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Introduction

- 1 At present, there is a heated debate about the future of agriculture and the rural landscape in the Netherlands. This country is certainly not the only one. Many other European countries, are involved in similar kinds of conflicts between governments on the one hand and farmers, with the support of agribusiness behind them, on the other hand. Concerns about the decrease of biodiversity in the agricultural landscape and wider concerns about emissions of nitrogen and greenhouse gases in the context of climate change are high on the political agenda of many governments. Due to the high population pressure, the scale of highly intensive animal husbandry and agriculture and the limited size of areas set aside for nature conservation in the country, the conflict may be more severe in the Netherlands than in a number of other countries.
- 2 Groups of Dutch farmers fear that they have to reduce their livestock as a result of the political decision to substantially reduce the emission of nitrogen. The poor state of the country’s biodiversity is the cause behind this political decision. Activist farmers’ organizations like Farmers Defence Force and Agractie are reacting strongly against the intention of the government. They use their powerful tractors to block highways and demonstrate in sometimes intimidating ways. The reverse Dutch flag (blue, white and red instead of red, white and blue) is the widely used symbol of their protest and many people support their actions. Numerous large banners and billboards with clear language along highways and country roads, express their concerns for what is called the ‘battle for the countryside’. Some billboards or banners are made locally, other are issued by a farmers’ organization. They carry texts like: ‘No farmers, no food’, ‘Our farmers, our landscape’ and ‘Manure smells, politics stinks’. More than ever before has

the future of agriculture and farmers, and thereby also the future of the country side, become such a hot political issue, of which the outcome is still uncertain.

Figure 1: Locally produced banners and billboards of farmers protesting against the government



Top, from left to right: Mest ruikt, politiek stinkt (Manure smells, politics stinks); Aannames in beleid. Heel Nederland spijt (Assumptions in policies, all of the Netherlands will regret); Opa was boer, Pa en Ma waren boer, wij zijn boer, onze kinderen???, en u eten? (Granddad was farmer, Dad and mum were farmers, we are farmers, and our children??? And your food?)
 Bottom, from left to right: Banners issued by Agractie: No farmers, no food (note the reverse Dutch flag); Onze boeren, ons landschap (Our farmers, our landscape), and Onze boeren, onze toekomst (Our farmers, our future); Wie zijn boeren niet waardeert, heeft van de geschiedenis niets geleerd (The one who does not appreciate his farmers, has learned nothing from history).

- 3 During the last national election for the Dutch parliament, in March 2021, the “future of agriculture” became a dividing issue among the country’s political parties. The ecological impact of the highly productive agricultural sector was discussed in terms of the large emission of nitrogen through its excessive production of manure, and the negative impact of the sector on the biodiversity through the increased intensity of the bio-industry. Some political parties are in favour of a 50% reduction of the population of cows, pigs and chickens. Farming families fear that they will not be able to pass on their farms to the next generation. A re-structuring of the rural landscape is considered necessary in which biodiversity and natural ecological processes will be restored in a country that is to a large extent dominated by completely ‘man-made’ landscapes. The heated political debates both in parliament as well as in the media, clearly show that the old idea that the countryside is the exclusive domain of farmers is no longer accepted. Other parts of society also claim a say in the way the environment is used and what kinds of values should be promoted instead of its sheer productive capacities in terms of meat, milk, cheese, and eggs.
- 4 In recent years the call to preserve some elements of the cultural heritage in the polders in the Netherlands has also become stronger in reaction to the increasingly large scale bio-industry in the country. While the number of farmers keeps on decreasing, the farms that remain become bigger in size with larger number of cows, pigs and chickens and mechanization of all relevant processes. The meadows become more monotonous as there is only one type of grass that is dominant, the so-called English ray grass (*Lolium perenne*). The result of this development is that the historical variety of the vegetation in the polders, with various types of grasses, wild flowers and herbs is decreasing. This also has a big impact on the wildlife in the polder as the number and variety of insects on which various species of birds are foraging, are

decreasing. Some species however, like geese and swans, do very well in these grasslands but they are a nuisance or even a 'pest' for the farmers as their manure reduces the amount of grass available for the cows.

- 5 One landscape element that used to be quite characteristic for the polder landscape was formed by small and scattered forest islands. The small plots of forests were used in the past for a number of purposes. However with the modernization of agriculture, strongly supported by national and European politics, the increased use of heavy tractors and the increased monoculture of the land, these forest islands have lost their direct economic functions and for that reason many of them have been removed. The trees on them were cut and uprooted, the ditches surrounding them were filled with soil and the land was converted into grassland, feeding the highly productive dairy cows. It is estimated that less than 20% of the original forest patches remain at present.
- 6 In this article I want to discuss the history and value of these small forest patches in the polder landscape, their origin, their functions and the reasons why so many of them have disappeared. However, in recent years the economic and rational efficiency of land use in the Dutch polders is no longer the only factor that is taking into account in the way the landscape is managed. For that reason, not only farmers and their facilitating and supporting institutions, like the banks and the agri-business industries, can decide on how the landscape and its resources are being managed. Increasingly nature conservation agencies, communities of landscape volunteers, non-farming residents in rural villages and consumer organizations, claim to have a say in how the landscape should be managed. In addition, national and provincial authorities, including the important water boards can exercise influence on particular issues, like the level of the water table. In this way the present-day landscape management is no longer based solely based on the knowledge, practices and priorities of the farmers as the main direct users of the landscape. The values and perspectives of other societal groups are competing with those of the farming sector.
- 7 This article is based on the available literature and field research on the history of the polder landscape with a focus on the small forest patches, in what is called the Green Heart of Holland, that is the so-called "peat meadow area" (*veenweidegebied*) between Amsterdam, The Hague, Rotterdam and Utrecht. In addition to the literature study, field observations and interviews with a number farmers and volunteers of landscape organizations were made over the past two years in a number of villages in the neighbourhood of Leiden and Alphen aan den Rijn (Hazerswoude, Zoeterwoude, Aarlanderveen, and Bodegraven). In addition field observations were made in a much larger area in the Green Heart.
- 8 In 1984, a booklet was published on these woody patches but surprisingly little has been published on this topic in the scientific literature since then (Teeuwisse 1984). However in local historical newsletters, one can find interesting references to these forest patches as part of the agricultural traditions. All of these publications are written in Dutch. In spite of the limited amount of attention in the scientific literature, the forest patches are increasingly being mentioned as valuable historical landscape elements, worth of protection both for the role they play in the biodiversity in the polder landscape as well as for their cultural historical reasons.

