

A three-century journey through the Herrenberg plains and slopes: From vineyards and fields to fruit tree meadows and pastures.

Historical Changes and Future Development in a Landscape of Southwest Germany

Abstract

The landscapes of Southwest Germany are characterized by an extremely high population density and the almost total lack of untouched areas. Thus, planning in this cultural landscape has to be done very carefully and oriented towards ecological sustainability. Possibilities to develop future states of the visual identity out of historical states of the landscape are shown.

The region of Herrenberg (45 kilometres south from Stuttgart) was chosen for investigation. It cannot be developed "backwards" to a diverse and characteristic landscape, because the frame conditions changed radically. The model for a future landscape is based on the natural conditions but leaves room to an economically-orientated development. To preserve and increase the biological diversity and characteristics, the landscape should not develop into a natural landscape but into a cultural one with respecting the natural conditions.

1. Introduction

The landscape of Southwest Germany today is characterized by intensive land use and the almost complete absence of natural or untouched areas. The population density is one of the highest of all developed countries. Various factors keep this landscape in continuous change. For the most part it remained forest land through the Middle Ages, but within a few hundred years it was completely changed into different states of (agri-)cultural land. The visual identity of this cultural landscape today is completely different to the cultural landscapes 100, 200 or 300 years ago.

What are the reasons for these changes? How can we influence these changes, especially towards ecological sustainability in non-protected cultural landscapes? This paper looks at the region around the city of Herrenberg which is located about 30 miles south from Stuttgart, the capital of Baden-Württemberg, and attempts to describe and interpret states of the landscape between 1680 and today and to find models for future development. Herrenberg was chosen because there the changes are very typical for SW Germany and we have reliable historical information about this region.

As this landscape is used almost completely and very intensively, we have to deal cautiously. The law of Nature Conservation of the Federal Republic of Germany (§1) prescribes that "nature and landscape have to be protected and maintained to preserve their diversity, their characteristics and their beauty." §2 (13) states more precisely that "historical landscapes and landscapes of characteristic identity have to be protected".

Cultural landscapes are not protected per se (which would not be possible because of the perpetual change mentioned above), but the political intention to influence the development based on ecological and esthetical factors is unambiguous. As the term "beauty" is very subjective and can be interpreted in many ways, we concentrate on the first two terms: Biological diversity can easily be influenced and treated by means of planning, but the characteristics of a landscape is based on the natural conditions. These natural conditions (geology, soil, hydrology, topography, climate, etc.) are therefore the basis for a lasting ecological, i.e. sustainable development (see chapters 3 and 4).

If natural conditions were the only consideration, there would be no development. But landscapes are living things, i.e. they change under the influence of man as human action is influenced by many factors (see chapter 4.1 and BRUNS 1994).

2. Materials and Methods

For the analysis of the different states of the landscape during the last three centuries, there were the following materials to evaluate:

- paintings of towns and the Swabian Map of Forests by Andreas Kieser of the year 1680 (scale: about 1:14,000),
- the Survey of Württemberg of the year 1830 (scale 1:2,500),
- the painting "Prayer at Noon" by the painter Theodor Schüz (1861)
- topographic maps of Württemberg (first and seventh edition, 1898 and 1986; scale: 1:25,000),
- historical photos and contemporary photos taken from identic spots.

In addition, materials like the "Description of the District of Herrenberg" (1855) which gave further reliable textual and statistical information were used. Also, the chronicles of two villages near Herrenberg (Kayh and Affstätt) rendered good information by citing primary data. The listed sources were analyzed to determine the different land use systems. Land use is considered as the dominant factor for the identity of the landscape around Herrenberg. Data from each period is put together in maps and compared.

The "value" of the different parts of landscape was measured in terms of diversity and characteristics as described in the German law of Nature Conservation. Several basic sources in literature define the degree of these two terms (KRAUSE et al. 1983, SEILER 1989, GAREIS-GRAHMANN 1994). The diversity of a landscape depends on the amount of different structures per square unit and is positively correlated with

- the number of different field species,
- the amount of changes in colors due to extensive land use,
- the number of transition zones between open land and forest,
- the amount of the relation between one-dimensional (i.e. linear or punctual) and two-dimensional elements.

For example, a landscape sector with a big number of borderlines between the field crops is more diverse than a sector with only one or two crops being grown in big plots. The characteristics of a landscape are the expression of its natural conditions, i.e. the quality and quantity of specific, unique sites (GANZERT 1994, KONOLD 1994).

