

The appearance of agriculture

An assessment of the quality of landscape of both organic and conventional horticultural farms in West Friesland

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Abstract

“This landscape is offered to you by the local farmers.” In several places throughout the Netherlands and Belgium, billboards with such text can be found along the road. Perhaps the idea to promote farming in this way is new, but, for centuries, farmers, with their techniques and traditions, have strongly influenced the formation and nature of the surrounding landscapes. But what qualities do these landscapes have today?

The aim of this study is to assess the (potential) contribution of farming systems to landscape quality. Eight horticultural farms in the region of West-Friesland (NL) were analysed after an intensive observation study during the four seasons of the year. A theory and a method on landscape quality at regional and farm level were developed. The starting point was that the visual quality of a landscape is determined mainly by four types of landscape coherence: vertical, horizontal, seasonal and historical. There are big differences between the landscape appearances of the eight farms, concerning, firstly, spatial aspects, like scale, layout and patterns, and, secondly, temporal aspects, like the expression of seasons. As an instrument to assess the quality of farm appearances, reference images were defined. In general, the organic farms had a better landscape quality than the conventional farms.

These results may offer possibilities to farmers, organisations and policy-makers to improve the qualities of the rural area, for example, by supporting landscape-friendly farming practices or by local/regional platform discussions. The criteria used can be placed in the cultural realm of the framework created in the Concerted Action on Sustainable Development of Landscapes (see Stobbelaar and Van Mansvelt, 2000). ©2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

The appearance of a farm is primarily the result of the mutual interaction between the natural features

of the region and the activities and mentality of the farmer. Each farmer has to deal with a framework offered by the landscape around (parcelling, water system, infrastructure, etc.), within which he has to mould his farm management. The choices made by the farmer within this framework become visible in the appearance of the farm (Fig. 1). This interaction has resulted in a wide variety of (agri)cultural landscapes, which,

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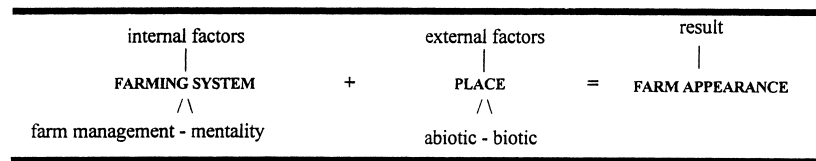


Fig. 1. Concept of the relationship between farm and landscape appearance.

nowadays, is threatened by developments that are not accompanied by a concern for quality of the landscape and the environment (Giorgis, 1995; RIVM et al., 1997). “Heritage”, as SNH (1993) writes, “is not just what we inherit: it is also that which we bequeath to future generations. . . We have a clear role as guardians to manage that heritage carefully and pass it on to posterity unblemished and where possible restored and enhanced. At the same time we have a legitimate role in creating new heritage provided that, in doing so, we are not damaging our inherited environment.”

The main focus of this paper is on the visual relationship between farms and their surroundings, and is written within the framework of the EU-Concerted Action: ‘The landscape and nature production capacity of organic/sustainable farming systems.’ Some of the criteria for the development of sustainable rural agricultural landscapes, developed in this concerted action, have been applied on four conventional and four organic farms. These criteria are related to cultural environment (see checklist, Stobbelaar and Van Mansvelt, 2000). The data used for this paper were gathered in a four-year research. The goals of this research were to develop a method to determine and evaluate the effects of farming systems on the landscape, and to give guidelines for the maintenance and creation of agricultural landscapes in which the natural and cultural potential of the region can come to expression in a regional identity (Hendriks et al., 1999).

2. Theory

In order to determine and evaluate the landscape appearance of farms in their regional context, a theoretical framework was developed, which allowed one to relate the landscape at farm level to the landscape at regional level.

Landscape is seen as the appearance of our surrounding, which is determined by the mutual coher-

ence and influence of natural and cultural factors. The quality of the appearance of a landscape can be assessed in different ways: by an interdisciplinary team of landscape experts or by asking people involved in the region for their appreciation of the landscape. In this study, the expert approach is chosen. Little research has been done on the relationships between landscapes at farm level and regional level. Therefore, an exploratory multiple-case study (Yin, 1994) was carried out. Clusters of organic and conventional farms in three different regions in the Netherlands were studied during four seasons.

2.1. Landscape quality

An important quality of the landscape for its users/consumers is the possibility of identification and orientation in space and time (Van Zoest, 1994). It is defined as legibility of the landscape and way finding (space), and the information given about the genesis of the landscape (time). In this way, it is also brought into the policy paper on landscape in the Netherlands (Min. LNV, 1992). In this research, additions have been made to these definitions, and they have been applied at the level of farms and their surroundings. Spatial aspects, like patterns and processes visible in the landscape, should be seen and understood clearly as a coherent unity. Every place or region has its own characteristics that can tell something about the region’s natural environment and the occupation patterns, and allow for orientation in space. Temporal aspects, like the history of the landscape and the seasons (e.g., cyclic processes), should be visible in the landscape to allow an orientation in time. These spatial and temporal relationships, being visible in the landscape appearance, determine the legibility of the landscape, and, in our theoretical framework, the landscape quality. Four types of relationships, or ‘landscape coherence’, are cited, namely, the vertical, horizontal, seasonal and historical landscape

coherence. It is important to note that these four types of coherences can be distinguished from each other, but cannot be separated from each other. The division of spatial and temporal aspects of a landscape is essentially an artificial act; in reality, they are strongly interconnected. According to Lemaire (1970), “The self-unfolding of the landscape is indissoluble related to the seasons and the day time. The visibility of the space depends on the regime of the ‘natural’ time of days and seasons; it is always a space in the morning or at night, in winter or in summertime. That is why the experience of the landscape is at the same moment an experience of the time. Space and time are perceived as mutually involved. To distinguish between them is a product of our rational mind”.

Besides the theme of landscape coherence, the theme of ‘landscape diversity’ is important for landscape aesthetics, as it is for landscape ecology. Results of perception research (e.g., Kaplan et al., 1989) show that visitors to landscapes perceive and appreciate complexity (variation/diversity) and order (coherence) in a mutual relationship. Diversity without coherence leads to chaos. Coherence with only a little diversity leads to fossilisation and boring landscapes for visitors. In this research, diversity is seen as a factor that is inseparable, but of secondary importance to coherence. Diversity becomes meaningful only when it ‘acts’ in a certain landscape coherence. Therefore, the diversity parameters are included in each type of coherence (‘diversity in coherence’). This differs from the theory of Kuiper (2000), in which diversity is linked mainly to the vertical coherence in a landscape.

2.2. Landscape coherence

The foregoing assumptions led to four criteria for orientation in space and time (Fig. 2), given through the four types of coherence.

2.2.1. Vertical coherence

Vertical coherence in the landscape appearance is the relationship between abiotic factors (soil, water, relief), biotic factors (flora and fauna) and land use. Vertical relations at three scale levels were distinguished (Fig. 2a).

1. Region: visibility of geomorphologic landforms and ecological adaptation of the land use to the regional (a)biotic characteristics.
2. Farm: adaptation of farm management to differences in abiotic circumstances.
3. Crop/vegetation: relationships between crop and soil by an organic soil layer, and/or expression of abiotic circumstances through crops and/or vegetation.

2.2.2. Horizontal coherence

Horizontal coherence in landscape appearance is the relationship between landscape components, either visual, spatial, functional and/or ecological. Horizontal relationships at three scale levels were distinguished (Fig. 2b).

1. Farm region: the presence and global composition of spatial components of a farm typical for the region (e.g., farmyard with planting, grasslands and ditches).
2. Farm surroundings: the relationship between spatial patterns at the farm and spatial patterns in the neighbouring region (e.g., planting, water, parcelling).
3. Farmyard fields: the spatial composition of the elements in the farmyard and the visual, functional and/or ecological relationships with the surrounding fields.

2.2.3. Seasonal coherence

Seasonal coherence in landscape appearance is the relationship between season (intensity of light, day length) and colour, form and texture of landscape components: the expression of the four seasons by the different landscape components (Fig. 2c).

2.2.4. Historical coherence

Historical coherence in landscape appearance is the relationship between human activities in the past and present, and possible developments (Fig. 2d). These relationships can be seen in the presence of subsequent historical elements and patterns, the quality and current function of historical elements and patterns and the coherence between those elements and patterns.