The Dutch polders

- 9 In the course of history, the efforts to make the swampy areas that were formed in the delta of the meandering rivers of the Rhine and Maas, transporting water from Switzerland, Germany, France and Belgium to the 'low lying country' productive, the land needed to be drained. In order to do so, polders were created by building dykes around a piece of land, digging ditches and discharging the surplus water out of the polder. This process was started in the 13th century. The invention and the use of windmills in the 15th century was a very efficient way to get the water out. The peat swamp vegetation was cut and gradually the fertile peat soils became available for agriculture and dairy farming in particular. In other cases, even shallow lakes were completely drained and the land was reclaimed for agriculture. For the cultivation of crops like wheat and potatoes the land was still too wet. Most villages were established on the elevated dykes surrounding the polders. Historians of the Dutch landscape usually indicate that the first polders were made in the province of North Holland (Lambert 1985, Van der Ham 2009). Over the years, almost 10% of the land area consists of this kind of polders. Initially, these polders were quite small because of the limitations of the available technology but in the course of history the size of the polders could be increased. In particular the polders of the former Zuiderzee, constructed in the 20th century, are very large compared to earlier ones. Windmills were replaced by diesel engines, which in turn would be replaced by powerful electro engines (Vossestein 2012, Van der Woud 2020).
- 10 The draining of the land was not only motivated by the future use for agriculture, the peat soil could also be used as fuel after it was dried. Much of the thick layers of peat, called "turf" after it was dried, has been used as the major source of energy for the early phases of industrialization in the Netherlands. It has also been used for the heating of the houses of the expanding cities. As a result of the draining of the swamps, and the digging as well as the oxidation of the dried peat, the land started to subside. This long term process continues until the present day which makes it necessary to pump out the water from the land lying below sea level. It also made it more and more difficult to use the land for anything else than pasture land, used for grazing cows. The water table was simply too high to allow for the cultivation of other crops like wheat, corn or potatoes. That is way the central part of the Netherlands, is still a large "peat meadow area".

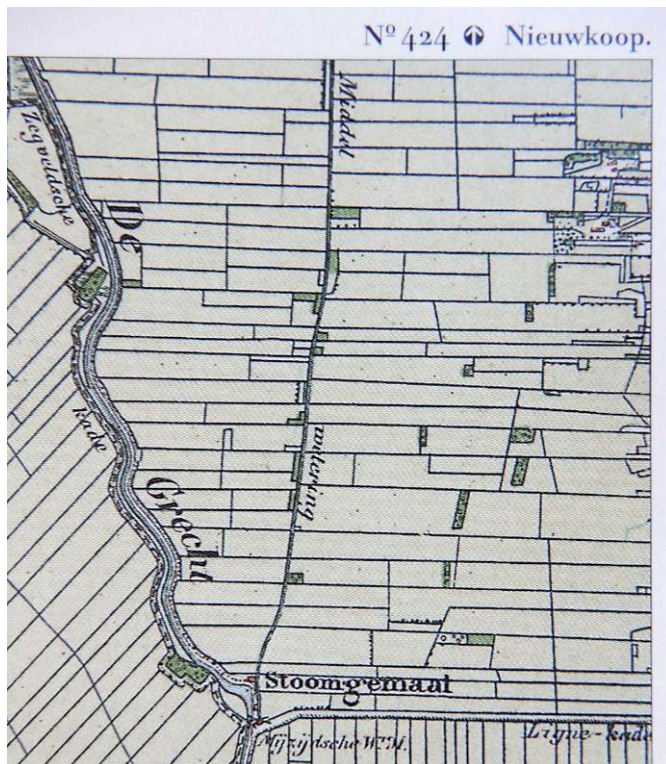
A bird's eye view

- 11 In contrast with forest patches in tropical areas, forest patches in the polder landscape in the Netherlands are not the remnants of the original forests (compare for instance Schelhas and Greenberg 1996, Laurance and Bierregaard 1997, Wiersum 1999, and Snelder and Persoon 2008). It is general acknowledged that the Netherlands has no remnants of the original "wild forests" any more. The last piece of such forest was cut in the second half of the 19th century (Freriks 2010, Van der Woud 2020). It was only at the end of the 19th century that the government established the national forestry service and that the first steps were taken towards reforestation because in many parts of the country the decline of forest had become a serious problem (Staatsbosbeheer 1946; Buis and Verkaik 1999). In other words, all present forests and even forest

patches in the country have been planted. Or to put it more dramatically, as one author on the history of forest in the Netherlands has stated: "There is a thought behind every tree in the country." (Buis 1993).

- 12 In a bird eye's view overlooking the polders in the Green Heart, it is common to see long lines of trees along the country roads, or along the dykes that separate polders from each other (Van der Ploeg 1999). Trees are also found around the farm houses where they are used to break the wind or for more decorative purposes such as the rigidly pruned linden trees in front of old farm houses. Trees are absent in the meadows where cows are grazing. Here and there one can find small orchards of fruit trees and on the outside rows, trees are used as a fence against the wind. But scattered in the landscape one can also find small forest islands. They are surrounded by ditches so that the cows or sheep cannot even get close in order to find protection against the wind, rain or sun. Some are located close to the farms, while other patches can be found in the middle of the long but narrow strips of land or at the far end of them, on the banks of the waterways that are used to drain the surplus water from the polders. The forest patches are all relatively small in size.