3. Natural Conditions as a Basis for the Genesis of Cultural Landscape

The first clearings of the primeval forests were done where the soil promised a good crop yield. If it came up to expectations, the cleared area grew. In regions with bad yields because of bad soils, rough climate or other unfavorable conditions, clearings were not extended. This conclusion may be simple and not true for every landscape, but here it is of great importance as it helps to explain the selective and regionally specific land use. For example, areas with a thick loess layer which formed deep, water-retaining and therefore fertile soils belonged to the first completely cleared areas during the Middle Ages in South-western Germany (JANSSEN 1990). Slopes in relatively warm regions not endangered by early and late frosts were cleared for vine and other warmth-loving plants such as apple and cherry trees (WELLER 1992).

4. Landscape in the Region of Herrenberg

4.1 Natural Conditions

The flat landscape in the west of Herrenberg is called "Korngäu". "Korn" means grain and indicates that the region is very fertile and has been cultivated since a long time. The town Herrenberg is situated at about 430 m above sea level at the foot of the "Keuperstufenrand", the borderline of the Keuper terrace. Geologically, Keuper is of triassic origin, i.e. part of the Permo-Mesozoic Cover, which forms the Southwestern German Table-land. The Keuperstufenrand is characterized by two terraces and gentle and steep slopes. It is the transitional region between the Korngäu and Schönbuch regions (DONGUS 1967).

The km1 soils cover gentle slopes and are fertile but made of clay and thus hilly and inhomogenous. The town of Herrenberg is located beyond a small and thin sandstone shelf (km2 terrace). The sites of the km2 and km3 zones have shallow soils and are exposed to the west, southwest and to the south. The Schönbuch is formed by a sandstone shelf (km4) at about 500 to 550 m above sea level. The sandstone soils are very inhomogenous and poor, thus the table-land is covered with forest (see fig 1).

If man ceased to culture the land, there would be beeches on the sandstone shelves (Luzulo-Fagetum), oaks on the steep slopes (Lithospermum-Quercetum), oaks and hornbeams on the gentle slopes (Galio-sylvatici-Carpinetum) and beech forest on the loess plain (Luzulo-Fagetum milietosum).

Fig. 1: Geology of the landscape in the surroundings of Herrenberg (WURM et al. 1990)

Korngäu (loess plain)	Keuperstufenrand	Schönbuch
(400-450 m)	church (430 m)	(500-550 m)
River Ammer	Herrenberg	
(400 m)	(430 m)	

4.2 General Land Use and Landscape from 1680 to 1990

Figs. 2a to e show the distribution of the land use in the loess plain, the gentle and steep slopes and the Schönbuch area southeast of Herrenberg schematically on a scale of ca. 1:25,000 (see chapter 2).

Three hundred years ago, the landscape was characterized by extensive land use. The population density had begun to rise again after hard depression during and after the Thirty Years' War (1618 - 1648). Agriculture was practised in the three-field system with one third of fallow land. Pastures and meadows did not exist on a large scale, animals (pigs, sheep, some cattle) were nourished in the forest. Thus the forests were rather sparse and were more and more devastated during the following two centuries by removing fallen leaves and twigs (JANSSEN 1990, EWALD 1994, KONOLD 1994).

Probably half of the landscape sector was used as grain fields (but not as meadows!) in small plots with so-called shading trees and fruit trees lining the traditional roads, paths and tracks. The soils of that area are characterized by loess and are the most fertile ones in the region. The wet surroundings of the river Ammer and the streams were used as

meadows or pastures. The gentle slopes formed by Gipskeuper (km1) soils were also used as fields and to a small extent as meadows, but the fruit trees (i.e. cherry on the slopes, apple and plum at the slope foot) dominated the site. The field character is also obvious through the existence of colluvial soils in the depressions, i.e. soil movement caused by growing crops along the slopes must have taken place. The steep slopes with a southern or southwestern exposure were mainly covered with vines, but also fields with fruit trees existed there. Altogether, the slopes might represent about one fifth of the landscape sector. The forest on the sandstone shelf (km4) above the slopes was used as pasture and was very sparse at that time. Town and village areas were very small.

This data was taken from the maps and paintings of KIESER (1680). There is no doubt about the general character of the landscape as described above, but due to the lack of correct and comprehensible data, the portions of land use indicated in fig. 2a cannot be taken for granted.