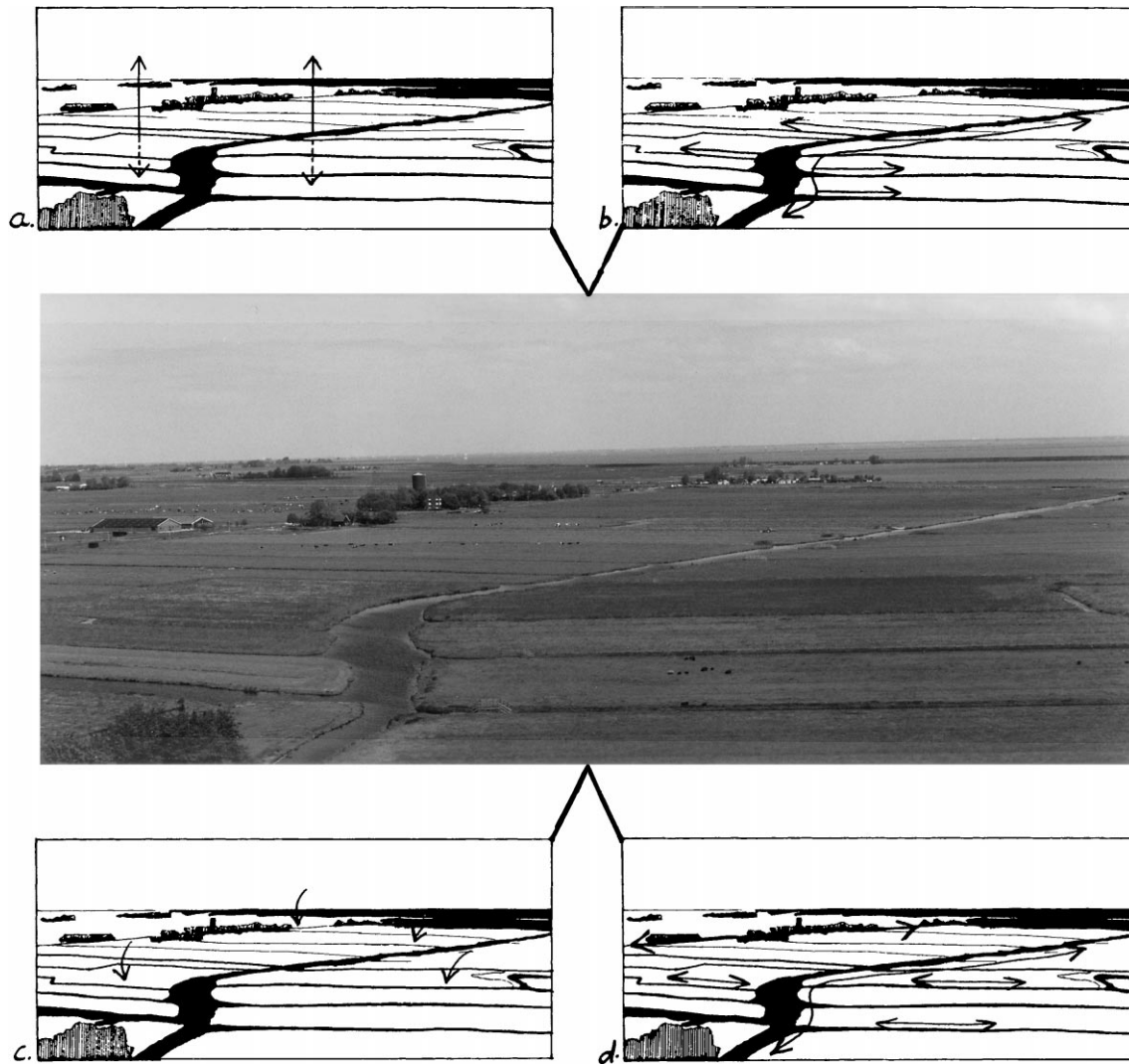


Fig. 2. An example of spatial and temporal characteristics in a landscape. (2a) Vertical coherence: grassland as land use and the vegetation reflecting characteristics of the high water table and peat soil. (2b) Horizontal coherence: the pattern of ditches reflecting relationships between sites in the landscape (organisation of water management, hydrology) and determining the spatial layout. (2c) Seasonal coherence: the colours, forms and textures of the vegetation (grasslands and ditch sides) reflecting the seasonal time of the year. (2d) Historical coherence: the pattern of occupation and ditches, and landscape elements reflecting the reclamation process.

2.3. Landscape appearance through time

The four types of coherence can be studied in the light of three time frames (Bockemühl, 1986).

First of all, the momentary time frame, in which the appearance of a landscape at a certain moment in the year can be observed (Fig. 3). Most of landscape research is done implicitly within this time frame, given

that the point of reference is mostly daytime in summer. The second time frame is the cyclical time frame. Here, the coherence in the rhythmic course of processes in the landscape appearance is the central topic. The seasons are seen as the most important cyclical process influencing the landscape appearance. The third time frame is the progressive time frame, which means the biography of the landscape.

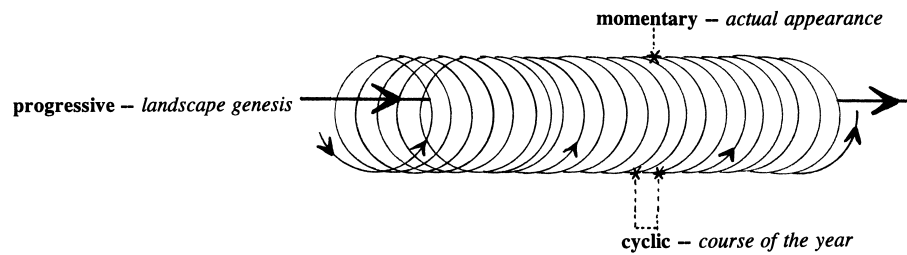


Fig. 3. The three time frames by which a landscape appearance can be observed.

Table 1

Landscape coherence defining the visual quality of a landscape on farm and regional level^a

Orientation in time	Orientation in space				Condition for coherence
Time dimension	Landscape coherence				
	Vertical coherence	Horizontal coherence	Seasonal coherence	Historical coherence	
Momentary	Relation between abiotic, biotic and anthropogenic phenomena	Spatial arrangement of the farm/region	Manifestation of the seasons in colour, form and texture	The visual signs of the history	Variation in space (patterns)
Cyclic	Relation between abiotic conditions and seasonal activities	Changes in the spatial arrangement through the seasons	Changes in colour, forms and texture through the seasons	Visibility of historical elements through the seasons	Variation in time (processes)
Progressive	Changes in the abiotic conditions by the land use	Changing in the spatial arrangement through the years	Changing (growth) of seasonal manifestation	Management and development of historical elements	Variation in time (processes)

^a See Fig. 2 for visual representation of landscape coherence.

In order to research landscape coherence, criteria can be given for each time frame (Table 1). These criteria are generally applicable in every agricultural landscape. When studying a certain landscape, these criteria have to be supported by area-specific parameters.

3. Method

For the development of the method, the landscape phenomenological approach has been used, as developed by Bockemühl (1997), and a general method for landscape analysis (Kerkstra and Vrijlandt, 1976). The assessment of landscape coherence in space and time (especially the seasons) and of the essential characteristics of a place are part of this method (see Pedroli, 1989; Colquhoun, 1997). The method can be laid out in three parts, namely, a descriptive part, which serves

as an analysis, and two normative parts, namely, the definition of a reference image and an assessment of the farm appearance.

3.1. Analysis of the appearance of both region and farm

The four types of coherence and their determining features are the instruments to analyse the landscape appearance of the region and the farms on the basis of a comprehensive observation study and literature survey. Data were gathered during observations of the farms and the region in all four seasons of the year (1995–1996). The analysis of the landscape on a regional level was made for the progressive, the momentary and the cyclical time frame, and was illustrated by photographs, tables, etc. It concludes with a summary of the most evident landscape characteristics of the region, the major changes that took place

during a year and the major changes that have taken place in the landscape throughout time. The analysis of the landscape on farm level was made for the momentary and cyclical time frames, and was illustrated with drawings, phenology diagrams, maps and photographs. In each season, viewpoints that represented the most important landscape components were visited and described. The descriptive part concludes with a summary on the differences and similarities between the farm's appearances.

3.2. *Creation of a reference image for the region and a farm*

To assess the contribution of a farm to the regional landscape quality, a valuing model is required. A reference image is defined with targets for the potential expression of coherence in this specific regional landscape. From this regional reference image, a reference image at farm level has been derived. The particular patterns, elements and processes of a region have their implications for the farm, which is always a part of the larger whole. The farm appearances can, then, be matched with the reference image at farm level. The creation of a reference image is important for two reasons. First, by making explicit the criteria for high landscape quality, the assessment of the farm appearance is reproducible. Second, the reference image can be seen as a design for the future, with regional guidelines to improve the landscape quality with help from farmers. In this sense, it is a beginning point for discussion in the region. The reference image is based on:

- observational study of region and farms,
- general theory on landscape development,
- literature about the region,
- policy for agriculture and spatial organisation,
- literature, experience and observations of comparable landscape types and/or problems, and
- perception research in the region (Van Haperen and Van Herpen, 1997).