Figure 2: Fragment of pasture area near Nieuwkoop with forest patches (1887)



Source : Brendel C. et al. 2008

Figure 3: A ‘pest forest’ near Hazerswoude in spring, summer autumn and winter



- 13 Comparing the present aerial view of the present distribution of the woody patches with what historical detailed topographical maps of the Green Heart show, it is evident that many of the forest patches have disappeared as if they have been ‘swallowed’ by the surrounding pastures. But in almost all cases it is possible to find the patches that exist today on the historical maps. In other words, many of the presently existing patches have quite a long history. A rich source for this comparison is the series of provincial ‘Historical Topographic Atlases’ with information collected during the last decades of the 19th century or the first decade of the 20th century (Brendel *et al.* 2008). With a scale of 1:25,000 and an extensive legend, it is possible to identify all kinds of landscape details. Older maps confirm a similar pattern although they show a great deal of congruence in terms of forest patches.
- 14 Based on various inventories the present number of forest patches in the Green Heart is estimated at about 1,000 (Jansen and Van Benthem 2005; pers. communication Teeuwisse). They are not evenly distributed. In some areas there are quite a number of them while in others they are relatively rare. These differences can usually be ascribed to the history of the area and in particular to the scope of the various interventions that have taken place in the landscape in terms of construction of new infrastructure, and the re-allotment of the farmland. In this context hundreds of these forest islands have been cut and uprooted, and their surrounding ditches have been filled up.

“Pest forests”, “cow bends” and “utility forests”

- 15 There is quite a variation of terms that is used to refer to these woody patches even though they look quite similar in terms of size and vegetation. In a general sense they are sometimes referred to as “polder forest patches” or *polderbosjes*. But beyond this general name one can find a variety of other names in the literature and in local archives: they are referred to as *pestbosjes*, *krengbosjes*, *miltvuurbosjes*, *hakhoutbosjes*,

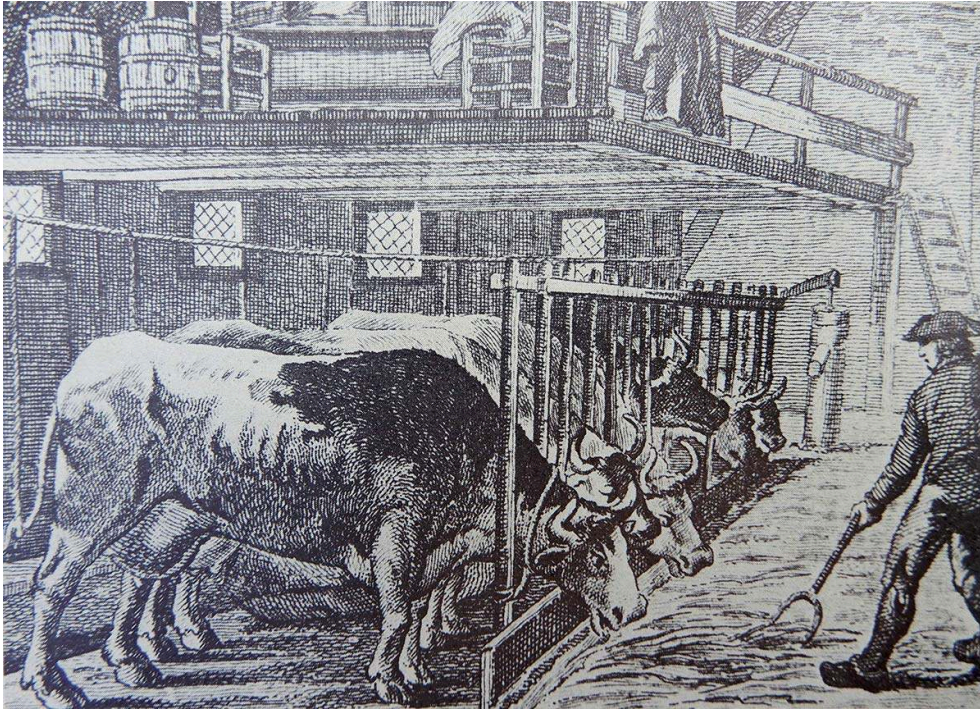
koebochten, *koeienbosjes*, *geriefhoutbosjes* or *boerengeriefhoutbosjes*, and *melkbosjes* or *melkbochten*. These names and their literal meaning refer to the various types of functions and uses that will be discussed in greater detail below.

- 16 The fact that they look almost identical is based on a number of characteristics. In the first place all woody patches are “islands”, as they are surrounded by water. Ditches have been dug around them to prevent cattle from entering these woody patches. The size of the patches is quite small, and varies between 100 and 600 square meters with a few exceptional cases that may be larger (Van Gent 2017).
- 17 The typical vegetation of the patches is formed by the following tree species: willows, alders, maples, ashes, trees that have been intentionally planted. In addition, numerous species of scrubs and herbs grow in these forest patches.
- 18 The old, and capriciously looking stubs on the outer edge are indicative for the age of the woody patches. Regular pruning of the newly formed branches prevents the trees from growing very tall. Tall trees growing on the soft peat soil could also easily be blown by the strong winds. The roots of the old stubs are also important for reinforcing the banks of the little islands, and protect them against eroding.
- 19 With regard to their original functions it is possible to differentiate three types of forest patches in the polder landscape: 1. “Utility forests” used for harvesting timber and fuel wood; 2. “Pest forests”, used for burying dead animals; and finally 3. “Cow bends” or “milk forests”, used as wind breaks while milking the cows.

Utility forests or coppice

- 20 In terms of numbers there can be no doubt that most of the woody patches have primarily been used by the farmers as a source of fuel wood, or for timber for a wide range of practical purposes in the daily operations on the farm. Most likely these kinds of forest patches are also the oldest ones. The so-called “farmers’ utility forests” or coppice (*boerengeriefhoutbosjes* or *hakhoutbosjes*) were little forest patches planted with trees and other plants that were of direct use for the farmers. The most popular trees were pollard willow, alder, poplar, and ash and to a lesser extent also birch and maple and oak (Goutbeek 2015). The various types of trees all had their specific usefulness. In addition to the large amount of fuel wood that was needed in the farmhouse but also for heating the water for making cheese, strong poles were needed in the stables to keep the cows in their fixed position during the winter period. These poles were called “cow poles” or *koestaken*. The preparation of these poles, usually made of ash-trees took quite some time. After cutting the branches, they were put in the water for an extended period. Then they were peeled and left to dry. This process made them strong, durable and smooth so that the cows could not injure themselves (Teeuwisse 1984). It is interesting to see how much attention is paid to these cow poles in an ancient book about agricultural practices in this area (Le Francq van Berkhey 1811).

