High Nature Value Farming in Europe

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2. HNV farming – central to European cultural landscapes and biodiversity

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Introduction

Unlike other continents, European landscapes have been shaped mostly by human activities, to the point that pristine vegetation and real wilderness are nowadays extremely rare in the European Union (EU). The role of agriculture in particular is outstanding as it accounts today for almost half of the total EU surface. The development of agriculture has been intertwined for millennia with the development of human culture, being the main source of subsistence and income for most of the population until the industrial revolution. The signs of such close links are deeply rooted in many European landscapes, and are visible in field structure, artefacts, vernacular buildings, cultural elements, tools, handicrafts, that all add up to a consistent cultural character that originates from a place and represents its identity. In this paper we give a short overview of the evolution of HNV farming landscapes and farming activity.

Evolution of HNV farmland and HNV farming

Farming and agriculture exist since humans became sedentary and developed agricultural practices to grow crops. Before that time man collected wild plants and fruits and hunted. However, there were several advantages in becoming sedentary and growing crops. This evolutionary step made it necessary to protect the fields against animals and also led to the development of husbandry. These first steps in the human evolution already created first elements of what we call today "landscape elements", e.g. stone walls, wooden fences, etc., that are key elements in a "cultural landscape". There are many publications on the evolution of cultural landscapes (e.g. Ellenberg 1988, Krzywinski et al. 2009, Küster 2010, Pedroli 2000, Pedroli et al. 2007, Tress 2000, Veen et al. 2009, Wilmanns 1998).

The aim of traditional agricultural systems was to provide food to humans and animals belonging to the local community, and farmers derived most of their needs from the immediate surroundings of their farms, usually with a mixed farming system, combining cultivation of crops and livestock rearing. Some features of such systems have been lost in the process of modernization (e.g. leaf cutting for fodder), but many others are (partly) still in place: traditional practices are found in extensive grazings in Scotland, in some olive groves in the Mediterranean, in dehesas and montados in Spain and Portugal, or in the traditional mowing of meadows once or twice a year in the mountain regions of Middle Europe, creating species-rich meadows.

Extensive farming systems share some common properties: they are characterised by production cycles that receive low inputs, produce relatively low outputs in relation to the carrying capacity of the land, are usually labour intensive and ecologically sustainable (Pienkowski 2011); they combine a high number of species and structural diversity in time and space, and maintain closed cycles of materials and wastes through effective recycling practices (e.g., use of waste as fertiliser). Traditional agro-ecosystems embed the socio-cultural influences that gave rise to them, such that Altieri (1990) states that the analysis of traditional agricultural landscapes should not be carried out separately

from the culture that nurtures them. This link makes traditional (agri-cultural) landscapes particular to the area where they are located. Such peculiarity is well evident in the great variety of European agricultural landscapes and explains why the word "heritage" is often attached to their description, so that they fully belong to the category of cultural landscapes.

However, there has been an evolution not only of the cultural landscapes – there has also been co-evolution of plant and animal species which have adapted to the new living conditions in fields (arable land and grasslands) and in man-made landscape elements (Gerke & Meyer, 1996, Küster 2010). Many species have become "culture accompanying" species such as the white stork *Ciconia ciconia*, barn swallow *Hirundo rustica* and house martin *Delichon urbicum* using habitats built by man, or plants such as many grass species (*Poaceae spp.*) and the wild salad plant Good King Henry *Chenopodium bonus-henricus.* Indeed, whole plant and animal communities developed in this way (Ellenberg 1988). Thus most of the plant communities of grasslands and weed communities of arable land have developed their typical composition over hundreds and sometimes thousands of years in a co-evolution of agriculture and nature. For example the grassland formations in south-west Germany comprise 146 different phytocoenological plant associations, that can be distinguished by several characteristic species and which are each typical of certain sites (Briemle 2003).

Kapfer (2010) and Reif et al. (2008) illustrate very well the development of grassland use in Middle Europe with reference to the differences of land use patterns in two European mountain regions. Some more details on the evolution of semi-natural and other HNV farming ecosystems as well as an overview of semi-natural vegetation types are given in chapter 3 of this book.

Several factors have influenced the evolution of farming and led to the highly diverse vegetation, habitats and landscapes that we call "High Nature Value Farmland" today (figure 1):

1. **Land use patterns and types**: The agricultural use of land created new land use patches within an originally more uniform and continuous landscape mostly dominated by forest: by grazing through cattle, by mowing for winter fodder, by ploughing and sowing etc. many landuse patches and habitats developed. Beside the site specific conditions the differences in the farmer's use of his parcels create habitat diversity and high nature value: grazing and mowing patterns, ploughing, sowing and harvesting variations for different crops, – different land use types create different patterns and habitats – as long as they are diverse patterns in the landscape and not huge uniform parcels.
2. **Site conditions and types**: The landscape is exposed to sun and rain and the differences in the site specific conditions (geology, soil, relief, water and nutrient supply) are reflected in the diversity of plant and animal communities; often there are very patchy micro patterns of vegetation reflecting patchy soil and water conditions – as long as the land use is extensive and the site is not made uniform through intensification and by applying fertilizer and biocides (figure 1).
3. **Adapted vegetation and fauna**: In most crops and cropping systems a specific accompanying plant community has developed; thus for example there are specific plant communities in cereal fields, in potato fields and in other kinds of crops. The plant communities in cereal fields also differ according to the site conditions, e.g. from alkaline to acid sites, from moist to dry sites etc.
4. **Breeding of plant and husbandry varieties**: From the beginning of ag-

riculture, man has used breeding to select plant sorts and livestock breeds (Körber-Grohne 1998). Over time a broad variety of plant varieties and animal breeds has developed, – all adapted either to specific site conditions and/or to special uses. For example there are over 2000 apple and pear varieties in Germany which form part of the genetic and cultural heritage of fruit orchards (Rösler, 2007). The type of livestock and of livestock management highly influences the vegetation mosaic and landscape structure.