3.3. *Assessment of the appearance of the farms*

The farm appearance is matched with the reference image for the farm level to assess the actual contribution of the farms to the landscape quality of the region, i.e., the distance between the actual situation and the

targets for criteria and parameters. For each parameter, a value is given in the range of very much/strong (XX), much/strong (X), moderate (0), little/weak (–) to nil (—). The parameters are given the same weight. The total score results in a range of farms with a high to low 'diversity in coherence'. In this range, groups of farms that have a similar overall score on the parameters can be distinguished.

4. Material

4.1. *Study area: West-Friesland*

West-Friesland is part of the province of North Holland. The farms are situated in the west and east of the region, and have a clayey soil. The region is a former tidal area, which, since 1300 AD, is protected from the sea by a high dike. Until 1960, the land was accessible only by a dense network of waterways. Market gardeners were living in villages, and went by boat to their 'floating' land. In the period 1965–1975, a radical land consolidation took place to guarantee an economically sound agriculture and to stop the migration of unemployed farmers from villages to cities, where jobs could be found in industries. The landscape changed completely. Many ditches were filled, the water level was lowered and the fields enlarged. This resulted in a large-scale, intensively used, open landscape, contrasting with the characteristic, small-scale, old villages. Modern houses and barns were built in formerly uninhabitable areas. Most fields are now below mean sea level, varying from 0 to 2 m. The average horticultural farm size is 10–12 ha. They are typically one-family farms. The land consolidation has been a success, although new problems have arisen, such as new competition on the market for horticultural products, and a strong pressure of urbanisation from cities. Also, there are people who are not happy with the actual landscape appearance (Van Haperen and Van Herpen, 1997), and a local pressure group demands the restoration of some of the old characteristics of the area, such as waterways.

The area can be characterised as an autumn landscape. Spring occurs late in the season, for until April not much can be seen. In summer, the fields are filled with crops, and in autumn, the area is a hive of activity. The fields are extremely colourful at this time.

Cabbage (*Brassica*) is harvested and transported to the storehouses.

4.2. Farming systems in West-Friesland

The research was exploratory in nature, with the objective to illustrate and assess the landscape appearance resulting from different agricultural strategies (De Jong, 1995, pers. comm.). Therefore, sample selection was stratified, rather than random. Four organic farms and four conventional farms were chosen. One of the organic farms was a flower culturist, the others were market gardeners. The conventional farmers were Environmentally Aware Practice (EAP) producers, who are partly controlled by the auction. They follow different strategies. Farms EAP-1 and EAP-2 grow labour-intensive, high quality products, with a high price per kilogram. The future of farms EAP-3 and EAP-4 lies in large-scale production of cabbage, with a year-round sale of a low price per kilogram. Some main features of the farms are given in Table 2.

5. Results

The farm appearances are described extensively in Hendriks et al. (1999). An overview of qualitative and quantitative (between brackets) data on the diversity is given in Table 3. The diversity of elements, species, colours, etc. is very different on the eight farms. In Fig. 4, two farms illustrate a difference in diversity in forms, spaces, planting and crops. The reference images, with targets for the landscape quality on regional and farm level, are shown in Table 4. In this table, the parameters for the assessment can be found (in italics), as well as their targets. The results of the valuation with regard to coherence in the momentary and cyclical time frame are given below and are further illustrated in Table 5.

5.1. Vertical coherence

On the region and farm level, there are few reasons for differentiation in land use because the abiotic circumstances are homogeneous. The differences between the farms with respect to vertical coherence were found mainly on the crop/vegetation level. The expression of natural characteristics can be stronger if

more crops are grown and if there is space for natural elements (see also Fig. 4).

Regarding land use in general, horticulture is well suited to this clayey area, and differences in this respect could not be assessed really. However, there was a clear difference between the organic farms and the conventional farms with regard to the number of crops grown and the soil structure. Both different crops and a better organic soil structure gave more expression to soil and water qualities than growing only one or two crops with the help of artificial fertilisers and crop protection. The larger surface for natural elements on the farm and the higher diversity of these elements in types and species, clearly differentiated three of the organic farms from the other five farms.

In summary, the two large-scale EAP farms had a low contribution to vertical coherence, the two small-scale EAP farms and one organic farm had a moderate contribution, and three organic farms had a high contribution to vertical coherence.

5.2. Horizontal coherence

The scale level of coherence between farmyard and surrounding fields appeared to be the most differentiating aspect. This coherence can be a visual, functional, and/or ecological relation between the spaces on the yard and the fields. The relation is very weak when there is no spatial transition from farmyards to fields (Fig. 5). Three organic farms and EAP-1 displayed strong visual, functional and/or ecological relations and a large diversity in spaces. It is striking that the two large-scale EAP farms displayed a very weak horizontal coherence at this level.

In the relation between farm and region, the organic flower farm (ORG-3) was not really in harmony with the reference image of the West-Friesian landscape because of its high tree density all over the farm (although it was situated near the village border). ORG-4 displayed strong relations and the other six farms were neutral in this respect. Regarding the relationship between the farm and its direct surroundings, there were three organic farms that were strongly connected with the surroundings by patterns of planting or ditches.

In summary, the horizontal coherence on farm EAP-4 was nil to weak, whereas on farms ORG-1 and ORG-4, it was strong (Table 5).

Table 2

Features of the farm management of the eight selected organic (ORG) and conventional (EAP) farms in West-Friesland

Features of farm management	ORG-1	ORG-2	ORG-3	ORG-4	EAP-1	EAP-2	EAP-3	EAP-4
Size (ha)	14	5.5	2.5	5.7	12	9.5	26	30
Crops	Potato, wheat, onion, cabbage, celeriac, beet, carrot, broad bean, tomato, cucumber, green herbs, sunflower, mixed flowers	White/red cabbage, celeriac, beet, potato, barley	Flowers, blue berries	Broccoli, chicory, pumpkin, potato, bean, beet, carrot	Green asparagus, white cabbage, finocchio	White/red cabbage, garlic, potato	White/red cabbage, flower bulbs	Cauliflower
Rotation ^a	Variation according to the crop and the variation in soil, 1:5 till 1:14	1:4 till 1:7	Complex rotation	1:4 till 1:6	1:2, asparagus 5 years fixed	Cabbage 1:2, garlic 1:6	1:1 or 1:2	1:1
Manuring	Farmyard manure, own force, green manure	Farmyard manure, own force, green manure	Compost	Horse manure, own force, green manure	Artificial fertilisers	Slurry, chicken manure, artificial fertilisers	Artificial fertilisers	Artificial fertilisers
Machinery	Mostly on farm, contract work for harvest and cereals	Mostly contract work	On farm	On farm	On farm	On farm, contract work	On farm	On farm, contract work
Supply of labour	2 full time, 5 holiday workers, 1 trainee	1 full time	2 full time	1 full time	1 full time	1 full time	3 full time	3 full time
Market	Wholesale house, auction, direct market, off farm	Wholesale house, auction	Direct market, auction	Wholesale house, direct market	Auction, off farm	Auction	Auction, grocery chain	Auction

^a The rotation is expressed in the frequency of a crop growing on a certain parcel. To avoid pests and diseases without chemicals, a low frequency is necessary.