Figure 4: Cows in between cow poles



- 21 Various kinds of fences and all kinds of farming tools like brooms and hay forks could be made of wood from these forest patches. Branches of alder trees were used to fertilize the land and the home gardens. The most important tree in these forest patches however was the pollard willow. The flexible and strong twigs of this tree could be used for thatching the reed on the roof of the farmhouses and stables. Larger branches were used for reinforcing the soft banks of peat meadows, to avoid erosion of the banks. The willow wood was also used for making wooden shoes. The bark of oak trees was used in the processing of leather products (De Rijk 1990).

Figure 5: Willow branches for reinforcing the soft banks of a forest patch



- 22 These woody patches were not cut or pruned every year. Depending of the type of timber or wood that was needed, a farmer could allow trees to grow for a number of years. Most of the work was usually done in winter time when the trees had dropped their leaves and ditches were frozen so that working on the trees on the outer edge of the forest patch was relatively easy. Twigs were tied into faggots (Jansen and Kuiper 2001, Kinds 2002, Van Gent 2017).

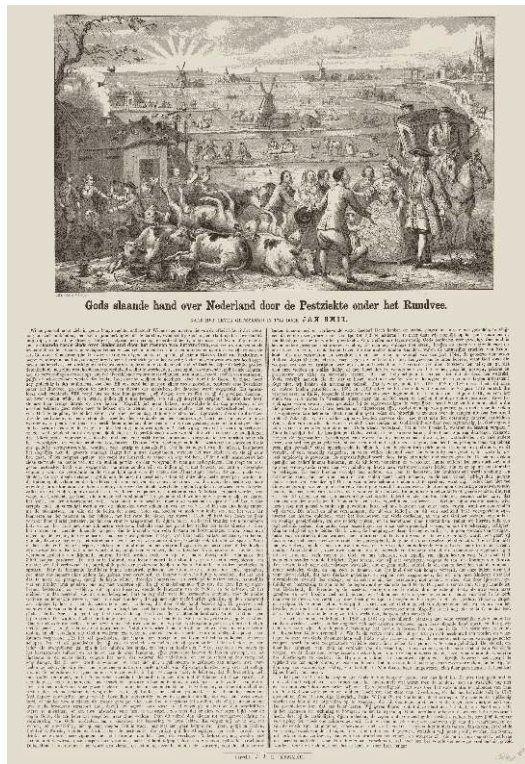
Pest forests, anthrax forests or carrion forests

- 23 A second important function of some forest patches was to bury animals that had died because of a disease and particular if it was a contagious disease such as cow pest, anthrax, foot and mouth disease and tuberculosis. That is why these forest patches are called “pest forests” (*pestbosjes*), “carrion forests” (*krengbosjes*) or “anthrax forests” (*miltvuurbosjes*). Little is known about this use from the early dates of the polders but during the 18th century cattle plague became a massive problem, not only in the Netherlands but across Europe. Outbreaks of cow pest have been reported in the years 1713-1719, 1741-1756, 1768-1786, 1799, and 1814 (Moers 2019). In local histories across the country, one can find numerous references to these dramatic events which ruined the livelihoods of many farmers (Bosman 1979; Van Gent 2017; Twerda n.d.; Van der Vaart 1997; Van der Wal n.d.). Often the disaster was interpreted in religious terms as God’s punishment for human sins (De Vries 2016). But at the same time, measures were taken to prevent further spreading of the disease. Farmers were forced to bury their animals a few feet deep after covering them under a layer of quicklime. Contact with other animals should be avoided at all times. So specifically for this purpose, little forest patches were established as “islands” in the polder. It was strictly forbidden to

use any part of the animal (meat or skin). Severe penalties were imposed on anybody who tried to avoid these sanitary restrictions.

- 24 In the text attached to a pamphlet, titled "Gods Beating Hand over the Netherlands by the Pest Disease of the Cattle" (*Gods slaande hand over Nederland door de Pestziekte onder het Rundvee*) designed by Jan Smit and issued by the States of Holland and West-Friesland in 1744, the government forced the farmers to bury all infected and dead cows on the farm in an isolated spot. And the farmers were strictly forbidden to use the meat, skin or any other part of the sick and dead animals. The pest was thought to be punishment by God for immoral behavior of the farmers. The farmers were unsuccessful in their request to the landlords to get reduction of the rents. The pest would return on a later scale in 1769 and 1770 when again tens of thousands of cows died because of the disease, killing more than half of the total herd. Both in the historical archives of Holland as well as those of Friesland there are numerous references to this function of the "pest forests" (*pestbosjes*) (see for instance Van der Vaart 1997; Van Gent 2017; Moers 2019).
- 25 When in the second half of the 19th century the cattle plague broke out again, the pamphlet of 1744 was reprinted as an effective way to spread the message of the risks if farmers would still try to use any part of the infected animals. In the official message from the government on 8 June 1867 it was stated that the animals that had died as a result of cattle plague, had to be buried in a pit of at least 1.5 meter deep, after their skin was torn to make it useless. Petroleum had to be poured over bodies and they had to be covered by a layer of quicklime. The site had to be effectively isolated so that other animals could never reach that spot. This implied the creation of small island forest patch surrounded by a ditch that was wide and deep enough so that healthy animals could not reach it (Van Gent 2017).