The data of the year 1830 is much more reliable because it is material of the official statistical inquiry and survey of the Kingdom of Württemberg (KÖNIGLICHES BUREAU 1855). Still the field area was almost of the same extent (JANSSEN 1990). The wet areas showed almost the same state and extent as in 1680. Due to the rising importance of cattle (plus better income after the agricultural crisis in 1816/17, improved methods for growing crops and the beginning of industrialization, see chapter 4.4), sites of suboptimal conditions for farming could be changed into grassland. Thus, on the gentle Gipskeuper slopes the arboreal fields were partly turned into arboreal meadows. As forest pasture was still very common and because of increased demand for animal feed, the Schönbuch forest was in a worse state than in 1680.

The production of wine had almost ceased and took only place on the warmest sites. The town area had grown but was still rather small (fig. 2b, JANSSEN 1990).

An impression of the discussed landscape of the 19th century is given in the painting of Theodor Schüz (1861; Staatsgalerie Stuttgart): The loess plain and the km1 slopes are almost completely used as fields, except the wet areas. The km2 terrace is not wooded in contrast to the km4 terrace. Right and left of the church, the arboreal slopes are to be seen. Even though every spot of the landscape is used agriculturally, this landscape is highly diverse because of the abundance of small structures like field edges, banks, trees, and flowers between or throughout the fields (figs. 2b and c).

In 1900, the land use and the landscape had changed again. Fallow fields were reduced to a minimum and due to improved transport, rising population, higher input of manure and mineral fertilizer, the field production was strongly intensified. On the other hand, the importance of the production of meat and milk had increased too, so that the wet river areas were drained and could be used as grassland. The hilly km1 sites which don't allow an intensive crop production were more and more transformed into grassland. The steeper slopes which were the traditional wine-growing sites changed completely: First of all they were used as hop fields and secondly as fruit orchards or fields which had been located in the km1 area in 1830. As forest grazing was stopped, the Schönbuch began to recover and became a more natural forest (fig. 2c, SCHÄFER 1984 and JANSSEN 1990).

Today the landscape around Herrenberg is characterized by an intensive field production in the plain and a small wet area along the river Ammer. The gentle km1 slopes and parts of the km2 terrace are diversely structured with fruit trees, pastures, meadows, small fields, tree gardens, and gardening allotments. Parts of the steep slopes (marl, km3) are covered with dry and half dry grasslands (festuco-brometea) and are protected areas (ÖKOPLAN 1993). Characteristical species on southern and southwestern exposures sites are *pulsatilla vulgaris* and *lathyrus pannonicus* (WURM et al. 1990), which are very rare in Germany.

The field area is only about two thirds of the area one hundred years ago. Furthermore it contains only a few structuring elements like tree-lined roads, solitary trees, field edges and banks. A lot of land was required for housing estates which was mainly taken from the plain. The Schönbuch forest has been dominated more and more by conifers and begun to "come down" the slope due to unprofitable agricultural use of these sites. In some places the forest covers the steep km3 slopes, the km2 terrace and even parts of the more gentle km1 slopes (figs. 2d and 3).

4.3 Evaluation of the Different States of the Landscape

The state of the Herrenberg landscape through the last three hundred years has never been totally unacceptable or ideal from the ecological point of view. We should remember that the visual identity of this landscape is not mainly a product of man's taste but is a result of poverty, food deficiency and technical imperfection. Since the Age of Enlightenment people have been trying to use land as intensively as possible (see BECK 1994 and KONOLD 1994)!

As far as we know, the biological diversity (which I postulate to be an important basis for the continuity of both materialistic and esthetic aspects of human life) in Central Europe was at its best between 1850 and 1900 (KONOLD 1994), *because* the natural landscape had been transformed into a cultural one. The multitude of different structures bound to the local site characteristics led to a multitude of biological diversity never reached before or after. Using the methods described in chapter 2, it seems that the diversity of the Herrenberg landscape in 1830 and 1900 was higher than the state in 1680 and much higher than today.

As the frame conditions are different today, it's impossible to recreate these former states of the landscape. But we can try to maintain and improve the diversity by respecting the local site features (for example extremes in humidity or temperature of the soils of these sites).