Table 3

Reference image: targets for landscape quality at regional and farm level

Regional level	Farm level
Vertical coherence 1. More differentiation in soil/water circumstances with related <i>land use</i> and vegetation; wet biotopes (waterways, grasslands) versus dry biotopes (dykes, creek ridges, and horticulture). 2. The dominating direction of the <i>wind</i> becomes visible in the way planting is used in the landscape. 3. The quality and management of <i>soil and water</i> is such that flora and fauna can develop in soil and water and old relief is maintained; no ploughing up of old grasslands for production of bulbs, no use of chemicals near and in ditches. Water is not quickly drained, but stored in the region so that irrigation and inlet of water from outside the region is brought back to a minimum. Horizontal coherence 1. The <i>spatial layout</i> of the area is characterised by (relative) openness of the agricultural zones contrasting with the closeness of the villages. Some large landscape components mark out the area (dunes, city, dykes, and forest) and the large spaces are indented by patterns of planting along roads and farmyards and waterways with vegetation. 2. Dykes, dunes and forests are important for the <i>ecological structure</i> on regional level. On a lower scale, especially the linear patterns of planting and margins of ditches and parcels are of importance. Water is the linking factor. 3. <i>Functional relations</i> in the area are legible. It is the dwelling and working place of people, so the landscape is attractive for ‘everyday recreation’; cycling and walking paths and waterways suitable for canoeing give possibilities to enjoy the rural land while dwelling in the city. The agriculture is place bounded; no anonymous iron sheds (for storage of crops) in the openness, no ‘wandering’ bulb production by farmers from other parts of the country. Seasonal coherence 1. <i>Winter</i>: In the open, agricultural area, the pattern of waterways is clearly visible by the golden, ochre colour of reeds and grasses, contrasting with the ploughed, brown fields. The twigs of indigenous planting colour red, yellow or purple. The main landscape structure is very clear in wintertime. 2. <i>Spring</i>: Bright colours are dominant in the margins of fields, in road verges, in forests and on farmyards. The grasslands are light green and little (green) colour appears on the arable fields. However, they still show a lot of brownish earth. 3. <i>Summer</i>: The landscape is spatially the most closed now because the planting is massive and the earth is covered with vegetation and crops. The richness of colours and textures of fields and margins is at the maximum. Flowering and growing changes into ripening. 4. <i>Autumn</i>: Red, orange, brown colours, seeds and fruits appear in vegetation and planting. A lot of root crops and cabbages are still on the fields.	1. <i>Land use</i> and choice of <i>crops</i> adapted to soil quality and water demand. On the farmyard, different types of use give expression to soil, climate and water circumstances. 2. The <i>vegetation</i> and <i>planting</i> at the farm show characteristics of the soil (clay, sometimes peat) and show relation with the water management, e.g., reed vegetation in the ditch side, green headlands. Planting at the yard is diverse in type, structure and species. 3. The <i>soil structure</i> is improved by organic manure. A living soil layer between the inorganic soil and the organic crops and vegetation exists. 1. Spatial coherence between the <i>layout of the farm</i> and the <i>lay out of the area</i>. Farmyards are situated along the road; ditches and margins are visible linear elements and diversity in crops articulate the open space. 2. The <i>spatial arrangement of the farm elements</i> is connected to the spatial arrangement of the direct surrounding. Patterns of ditches and planting are related and the pattern of parcelling becomes visible by colourful vegetation or, e.g., by planting accentuating a crossing of waterways or property borders. 3. The <i>spatial arrangement of the farmyard</i> is diverse in scale and use, and the different parts of the yard are linked with each other and with the surrounding fields. This relation can be visual (transparent planting, variation in openness, ecological (a network of natural elements) or functional (paths). 1. <i>Planting at the farmyard</i>: winter: richness of forms, clear sight, brown-red tones in twigs; spring: flowering bright colours, a range of light greens; summer: a range of greens, flowering herbs; autumn: fruits (berries), ochre-orange-red-brown colours in planting and vegetation. 2. <i>Gardens</i>: winter: richness of form, signs of decay, ochre-red-brown colours; spring: bright colours of flowers and leaves (red-yellow-pink-white); summer: flowering, clear tones of green-blue-purple-grey; autumn: ripening and starving, ochre-orange-red-brown colours. 3. <i>Field</i>: winter: brownish, ploughed soil, ochre remains in catch crops; spring: light greens, different textures of crops; summer: little soil visible, lot of different colours and forms; autumn: variation in colours and forms of typical autumn crops as cabbages and root crops, light green of catch crop. 4. <i>Margins</i>: winter: ochre-green colours, short-smooth vegetation, golden reed in ditch side; spring: a range of light greens and spring flowers (yellow-white); summer: a range of greens and summer flowers (yellow-white-pink); autumn: seeds, colours change from green to ochre.

(Continued)

Table 3 (Continued)

Historical coherence 1. The <i>temporal continuity</i> of the landscape appearance is ‘repaired’ by giving the water an important role again in the landscape. The pattern of waterways is extended and refined, looking at the historical patterns and shows a hierarchy in canals and ditches with different scale, use (agricultural and recreational) and management. Little bridges replace the present culverts. 2. In the extension of villages and newly-built farm (buildings), a (new) regional building style is looked for, and a link with the historical structures (often linear) is made. 3. <i>Natural elements</i> can develop towards a species-rich vegetation and are mostly linked to elements of cultural-historical importance as dykes and waterways.	1. <i>Buildings</i> added to the farm fit in the existing situation by the choice of material, scale, colour, etc., and the addition of planting elements. 2. The <i>planting</i> planted after the land consolidation has developed towards a species rich vegetation by a proper management. During time, trees and shrubs are added, so a balance in age structure guarantees a sustainable planting structure. 3. <i>Natural vegetation</i> at the yard, along fields and in ditches has developed towards a soil covering vegetation. 4. <i>Elements of culture-historical importance</i> are maintained and are visible in the landscape, e.g., grave mound, old borders of little polders.
Course of the year Spring starts with green spots between the dead, ochre reed and grass in the ditches and the margins of ditches and roads. Vivid colours, like pink, yellow and orange, enlighten farm gardens, while trees start to show all different kinds of greens. Especially in this time, while fields are still mainly brown coloured, the colourful margins accentuate the historical pattern of watercourses. During May and June, the fields get their colours and forms, planting gets closed and spaces in the landscape become smaller and more diverse. The ripening period of July, August and September makes colours less vivid and more equal, whereas in autumn, new sprinkling colours arise in berries and tree leaves. Everything becomes more transparent again, the fields get empty and margins are mown and cleaned, but a pattern of reed vegetation will stay visible in the open, simplified winter image.	<i>Planting at farmyard:</i> Subtle, diverse changes from bare structures, with brownish-red colours in winter, to transparent forms with many green and orange tones in leaves and aspects of flowering. Then changing to closed, the green mass slowly becomes transparent again in autumn showing yellow–orange–red–brown tones in leaves and bearing fruits. <i>Gardens:</i> The main structure of the garden remains visible the whole year, having a resting period from December to March. In spring, diverse, short-time changes can be seen with vivid colours, slowly changing to subtler, long lasting changes of forms and clear colours in summer. In autumn, the colours become mat to be mainly ochre-brown when winter starts. <i>Fields:</i> After a long, quiet period from December to March/April, the rough structure of the brown earth changes makes place for fine textures and different colours of the young crops. Colours and forms increase in number and intensity during spring and summer and slowly or abruptly (depending on the way of harvesting) vanish in late summer and autumn. When there is no ploughing before winter, the brown earth is covered with ochre crop-remains. <i>Margins:</i> The structure of the margins is solid and steady, with a closed vegetation cover during the whole year. It contains spring flowering, is slowly getting luxuriant forms and summer flowers. After mowing and taking away the litter, autumn flowers have a chance to grow and the vegetation will go short and ochre through winter.

5.3. Seasonal coherence

The differences in expression of colours and forms related to the seasons in West-Friesland are very large. This varies from little expression on EAP-3 to a high degree of expression throughout the year on farm ORG-4 (Fig. 6).

The three organic farms (ORG-1, ORG-3, ORG-4) had a strong seasonal expression concerning the farmyard. This was moderate on farms ORG-2, EAP-1, and EAP-2, and there was little, or even no, ex-

pression on EAP-3 and EAP-4. On the fields, there was a clear difference between the organic farms and EAP-1, with a lot of colours and forms on one hand, and EAP-2, EAP-3 and EAP-4 on the other. All farms, except ORG-4 and EAP-1, had very little expression of seasons in their margins of fields and ditches.

In summary, the large-scale EAP farms had a weak seasonal coherence, the small-scale EAP farms and (ORG-2), a moderate, and the other three organic farms show a strong seasonal coherence.



Fig. 4. Landscape diversity at two farms in summer. (4a) A high diversity of different aspects, like planting, crops, vegetation, colours, forms and spaces (EAP-1). (4b) A low diversity of landscape aspects (EAP-4).