Figure 6: Pamphlet titled "Gods Beating Hand over the Netherlands by the Pest Disease of the Cattle" (*Gods slaande hand over Nederland door de Pestziekte onder het Rundvee*) published in 1744 and again in the 19th century with a somewhat modified text



- 26 The serious effects of the outbreaks of the cattle plague and other diseases have been a major factor in the development of veterinary care and the search for medicine (Berns 1983). An early form of medicine against cow pest is considered to be developed by a farmer from Groningen, Geert Reinders (1737-1815), who had noticed that cows that had survived the cow pest, produced calves that were immune against the disease. So, he discovered a phenomenon that later became known as (passive) maternal immunity, and that was further developed in effective vaccination against this disease (De Vries 2016).
- 27 Due to the major improvements in veterinary medicines and care in the 20th century, some diseases did not occur anymore at the same scale as in the past. At the same time, the farmers were no longer responsible for burying their dead animals on their own farm land. In the beginning of the 20th century legal measures were taken to collect and destroy seriously ill and dead farm animals. A specially assigned company was put in charge. So by that time, by definition all 'pest forests' lost their original function. In the literature sometimes doubt is expressed whether or not the concept of "pest forests" is used too often for forest patches, and also for forest patches that were not used for that particular function. Only clear evidence from soil research could confirm whether or not a particular forest patch was actually a "pest forest" (Teeuwisse 1984, Van Dort et al. 2003). But there can be no doubt, based on accounts from local history and archives, that (some) "pest forests" did indeed fulfil that function (Jansen and Van Benthem 2005, Zijlstra et al. 2012). It also seems logical that forest patches at the far end of a meadow, at a longest distance from the farm, were most likely "pest forests".

Cow bends or milk patches

28 As a result of the way the polders were designed in terms of water management with numerous ditches along long but narrow stretches of meadows and because of the prevailing inheritance patterns which led to increasing fragmentation of the meadows, it was impossible for farmers to take their cows to their farms twice a day to be milked. Many farmers had a number of small and often dispersed meadows on which not more than a few cows could graze. So, the farmers had to go to their cows in the meadows to milk them. Special forest patches were created as wind breaks in the open landscape for milking the cows which was still a very labour-intensive process. Sometimes these patches were fenced to keep the cows together during the night. This also made it easier to collect the dung later or to manure the fields where some crops were grown. These patches, often in a L-shape, are called “cow patches” (*koebosjes*), “cows bends” (*koebochten*), or “milk patches” (*melkbosjes*) or “milk bends” (*melkbochten*) (Busz and Hine 2001). After milking the cows, the milk was put in cans and taken to the farms with the help of a flat rowing boat. Part of the milk was used for cheese making on the farm while another part was sold to traders or directly to consumers. In the tradition of romantic landscape painting at the end of the 19th and early 20th century, there are quite number of paintings with a farmer milking cows against a background of a number of trees. Willem Maris (1844-1910), of the school of impressionistic painters of The Hague, has various paintings with this theme which are labelled as ‘cow bend’.

Figure 7: ‘Koebocht’ by Willem Maris (1844-1910)



Figure 8: (Koebocht in Aarlanderveen). A family with a number of helpers milking cows near a 'cow bend' in the village of Aarlanderveen (picture taken around 1905, photographer unknown, courtesy of Adrie Verboom)



- 29 In addition to above mentioned functions of the forest patches, farmers also benefitted from them in terms of collecting fruits and berries and small-scale hunting practices. Some wild plants like blackberry and elder produce fruits that can be used for human consumption. Special cages were sometimes set up to catch wild ducks. The patches also provided a good hide out for shooting pheasants or hares or for collecting eggs from larger birds. In the ditches around the forest patches farmers set up traps for catching eels that were particularly numerous in the thick and muddy peat soil on the bottom of the ditches.

"Rationalizing" the landscape

- 30 The appearance of the Dutch polder landscape has dramatically changed in recent decades. Modernization and mechanization processes have deeply affected the landscape. Improved water management with powerful electro engines has replaced the traditional wind mills in preventing the polders from flooding. Numerous ditches have also been filled to expand the grazing area. Many traditional farms, built in architectural style typical for every region, with integrated spaces for people and animals to live in, have lost their agricultural function. They and are replaced by impressive complexes with separate houses for the farmers' families and large stables for the herds of dairy cows. All kinds of powerful machines and technical installations have replaced a large amount of human labour on the farms. In the landscape the narrow polder paths have given way to wide all-weather roads and no use is made anymore of transport across the ditches and canals. Their core function is to drain the polder or, during the recent hot summers, to let water in to allow the farmers to water the pasture land and other fields. In the course of these processes many historical landscape elements have disappeared. The forest patches with their diverse functions are among them. Kilometers of hedges used to separate meadows have been uprooted (Rijsdijk 2022). This happened because they lost their economic functions for the farmers. Barbed wire became available and was an attractive alternative. New types of construction materials and new sources of energy became available and numerous homemade agricultural tools were replaced by superior and industrially manufactured

alternatives. At an earlier stage in history the improved veterinary care had turned the pest control function of these patches to become irrelevant. Hedges and woody patches became indicators of an old-fashioned type of farming.

- 31 This was not only the view of most of the farmers themselves but also of the governmental institutions, agricultural extension services and banks active in the agricultural sector. The aspiration of growing bigger and more modern is usually referred to in the Netherlands as the “Mansholt virus”, named after Sicco Mansholt, the Dutch minister of Agriculture (1945-1958), who later also became the EU commissioner for agriculture (1958-1972) and the chair of the European Commission (1972-1973).¹ This process is often phrased in terms of the “rationalization of the agricultural sector” (Van Merriënboer 2019, Van der Woud 2020). Traditional farmers had to be turned into “agricultural entrepreneurs” making the optimal use of the available production factors. An important element of this agricultural modernization process in the Netherlands was the re-allotment of dispersed pieces of land, locally known as *ruilverkaveling*. In the course of history, as a result of the fragmentation of the land caused by population pressure and because of inheritance rules, many farmers had many small pieces of land distributed over a rather large area. Construction of new roads and railways across the landscape, and the digging of large canals to facilitate the transport of all kinds of products over water, had further complicated the daily activities of many farmers affected by these interventions (Van der Ham 2021). Government supervised re-allotment of the agricultural land aimed to undo the irrational land distribution by exchanging plots of land among farmers so that they could avail of their land close to their farm. This gradually led to other ‘styles of farming’ in terms of increased capital investment, specialization and market orientation (Van der Ploeg 2008). In order to make more land available for remaining farmers, the government also tried to persuade some of them to give up farming. In other cases young and energetic farmers could apply for a new farm in the large polders of the former Zuiderzee, called IJsselmeer after the construction of the Barrierdam (*Afsluitdijk*) in 1932 (Vriend 2012). In this process many elements that prevented the optimal and rational use of the agricultural land were removed. This had a big impact on many historical elements of the polder landscape. The network of country roads and waterways was redesigned to facilitate the larger machines (trucks and tractors) used by the farmers and the agro-industrial companies. Many forest patches, hedges and isolated trees were removed from the landscape in this “agricultural rationalization” process. Many farms lost their mixed character. In the early 1980’s it was estimated that about 65% of the forest patches had disappeared since the Second World War (Teeuwisse 1984). This process certainly has not stopped since that time and now less than 20% of them remain. In the same period of about 40 years some 1.5 million hectares (about half of the old agricultural land) was modernized and equipped for modern farming in the future (Van der Woud 2020).
- 32 But while this modernization process was going on, another perspective started to emerge. Though the agricultural land itself may be legally owned by the farmers, the general public also takes an interest in the rural landscape. Also non-agricultural values, including landscape and heritage values, were becoming more important. This perspective focused initially on the traditional farmhouses and the wind mills which should not only be viewed in terms of their economic efficiency but also from a cultural heritage perspective. Through new legislation numerous farms specific for certain

