>Luronium natans</i> (L.) Raf.	58. <i>Gentiana lutea</i> L.
31. <i>Marsilea quadrifolia</i> L.	59. <i>Ruscus aculeatus</i> L.
32. <i>Moehringia jankae</i> Griseb. ex Janka	
33. <i>Paeonia officinalis</i> L. ssp. <i>banatica</i> (Rochel) Soó	
34. <b><i>Poa granitica</i></b> Braun–Blanq. Ssp. <i>disparilis</i> (Nyár.) Nyár.	

Table 1. The list of plant taxa from the Habitat Directive 92/43/EEC, present in Romania and nominated in the Accession Agreement of the Romania to the European Union. Taxa included in the Habitat Directive as a result of Romania and Bulgaria accession to EU are given in bold letters.



*Aldrovanda vesiculosa* - threatened in Europe (Habitat Directive - Annex IIb). (Photo: Anca Sârbu)



*Centaurea pontica* - globally threatened (Habitat Directive - Annex IIb). (Photo: Anca Sârbu)

- 116 types of threatened habitats (24 globally threatened and 92 threatened in Europe), and
- 17 types of unprotected habitats.

The latter category refers to habitats that presently are neither included in the national or international protection system, nor included in the Habitat Directive. They are still very representative for Romania's bio-geographical zones and rich in plants that are threatened globally, in Europe or nationally.

The IPA priority sites marked in figure 1 may have different sizes and relationships with

the existing system of protected areas. Some of them may contain a protected area, be contained by a protected area or overlap a protected area, while others may be entirely located outside the existing protected areas.

A special attention was given to the plant taxa that are nominated in the Habitat Directive – Annex IIb, IVb and Vb, and are still present in Romania (Jalas & Suominen, 1972-1999; Oltean & colab., 1994; Negrean, 2001). They represent key species to be considered in the Natura 2000 Network establishment in our country (table 1).



Vest pontic steppe with *Paeonia tenuifolia* (Habitat Directive 6290) - Zau de Câmpie Natural Reserve. (Photo: Anca Sârbu)

### Rich but threatened habitats

If looking to the threatened habitats of the Habitat Directive, it is possible in Romania to still find many globally threatened habitats (woodlands and forests, grasslands, mire bogs, fens, scrubs, screes, inland surface waters, etc.) nominated for conservation.

Unsustainable tourism development, agriculture intensification, forestry practices, poor water management system, habitat fragmentation, and eutrophication are at this moment the main threats of these sites. The accession to the EU can generate further negative impacts on the Romanian flora and habitats.

Many beautiful landscapes, like that from Transylvania, can be significantly affected. It also hosts 16 plant taxa that are threatened globally, 36 threatened in Europe, 69 endemic and near-endemic and 36 habitat types that are nominated in the Habitat Directive. The maintenance of the traditional management of the land is an important condition for their persistence.



Surface standing water (Habitat Directive 3150) - Danube Delta Biosphere Reserve. (Photo: Anca Sârbu)

### Conclusions

According to the Global Strategy for Plant Conservation, we are in the stage of understanding and documenting the diversity of the Romanian flora. In this respect, the results of the project Identifying Important Plant Areas (IPAs) in Romania offered significant scientific information concerning the distribution of threatened plants and habitats, the botanical richness of the selected sites, their protection and management.

All the up-dated scientific information and all the results provided by the project, including the presentation of the 276 IPAs, will be published at the end of 2006 in a special book. This book is addressed to scientists and decision makers, but also to the general public.

Unfortunately, the lack of up-dated and centralised information on the Romanian flora and habitats is still a reality. The existing information obtained during this project is neither enough for scientifically supporting the Natura 2000 sites selection process, nor for their management implementation.

### Future actions

There are two other important steps from this stage up to the level of conservation and sustainable use of plant diversity. The first is building the scientific and humane capacity for conserving the plant diversity. Secondly, an education and awareness system about the plant diversity and its continuous decline has to be developed.

We need to develop our scientific and management capacities in these respects and to avoid the damage on our natural heritage which may arise after the EU accession.

Looking in the past and looking into the future, a few requirements can be underlined:

- **the need to update** the information (distribution, population size, management, threats





*Traditional hayricks in the diverse Transylvanian landscape. (Photo: Anca Sârbu)*

etc.) about the priority taxa from Romania which are included in the Habitat Directive, and to make it accessible for both the policy decision staff and the private landowners,

- **the need to develop** a new generation of taxonomists (mycologists, bryologists, high vascular plant specialists), and

- **the need to organise** an exercise, a pilot study, on how the concept of sustainable use of the landscape can be implemented in

Romania.

According to our opinion and experience, the previous topics can really help to build a scientific, humane and management infrastructure, in order to support the conservation and sustainable use of the Romanian landscape values. To reach this, Romania needs specialists, good scientific information, education and awareness for the target group of decision makers involved in the processes.

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# Agricultural landscapes in Eastern Europe as reference areas for Swedish land management

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## Background - landscape changes and conservation efforts in the West

In Sweden, as in many West-European countries, the rural landscape has undergone large scale changes during the last century (see also Ihse 2007; this volume). In the forested landscape dominating in the northern two thirds of the country, most farming has ceased. Almost all of the smaller farms have been abandoned or transformed into leisure houses, while the agricultural land has been planted with spruce forest. The forest grazing that previously was very common, has now ceased except in a

few sites. Farming is industrialised in the agricultural plains of the south. Farms are big (often hundreds of hectares) with large, monoculture fields having little variation in crops grown. Many natural grasslands and wetlands have been transferred into tilled fields. Agricultural practices are highly mechanised, and the use of fertilisers as well as pesticides is intensive. The livestock is sparse, concentrated to a few farms, and mainly kept indoors. One of the most obvious ecological effects resulting from this landscape transition is the dramatic reduction of the area of semi-natural grasslands, that



*There are just a few places of refuge for the flora or the fauna remaining in the hardly rationalised agricultural landscape of the plains. Uppland, Sweden.  
(Photo: J-O Helldin)*

is, permanent pastures or meadows for grazing and mowing, respectively.

The present agricultural system of Sweden is in many respects not sustainable. Biodiversity and ecosystem services are lost. There is a leakage of nutrients, leading to eutrophication of lakes, watercourses and sea areas. Furthermore, many cultural values of the landscape are lost, and the landscape view created is less attractive, which decrease the tourism potential of the areas.

Swedish authorities are concerned with the loss of biodiversity and cultural historical traces. They are trying to deal with the problems by conserving what is left of the pre-industrial landscape and re-creating lost values. For example, large efforts are put into conserving the small remains of traditionally managed habitats, such as wetlands and semi-natural grasslands. The aim is partly cultural historical, partly to conserve the flora and the fauna linked to the agricultural landscape. Much of the agri-environmental payments (from the EU and the Swedish state) are directed to such conservation. Detailed action plans for threatened species are developed. Also the cultural heritage from traditional farming, such as buildings, fences, old cattle trails, and stone-mounds, are important targets for conservation.

Restoration of wetlands, semi-natural grasslands, pollarded trees, and other rare habitats also receive a lot of attention. There are many prominent examples of Swedish landscape restoration projects; some worth mentioning are the agricultural landscape of Southern Öland (presently a Unesco World Heritage, where agri-environmental payments effectively have been directed to benefit environmental conservation), the Bråbygden region (where a local landscape restoration initiative has formed a basis for a positive rural development), and Lake Hornborgasjön (where restored grazing

and water regimes have drastically improved its value to the birdlife, and the lake is visited by several thousands of tourists each year).

The Swedish agri-environmental payments are in total about 400 million Euros annually. Many landscape restoration project budgets range up to millions of Euro. The total cost of all conservation and restoration efforts in Sweden are not known, but should sum up to billions of Euro.

One problem in conservation and restoration is, however, that we have only vague ideas about the original state of the traditionally managed landscape of Sweden. The present contents of the landscape, such as distributions of species or ancient remains, give us some clues. Historical sources – maps, pictures, written information – are also important in this respect. Studies of agrarian history have received much interest by conservationists in the last couple of decades. It has grown into a scientific discipline on its own, but has its obvious limitations.