4.4 Reasons for Changes in Land Use

As we can see, the landscape has changed continuously and probably will go on changing. In Herrenberg, poverty, rising population and improved farming methods made people intensify the field production and drain the wetlands along the river Ammer. Other reasons for change were improved transport, plant diseases and a tax system referring to wine production which made people replace vine by fruit trees and hop. The latter remained on the slopes of Herrenberg only for a short time (1870 to 1920). Decreasing hop prices, suboptimal climatic conditions, reduced population after World War I, and rising possibilities for industrial work made hop disappear again totally. The particular reasons for changes of land use and their effects are listed beyond (table 1). However, the change from one period to the other was not of a linear character - it was marked by ups and downs. This is why it is possible to find aspects for growth and for decrease in the same row.

Table 1: Reasons for Changes of Land Use from 1680 to 1990 in southwestern Germany

(sources: BECK 1994, GANZERT 1994, JANSSEN 1990, KONOLD 1994, KÜPFER 1995, WELLER 1992 and 1993)

1680 to 1830

- Age of Enlightenment: Use of every spot of the landscape,
- (slow) increase in population: Intensification of land use,
- crisis 1816/17: Famine and emigration, change from labor-intensive and "luxury" viniculture to labor-saving and crisis-proof fruit production,
- wine-referring tax system: Change from wine to fruit production,
- improved methods (fertilizing, growing of N-assimilating plants): Intensification of crop production.

1830 to 1900

- (quick) increase in population: Intensification of land use,
- increasing mobility of people and goods through new transport systems (railway in Herrenberg: 1879): Raise in concurrence production in climatically favorable regions, decrease in grain and wine price,
- crisis 1849 (crop failures since 1846 and revolution 1848): Famine and emigration,
- support of the fruit production by the State of Württemberg (1850), vine pest (1850): Expansion of the fruit tree area, heavy decrease in viniculture,
- technical progress (development of anorganic fertilizers, tractors, draining methods): Intensification of land use, drop in grain price,
- raise of beer consumption in industrial towns like Stuttgart or Böblingen (1870): Growing of hop on slopes,
- Beginning of industrialization (1870): Beginning of the reduction of people working in the agricultural sector.

1900 to 1990

- increase in population; World Wars I and II, intensive industrialization (Daimler Benz, IBM), huge reduction of people working for agricultural production: Enlargement of field plots and farms, intensification of land use, temporarily strong decrease of the working population in general, concentration on labor-saving products (decrease in hop, increase in the number of fruit trees),
- low energy price: Specialization on a small number of energy-intensive products, heavy loss of diversity in the landscape,
- Regional and Land Use Planning in Baden-Württemberg (1960): Concentration of industrial surface utilization along the highway A81 (5 km from Herrenberg),
- support of the clearing of tall fruit trees in favor of crop production and more profitable low-branching fruit tree plantations (1950s/60s): Clearing of fruit trees in the plain but not on the slopes due to the lack of a profitable alternative,
- high demand of living space (1970s/80s): Fast expansion of the town of Herrenberg,
- Law of the Protection of Nature (1976), beginning of higher sensitivity to ecological problems (since 1980), state and regional programs to maintain and increase the biological diversity in the landscape: Beginning of the restructurization of the landscape by planning, i.e. beginning of the extensification of fields, replanting of high-branching fruit trees.

4.5 Models for Future Landscape Development

What will the landscape look like in fifty years? What are the reasons for future changes? Can we influence the visual identity of our landscape by appropriate planning?

In a scenario there are two extremes which can be imagined: The worst and the best case, with hundreds of steps between these extremes:

a) Worst case for the year 2050 ("negative model", fig. 2e)

Frame conditions:

- strong growth of the town area due to continuing demand of living space,
- sinking prices for agricultural products; no support of diversity-stabilizing elements,
- total mobility, low energy price,
- political decisions which would reinforce the conditions listed above.

In that case, the diversity of the landscape which had already been reduced to a large extent between 1900 and 1990 would still decline. The wet meadows close to the river Ammer would almost disappear, the Schönbuch forest, mainly consisting of quick growing but ecologically non adapted spruce, would cover most of the steep slopes and only a part of the gentle slopes would be used as fruit orchards or gardens.

b) Best case for the year 2050 ("positive model", fig. 2f)

Frame conditions:

- moderate town growth (condensation inside the town),
- stabilizing payments for agricultural work (products and services like landscape management),
- rising energy price (strengthens local and labor-intensive products),
- rising sensitivity of the population for ecological problems, strong support of landscape elements which stabilize diversity,
- political decisions which would reinforce the conditions listed above.