regions were listed as official monuments which implied that they could not be taken down or transformed into modern farms.

- 33 Already since a long time the Dutch government decided that certain types of traditional farms needed to be protected and conserved. Through the Monuments Act farms were declared to be part of the national heritage just like certain types of houses in the larger settlement or characteristic buildings like wind mills or churches. Representative examples were declared as monuments which implied that their physical appearance could not be changed. At the moment there are about 8,000 of them. This is one of the reasons why many of these monumental farms could not be combined with the needs of present-day farming practices with increased mechanization, larger farming equipment, etc. Most of the traditional farms have for that reason lost their agricultural function and were turned into buildings used mainly for living with small scale "hobby farming" activities.
- 34 The same was done with the traditional windmills. Within a little over half a century their numbers had went down from more than 15,000 at the end of the 19th century to less than 1,000 in the 1960s. Even though most of the remaining windmills had lost their economic function for draining polders, grinding wheat or sawing timber, most of them were declared as 'monuments'. Financial support is made available to the owners of the monumental farmhouses and windmills to maintain the buildings in their (more or less) traditional appearance. This renewed interest in the agricultural heritage has been quite successful (Stokhuyzen 2022).
- 35 In addition to this cultural aspect of landscape, ecologists and biologists became concerned about the decrease of biodiversity in the agricultural landscape. Populations of the typical meadow birds like the gotwick and the lapwing were declining dramatically as a result of the intensification of the agriculture (Sovon 2018). Use of new species of highly productive grass, use of fertilizers and chemicals, mechanization of the mowing of the grass in repeated cycles, made it more and more difficult for the birds to successfully raise their hatchlings. The disappearance of the forest patches from the landscape was another factor in the reduction of biodiversity in the agricultural landscape. The interconnected food chain of flowering grasses, wild flowers and herbs, which attract all kinds of insects, which attract various types of birds which in turn attract raptures, etc. was seriously disturbed.
- 36 While farmers often claim that they have collectively created the present agricultural landscape in the Netherlands, which cannot be denied, this does not necessarily imply that only farmers can decide how the countryside should look like in the future. In the last few decades a wide range of (semi-) governmental institutions and non-governmental organizations like consumer organizations have claimed a say in the management of the landscape. The focus is no longer on just economic efficiency and high productivity in terms of units of land and animals. The decrease in biodiversity measured in species of flora and fauna, as a result of the large scale bio-industry has been noted for a long time. Initiatives have been taken to protect and restore populations of meadow birds by postponing the moments of mowing the grass until after the breeding season so that the small birds are big enough to escape when the powerful mowing machines enter the fields. Farmers were also asked to leave the edges of the farmland untouched so that all kinds of herbs and wildflowers, crucial for countless insects and birds, could flower. Farmers were urged to reduce the use of

fertilizer in order not to pollute the ground and surface water. Farmers could be compensated for the reduced harvest (De Snoo et al. 2017).

- 37 National NGO's like *Natuurmonumenten* (Nature Monuments), all twelve provincial landscape organizations, *Vereniging Nederlands Cultuurlandschap* (Dutch Association for the Cultural Landscape) and numerous local organizations try to buy pieces of agricultural land and turn them into small nature or bird reserves. They do so by not mowing the grass in spring or early summer, which stimulates the growth and flowering of all kinds of grasses and herbs, which attract insects and thereby also numerous species of birds. They also do not use any fertilizer and, whenever possible, they try to raise the water table to increase the suitability of the area for specific species of meadow birds and reptiles (Sovon 2018). In some cases they try to buy the small forest patches from the farmers to make sure that they will not disappear in the future. If buying is not an option, they may offer to take over the maintenance of the patches by regular pruning the trees inside these patches. In some cases individual farmers also take pride in maintaining such historical elements. This holds in particular for farmers who are committed to become "biological farmers" for whose products there is a kind of niche market. They often run a farm shop in which they sell their products directly to interested consumers.

Figure 9: Volunteers at work in a forest patch



Biological value of forest patches

- 38 While in the past the most important value of the small forest patches was, in addition to its pest control, in terms of the timber, the fuel wood and the branches they produced for direct use by the farmers, at the moment the value of the patches is mainly expressed in terms of landscape values and in particular their biodiversity. The most common species of trees that were planted in these patches are alder, ash, maple, and willow. But in addition to these intentionally planted trees, all forest patches harbour a large variety of wild herbs, scrubs and bushes many of which have berries (like elder, rowan berry, and holly), which attract all kinds of insects. Birds have been spreading the seeds of these plants to the forest islands where they are protected against grazing cows and sheep. Other vegetative layers can also be found in these patches including typical wetland plants like swamp ferns, reed and water lilies. The humid climate in the forest patches, in combination of the presence of stubs, dead

wood, and a layer of withering vegetation creates an ideal environment for numerous insects, like beetles, and for mushrooms and mosses.

