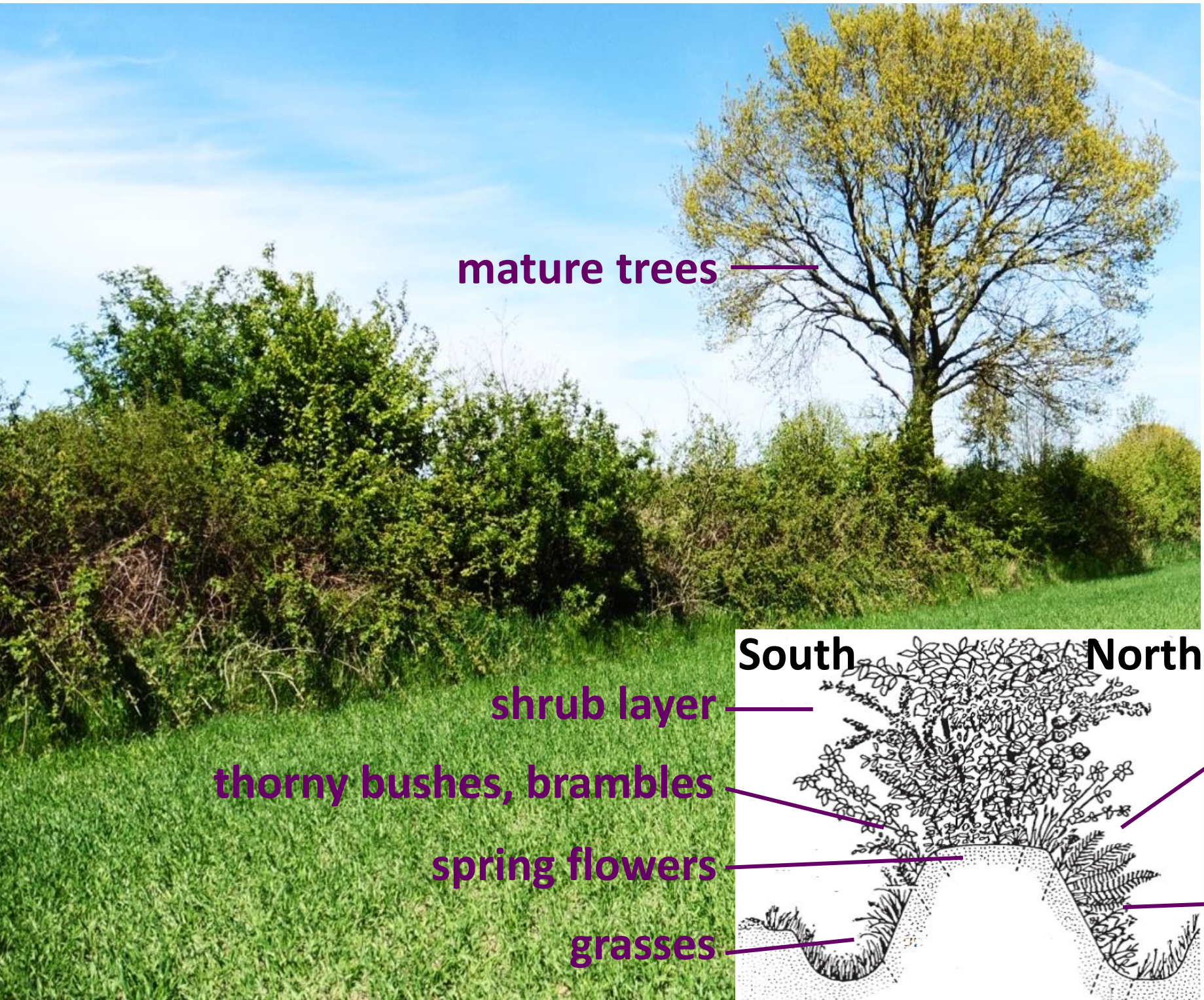


A wide-spread traditional agroforestry system and modern agriculture in Germany’s federal state Schleswig-Holstein

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‘Knicks’ are a traditional hedgerow system and a wide-spread and characteristic landscape feature in Schleswig-Holstein (S-H), Germany’s most northern federal state, located between the Northern and the Baltic Sea. The prevalent Knick-systems are hedgerows on man-made soil ridges, so-called “Wallhecken”. The ridges are covered with various combinations of herbs, shrubs and trees.