Table 4

Valuation of aspects of landscape diversity of the eight organic (ORG) and conventional (EAP) horticultural farms in West-Friesland. The valuation is given on a relative scale (XX, very much; X, much; 0, moderate; – little; —, very little diversity) and where possible in an absolute quantitative way between brackets

Parameters	Farms							
	ORG-1	ORG-2	ORG-3	ORG-4	EAP-1	EAP-2	EAP-3	EAP-4
Farm								
Biotopes ^a	X (4)	– (2)	XX (5)	XX (5)	0 (3)	0 (3)	0 (3)	— (1)
Percent nature ^b	0 (3.5)	— (0.6)	XX (10.3)	XX (7.4)	– (2.1)	– (2.3)	— (1.1)	— (1.0)
Colours/forms ^c	X	0	XX	X	0	–	–	—
Spatial layout	X	–	X	0	0	–	–	—
Fields								
No. of crops	XX (13)	X (8)	XX (100)	X (8)	– (3)	0 (3)	– (3)	– (2)
Crops per hectare	X (1.4)	X (1.5)	XX 40)	X (1.4)	– (0.4)	– (0.3)	— (0.2)	— (0.1)
Margins								
Plant species	–	–	–	XX	X	–	—	—
Farmyard								
Biotopes	X (4)	– (1)	X (4)	X (4)	0 (2)	0 (2)	0 (2)	— (0)
Percent nature	X (59)	– (16)	XX (78)	0 (32)	X (58)	XX (78)	0 (41)	— (0)
Types of planting ^d	XX (5)	– (2)	XX (6)	X (4)	0 (3)	– (2)	– (2)	— (0)
Types of land use ^e	XX (5)	– (2)	XX (5)	X (4)	0 (3)	0 (3)	0 (3)	— (1)

^a Natural biotopes at the farm like ditches, planting, field margins, orchard, etc.

^b Percentage of surface of the farm area covered by natural biotopes.

^c The variety of colours and forms (trees, flowers, crops, etc.) at the farm through the seasons.

^d Tree group, shrubs, broad hedge, low hedge, orchard, tree row, etc.

^e Buildings, garden, vegetable garden, orchard, planting.

5.4. Historical coherence

The differences in this aspect are determined by whether the farms had added elements during their existence, and if historical elements, which were al-

ready present, had been maintained. Some farms emphasised a certain period in history in their appearance, e.g., the year of land consolidation (EAP-2, EAP-4); the only difference is that trees have grown taller. At other farms, elements had been added: buildings in

Table 5

Valuation of the landscape coherence of the eight organic (ORG) and conventional (EAP) horticultural farms in West-Friesland. The valuation is given in a relative score (XX, very strong; X, strong; 0, moderate; –, weak; —, very weak) and indicates the contribution of the farm to the landscape quality of the region according to the reference image (Table 3)

Parameters	FFarms							
	ORG-1	ORG-2	ORG-3	ORG-4	EAP-1	EAP-2	EAP-3	EAP-4
Vertical coherence								
Land use	X	0	0	0	0	0	0	0
Vegetation	X	–	XX	X	0	–	–	—
Crops	X	X	X	X	0	0	–	–
Soil structure	X	X	X	X	0	0	0	0
Horizontal coherence								
Farm and region	0	0	–	X	0	0	0	0
Farm and surroundings	X	0	0	X	X	0	0	–
Yard and field	X	–	X	X	X	0	–	—
Seasonal coherence								
Yard planting	X	–	XX	X	0	0	–	—
Yard garden	X	0	XX	X	–	0	–	—
Fields	X	–	XX	X	X	0	0	0
Margins	–	–	–	X	0	–	–	–
Historical coherence								
Building	X	X	0	0	0	0	–	0
Planting	X	–	X	X	X	0	–	—
Vegetation	X	–	XX	XX	X	0	–	–
Historical elements	0	0	–	X	–	–	–	–
Course of year								
Yard planting	X	–	XX	X	0	0	–	—
Yard garden	XX	0	XX	0	–	0	–	—
Fields	XX	X	XX	XX	X	0	–	–
Margins	0	–	0	XX	X	0	–	–



Fig. 5. A very weak horizontal coherence between yard and field, because of the hard edge.

the case of ORG-2 and EAP-3, and buildings with planting in the case of farms ORG-1 and ORG-4. At other farms, mainly natural elements had been added (ORG-3, EAP-1).

Regarding the way new elements had been adapted to existing situations, on three EAP-farms (2, 3, and 4) few changes were found. If changes had taken place, they were added, rather than incorporated. On EAP-1, ORG-2 and ORG-3, elements like buildings and planting had been added or incorporated, or existing historical elements were being managed well. On ORG-1 and ORG-4, many elements had been added, incorporated, some natural elements had been developed and existing historical elements had been managed well.

In summary, there is a clear difference in the cultural historical coherence between two organic farms

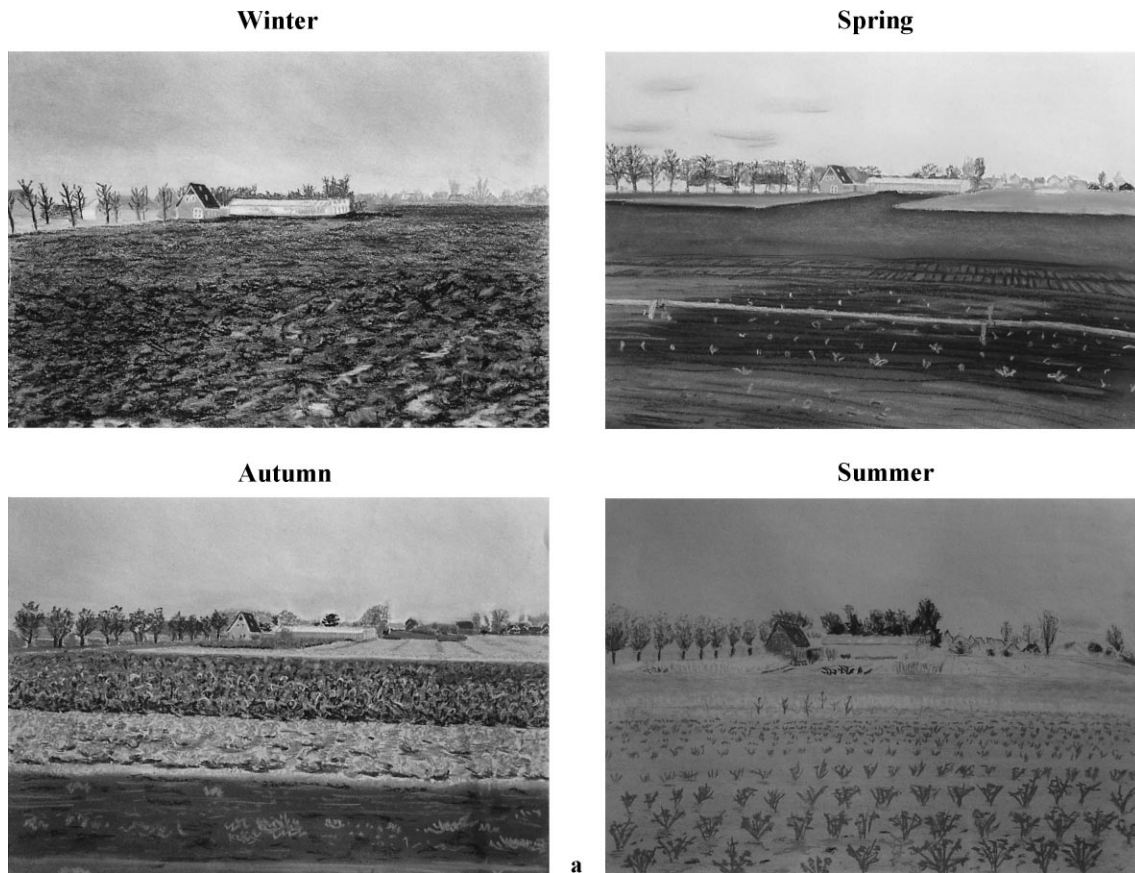


Fig. 6. Drawings of the four seasons showing the seasonal characteristics of two farms. (6a) ORG-1 has a high diversity of colours, forms and textures, and the spatial coherence between the farmyard and its surrounding changes from weak in winter to strong in summer. (6b) EAP-4 has a low diversity of colours, forms and textures and the spatial coherence between the farmyard and its surrounding is nil in all seasons.

(strong) and three conventional farms (nil). Two organic and one conventional farm had a moderate score.

5.5. The course of the year

The course of the year expresses itself differently in the different landscape components of the farms. The farmyards, with their planting and gardens of ORG-1, ORG-3 and ORG-4, clearly illustrated a strong course of the year. All other farms ranged from no to moderate expression of the course of the year in their farmyards. Regarding the fields, the organic farms and EAP-1 displayed a strong course of the year, the other EAP

farms, a weak course. In the field margins and sides of ditches, only EAP-1 and ORG-4 really displayed some course of the year (Fig. 7). The margins of the other farms did not show much change throughout the year.