5. **Structural Elements**: Additional to the land use itself there are often landscape elements, either natural elements such as rocks and water courses which cannot be used in the same way as the bordering parcels, or artificial elements created by farmers such as stonewalls, hedges, ditches, tree lines and many others. These create a diversity of ecotones – transitions of vegetation (and animal communities) from the used parcel to the landscape elements.
6. **Mosaic in space**: The different types of vegetation and land use build a mosaic in the landscape which depends on both natural conditions and the farmers' land use patterns. Many farmers with many small fields and different land uses create a high diversity in the landscape. Thus there is a spatial mosaic, sometimes also a three dimensional mosaic, for example in orchards and wood pastures.
7. **Mosaic in time**: Depending on different land uses a mosaic use of the landscape is created, e.g. meadows mown early in the year, others later in the year, some only cut for bedding in autumn, others grazed after mowing, others only mown in strips for daily fodder use etc.. The diversity in different uses and in different farmers using their parcels at different dates creates a mosaic in time.

These seven main factors are responsible for the evolution of a broad diversity of habitats and land use mosaics. On the landscape scale the most striking diversity is the diversity of the semi-natural vegetation and mosaics formed by landscape elements and land use patterns. The different types are described in detail in chapter 3.

Deriving from the evolution of cultural landscapes and semi-natural vegetation several characteristics are common and characteristic for HNV farmland today. These characteristics determine the high biodiversity and the outstanding values also in respect of other public goods:

- site adapted use of land, but differing from site to site and year to year (some under-use and/or over-use may occur and/or be normal part of the whole land use system),
- patchy use according to the growth of vegetation and to the limited working capacity of man in one day,
- absence of or only little external input (use of fertilisers, pesticides and energy),
- development of landscape elements.

These characteristics of course developed and changed over centuries and keep on changing. Especially the two factors external input (use of fertilisers pesticides and energy) and patchy use due to the limited working capacity have changed enormously in the last few decades, thus also influencing or changing the other factors such as site adapted use and landscape elements. We are now facing such huge changes in landscape use and in the diversity of the landscape that we risk losing not only HNV farmland but also a large part of our natural and cultural heritage.

Peculiarities of HNV farmland, why is it different from other types of agriculture?

The reason for the close link to biodiversity is that HNV farming systems are mostly low-intensity systems that make

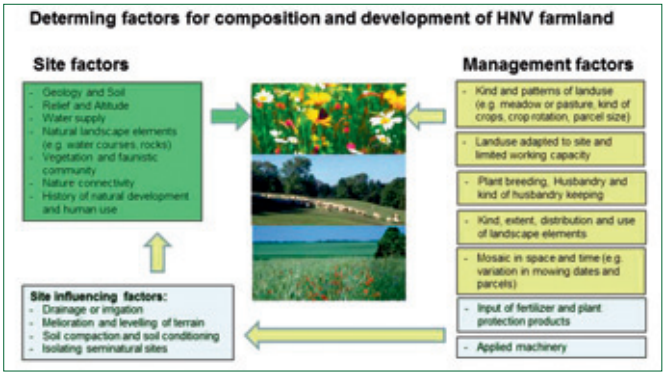

Fig. 1: HNV farmland and especially semi-natural vegetation is originally determined by site factors and extensive land management factors. However, with technology development and more site influencing factors (blue shaded boxes) the land management became more intensive and more severe.

use of little external input, while intensification of agriculture and consequent use of fertilisers, pesticides, irrigation and heavy machinery is a well-known cause of biodiversity loss. Moreover, HNV farming systems often maintain characteristics of pre-industrial agriculture. The reason they are still in place is either because they are located in areas not apt for intensification (a typical situation in Western Europe) or because they are located in regions where socio-economic conditions have prevented or sometimes reversed the intensification process in more recent years (i.e. Romania and Bulgaria).

In these cases HNV systems correspond to traditional agricultural landscapes, although often with some modifications reflecting technological developments. These are cultural landscapes that are valuable because they preserve both natural and cultural diversity. They are characterized by extensive farming practices that support biodiversity in its three dimensions: the genetic variety of domesticated plants and animals, wild biodiversity (wild flora and fauna related to farmland) and life support systems (soil organisms, pollinators, predators), and since they are the "custodians" of agricultural traditions that can be centuries old, they also protect cultural diversity against societal homogenisation trends driven by globalisation (Ramakrishnan, 2006).

Evolution of the factors driving the use of farmland

The factors and their extent determining the management of farmland changed considerably over the last centuries and even over the last few decades. Mainly site and nature factors as well as the specific farm factors determined farmland use (figure 1). While agriculture developed according to human needs (food and raw materials) the use of landscape evolved accordingly, together with agricultural biotopes, offering new sites for farming and habitats for plants and animals. In the last century further factors influencing the farmer's work acquired importance: technological development (induced by the availability of fossil energy, fertiliser, animal feeds, etc.), market factors (induced by transport possibilities) and the Common Agricultural Policy (driving primarily high-yield production). These new factors gained more and more influence on the farmer's work and thus also on the development of farmland in general and HNV farmland in particular (figure 2).

Driven by the relatively new possibilities of farming due to technological development and other determining factors, nutrient cycles opened, site specific limitations partly disappeared, landscape elements and their specific use lost their relevance. Thus landscape elements and habitats are now often only seen as by-products of farming. These by-products were not recognised as having their own value as long as they were widespread. With the rapid development of technical possibilities such as converting sites by drainage, usage of powerful and fast machinery, application of fertilisers and plant protection products, use of fossil energy and trans-