Knicks – a hedgerow agroforestry system with manifold growth zones.

The term ‘Knick’ derives from the German verb “knicken” and describes the process of bending branches downwards and sticking them into the soil to promote dense growth. The aim hereby was to establish “living fences”: Knicks have been created since the ~10th, but especially during the 18th century, when commonly used land was distributed amongst farmers. Knicks were established to mark plot boundaries of fields and meadows and to ensure that grazing livestock did not stray onto neighbouring land. In addition Knicks functioned as a source of various goods, e.g. fuelwood, construction timber, livestock feed, berries and nuts.

Maintenance measures had been adapted to the traditional shift between arable farming and grazing. Knicks were usually cut back when grassland was ploughed and turned into arable land. During the perennial crop production phase Knicks turned again into living fences.

The **ecological diversity** of well-maintained ‘Knicks’ is remarkable: Knicks are structured like assembled forest margins, with tree, shrub and grass layer. Based on the composition of plant species, 85 types of Knicks have been differentiated in S-H and as many as 7.000 animal species have been found in Knicks. One individual Knick can contain 1.600 to 1.800 animal species, primarily invertebrates as locusts, hoverflies, butterflies, wasps, bees and beetles. A further peculiarity is the large variety of *Rosa spp.*, e.g. ~100 bramble species. During the periodic pruning measures, at least one tree every 40 - 60 meters should be preserved. Thus, older mature trees can develop. Their value as habitat for various animal species is increasing with their age, e.g. up to 400 animal species were found in mature *Quercus robur* trees.

With more than two thirds of S-H’s territory being used for agricultural purposes, but only ~10 % of forest cover, Knicks form valuable retreat and habitat for flora and fauna. At the dawn of the 20th century, Knicks had a **density** of more than 6 km in length per km². At present, as a result of agricultural intensification and settlement development, the estimates range from 2.8 km to 4.3 km in length per km². The combined length of Knicks on the territory of S-H (15.800 km²) is estimated at 45.000 to 68.000 kilometres.

Ecosystem services

The importance of Knicks has changed: they widely lost their function as a source of food and feed; instead they are increasingly valued for providing a great variety of further ecosystem services.

- Biotope quality**
- Since the 1950s, in the course of the agricultural intensification and industrialization, not only the extent, but also the biotope value of the hedgerow system has declined. Common causes include:
- soil ridges suffer mechanical damage by ploughs or through livestock;
 - woody vegetation with gaps or in parts completely missing;
 - due to lack of maintenance measures, Knicks turn into a tree row, the characteristic vegetation structure and the ecological variety that comes with it decreased;
 - severe pruning measures transformed Knicks into narrow “garden hedges”;
 - chemical and organic substances from farming, industry and traffic lead to changes in fauna and flora;
 - replanting Knicks with non-native woody species;
 - monotonisation of flora due to fertilisation.