The number and nature of changes are schematically illustrated in the phenology diagrams (Fig. 8). On three organic farms, the course of the year was an ongoing process of mainly subtle changes (ORG-1, ORG-3, ORG-4); on some farms, the process is sometimes continuous, sometimes abrupt, with small and big changes (ORG-2, EAP-1, EAP-2), and on two conventional farms, the process was abrupt, with a low frequency of changes (EAP-3, EAP-4).

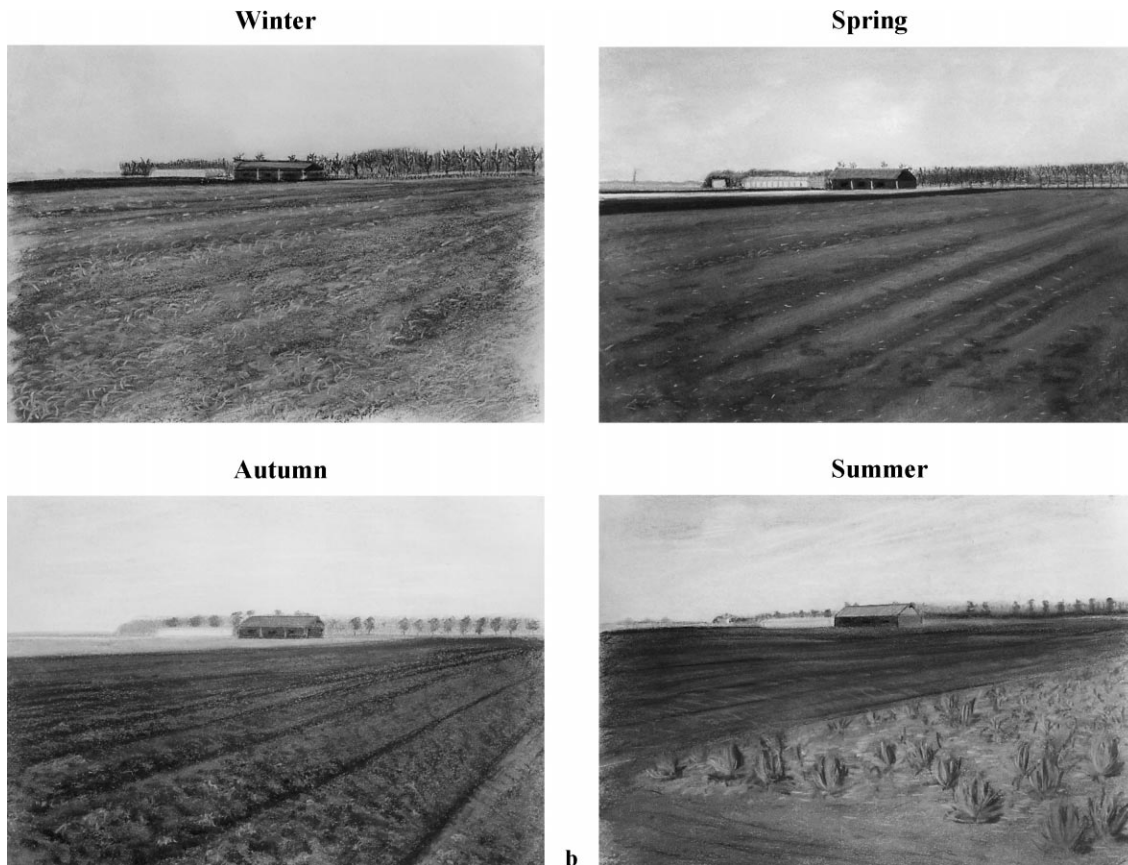


Fig. 6. (Continued)

6. Discussion

6.1. Discussion on the results

In our opinion, it is important that a farm expresses natural and cultural potentials of the region in which it is situated. By doing this, the farm has to embrace as much as possible the regional and local landscape structure to provide for orientation in space and time. The farms studied had very differing degrees of success in relation to this aspect.

Fig. 9 shows that the four subgroups, which were distinguished, cannot simply be related to two groups of farming systems, organic versus conventional. However, an explanation for the fact that three organic farms have a higher contribution to the landscape quality than conventional farms, can be found

partly in the guidelines for organic agriculture. For horticultural organic farms, a wide crop rotation is important. This results in fields that show a greater variety of crops, with more colours, forms and textures in the momentary time and in the course of the year, than on conventional farms. A higher landscape diversity caused by the crop rotation, is also what Redman (1992) mentions as one of the advantages of organic farming. Reitsma et al. (1998) did an observation study at several farms in West-Friesland. They concluded that organic farms offer more variation in experiences and observations; there is a greater variety of crops on the field, and landscape elements are managed with more sensitivity to requirements than the conventional farms. So, besides the effect of the guidelines, they found other qualities as well. Choosing for organic agriculture seems to imply that

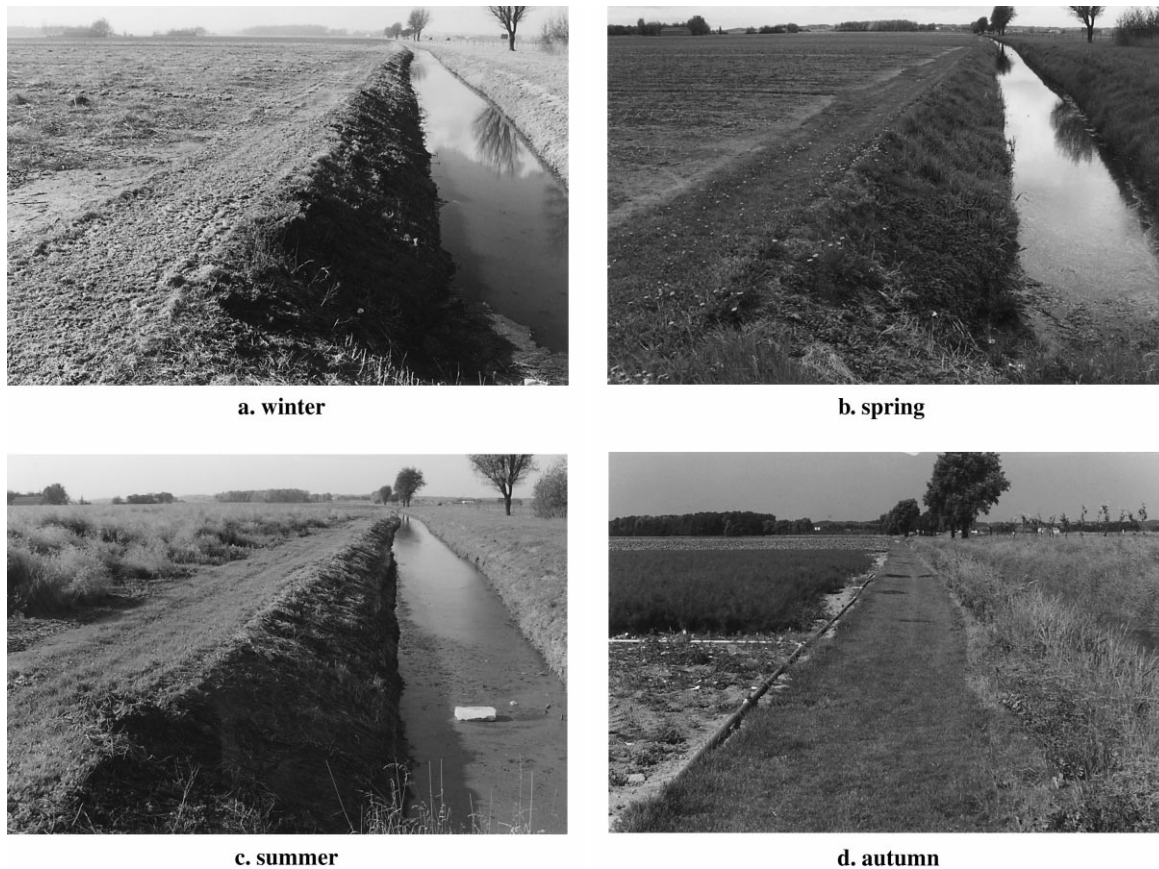


Fig. 7. Strong, temporal coherence in the course of the year at EAP-1. (7a) Short ochre vegetation in winter and crop remnants on the field. (7b) Short light-green grass vegetation with yellow dandelion in the field margin and field in preparation for the new crop. (7c) Mowed green grass in the field margin, a colourful, species-rich vegetation on the ditch side and crops developed in colour, form and texture. (7d) Mowed green-ochre vegetation and crops that show yellow-brown autumn colours.

not only food and environmental issues receive attention from the farmer, but also nature itself and landscape quality. This idea is confirmed by Entec (1995), reporting that farmers who adopt organic farming systems have a positive attitude towards their environment and, therefore, are more likely to apply land management practices that are beneficial to the environment, e.g., tree and woodland planting. This means that the mentality of the farmer is a crucial factor in farm appearance (see Fig. 1). The results of this research suggest that the chance of a higher landscape quality is greater with organic farmers, than with conventional farmers. However, our research shows that the opposite can also be found. Conventional farmers can have an active concern with their surroundings

(EAP-1), whereas an organic farmer converted for narrow reasons (e.g., no use of herbicides/pesticides), can easily fall behind in his contribution to landscape quality (ORG-2). This especially so if a conversion process from conventional to organic farming is done mainly for economic reasons.