### Romania as a reference

In Romania, and some of its neighbouring countries, vast areas in mountain regions still have intact, traditionally managed agricultural landscapes. Their biodiversity and cultural remains are outstanding in an international comparison. Such landscapes may serve as reference for Swedish conservation and restoration efforts, in addition to ecology and agrarian history research.

Preliminary studies indicate that small scale farms in the mountain areas of Romania are managed in similar ways as the pre-industrial farms in Sweden were. For example, livestock systems, harvesting methods, crop rotations, and land owning structures are similar. In higher altitudes of the Carpathians, the environment and the vegetation are quite similar to

that in Sweden. The pools of flora and fauna species are overlapping to a large extent. Many species linked to the agricultural landscape that are red-listed in Sweden occur in strong populations in Romania.

Hence, areas in Romania could be studied to better understand Swedish landscapes and Swedish history. In particular, the following aspects are of interest:

- Harvesting methods and dynamics.
- Extent and ecology of semi-natural grasslands (hay-fields and pastures).
- Population ecology of species that have previously been common in Sweden, but now are rare.
- Transhumance and shepherding systems.
- Grazing in alpine environments (frequency, structure and effect on vegetation).



- Tree management on agricultural land (pollarding and coppicing of trees, the resulting vegetation structure).
- Occurrence and use of farm buildings and fences.
- Occurrence and character of cultural remains.
- Occurrence and conservation of local breeds and crops.
- Traditional knowledge of natural resource use.
- Systems for inheritance, tenancy and ownership of land and their effects on the land management.

#### One current example - population ecology studies of grassland plants and beetles

Restoring declining populations of threatened species require detailed knowledge about several aspects of the species and their environment. For species in the agricultural landscape, the questions may concern:

- Management methods?
- Timing of management?
- Temporal variation?
- Fragmentation effects?
- Small-population effects?
- Interplay with the surrounding landscape?

Our sources of knowledge are often limited. We can describe the remnant populations in Sweden in order to perform deficit analyses. We must, however, acknowledge the risk of arriving at wrong conclusions because the studied populations are too small, fragmented, and often occur in suboptimal or untypical habitats.

*The meadows have a rich biodiversity, and are also appreciated for their beauty or good tasting hay. Gârda, Apuseni mountains, Romania.  
(Photo: J-O Helldin)*

Experimental manipulations may provide additional information, but are not always possible to perform because of small population sizes. Historical data may tell us about the species' environment in past landscapes, that is before their decline, but most historical sources have unfortunately rather little of ecologically relevant data.

Instead, we may turn to landscapes where the species are still common, and where they can be assumed to occur in their original habitats. Such reference landscapes for Swedish red-listed species are found in, for example, Romania. As a pilot project, we have started to study five red listed Swedish species using this

approach: *Gentianella* spp., the tortoise beetles *Cassida murraea* and *C. ferruginea* (feeding on *Inula*), the butterfly *Parnassius mnemosyne* (feeding on *Corydalis*), and the longhorn beetle *Plagionotus detritus* (living on oak). For the *Gentianella* species, for example, it seems clear that the Romanian landscape can fill most of the gaps in our knowledge about the most important relationships between the species and the management of its habitats.

By attaining ecological knowledge about the species and their habitats combined with information about the traditional management of these habitats, we can analyse the relationship between land use and the landscape, habitats,



Grazing after mowing gives extra fodder and enhances the biodiversity further. Areşeni, Apuseni mountains, Romania. (Photo: J-O Helldin)

and species. These results can be brought back to Sweden to help us restoring populations of declining species.

The results are, however, also important for the management of the Romanian semi-natural landscapes. If the ongoing traditional land use will change in the future, it is necessary to know which aspects of the traditional farming that have to be maintained to avoid similar losses of biodiversity as those that have taken place in Western Europe.

### **An asset for development**

In addition to the value as a reference, the traditionally managed landscape in Romania is an important component of the European cultural and natural heritage. Therefore, it has an inherent value *per se*. The international importance of traditionally managed landscapes should be considered as an asset for development, on local scale as well as nationally in Romania. Both the international interest and the potential international funding could be important for the rural

development. The agri-environmental support from the EU will be important in this respect. The development of rural eco-tourism and cultural tourism are obvious opportunities, export of certified organic products is another possibility. There are options for further innovative solutions based on local initiatives. This unique potential of rural Romania must be emphasised in international negotiations.

Scientifically, there is a need for knowledge exchange programmes, where Swedish professionals are given the opportunity to visit and study Romanian landscapes, and *vice versa*. Such bilateral studies would give important, new insights for researchers and land managers about how to deal with their daily work. It would bring new ideas for research and management projects. The Swedish Biodiversity Centre, together with a network of Swedish county administrations, universities and KSLA, are presently developing a co-operation with Romanian institutions. The aim is to realise such knowledge exchange and joint research programmes.

# Biological and cultural landscape values - why and how to maintain them?

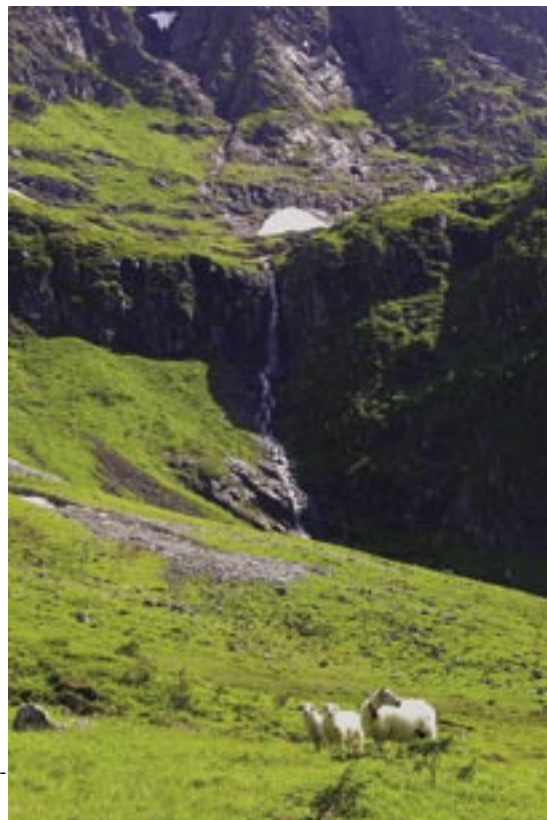
ANN NORDERHAUG, BIOFORSK MIDT-NORGE, KVITHAMAR, NORWAY

The European agriculture faces a paradigm shift. Due to WTO-negotiations, globalisation and efficiency in food production, the European agriculture has been challenged to see agricultural production in a broader perspective (Olsson 2003). Furthermore, increase in high-intensity land use and cessation of low-intensity land use in semi-natural habitats has been identified as one of the major factors adversely affecting and reducing the biodiversity in Europe (Dolman & Sutherland 1992, Fischer & Stöcklin 1997). Since many European countries have pledged themselves to the conservation of biological diversity and landscapes by signing the Convention on Biological Diversity (1992) and the European Landscape Convention (2000), the multifunctional role of agriculture has been more and more underlined. The primary production – i.e. food, fodder and goods – is still in focus, but at the same time, the production of public benefits has become more important. Accordingly, the agricultural support in EU gets displaced against the ‘green box’.

## Norwegian traditional agriculture

Norway is a mountainous country. Mountains cover about 70% of the land area, whilst the area of arable land is only about 3%. The pre-

industrial agriculture was therefore an out-field-infield system that mainly was based on the outlying land. Most of the fodder was harvested in the outfields, and large such areas were required to produce enough manure for the infields. Summer farming (transhumance) was especially important, making it possible



*Mountain outfield grazing – important for surviving in the past and for the landscape maintenance. Sunmøre, Norway. (Photo: Knut Per Hasund)*

to utilise resources far from the main farms for grazing and haymaking.

The fodder harvesting was quite diversified, involving grazing, haymaking, harvesting of leaf fodder, bark and lichens. It created open agricultural landscapes and several different semi-natural vegetation types. In this way, new possibilities for many species were created. The biodiversity in terms of both landscape and vegetation types increased accordingly. In addition, semi-natural unfertilised grasslands with long continuity can be very species-rich.