In the second scenario, a return to a state of the landscape as it was between 1680 and 1900 is neither attainable nor desirable. Even though the biological diversity in this (cultural) landscape was highest around 1850/1900, the positive model cannot be identical with that past state. As we have a limited influence on future developments, the positive model for 2050 should be open for many possibilities to use land and leave room for dynamic processes. The basis for this model is a land use which is adapted to the natural conditions but also admits economically orientated agricultural production. A wide-spread land use which is mainly based on support is instable because it is dependent on the industrial net product and on social acceptance. On the other hand, intensive farming in southwest Germany becomes more and more unprofitable due to sinking product prices. If there was a "market" for the "production" of visual identity of landscape (HAMPICKE 1994), the support money could be used to maintain a diversive and site-adapted land use. Meanwhile, there is a big number of regional initiatives to find all over Germany, who successfully try to trade with regional high quality food to increase the population's sensibility for the visual character of their landscapes (KÜPFER et al. 1997).

Land use in the landscape around Herrenberg close to the ecological optimum could look the following:

- wet surroundings of the river Ammer and the streams: Meadows with no more than two or maximal three cuts per year, low fertilizer input, no pesticides,
- loess plain: Crop production on a moderate level of intensity, i.e. fertilizing following soil analysis, growth of many different crop species, small parts of grassland between the fields, maintenance and rebuilding of banks and field edges, solitary trees and traditional tree-lined roads,

- surroundings of the town and villages: Maintenance and laying out of traditional fruit tree belts, no fertilizers and pesticides;
- gentle slopes: Mainly used as arboreal meadows, maintenance done by direct marketing of regional food, if necessary supported by the government. Alternatives for apple, cherry and plum should also be of wooden character, i.e. fruit trees or bushes or at least grassland, but not fields or forest. Arboreal gardens without artificial treatment can occur, too. Should the climate change, the return of vine is feasible!
- steep slopes: This part of the landscape is the most difficult one, because there agriculture cannot be profitable without very strong support. So probably these sites would afforest themselves, and because this should not happen to a large extent (extremely dry sites with high potential for dry grassland) the maintenance has to be organized and paid. If the maintenance is too expensive for special sites (very steep, dry, wet etc.), these sites will become natural forests by going through the several stadiums of succession without forestry use. In this case, the maintenance should be restricted to the protected areas.
- Schönbuch (km4 terrace): there is and probably won't be an alternative to forestry use or natural forest. Thus, the forest should be maintained in a natural way, i.e. planting of adapted delicious trees (first of all beeches) should be forced (fig. 2f).

But why should we desire a certain model of a cultural landscape? Isn't a natural one more stable from the ecological point of view? The areas without any influence of man in south-west German landscape should be enlarged in the future. But as a huge enlargement of the natural areas in this densely populated country is not possible and even not desirable under the aspects of high diversity in visual identity and plant and animal species, we should care very much about cultural landscape.

5. Summary

The landscape in South West Germany has been changing continuously over the centuries under the influence of man. Originally, forest more than 95% of the land. During the Middle Ages the natural forest had been reduced to less than 10% in some regions, due to extensive agricultural land use. For example, in the region south of Stuttgart the production of wine and (later) of fruits began to characterize the landscape. Around the year 1900, the apple production area had found its maximal spatial expansion. Changes in visual identity of the landscape are the expression of the reaction of man on natural conditions, technical progress and change of eating habits political events and changes.

Different methods facilitate the documentation of these changes. The main instruments are maps and paintings of Swabian towns and their surroundings, photos and aerial photographs, statistics of land use and topographic maps. We can visualize the changes of the landscape by comparing historical and current paintings and photos or by drawing maps which include the distribution of land use. The "value" of a landscape is measured in terms of biological diversity and characteristics. Considering the natural conditions, we can create a model for future landscapes from this material.

The region of Herrenberg cannot be developed "backwards" to a diverse and characteristic landscape, because the frame conditions changed radically. The model for a future landscape is based on the natural conditions but leaves room to an economically-orientated development. To preserve and increase the biological diversity and characteristics, the landscape should not develop into a natural landscape but into a cultural one with respecting the natural conditions. Extensively used grassland, i.e. meadows and pastures of low intensity, play an important role in this process.

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