6.2. Discussion on the criteria and the method

The *scheme* with the coherence factors (Table 1) at three time scales appears to be a useful instrument to cover the aesthetic dimension of the landscape more objectively. The criteria and parameters used here are an elaboration of the criteria 'expression of site' and

PHENOLOGY DIAGRAM ORG 1

a

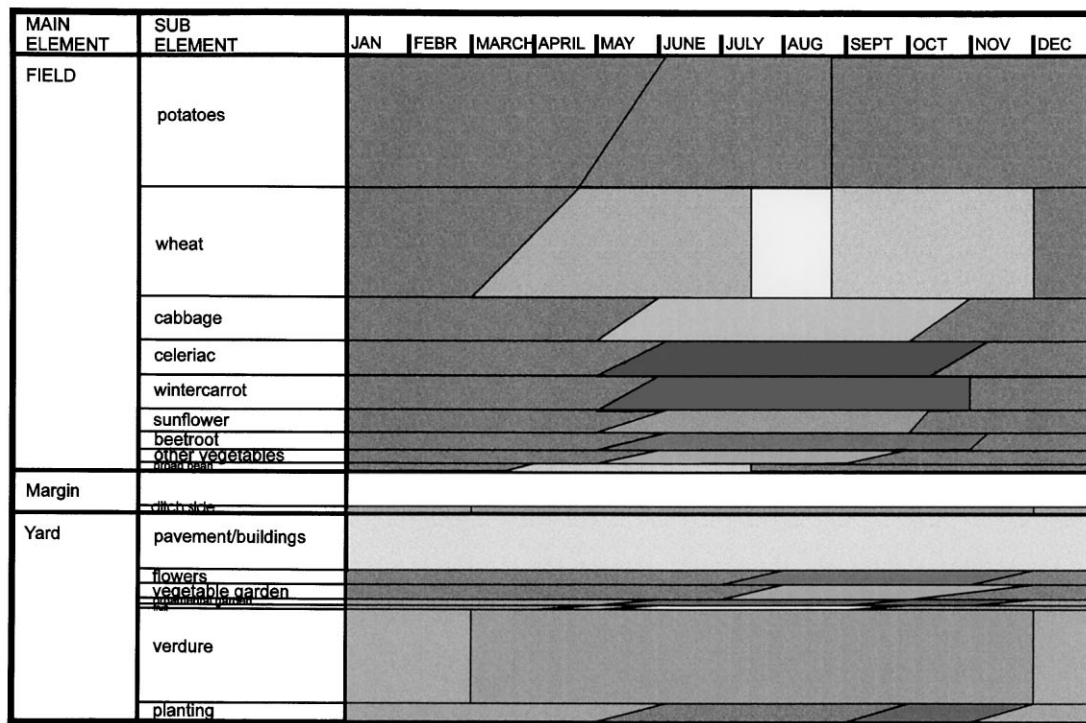


Fig. 8. Phenology diagrams show the temporal changes during the course of the year. (8a) This diagram illustrates the great variation in long lasting, small-scale changes in the landscape appearance of ORG-1. (8b) This diagram illustrates the small variation in abrupt, large-scale changes in the landscape appearance of EAP-4.

‘expression of time’, presented by Stobbelaar and Van Mansvelt (2000). The scheme with the coherence factors gives a framework for the implementation of those criteria.

The *four-season fieldwork* shows that farms can change very strongly during a year. A farm that has a high quality in summer does not necessarily have a high quality in winter. We consider it a crucial point for observation studies, that one gets a much richer and dynamic image of a farm, or a region, by observations during the four seasons. Still, the terminology used for describing the course of the year needs further elaboration.

A sound *methodological relationship between the farm level and the region level* is necessary for the assessment of landscape quality on farm level. The reference images used for valuation are an essential tool. This reference image could be even more effective if

it was the result of a discussion between both experts and land users in the region (Volker, 1997). On the other hand, the developed reference images can be a good start for such a regional platform discussion as well.

The *parameters* used to assess the levels of coherence are part of the method, but also the result of the research. They resulted from frequent study of a landscape at different scale levels. In another region, the parameters may have a different emphasis. The parameters for vertical coherence have been quite approximate. This is mainly due to the homogeneity of the abiotic circumstances. The extent of vertical relationships largely complies with the measure of diversity of natural elements, species and crops. This can be explained by the fact that the diversity meets the demands of vertical coherence. In other words, species and elements are suited to the soil and water qualities.

PHENOLOGY DIAGRAM EAP 4

b

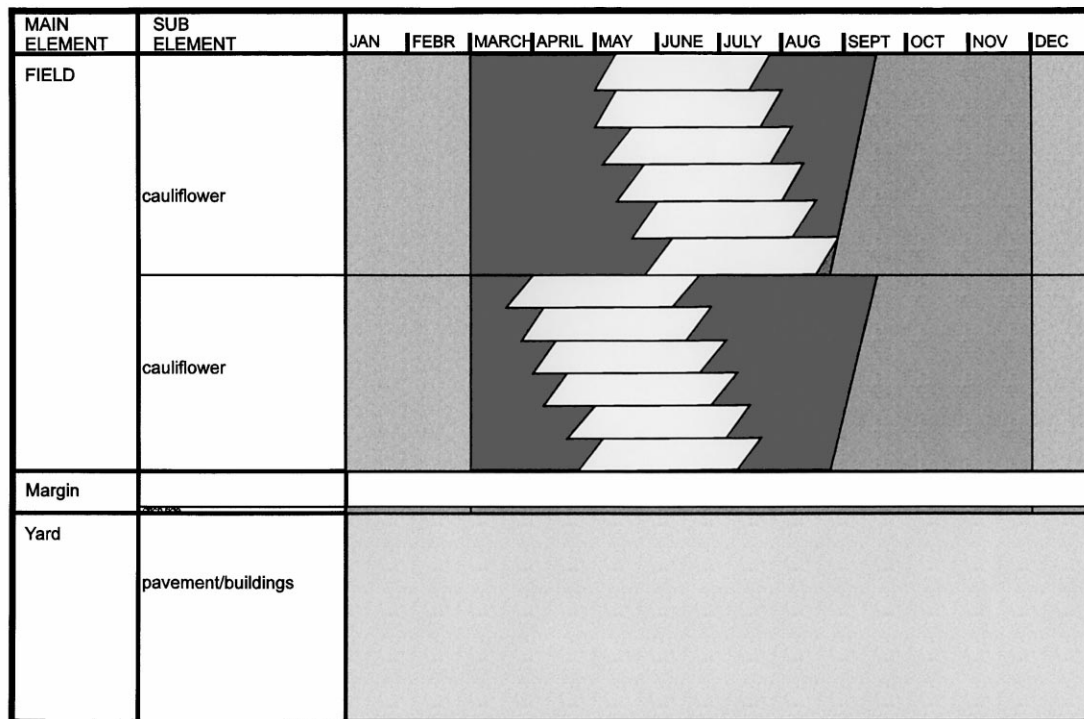


Fig. 8. (Continued)

The seasonal coherence in farm appearances also complies with the diversity of planting types, margins, plant species and crops. As long as these elements and species are vertically coherent, these aspects have a positive correlation. The high variation results in many small changes in colours, forms and textures during the year and so in a strong 'course of the year'. When variation in natural elements is lacking, or is small (all other farms), the 'course of the year' is also weak. So, there also seems to be a positive correlation between vertically coherent variation and the course of the year. Does this mean that we have to look only for the vertically coherent diversity to come to a conclusion on vertical, horizontal, seasonal coherence and the 'course of the year'? This seems to be possible for the extremes (subgroups I and IV), but not for the farms that are in between the extremes. Especially between the vertical and horizontal coherence, the relation is more complicated. By using this method in other regions of the Netherlands

(Waterland and Drenthe), it will be possible to explore further the relationships between the criteria and the eventual differences between organic and conventional farms.