However, when modern farming was introduced around 1900, both food and fodder could be produced in the infields. The traditional outfield-infield system ceased gradually. Semi-natural vegetation types are mostly abandoned since they are no longer seen as economically feasible. Forest is gaining ground. The agricultural production has increased considerably, especially from 1950, but the landscape has at the same time become more uniform (Norderhaug et al. 1999).

### **Irreplaceable values get lost**

The land use changes during the last decades have caused loss of irreplaceable landscape, biological and cultural values. These may be used as resources for both agriculture and rural development. In 2004, the Nordic Council of Ministers focused on the need to maintain these values (the Akureyri declaration 2004) and the Nordic Joint Committee for Agricultural research (NKJ) decided to follow up this declaration by a report on Maintenance of the cultural landscape as a resource for sustainable agricultural development (Norderhaug et al. 2005). In this report, attention is paid to several 'secondary products' of agriculture that may be as important as the primary products (i.e. food, fodder and fibre). They are presented below.

### **Biodiversity**

Agricultural landscapes are of utmost importance for biodiversity. Many important habitats for biodiversity and wildlife have been created and maintained by millennia of extensive, low-intensity land use. Their maintenance depends on traditional land use as mowing, grazing or burning. Biodiversity – comprising the scaling from genetic to species, habitat and landscape level – is one of the most important preconditions for evolution and development.

### **Ecosystem services**

Ecosystem services are increasingly acknowledged, and the importance of agriculture for the ecosystem services is stressed in the WTO-negotiations. Ecosystem services are natural functions of an ecosystem that can be used for the benefit of humans, such as pollination of native and agricultural plants and soil fertility (De Marco & Coelho 2004). They are provided by nature and involve bio-geo-chemical cycles of our living environment. In this connection, biodiversity is a key factor. Many ecosystem services have been degraded by recent land use changes due to intensified farming (Olsson 2003). It is important to underline that agricultural landscape management implies ecosystem management with both time and space dimensions.

### **Cultural monuments**

Cultural landscapes often contain numerous types of cultural monuments telling a lot about our ancestors and their life. Antiquities and old buildings are mostly easy to identify. Their values are established by the law in Norway. In addition, cultural landscapes contain immaterial cultural monuments as traditions, place names, legends and knowledge of old (pre-industrial) farming systems. The Convention on Biological Diversity (1992) stresses the importance of such



local traditional knowledge for a sustainable rural development and *in situ* preservation (cf. Tunón 2004).

#### Historical values

In Norway, we may still read our history in the landscapes. The landscape structure, the many cultural monuments, the semi-natural vegetation types and occurrence of indicator species may tell a lot about former land use. Traditional landscapes express a unique sense or spirit of place, many have a symbolic value, are shaped by ideology, and contribute to local or national identity (Antrop 2005). In changing times, such historical foundation may be of special importance.



#### Ethical values

The agricultural landscapes are created by the activity and work of generations and represent an important part of our cultural heritage. This contributes to the ethic values of the cultural landscapes.

#### Aesthetic values

Beautiful landscapes and nice views are of vital importance for tourism, but also for local people. The 'traditional' rural landscapes are light, open and characterised by variation regarding both content and form. Psychological studies confirm that this kind of landscapes are perceived as pleasant and make most people feel well (Strumse 2002).

#### Experience and recreation values

The natural and the cultural heritage of the agricultural landscapes do, each and together, represent a large potential as experience values for tourism as well as for local people (Austad & Ådland 2002). Different studies show that the importance of experience tourism is rapidly growing. This creates new possibilities for the development of rural tourism favouring the local economies.

#### Local environments

The agricultural landscape qualities may create nice and attractive local environments. Some rural societies have managed to reverse depopulation to 'immigration'. The population has increased by encouraging people to move out for restoration and maintenance of the agricultural landscape qualities (Aronsson & Gjerdehag

*Biodiversity rich meadow with log larder and log barn. Buskerud, Norway.  
(Photo: Ann Norderhaug)*

1999). In addition, voluntary work and joint important areas often create new social networks and commitment.

#### Social values and welfare

Historical roots, identity, local environment qualities, social network developed by joint important areas, and possibilities for teaching in different subjects (history, ethnology, biology, ecology etc.; Bele et al. 2004) are examples of social values connected to the agricultural landscapes. Furthermore the agricultural landscape qualities may be utilised in public health work and as 'good medicine'. In Norway, they have been used in connection with 'Green care'-projects.

#### Multifunctional economy

The agricultural landscape qualities also represent economic values. As mentioned, the beautiful and comprehensive agricultural landscapes are of utmost importance for tourism. Thereby, they may be vital for the economy of local societies as well as for regions and nations. In addition, the cultural landscape values may in several ways be used for development of labelled products, for instance by documentation of the public benefits produced by (traditional) farming practices. Such high quality products now become more and more important for the economy of European agriculture and rural societies.

#### Maintaining agricultural landscape values

The maintenance of valuable agricultural landscapes is an immense task! In Norway, agriculture is obliged to show consideration to certain cultural landscape values. However, this is not enough. In many European countries, some especially valuable areas are therefore protected by law. Such preservation may sometimes be necessary, but will in most cases secure just

small areas in a changing landscape. To secure maintenance of large valuable areas and landscape qualities as resources for the future, a sustainable cooperation between agriculture, rural development, nature conservation and cultural monument protection is necessary.

A win-win situation can be created if support is given to vital rural districts where the locals are interested in the maintenance of landscape values and want to use them as resources for rural development. Priority should in this connection be given to particularly valuable areas containing many cultural monuments, different semi-natural habitats and the history still traceable in the landscape. In such rural districts, agriculture producing landscape values should be favoured. It is of utmost importance that regional and national processes and measures really support sustainable local processes. Furthermore, a sort of 'local agreement' regarding land use within such areas is necessary to avoid that one activity destroys for another. Instead, different rural development activities should supplement and strengthen each other. Holistic thinking and long-term planning are fundamental conditions for maintenance of valuable agricultural landscapes!

Furthermore, knowledge is a key factor for successful agricultural landscape management. Local knowledge of traditional land use is very important. Sometimes, however, necessary knowledge of landscape values and proper management has to be imparted. There is also a general need to strengthen our knowledge regarding landscape values, as for instance ecosystem services.

#### Why maintaining agricultural landscape values?

Agriculture once created these landscape values. This matter of fact is now used as a star-

ting point for agricultural and rural development in combination with nature conservation. Countries like Norway, Sweden and not the least Romania with beautiful and comprehensive agricultural landscapes, may benefit by this paradigm shift. Then we have to remember that it is what we do today or, perhaps even more important, what we do not do today, that is shaping the landscapes of tomorrow. We cannot recreate what we lose of our natural and cultural heritage!

*Coppiced trees and an earth-rampart in the outfield hills of Maramures, Romania. The twig is a sign to the shepherds: "Do not graze this plot. We intend to mow here this year". (Photo: Knut Per Hasund)*



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# Changes in the Scandinavian cultural landscape of importance for biodiversity

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## A biological cultural heritage

The agricultural landscape of today and its biodiversity is not what it seems to be at the first glance. It is not just shaped by the present land-use and management methods. As much, it is the result of past land-use and shifting management methods. Since the first agricultural settlement, various periods have left different types of traces, some still present, others destroyed. The land-use has been adapted to the natural conditions of soils, land-form and climate, but also – often forgotten – the past societies. Their rules, institutions, cultural habitats and their agricultural technology or land management methods have created our natural and cultural landscape heritage. This has given a wide range of conditions for biodiversity.

The cultural heritage, in terms of old settlement relics or for example grave-fields, is well protected. Their importance is generally acknowledged, with many methods to document. The natural heritage is less understood, however, even if as important. It is present in the living ecosystems, such as pastures, forests and specific old trees. The plants and animals in grasslands may tell as much of our history for those who can read the landscape, as the ruins and old settlements will do. It is, however, necessary to consider the natural and cultural elements together, in a holistic way, to understand the full value of the agricultural landscape.