- 39 The forest patches are also crucial for many bird species in the polder landscape as resting and nesting sites. Birds that are often found in and around these patches are blackbirds, sparrows, little owls, long eared owls, tawny owls, sparrow hawks, buzzards, and pheasants. In addition the forest patches also offer resting sites for migrating birds like greenfinch and common starlings on their ways to the north or the south. On the edge of the forest patch, one often finds nests of swans, grebes, common coots, moorhens and a variety of ducks.
- 40 In terms of mammals, the forest patches have offer a suitable habitat for a number of bats, mice and rats while occasionally pine martens have been found. In the pasture area itself numerous hares can be found. In spring time young hares are often caught by various types of raptures that overlook the meadows from the forest patches.
- 41 Reptiles and amphibians also occur in and around the forest patches, where they can find a safe place to hide, rest and hibernate. Different types of frogs, and toads are found in them.
- 42 Based on a longitudinal entomological study in one particular forest patch in the village of Waarder near Utrecht, owned by the provincial landscape organization, a surprisingly large variety of insects was found. In particular the large number of some specific types of wasps, flies, and mosquitos was remarkable. Within this single forest patch more than 30% of species of the parasitic wasps (*Braconidae*) known for the Netherlands were found (Van Achterberg 2007). Most likely these high numbers of insects could also be found in other patches and this probably explains why so many birds are to be found in and around these patches.
- 43 Some types of living organisms in these patches are relatively easy to identify for a trained eye while others require specialized observers and sophisticated research techniques. In some cases, provincial or municipal agencies have made inventories of the most important types of organisms. Very few of them have officially been published and if so, always in Dutch. Based on factors like size, degree of isolation in relation to other forest patches, type of soil, and level of management (intensity of use and chopping or trees and branches) the variation of the types of organisms may differ. Based on all inventories however it has been concluded that the level of biodiversity is high in relation to the general small size of the forest patches. The so-called edge effect of the patches in relation to the surrounding pasture area and the density of the network of ditches and larger waterways is probably the most crucial factor for this high biodiversity.
- 44 In the two tables below some of the most common tree species of the forest patches are mentioned as well as the birds that can be found in and around the small forest islands.

Table 1: Species of trees commonly found in the forest patches

English name	Latin name	Dutch name
Maple	<i>Acer pseudoplatanus</i>	Gewone esdoorn
Black alder	<i>Alnus glutinosa</i>	Zwarte els
Birch	<i>Betula pendula</i>	Ruwe berk
Soft birch	<i>Betula pubescens</i>	Zachte berk
Hawthorn	<i>Crataegus monogyna</i>	Meidoorn
Ash	<i>Fraxinus excelsior</i>	Es
Holly	<i>Ilex aquifolium</i>	Hulst
Poplar	<i>Populus spec.</i>	Populier
Bird-cherry	<i>Prunus alba</i>	Vogelkers
Summer oak	<i>Quercus robor</i>	Zomereik
White willow	<i>Salix alba</i>	Schietwilg
Osier	<i>Salix viminalis</i>	Katwilg
Grey willow	<i>Salix cinerea</i>	Grauwe wilg
Rowan berry	<i>Sorbus aucuparia</i>	Lijsterbes
Ivy	<i>Hedera helix</i>	Klimop
Privet	<i>Ligustrum vulgare</i>	Liguster
Black berry	<i>Rubus fruticosus</i>	Gewone braam
Elder	<i>Sambucus nigra</i>	Gewone vlier
Black currant	<i>Ribes nigrum</i>	Zwarte bes

Table 2: Species of birds commonly found in forest patches

English name	Latin name	Dutch name	Note
White throat	<i>Sylvia communis</i>	Grasmus	Birds breeding in the open field and foraging inside the patches and their surroundings
Great spotted woodpecker	<i>Dendrocopos major</i>	Grote bonte specht	
Goldfinch	<i>Carduelis carduelis</i>	Putter	
Sedge warbler	<i>Acrocephalus</i>	Rietzanger	
Tree sparrow	<i>Passer montanus</i>	Ringmus	
Robin	<i>Erithacus rebecula</i>	Roodborst	
Chiffchaff	<i>Phylloscopus trochilus</i>	Tjiftjaf	
Collared dove	<i>Streptopelia decaocto</i>	Turkse tortelduif	
Pied wigtail	<i>Motacilla alba</i>	Witte kwikstaart	
Common pheasant	<i>Phasianus colchicus</i>	Fazant	
Short-toed treecreeper	<i>Certhia brachydactyla</i>	Boomkruiper	Birds breeding in forest patches and foraging on insects
Lesser whitethroat	<i>Sylvia curruca</i>	Braamsluiper	
Willow warbler	<i>Phylloscopus trochilus</i>	Fitis	
Hedge accentor	<i>Prunella modularis</i>	Heggenmus	
Great tit	<i>Parus major</i>	Koolmees	
Blackbird	<i>Turdus merula</i>	Merel	
Blue tit	<i>Parus caeruleus</i>	Pimpelmees	
Wren	<i>Troglodytes troglodytes</i>	Winterkoning	
Song Thrush	<i>Turdus iliacus</i>	Zanglijster	
Grey Heron	<i>Ardea cinerea</i>	Blauwe reiger	
Magpie	<i>Pica pica</i>	Ekster	Birds breeding in forest patches and foraging in the surroundings
Wood pigeon	<i>Columba palumbus</i>	Houtduif	
Mute Swan	<i>Cygnus olor</i>	Knobbelzwaan	
Common Coot	<i>Fulica atra</i>	Meerkoet	
Moorhen	<i>Gallinula chloropus</i>	Waterhoen	
Mallard	<i>Anas platyrhynchos</i>	Wilde eend	
Carrion Crow	<i>Corvus corone</i>	Zwarte kraai	
Eurasian jackdaw	<i>Corvus monedula</i>	Kauw	
White Stork	<i>Ciconia ciconia</i>	Ooievaar	
Long-eared Owl	<i>Asio otus</i>	Ransuil	
Sparrow Hawk	<i>Accipiter nisus</i>	Sperwer	Raptures breeding in forest patches
Common Kestrel	<i>Falco tinnunculus</i>	Torenvalk	
Barn Swallow	<i>Hirundo rustica</i>	Boerenzwaluw	Migratory birds making use of the forest patches to rest
Greenfinch	<i>Carduelis Chloris</i>	Groenling	
Chaffinch	<i>Fringilla coelebs</i>	Vink	
Common Starling	<i>Sturnus vulgaris</i>	Spreeuw	