7. Conclusions

At first sight, the differences in the appearances of the eight horticultural farms were not very large. For instance, the differences in scale were not so obvious that they could be seen directly. On taking a closer look, there certainly were big differences, as one can see in the figures indicated. According to the valuation of the appearances of the eight farms, four subgroups differing in their contribution to the landscape quality of the region can be distinguished (Fig. 9). The four subgroups cannot simply be related to the difference between organic and conventional farming systems, but, nevertheless, it is clear

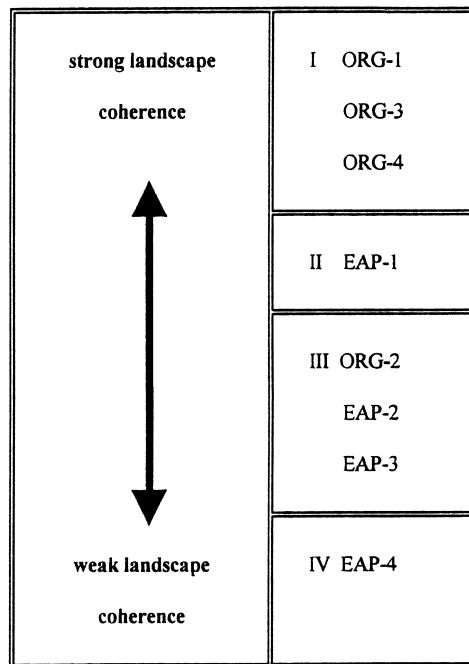


Fig. 9. Contribution of the farms to the landscape quality of the region.

that in subgroup I, only organic farms are represented. At these farms, all types of coherence come to expression often quite strongly. There is a high diversity on the farm, in elements, species, crops, colours, etc., and everything has its place in a coherent spatial and temporal network. Subgroup IV contained a conventional farm that displayed a very low score on all criteria. The farm had a monotonous appearance, with one crop on large parcels and very little space for natural elements. In between these extremes, there are two groups, in which there is no clear distinction between organic and conventional. In subgroup II, a conventional farm displayed moderate expression of all types of coherence. There is quite some diversity in elements and in colours during the year. Subgroup III is a mixture of very different farms, with different scores (from weak to strong) on the different types of coherence. The organic farms have many different crops with their specific colours and forms during the seasons, but there is little space for natural elements between the fields or in the yard. Farms EAP-2 and EAP-3 can both be seen as an average horticultural farm in this region: few crops,

some ditches with common vegetation and a yard with a simple layout where little has been added over time.

8. Recommendations

Because of their environment friendly farm management, organic farms have a great potential to contribute to landscape quality (Van Mansvelt and Mulder, 1993). That this contribution does not come spontaneously, is shown in our sample of farms. The attitude of the farmer is all important, and although this attitude is anticipated in the preface of the standards for organic farming, it is not included in the standards themselves. In the authors' opinion, a clear 'farm nature and landscape plan' is an indispensable requisite in aiding the conversion to an organic farm that would be an example of environment friendly farming in the broadest sense. It offers the farmer the possibility to approach his farm in the context of a natural and cultural environment, which can lead to a better image and a higher valuation from his social environment (Stobbelaar et al., 1998). Of course, a nature and landscape plan is not a tool for organic farmers only. The more the conventional farmers become conscious of their living surroundings, the greater the possibilities for a sustainable agricultural landscape.

This research shows that some elements or patterns on a farm can score on all types of coherence. We do not think this is a disadvantage. On the contrary, it demonstrates that with simple means, a landscape can be improved. For example, planting an elderberry on the edge of a parcel, results in indentation of space (horizontal coherence), blossom and berries (seasonal coherence) and biodiversity related to the soil type (vertical coherence).

Besides landscape plans for individual farms, a landscape plan for the region as a whole, with participation of all stakeholders would be useful. It is important that the non-farming inhabitants of the region become conscious of the (potential) qualities of their region as well. They are needed to support the process of landscape improvement, in practical, social and/or financial ways. The reference images we constructed for this study could be a start for discussion on such a landscape plan.

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References

- Bockemühl, J., 1986. *Dying Forest — A Crisis in Consciousness*. Hawthorn Press, UK, p. 96.
- Bockemühl, J., 1997. Aspekte der Selbsterfahrung im phänomenologischen Zugang zur Natur der Pflanzen, Gesteine, Tiere, und der Landschaft. In: G. Böhme und G. Schnieman (Hrsg.), *Phänomenologie der Natur*. Suhrkamp, Frankfurt am Main.
- Colquhoun, M., 1997. An exploration into the use of Goethean science as a methodology for landscape assessment: the Pishwanton Project. *Agric. Ecosyst. Environ.* 63, 145–157.
- Entec, 1995. Effects of organic farming on the landscape. A report to the Countryside Commission. Warwick, England, p. 43.
- Giorgis, S., 1995. Rural Landscapes in Europe: Principles for Creation and Management. Council of Europe, Steering Committee for the Conservation and Management of the Environment and Natural Habitats. Planning and Management Series No. 3, Strasbourg, p. 72.
- Hendriks, K., Stobbelaar, D.J., Van Mansvelt, J.D., 1999. De verschijning van de landbouw. Onderzoek naar de landschapskwaliteit van biologische en gangbare tuinbouwbedrijven in West-Friesland. Biological Farming Systems Group, Agricultural University Wageningen, p. 120.
- Kaplan, R., Kaplan, S., Brown, T., 1989. Environmental preference: a comparison of four domains of predictors. *Environ. Behav.* 5, 509–530.
- Kerkstra, K., Vrijlandt, P., 1976. *Mergelland — landschap en mergelwinning*. Vakgroep landschapsarchitectuur, Landbouwhogeschool Wageningen, 3 vols.
- Kuiper, J., 2000. A checklist approach to evaluate the contribution of organic farms to landscape quality. *Agric. Ecosyst. Environ.* 77, 143–156.
- Lemaire, T., 1970. *Filosofie van het landschap*. AMBO Bilthoven, p. 223.
- Ministerie van Landbouw, Natuurbeheer en Visserij, 1992. *Nota Landschap, Regeringsbeslissing Visie Landschap*. SDU, Den Haag, p. 61.
- Pedroli, B., 1989. The nature of landscape. A contribution to landscape ecology and ecohydrology with examples from the Strijper Aa landscape, Eastern Brabant, The Netherlands, Ph.D. Thesis, University of Amsterdam, p. 156.
- Redman, M. (Ed.), 1992. *Organic farming and the countryside. A special report from British Organic Farmers in conjunction with the Soil Association*. Organic Food and Farming Centre, Bristol, England, p. 104.
- Reitsma, T., Hendriks, K., Stobbelaar, D.J., 1998. Landbouwbedrijven in het landschap. De ruimtelijke wisselwerking tussen landbouwbedrijf en landschap nader bekeken. *Landinrichting* jaargang 38 (1), 27–34.
- RIVM, IKC-N, IBN-DLO, SC-DLO, 1997. *Natuurverkenning 97*. Samson H.D. Tjeenk Willink bv, Alphen aan den Rijn, p. 183.
- SNH, 1993. *Sustainable development and the natural heritage. The SNH approach*. Scottish Natural Heritage, Battleby, Scotland, p. 26.
- Stobbelaar, D.J., Hendriks, K., Van Elsen, T. 1998. Improvement of landscape and nature values in organic agriculture. *Ecology and Farming* 4, 30.
- Stobbelaar, D.J., Van Mansvelt, J.D., 2000. The process of landscape evaluation. Introduction to 2nd special AGEE issue of the EU-concerted action: the landscape and nature production capacity of organic/sustainable types of agriculture. *Agric. Ecosyst. Environ.* 77, 1–15.
- Van Haperen, H., Van Herpen, T., 1997. *Belevingswaarden van biologische en gangbare tuinbouwbedrijven in West-Friesland*. Louis Bolk Instituut, Driebergen, p. 52.
- Van Mansvelt, J.D., Mulder, J.A., 1993. European features for sustainable development: a contribution to the dialogue. *Landscape and Urban Planning* 27, 67–90.
- Van Zoest, J.G.A., 1994. *Uitwerking van de kwaliteitscriteria in de Nota Landschap*. Staring Centrum (SC-DLO), Wageningen. *Onderzoeksrreek* Nota Landschap nr. 1, rapport 349, 334 p.
- Volker, K., 1997. Local commitment for sustainable rural landscape development. In: Van Mansvelt, J.D., Stobbelaar, D.J. (Eds.), *Landscape values in agriculture: strategies for the improvement of sustainable production*. Special issue, *Agric. Ecosyst. Environ.* 63, 107–120.
- Yin, R.K., 1994. Case study research: design and methods. *Applied Social Research Methods Series*; vol. 5, p. 171.