## Cultural landscapes have to be maintained

Agricultural landscapes, and meadows or pastures in particular, differ from virgin nature by

requiring human management for preserving their biodiversity or cultural heritage. Without mowing, livestock grazing or maintenance measures, the landscape values will deteriorate. In Scandinavia as in all other countries of Western Europe, the changes of agriculture have, however, implied less landscape management. The grassland area has decreased drastically, leading to fragmentation and isolation of populations with severe consequences for the flora and the fauna. Romania has, on the other hand, still exceptionally well preserved landscapes of wide, connected grasslands. They are unique *per se* for their beauty and bio-cultural richness, but also as the last reference to understand the treasures of the European landscapes – and how to preserve them.

## Historical changes in land use

The landscape is not a static place. It has always changed. The changes in the past were slow, allowing the species and the ecosystem to adapt to new conditions. On the contrary, the changes have been very quick during the last hundred, and especially in the last fifty years. It has led to large monocultures with the same type of development almost everywhere. This has drastically changed the conditions for species and biotopes, resulting in decreased biodiversity.

As the people in cities created the cultural heritage, in churches, castles, sculptures and paintings, the farmers created the natural he-

ritage. By mowing the meadows, pollarding trees, enhancing the forests by protecting certain species and taking away other, managing the pastures by different types of grazing animals at different times, the farmers created habitats for an increased variety of plants, insects, birds and mammals.

Landscape changes in the previous 300–400 years were slow and mostly quite small. In most parts of Scandinavia, meadows dominated in the infield area, the area next to the villages. They had sometimes ten times larger area than the arable fields. The outfielders were mostly not mapped until the last century, but according to written sources they were commons, dominated by forests of varying density, heath-lands or dry grasslands. There was a balance between the area of meadows, the amount of animals and the area of arable land, because the number of cattle limited the area that could be fertilised with manure. The meadows produced winter fodder, while the large pastures were used for summer feeding of the livestock. Until the late 19<sup>th</sup> century, the fields were used just for producing crops for direct human consumption.

All manure was used on the fields, implying a prolonged transport of phosphorus and other minerals from the grasslands.

The enclosure acts took place in different steps over almost a century. The land of each farmer was collected into one, continuous piece of land. It split the villages and gave rise to the landscape of scattered farms seen in the Nordic countries. These enclosure acts also changed the landscape and its contents. Especially, the former widespread and interconnected meadows got fragmented. The fields grew bigger, as many meadows were ploughed.

#### Ecological consequences of the changes

The agricultural practice, based on husbandry, made the dense deciduous forests more open. It resulted in a mixture of dense forest areas, areas with shrubs and bushes, and successively larger areas of open grassland. In this way, cattle, horses and sheep continued to open the forest and maintain an open landscape. Possibly, it had many similarities with the landscapes once created by the large herbivores. During this



*Grazing is important to maintain the biodiversity and the cultural heritage. Österlen, Scania, Sweden. (Photo: Knut Per Hasund)*

period, considerably more biotopes and micro-niches were created in the agricultural landscape, compared to the denser virgin forests. Accordingly, the biodiversity increased.

As long as the changes are not too fast or too widespread, we can assume that the resilience of the ecosystem will remain high. Hence, the traditional landscape of long time continuity and large space continuity continued to produce ecosystem services that were based on high biodiversity.

### Present land use and landscape changes

The present development of the agricultural landscapes in Western Europe has for 50 years been characterised by rationalisation and intensification. The dominating present land-use is a highly mechanised farming, depending on chemicals, like herbicides and pesticides, as well as industrialised fertilisers. The arable fields and the number of animals in industrial breeding

are getting larger and larger. Arable fields dominate the landscape. The formerly ubiquitous grasslands of meadows and pastures are of minor importance and only found in small patches, situated far from each other.

The most prominent change in Scandinavia is that the total area of cultivated fields has decreased, while the forest area has increased. The former fields have been overgrown by shrubs and bushes or planted with spruce. The grasslands, with mowed meadows or grazed pastures have decreased and been replaced by coniferous plantations, tilled fields or buildings and roads.

Nature conservation can be seen as a new type of land-use that has been developed during the last 100 years, and especially the last thirty years. In the beginning of nature protection, the great wilderness areas of forest and mountains were protected from 'bad influence' of humans. A 'dead hand' was put on these landscapes, allowing no land-use or management. The same



*Hayrick and stick-fence. Landscapes with connected grasslands like this have all disappeared from Scandinavia. Apuseni mountains, Romania. (Photo: Knut Per Hasund)*

strategy has been devastating for the protected agricultural landscapes, since their values depend on maintenance and management by continuous mowing or grazing. Parallel to the increased intensity and homogenised management methods of both agriculture and forestry, the area of protected areas and nature reserves has increased. Many of these areas have no virgin nature, especially in Europe with such a long historic development of the agricultural landscape. These areas were not the result of 'no influence', but instead the result of long continuous management. They have high natural and cultural values, and they need to be managed as the living heritage. Nature conservation and cultural heritage protection have to go hand in hand.

### Ecological consequences of recent changes

Research in the Nordic countries has shown that both centralisation and marginalisation cause landscape changes decreasing the biodiversity and the biological values of flora and fauna. This has happened not only in certain regions or in a national scale, but also at the European level.

Intensification or abandonment of former land-use is regarded as one of the greatest threats to biodiversity in the cultural landscape. Adequate attention and management are needed to maintain the rich biodiversity still remaining in the cultural landscapes.

Many still existing grasslands have lost their high biodiversity as they have been fertilised, especially by industrially produced nitrogen. The grasslands have decreased by 98% during the last 100 years in Sweden. Most of the remaining grasslands are small grazed spots, fragmented and without any connection in the landscape. Only two per thousand of the meadows are still mowed. This is alarming, since

they are exceptionally rich in biodiversity and habitats for a large amount of now threatened species, many that formerly were common.

To understand the possibilities for a rich flora and fauna to exist, it is necessary to look at changes. Not only the number of species, common or threatened, is relevant, but also the landscape ecological changes. To have a high biodiversity in the landscape and thus maintain the natural heritage, factors such as landscape patterns and structures that can support good ecological networks have to be considered.

Three tendencies can shortly describe the changes of importance:

- decreased, increased, or lost continuity in time
- decreased, increased, or lost continuity in space, and
- lost management.

Declining areas as well as numbers of meadows, pastures and wetlands decrease the biological values since the number of potential biotopes diminishes. Similarly, the increased size of agricultural fields decreases the values, as possible linear elements giving habitats and connecting biotopes in the landscape disappear.

The flora is highly affected by the loss of areas and number of meadows and pastures. It is especially the loss of geographical continuity in the landscape of formerly wide spread and interconnected meadows that is harmful. Ecosystem functions and processes like pollination and seed dispersal are then negatively affected.

The most severe threats are caused by ceased management by mowing or grazing, and by nitrogen fertilisation. Ceased management leads to encroachment of bushes and trees, thus threatening the light demanding grassland species. Nitrogen fertilisation favours quickly growing, tall grasses at the expense of the low meadow herbs. A few, trivial species of the tall

TROLLEHOLM 1947



TROLLEHOLM 1978



Figure 1. The loss of linear and point elements in the agricultural landscape. An example from Trolleholm, Scania, 1947 and 1978. (Source: Margareta Ihse)

grasses will dominate and supersede many low, flowering herbs. Biodiversity is accordingly reduced. With resumed management of shrub encroached areas, many of the flowering meadow species will come back. Grazing on former, mowed meadows will maintain most of the species, but some that are adapted to specifically to mowing will disappear. Grazed pastures and mowed meadows have a big stock of species in common, although many are only found in the mowed areas.

In areas fertilised with nitrogen, the changes in the flora composition are difficult to reverse. These changes are drastic. From 40 species per square meter, they may decline to less than 10. Even after more than 50 years after fertilisation, the composition of species is not the same, and many species are missing.