Regulating services	Cultural services	Provisioning services
<ul style="list-style-type: none">• (Micro-)climate regulation for crops, livestock and settlements, e.g. protection against sun and weather;• protection against wind, snowdrift and sand drift;• ground & surface water quality maintenance;• water regulation, e.g. water retention;• disease regulation, e.g. habitat for beneficial organisms;• pollination of crops;• air quality maintenance, e.g. degradation of pollutants;• soil quality maintenance and soil protection;• erosion control: wind & water erosion;• boundaries for fields and homesteads;• carbon-sink; better use of nutrients.	<ul style="list-style-type: none">• Enhanced recreational value: landscapes and residential environments; ecotourism;• sense of place: characteristic landscape;• cultural heritage values: historic and landscape development;• structuring landscape and settlement areas;• aesthetic values and enjoyment;• educational value;• inspiration, e.g. artistic inspiration; cultural diversity.	<ul style="list-style-type: none">• Wood chips for energy and heat generation;• timber;• food, e.g. fruits and nuts;• ornamentals;• genetic resources, e.g. endemic species.
Supporting services		
<ul style="list-style-type: none">• Larger habitat diversity, e.g. positive impact on biodiversity;• biotope network in countryside and residential area, e.g. connecting cropland and forests;• habitat provision, e.g. for endemic flora, species-rich invertebrates fauna, for small mammals , for bats as well as breeding, resting and feeding biotopes for protected bird species;• photosynthesis: biomass production, production of atmospheric oxygen;• soil formation, nutrient cycling, water cycling.		

Ecosystem services provided by Knicks.

Protection initiatives

- Farmers and individual initiatives in S-H have taken measures to preserve existing or to plant new Knicks, inter alia:
- the Marius-Böger Foundation supports maintenance measures for Knicks with funding; in addition the foundation owns and maintains historic and newly created Knicks;
 - the County of Stormarn, in cooperation with local farmers, is enhancing its Knick-network with planting measures (Funding: European Union, Stormarn County);
 - other regions support the plantation of oaks
 - Knick-competition to select and feature the best maintained Knicks, organized by various stakeholders, e.g. the farmers association;
 - the agricultural operation ‘Rindergilde Geesthacht’ increased its Knick-network from 0,8 to more than 4 km; the farm cattle is using Knicks as an additional source of fodder.

Binding maintenance measures

In S-H, the following protection and maintenance rules for Knicks apply:

- In order to maintain their diversity and functions, Knicks have to be cut back periodically: every 10 to 15 years, shortly above the ground or the coppice shoots, from October to February, proper maintenance (no cracks).
- At least one mature tree every 40-60 meters has to be preserved.
- Cutting measures shall be carried out in sections to avoid clearcutting.
- Lateral pruning can be repeated after three years at the earliest: with 1 m distance from the soil ridge, up to 4 m in height.
- On arable lands a 0.5 m wide protection-strip may not be planted with crops, fertilized or sprayed.
- Planting of non-native woody or herbaceous plants is not allowed.
- Appropriate maintenance of soil ridges can only be carried out from November 15 until end of February.
- Damages by grazing livestock need to be avoided.
- No storage of materials as sawn wood or shredded biomass in Knicks.
- Herbaceous vegetation on the flanks of the soil ridges can be mown between March 1 and November 14.
- The removal of Knicks is only permitted with authorisation.

According to S-H’s current regional Rural Development Programme, Knicks are considered as protected landscape elements and can be factored for greening obligations due to their special ecological value. Greening payments offer a compensation for loss of earnings, but they do not cover investment costs as the installation of fences, planting material or maintenance costs for Knicks. In S-H, the current implementation rules for the second pillar of the Common Agricultural Policy do not offer support for maintenance measures to restore existing or measures to plant new Knicks.



Knicks - different stages of management and growth

Further questions

- Impacts of Knicks on land use: no in-depth analysis available, previous investigations concentrate on the decline in agricultural yield in immediate proximity to Knicks
- How to enhance contributions for protecting biodiversity: The number of species on S-H’s Red List continues to climb, e.g. more than half of the domestic beetle fauna has been added to the list, and less than 50 % of the indigenous bees have a stable population sizes
- Knicks in agri-environmental schemes: what are sufficient, but cost-effective incentives for farmer’s to encourage participation
- Ecosystems services provided by Knicks: higher esteem for the economic value of nature’s services, valorisation of ecosystem services, analysis of costs for provision and maintenance

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