Source: Teeuwisse 1984 (after Spruit and Achterberg), Sovon 2018, field observations

- 45 In a few recent publications, attention has been drawn to some interesting aspects of forest patches, that may also be of relevance for the patches in the Dutch polder landscapes. Based on European wide comparative studies about their biodiversity and ecological quality the researchers found relatively high levels of ecosystem services, measured in terms of sources of pollination, carbon sequestration, and food availability for birds and other animals. These characteristics are partly attributed to the edge effect of small forests (Decoqc et al. 2016; Proesmans 2019; Nieuwsblad 2021).

Production of biomass for energy production is another factor that is mentioned in this context (Jansen and Kuiper 2004; Decocq et al. 2016).

Conclusion

- 46 At present, heated debates are taking place in Dutch society about the quality and status of the Dutch rural landscape. The high productivity of the agricultural sector measured in terms of quantities of meat, milk, cheese and eggs per unit of land has had a determining influence on the landscape. The small-scale landscape with a variety of cultural and biological elements has been replaced by a more monotonous landscape of a decreasing number of farms which have grown bigger and bigger in recent times. The uniform type of modern farms has also replaced the large diversity of farms typical for specific styles of farming and architectural traditions (VNC 2010). Technological innovations have further increased their productivity. As a result of the surplus of nitrogen emission the biodiversity of the countryside has decreased including the areas that are part of the European Natura 2000 ecological infrastructure. There is a call for a reduction of the number of cows, pigs and chickens and to bring the capacity of the agricultural sector more in line with the limits of the available land while restoring some of its original biodiversity, by reducing the emission of nitrogen. Some argue for a less export oriented and more cyclical agricultural sector which is less dependent on imports of animal fodder made from soy and cassava from distant countries, like Brazil and Thailand. It is argued that a small country like the Netherlands should not focus so much on the export of agricultural products as it cannot cope with the effects of the production processes like the large quantities of manure which is the basis of the nitrogen deposits. Hoping that technological innovations provide satisfying solutions to this problem in the near future in an effort to buy time, is, according to many experts, an illusion (Van der Ploeg 2022).
- 47 It is clear that this debate is not only taking place among stakeholders with a direct link to the agricultural sector like the farmers, the agro-industrial private sector and the banks. There is certainly also part of the general public that sympathizes with the farmers and their role as providers of high quality and relatively cheap food. However, that is also another part of the general public that, through a number of political parties, claims a say in the discussion about the agricultural landscape. Aesthetic and recreational aspects, which include also its cultural and biological heritage, are to be integrated in the way the landscape is managed. Nature conservation agencies, both (semi-) governmental as well non-governmental, are working towards this end. Also, through their purchasing power consumers can have an influence of how agricultural production take place in terms of farming styles, animal welfare and biodiversity. Various voluntary certification systems have been established to work towards these ends.
- 48 In this debate, the role of historical landscape elements, like the forest patches and hedges, but also shelter belts, the diversity of traditional farms characteristic for each region, various types of windmills, typical dyke houses and numerous other elements are important (VNC 2010, Rijdsdijk 2022). A handbook was published for the management of these kinds of valuable cultural and historical elements (Baas et al. 2010). It is based on the idea that a renewed interest and appreciation for the ways past generations of farmers have created the typical Dutch landscape through their

agricultural practices. Even though the practical basis behind some of these practices may have disappeared, the aesthetic, recreational and ecological aspects have taken over the original function of these landscape elements. Farmers no longer need "pest forests" to get rid of sick or dead animals. They do no longer need a windbreak of trees to protect them against the harsh conditions during the winter in the open polder while milking the cows. Milk robots and complex technical installations have taken over these tasks. They also do not need fuel wood for making cheese or timber to make fences or farm tools. But forest islands in the polder landscape are a reference point of these past agricultural practices and can now be appreciated because of all their ecological functions that we are now aware of along with many other historical landscape elements. They add an interesting dimension to the appreciation of the agricultural landscape in an increasingly urbanized part of the country.

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NOTES

1. Only later in his lifetime, and under the influence of the famous Report for the Club of Rome 'Limits to Growth' (1972), he regretted that farmers had become too much dependent on subsidies and financial institutions and that he had not paid more attention to issues of sustainability (Westerman 2008).

ABSTRACTS

Small and scattered patches of forests contrast sharply within the context of the flat and monotonous dark green pastures in the Dutch polder landscapes. These patches, with various types of trees, are like little islands, surrounded by ditches. They are not remnants of the original old peat swamp forests but farmers created the patches in the past for particular purposes. Their names offer clear indications: in addition to the general name of 'small polder forests' (*polderbosjes*) they are called 'pest forests' (*pestbosjes* or *krengbosjes*, places where contaminated or dead animals were dumped), 'farmers' utility or coppice forests' (*boerengeriefhoutbosjes* or *hakhoutbosjes*, from which farmers collected all types of useful wood), or 'cow bends or milk forests' (*koebochten* or *melkbosjes*, places where the cows were milked and where the manure could be collected). With the modernization of agriculture and alternative sources of energy, many of these forest islands have been cleared for the sake of expanding the pastures. However, increasingly these forest patches are also viewed from a different perspective. Nowadays they are valued as an important element in the country's (agri)cultural heritage, but also for the role they play in terms of the polders' biodiversity (flora as well as fauna), which has rapidly declined with the modernization of agriculture in recent decades. In this article an overview will be given of the origin of these 'forest islands' and how they have functioned in the Dutch polder landscape in the past century as an often ignored aspect of farmers' knowledge and practices. Attention will also be paid to the present efforts to maintain these forest islands.

INDEX

Keywords: forest patches, historical landscape elements, cultural and biodiversity values, The Netherlands

AUTHOR

GERARD A. PERSOON

Leiden University