The fauna is also affected by the disappearance of grassland. Many insects, beetles and butterflies are depending on only one or a few plant species, and if they disappear, the insects also disappear. A wide range of plant species gives rise to a wide range of insects, who may give rise to many birds and small mammals in an ecological chain. Old trees are important, by being habitats for a lot of insects and birds. These habitats can also be found in small li-

near or point elements of the arable fields. The fields are often surrounded by hedges, rows of trees and bushes, ditches, stone walls or small farming roads. These linear elements have more or less wide vegetation strips along them. In the Nordic countries, the fields often have point objects, like small ponds, big boulders, large solitary trees or islets of trees, bushes and grasslands on bedrock with thin soils or moraine. The solitary trees of the grasslands are sometimes pollarded.

The point and linear elements do not cover any large area, but create an ecological network of small biotopes. Often, the islets in the fields are the main biotope for game, like hares, pheasants and partridge, and small mammals, like voles and field mice. Other animals, like amphibians (frogs, snakes, lizards) are also depending on this type of biotopes, both as refuge habitats and as connectivity zones.

When the field sizes increase, this ecological network of patches, linear elements and point elements will diminish and disappear. Consequently, the possibilities for the animals to survive in a long time perspective vanish.

Any development of the agricultural production without considering natural and cultural values leads to decreasing biodiversity and



decreasing ecosystem services. And at the same time, development for preservation of cultural landscapes without concern of the needs for land management will also lead to decreasing biodiversity and decreasing ecosystem resilience. Accordingly, the ecosystem services will decline implying a less sustainable landscape.

### Processes, factors and drivers in agriculture and society

Two counteracting processes take place in the landscape development - centralisation and marginalisation. They can be seen throughout all the history of colonisation, causing different types of effects on the biodiversity and on the cultural heritage. Centralisation is leading to intensification in land use. Marginalisation leads to extensification and abandonment.

In a national scale, the agriculture became centralised to the most fertile areas of the plains. These flat areas were also the most easy to cultivate in a mechanised production. Small tractors were working on small fields. The large machines of today are demanding large fields. Intensification involves that only one activity dominates in a large area of a landscape or a whole region. The crop farming becomes specialised and the livestock production gets intensive at large scale. By such centralisation to certain areas, the resulting landscape has hardly any room for variation in biotopes, least of all semi-natural vegetation.

Marginalisation often occurs in less favoured regions, with nutrient poor soils, stony land and steep terrain. Their landscapes may be small-scale mosaics and the climate harsh. In these areas, animal husbandry has often remained in the traditional mixed farming, as cattle and sheep could well survive in these pastures. The farming profitability of these areas continues to decline. The varied landscapes become

abandoned by agriculture. Most of the former open fields are invaded by trees and shrubs or are planted with trees, mainly spruce.

Historically, the Scandinavian landscape was shaped by animal husbandry and not by the crop production that is dominating the land-use today. However, during all the agricultural history, except for the last fifty years, animal and crop husbandry were linked to each other. Almost all farms in the Nordic Countries had many types of domesticated animals. Cattle, horses, pigs and – in some regions – sheep, were the most important. At present, only a few have animals. Most farms are specialised either in crop growing or in cattle or swine breeding.

Another process is that the cultivated area has continued to increase. The reason is that it is not depending on the supply of cattle manure any more. Its productivity has instead been enhanced by imported guano and later industrial fertilisers.

The driving forces of the landscape changes are not a few factors but a complex combination of ecological factors in a social context of politics, economics and technology. They operate in a feed back system of social institutes. Some of the changes erase all the traces of the former land-uses, while other allows traces to remain.

The core landscape processes include fragmentation, diminishing, disappearance and isolation. Fragmentation is the most prominent process working in landscape changes, both in intensified landscapes and in marginalised landscapes. In an intensified landscape, the fragment of grasslands will be isolated and surrounded by arable fields. In marginalised areas, they will be surrounded by forest, mostly coniferous forests.

Disappearance of grasslands and agricultural fields by spontaneous forest overgrowth or intentional afforestation is the most common landscape change in a large part of the small

scaled semi-open landscapes. The spruce plantations have been dominating during fifty years. It has completely changed the ground flora of meadow species into a forest ground without any vegetation cover and with just a few species.

### Case studies

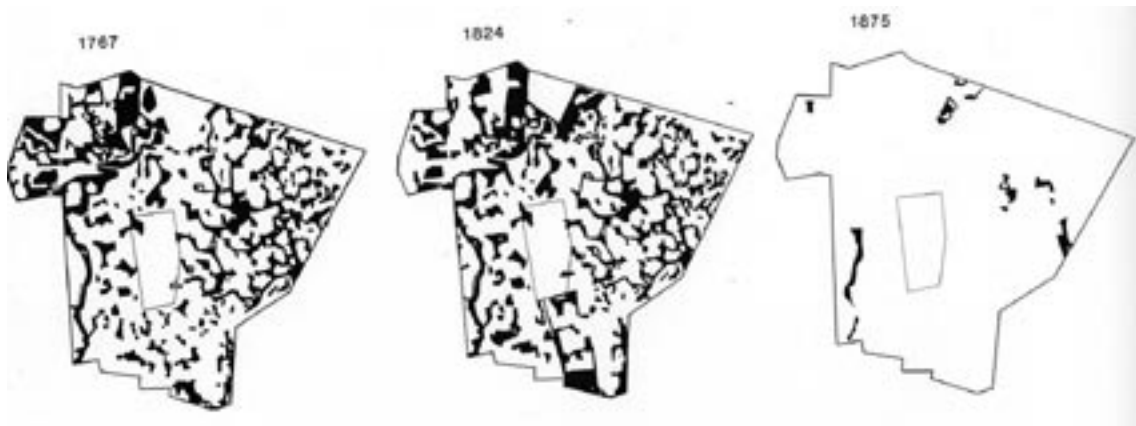
#### Jordtorp – an example of fragmentation and shrinkage

The Jordtorp area lies in a semi-open, mixed and small scaled landscape in Öland, a large island of the Baltic sea. It has been followed in several steps from 1725 to 1994, showing fragmentation and disappearance of grasslands. In the beginning of the 1700s, the grasslands totally dominated the area. All grasslands were mowed as meadows or grazed as pastures. The tiny villages were surrounded by small areas of tilled fields, like islands in the surrounding

grasslands. In the beginning of the 19<sup>th</sup> century, the arable area has expanded slowly into the meadows. Fifty years later, around 1850-1875, the expansion of the fields has continued but with a higher pace. The whole centre of the landscape was dominated by arable fields, while the grasslands were found in a broad outer zone. At the same period, the first small areas of forest were mapped in the outskirts.

From the middle of the 1900s, there is a quick expansion of forest. It is expanding towards the centre and the fields, at the expanses of both grassland and fields. In the last fifty years, the cultivated fields have continued to expand towards the outer zone. At the same time, the forest has expanded towards the centre. The remaining grasslands are squeezed between them, getting reduced to a small fringe between forests and fields.

The grasslands with a management continuity of almost 300 years were only found as fragments isolated from each other. No grass-



*Figure 2. The tilling of grasslands into arable fields has been common, not the least in the large scale agricultural plains. The three maps show the changes from a grassland dominated landscape with meadows in a geographical continuous pattern, into a naked landscape with hardly any grasslands but only arable fields. The grassland area of Jordberga, Scania in 1767, 1824 and 1875. (Source: Margareta Ihse)*

lands were mowed as meadows and only a few were grazed. Most of the remaining grassland was encroached by bushes and shrubs.

The age and the former land use of the respective grasslands could be determined by the methodology of air-photos and historic maps. The plant species were surveyed in these areas of different age and historic land use dynamics. It showed that the grasslands having the longest continuity had the largest biodiversity. It was much smaller in those recently created.

#### Jordberga – an example of grassland fragmentation

In the most southern Swedish county, Scania, the estate of Jordberga is situated in an open large scale agricultural landscape. The grasslands were found to dominate the landscape since the beginning of the 18<sup>th</sup> century, in a more or less continuous structure. The mesic and moist meadows were situated on the sloping lower parts of the hilly landscape. Only the dry hilltops were ploughed, creating a mosaic pattern. All these spatially continuous grasslands became fragmented by ploughing. In the end of the 19<sup>th</sup> century, all but a few had disappeared. None with longer continuity were left in the middle of the 1950s.

#### Summing up

It is a huge challenge to maintain the highly valuable European meadows and pastures as a whole landscape. For maintenance of their biodiversity, it is necessary not only to modify the traditional nature conservation methods of a 'dead hand' or non-touch approach, but to develop new strategies. There must be a close interaction between the fields of ecology, economy, and agronomy with the social institutions of the society to get a positive rural development.

Neither in an abandoned landscape, nor in a too intensified landscape will it be possible to maintain an acceptably rich biodiversity. In Sweden, all meadows and pastures are investigated in a national survey. The ancient grasslands were found only as small patches, lying many kilometres apart. Many of these areas are today selected as Natura 2000 objects and are financed by the EU agri-environmental payment scheme.

Besides traditional ecological knowledge of the ecosystem and the occurrence of species, there must also be a landscape perspective, identifying the important regions. Other types of knowledge that are needed are:

- a) knowledge of the landscape pattern, the elements creating the ecological network,
- b) knowledge of landscape history, and
- c) knowledge of the traditional land-use and the biotope management.

Most important is to develop holistic models for sustainable use and management of semi-natural vegetation or habitats. It has to include cultural and biological heritage, as a part of a modern ecosystem driven and based agriculture.

It is essential to all Europe that landscapes as those in Romania, with a spatial and temporal continuity in meadow and pasture landscapes can be maintained and developed in such a way that they can be used as references for whole Europe. Here, the ecologists could then study basic processes of the grassland ecosystem, and the services it provides. A most urgent task is to achieve better landscape ecological knowledge of seed dispersal, based on meta-population theories. Processes like seed dispersal, pollination and plant establishment of strategically selected species and biotopes must be better understood. Landscape strategies have to be developed to secure the use of scientific know-

ledge in landscape management, agricultural and rural development.

There are no such areas of wide grassland landscapes left in Sweden or in the other Nordic countries. We can only get some knowledge on the former distribution of these landscapes from old historic maps. We have, however, developed quick and efficient methods to identify both valuable and less valuable areas in a regional scale by using CIR aerial photos.

The Romanian landscape can give the ans-

wers to many of these challenges, being a reference landscape for many western European countries. Nature and cultural landscapes all over the continent need it to be maintained and developed in an optimal way.

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## Economics and policies for rural landscapes

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It was an honour and a dear mission to investigate at the KSLA-seminar how efficient policy measures for rural landscapes can be developed. I have lectured on this topic many times over the years, and it will now be a challenge to do it also in this context. The brief presentation will bring up the questions:

- How to design efficient Agri-Environmental Payments, AEPs.
- Goals and premises for the analyses and the proposals.
- The market is inefficient in managing public goods.
- What merits for AEPs?
- Conclusions.

### How to design efficient Agri-Environmental Payments, AEPs

Efficient AEPs are, from the perspective of economic science, compensation and an allocation of resources from the society to the production of biodiversity, cultural heritage, scenery and other public goods of the rural landscape. If the aim is to develop an efficient payment system, theory and practice tell that three 'rules' have to be followed:

- Direct the AEPs toward the environmental goods.
- Differentiate the payments according to the values.
- Establish a complete, general system.

The AEPs have to be directed as close as feasible to the environmental goods that society wants to have, for several reasons. It means that if it is biodiversity that is demanded, the payments

should preferably be related to the amount of biodiversity provided, and not via something else. If not directing the policy measures on the problem itself – in this case the undersupply of biodiversity – there are severe risks that they:

- become less efficient, with
  - lower goal attainment
  - higher resource use,
- give negative side-effects,
- have lower transparency.

The risk of low goal attainment is caused by more or less misleading policy signals. The focus of the farmers is to comply with the stipulations of the payments, but it does not necessarily lead to the intended end, unless they are direct for the environmental good. A striking illustration is the previous Swedish subsidies to grain production aiming also at maintaining arable land and preserving the cultivated landscape. Quite some land was actually preserved, even in marginal areas, although 10–40% was abandoned in the respective regions over a couple of decades. The quality of the landscape from an environmental sense deteriorated, however, partly as a result of the policy. There were no incentives directed to maintain the most valuable landscapes, nor to the characters that enhanced their biological, cultural or social qualities. The higher grain prices gave incentives to produce more grain by using more fertilisers and biocides, mechanising and making the fields larger, etc. It became a very costly way to maintain land or landscapes, since much of the resources were used to other production inputs, and since the world market value of the resulting overproduction was low. Negative side effects arose

*Landscapes have a non-rival consumption character – many people may enjoy the same view. Evening light over agricultural valley, Uppland, Sweden. (Photo: Knut Per Hasund)*



in the form of increased pollution. Paying for grain to get landscapes also made it hard to see how the complex system actually functioned.

Similar problems of the AEPs occur when they are not well directed. In some European countries, large means are going to everything called grassland but the contribution to the biodiversity or other public goods is often limited, since much of the land has been cultivated, fertilised or sprayed and there are no incentives to enhance their low biodiversity. At the same time, valuable semi-natural pastures may not get sufficient resources to be maintained.

Another risk is by AEPs stipulating the farmers what to do or not to do. The aim of the payments may still not be achieved, as other conditions for preserving the environmental qualities could be missing. For example, there may be stipulations concerning chemicals and grazing pressure that the farmer complies with, but nothing stating that there must not be any motorcross on the site which may spoil the flora. Even more important is that management stipulation

does not open for flexibility to the farm conditions. The farmers may also become reluctant to preservation when commanded what to do. If instead getting remunerated for ‘the products’ (biodiversity etc.), but are free to choose the management methods, the landscape will be more efficiently preserved or developed.

The payments have to be differentiated according to the values of the public goods to become efficient. The ideal solution would be payments identical to the value of each unit of the public goods. If, for example, birds (e.g. curlews) or stone-walls are valued *per se*, a payment per couple of breeding curlews or meter of stone-wall of a certain quality would allocate appropriate resources and give the correct incentives. Such a system is of course not practically manageable. There has to be a trade-off between precision and transaction costs, that is, the costs of handling the system. A compromise could be to pay per hectare of land according to a proxy of its aggregated public good values.

What happens if the payments are not diffe-

rentiated according to value, but general? Take the example of a payment of 100 Euro per hectare and year equally to all agricultural land, or all pasture land. Then consider three different hectares of pasture, each with its values and costs as in figure 1. The left column for each of the hectares illustrates the value of its public goods, that is, how its biodiversity, cultural heritage and recreational qualities are valued at some given situation. The right columns illustrate the net costs for providing these qualities. It can be seen as the difference between the production costs using the optimal technology and the revenues from the yield of private goods, such as milk and beef. The environmental benefits as well as the costs may of course be influenced by the farmer by changing land use and production technology, that is, the land management.

The illustration of figure 1 shows that the hypothetical site A is very rich in biodiversity, cultural heritage or other public goods, but that

it also is costly to maintain (high columns). The value of the public goods are, however, significantly larger than the maintenance costs, so it is socially efficient<sup>1</sup> to preserve the pasture. This pasture would nevertheless probably be abandoned if a uniform payment of, for instance, 100 Euro per hectare and year was introduced. A rational farmer would see that the payment is lower than the costs and that he would make a loss, which he possibly not would be willing to pay or could afford.

It is, however, not socially efficient to maintain site B. The costs of maintaining it are, unfortunately, higher than the environmental benefits. With an undifferentiated payment of 100 Euro/ha it would still stay in production, as this payment is higher than the costs. A large fertilised and cultivated pasture with low biodiversity and fairly low costs of fencing, animal handling, etc. could be in this category. The inefficiency is caused by allocating more resources

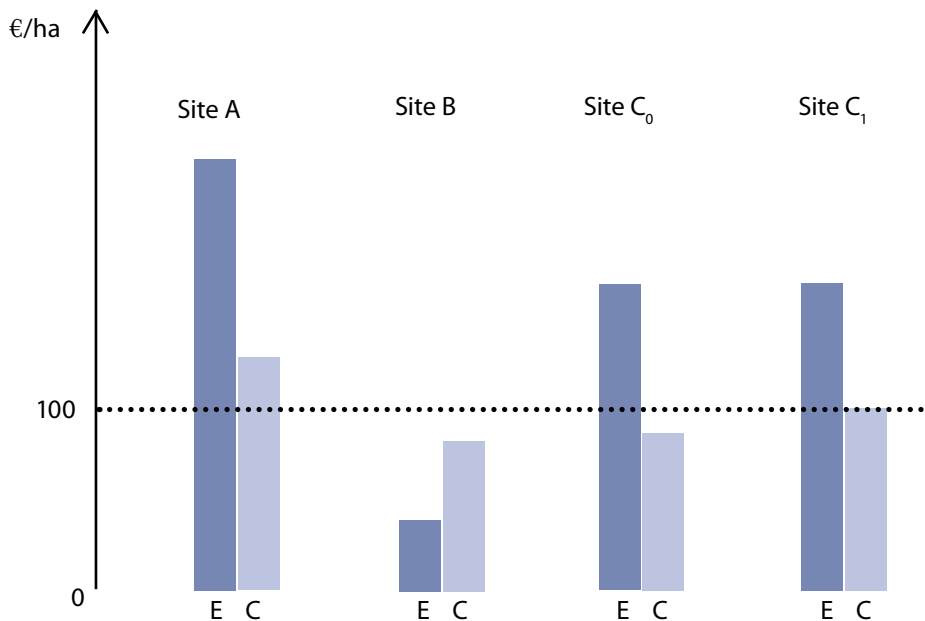


Figure 1. Three sites, A, B and C, and their aggregated values of environmental public goods and the net costs of maintaining the land. Euros per hectare and year. (Source: Knut Per Hasund)

E: Environmental benefits, the aggregated value of the public goods.  
 C: Costs, the net cost of maintaining the land use.

1) Note that the opportunity costs of land, labour and other resources should be included in the total costs.



*Beauty, biodiversity or recreation sites are agricultural products as much as milk or wheat if people value it, have a demand. Old log cottage and spring pasture in Södermanland, Sweden. (Photo: Knut Per Hasund)*

to the site than it is worth.

Site  $C_0$  is yielding higher benefits than its costs, which makes the land maintenance socially efficient. It is also maintained, as the uniform payment covers the costs well. In a future situation, the maintenance costs may rise and approach the payment tariff, as for site  $C_1$  in figure 1. What will happen? Will the farmer find it worth to keep this pasture, or will the next farming generation be willing to take over when there is no profit to live from? This risk ensues from not paying for the full value of the public goods (corresponding to the height of the left column), but at some lower tariff which maybe is sufficient in many places at present.

The third 'rule' above was that a complete, general system has to be established, at least if the aim is to achieve efficient production. Inefficiencies arise if paying for some environmentally valuable sites but not for other, more or less valuable sites, or if paying for some kinds of public goods but not for other. It is only if the budget constraints dominate over the wish to preserve the environment efficiently that it could be a defensible solution to concentrate the resources to just the preservation objects of highest priority.

### Goals and premises for the analyses and the proposals

There are no good or bad policy measures from a strictly scientific point of view. Good or bad always have a normative element. However, given political decisions of which normative criteria to apply, alternative policy measures can be analysed scientifically or developed and proposed based on the criteria.

The analyses of this chapter and the proposed policy measures are based on two major criteria:

- Social efficiency
  - Valuations of the citizens.
  - (Politically settled environmental goals).
- Fairness
  - PPP, Polluter Pays Principle.
  - PCP, Producer Compensation Principle.

There are certainly a number of other criteria to use instead or as supplements to these two when assessing and choosing agri-environmental policy measures. Social efficiency is furthermore a composite criterion, which can be analysed by sub-criteria of goal attainment (environmental effects), costs, controllability, etc. There are certainly also many criteria of



fairness. For simplicity, only those above will be employed here.

The concept of 'social efficiency' implies that all resources are used when, where and for what they give the maximum welfare to society. Both the efficiency and the welfare concepts are strictly defined in economic theory. The welfare is the sum of the utility of all individuals in society, as judged by the individuals of their own utility. Assume, for example, that somebody prefers that 100 000 ha of semi-natural pastures are preserved even if it would imply 10 Euro less for other consumption. Such a situation is then connected to a higher utility for the individual, a higher welfare for the society and a more efficient resource use than if not maintaining the pastures at that cost to the individual. Clean air, biodiversity or landscape scenery can be included in the welfare just as well as other goods and services as long as there is somebody who values them.

An efficient pasture production implies that all land is used for pastures where it increase the welfare more than any other land use. It also implies that the site-optimal production technology is used, giving the highest total benefits over total costs. All benefits from private goods (milk, beef, hunting, etc.) and from the public goods (biodiversity, cultural heritage, etc.) should be included, as well as all costs.

Efficiency is one thing, fairness something else. The Polluter Pays Principle, PPP, stipulates that it is the agent who causes the environmental damage who shall bear the costs<sup>2</sup>. The less applied, inverse principle for positive environmental effects is called the Producer Compensation Principle, PCP. According to this principle, it is not the farmers or the land owners who solely shall take the costs of producing agricultural landscapes and their environmental services. PCP stipulates that it is the society who shall compensate the produ-

cers according to the value of the public goods. Accordingly, the AEPs are compensations and not grants or subsidies.

### The market is inefficient in managing public goods

Why do we have environmental problems? Why are we losing culturally valuable landscapes and biodiversity? Do we need an environmental policy? The resources are limited, for certain, but the market has been giving us shoes and books, so why not a good environment?

Perfect markets are efficient, as proven by Arrow and Debreu in 1954. Private markets also compensate the producers. There are, however, no perfect markets in reality. Non-excludability and non rivalry are two important market imperfections that explain why the agricultural landscapes and their environmental qualities are getting lost.

#### Non-excludability

Some things have the character of non-excludability. It means that nobody could be excluded from consuming the good, independent whether you have the legal right to it or not, and independent whether you pay for it or not. The character is a physical property of the good, or caused by institutions, often because the property rights are not settled.

The ozone layer in the stratosphere is a typical non-excludability good. Everybody enjoy its protection against harmful radiation. Nobody could in a meaningful way claim the property rights to it and exclude those who do not pay for it from consuming its service. It protects those who use refrigerators emitting CFC that destruct the ozone layer as much as those who pay more for CFC-free refrigerators. Similar characters are valid for many of the rural landscape goods and services, like the scenery, the exist-

<sup>2</sup>) Efficiency can be attained also if the victims are paying for the pollution abatement costs, as proven by the Nobel Prize winner Coase, 1960.

tence of cultural relics, the preservation of species, and in Sweden also the legal public access to land for recreation, 'allemansrätten', which is institutionally determined.

Why does the non-excludability cause environmental problems? The reason why the market cannot handle the demand for these goods is that they give free-riding incentives. It is not rational for people to pay for consuming them, since they will get what there is of them anyway. Consequently, it is rarely rational for anyone to produce such goods, or put resources for maintaining them. The producer will not be paid by those who enjoy the environmental good, and can in many cases not afford to or be willing to finance it herself/himself. Consider a person who would be willing to pay 100 Euro for preserving the semi-natural pastures of her country. The person knows that this contribution is very small, perhaps enough for a couple of hectares, which is almost negligible. For this amount of money, the person could increase her utility more by spending it for something else.

As can be seen, just minor resources will be allocated for non-excludable goods. They exist mainly because they are natural endowments or bi-products in joint production. However, less and less of biodiversity and other landscape amenities tend to be bi-products of the dairy, meat or crop production with the changing relative prices – making labour more expensive – and the new agricultural technology.

#### Non-rivalry in consumption

Public goods have at least one of two characters. Non-excludability is one, non-rivalry the other. A definition of non-rival goods is that one person's consumption of it does not reduce other persons' utility of, or possibilities to consuming the good. If somebody drinks a cup of coffee, it prevents other persons drinking that cup. Our consumption is rival. However, if I

am happy that there are orchids growing in the pastures (it increases my utility, *ceteris paribus*), it does not rival with other persons' pleasure of them.

The market is based on property rights and voluntary contracts, which are upheld by the state. It implies that people may consume or produce what they want, given the legal conditions, or make agreements with other agents. The production of airplanes, advanced medicines or music-CDs can be organised by the market as people make agreements on employment and exchange of goods and services. The price mechanism is central to make the system efficient by directing incentives, by signalling about preferences, resource scarcity and technology, and by compensating. The price reflects how all individuals in society value a private good<sup>3</sup> of a certain quality and all costs it takes to produce it.

When there is non-rivalry, the price does on the contrary not express the full value to the society of the good. The market price reflects only the value of one agent, the buyer, which does not cause efficiency problems if there is only one consumer. Economic incentives and resources for production come as the producer of this good is paid by its consumer. Each non-rival good can, however, be enjoyed by many 'consumers'. One hectare of managed traditional meadows may be valued by thousands or even millions of people. Adding these values together make a total social value of the meadow much larger than its market price.

Hence, the market is inefficient in managing public goods. Non-excludability leads to free-riding. Non-rivalry implies that something can be very valuable, as there can be many appreciating it, but this is not considered by any market mechanism giving incentives or resources for production. The landscape production becomes sub-optimal; see figure 2. Too little of

3) Private goods have defined property rights, and are excludable as well as rival in consumption.

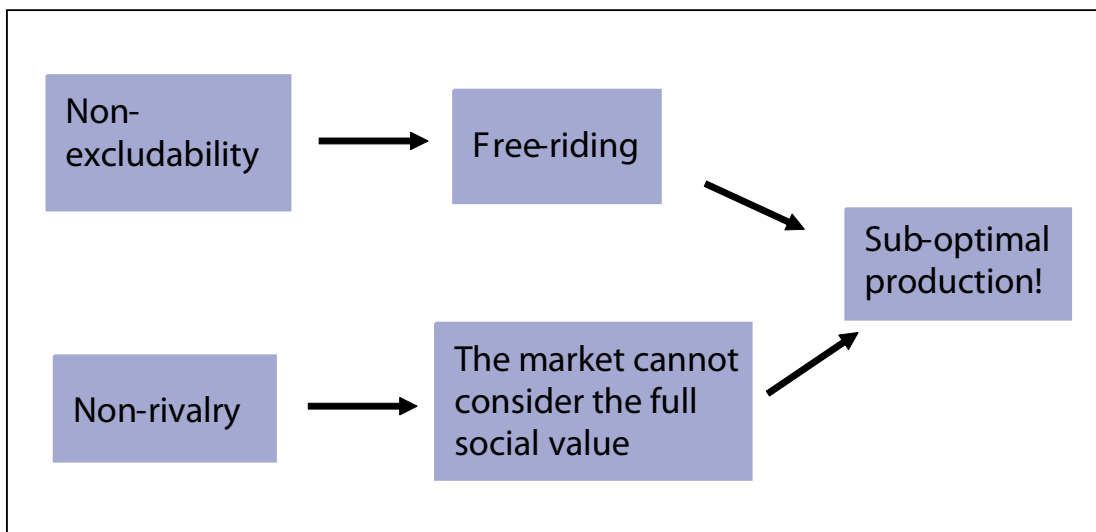


Figure 2. The market is inefficient in managing public goods.

semi-natural pastures, stone-walls, nice views or butterflies are ‘produced’ considering how much people in society actually value them.

Besides the public good character of most environmental qualities of the rural landscape, there are also other reasons why they are threatened. High transaction costs, externalities, distribution questions, risk and information are among the explanations of economic theory.

### What merits for Agri-Environmental Payments?

The resources of the society are scarce, and the agri-environmental budget maybe even more so. What would be the best use of these means, and what could possibly be better to let the consumers, the farmers or the citizens take care of without grants? Applying the criteria above, some things that presently get funding are dubious, while other things are well motivated (see table 1).

Biodiversity is a very wide concept, but almost all aspects of it have the characters of pub-

lic goods. The market will consequently not produce enough according to the demands of society (and present technology). AEPs for producing biodiversity is further not violating PPP or PCP. The biodiversity linked to the agricultural landscape would almost entirely disappear if there were no farming to maintain the meadows, the pastures or the field elements. Biodiversity should according to these efficiency and fairness criteria be eligible for AEPs.

Cultural heritage and other socio-cultural phenomena in the rural landscape are as eligible for AEPs, since they are public goods and produced as positive external effects. How large the payments for these things should be to become efficient depends how much society values them.

Also the net binding of green house gases would be AEP-eligible in principle, as the climate is a pure public good. In reality, however, it is questionable whether agriculture binds more carbon-dioxide and emits less of N<sub>2</sub>O than if the land was abandoned, so the

	Concerns a Public Good*	According to PPP / PCP**	Eligible for AEP***
Biodiversity	Yes	Yes	Yes
Cultural or historic landscape qualities, heritage features	Yes	Yes	Yes
Social landscape qualities (scenery, recreation, etc.)	Yes	Yes	Yes
Net binding of greenhouse gases	Yes	(Yes)	(Yes)
Reduced leaching of nutrients	Yes	No	No
Reduced leaching of biocides	Yes	No	No
Ecological production	Partly	No	No
Soil protection	No	No	No

*Table 1. What merits for Agri-environmental payments? Environmental effects and measures within agriculture that comply with the Public Good and the Producer Compensation criteria.*

- \* Public good: non-excludable and/or non-rival character
- \*\* PPP Polluter Pays' Principle, fairness criterion
- \*\* PCP Producer Compensation Principle, fairness criterion
- \*\*\* AEP: Agri-Environmental Payments

compliance with PCP may vary.

Arable land, but also some pasture land is leaching a lot more nutrients (nitrogen, phosphorus), herbicides and pesticides than forest or uncultivated land. The rivers, lakes and seas thus damaged are to a large extent public goods, but to give the farmers AEPs for reducing these emissions would be against PPP. Also from an efficiency point of view, it would be better to tax the polluters for the emissions.

Ecological production may differ from conventional production in three main respects: food quality, working environment, and ecosys-

tem effects. The ecosystems are clearly public goods. The food quality and the working environment are not so. Why should the dear AEP-funding go to finance somebody's consumption of possibly more tasty or healthy carrots? And it should be in the interest of the farmer or farm worker to take the appropriate precautions for his/her own health.

Furthermore, subsidising ecological production is also against PPP. Polluting less is to be doing less damage, but not producing something positive. PPP and PCP say that producers should not be subsidised to reduce their damage.

Soil protection concerns a private good, land, and it should in principle be in the interest of the landowners to preserve it well. Scarce public means could be better used for preserving biodiversity and other public goods. In case of erosion and sedimentation problems, PPP stipulates to use taxes or other restrictions on the polluters instead of subsidising erosion control.

To sum up, large amounts of money are paid today for things that not are public goods or against PPP. Meanwhile, cultural heritage, biodiversity and other public goods may not be sufficiently paid by the AEPs according to what would be socially efficient.

## Conclusions

- Agriculture produces biodiversity, cultural landscapes, etc., which are public goods.
- Public goods are most efficiently financed by public means. The market can normally not manage them.
- Agri-environmental payments are thus necessary to provide the optimal area of fields, meadows and pastures and the environmental qualities that are demanded.
- The agri-environmental payments have to be directed and value-based, to give the correct, long term incentives and efficient resource allocation.



*The historical stone-wall and the biodiversity of this typical wooded pasture are public goods – they will probably not exist without agri-environmental payments in the future. (Photo: Knut Per Hasund)*



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The Romanian cultural landscapes, in particular those of Transylvania, are unique in Europe in many respects. The large amount and the extensive distribution of traditionally mowed meadows and semi-natural pastures make the region one of the very richest in Europe concerning biodiversity.

Besides carrying exceptionally high values for nature conservation, they are also very interesting when it comes to cultural heritage, showing a living part of the former European agrarian history. In this region, many traditional methods were conserved during the socialist regime, when they disappeared in most parts of Western Europe.

This report provides an overview of traditionally managed landscapes in Romania and the Nordic countries seen in a European perspective. It discusses possibilities for research, education and management cooperation between Sweden, Norway and Romania to support the landscape preservation policies. The report is a result of a joint initiative from the Royal Swedish Academy of Agriculture and Forestry (KSLA) and the Swedish Biodiversity Centre (CBM).



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