Simon Halberg

Birth of the Sleepless Land

The Arrival of the Sugar Beet and Some Ethnological Observations on the Steam Plough and its Fossil Mode of Operation in Scandinavian Agriculture ca. 1880

Abstract

In this paper, I track the arrival of the sugar beet in Scandinavia and explore the technical changes, ecological implications and new social arrangements that followed in its wake. Based on ethnographic records and other historical material dealing with agricultural practices, I argue that an ethnological view that takes the agrarian landscape and the organisation of social life together as one analytical totality may be useful for addressing an important question: What are the implications in everyday life of an energy transition into—and out of—fossil-fuelled food production? The analysis demonstrates that the sugar beet arrived along with fossil fuels, steam ploughing, commercial fertiliser, migrant labour and agricultural consultants in a large infrastructural complex that significantly impacted the landscape. These material elements mirrored the historical victory of bourgeois industrial logic over peasant forms of life whose ecological cornerstone was the fallow land. Agricultural land became sleepless in the Anthropocene—and rural life became fossilised.

Keywords: Black Transition, Cultural Landscapes, Ecological Boundaries, Fossil People, Modes of Operation, Sleepless Land, Steam Plough, Sugar Beets

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The Spiral of Climate Change Begins

The path to a non-fossil world is sometimes called the Green Transition (Raskin et al. 2002; European Commission 2020). To gain a better perspective on just what such a transition may look like in agriculture, I propose that we take a closer look at its historical opposite—what we may preliminarily call the 'Black Transition'. [1] My argument is that the changes occurring when local landscapes and livelihoods became fossilised has something to tell us about how to defossilise ourselves and our ecology. Based on an ethnographic analysis of the agricultural plans of operation and other material shedding light on practices with the soil, I draw attention to perhaps the most inconspicuous part of the agricultural landscape, the fallow. I argue that the idea of fallow land provides a hidden key to understanding the political ecology of the 'green transition'.

'The spiral of climate change', writes human ecologist Andreas Malm, 'is set in motion by the act of identifying, digging up, and setting fire to fossil fuels' (2016b, 222). The birthplace of the fossil economy was the British textile industry, where steam engines were united with proletarian labour in the factories. Later, fossil-fuelled technologies slowly spread to almost all spheres of human life. From people's clothes, to transportation across oceans, to the way houses were lit, fossil fuels conquered more and more dimensions of social life: first coal, then oil and gas. Even the food we eat somehow ended up deeply embedded in the global commodity flow of the fossil economy (Pfeiffer 2006). A historical break occurred between non-fossil agricultural practices and the globalised agro-food system that emerged after the Second World War. Commenting on the rapid social transformation resulting from the *fossilisation* of agriculture, historian Eric Hobsbawm (1995, 288) wrote that for '80 percent of humanity, the Middle Ages ended suddenly in the 1950s; or perhaps better still, they were felt to end in the 1960s'. In the Scandinavian context, however, there was a historical precursor. Already in the 1870s and 1880s, a sugar industry was established in Sweden and Denmark, and from its inception it was a thoroughly mechanised and industrial form of agriculture. While the 'green revolution' that followed soon after the Second World War was largely fuelled by oil, it was coal that first fossilised sugar landscapes in the 19th century. The contrast between the before and after of fossil-fuelled agriculture is striking in this region at a time when relations between the soil, the landscape and the people who depended on it were rearranged.

To fully grasp the social and ecological implication of 'the black transition', this article revisits the classical ethnological concept of cultural landscapes to

1 What follows is the first results of a research project on the fossilisation of Scandinavian rural life entitled 'Sleepless Land, Fossil People'.

answer the following questions: *Seen from the perspective of landscapes in southern Scandinavia, how did the introduction of coal reorganise ecological circuits in sugar beet agriculture? What social changes were fuelled by this historical energy transition from renewables to fossil fuels? What, in other words, was the political ecology created by the first arrival of fossil fuels in the agricultural regions of Scania and Lolland around 1880?*

By addressing these issues, the article makes an ethnological contribution to ongoing debates on historical energy transitions. While the study of energy as culture is a rapidly growing topic, most ethnographic contributions analyse contemporary attempts at managing energy transition and the cultural problems that arise from such projects (Boyer 2019; Coronil 1997; for an overview of the field, see Smith and High 2017; Halberg forthcoming). Current approaches take a quite different approach than classic historical studies on industrialisation (Landes 1969) because the planetary condition of the Anthropocene has challenged fundamental presumptions about the directionality of social and technological progress in history (see also Pomeranz 2001; Podobnik 2006). Marxist scholars have been particularly successful in demonstrating that the 'black transitions' of the past should really be seen in the light of the social contradictions inherent in particular historical energy systems (Malm 2016; Mitchell 2013). Owing to the industrial basis of Marxist theory, these contributions tend to depict the social world through the labour–capital binary. While the dynamics of this contradiction no doubt account for the rise of fossil capital, as Malm (2016) argues, it tends to lose sight of the people who make up—in one form or another—the peasantries of this world. The goal, then, of this article is to contribute to ongoing discussions based on an ethnographic approach to historical studies on how we became fossil. At a time when most discussion of energy shifts are dominated by technological discourse, I would like to propose a more synthetic approach that allows us to see how political struggle over what makes life worth living takes place in relation to technologies in the landscape. Seen from the perspective of the Anthropocene, there is good reason to begin describing the energy transition involving fossil fuel with new metaphors that highlight the social and ecological contradictions of it rather than dissolve them into gradualist, historical narratives. Whereas most historiographies of this agrarian revolution, as Boyhus (1976, 27) writes, deal with it in terms of 'development and progress' and thus describe 'the problems from without and retrospectively', I opt for another narrative—one that relies more on metaphoric reasoning (the sleepless land and the black transition) to highlight the point that a landscape with and without fallows are two fundamentally different ecologies, in which people's lives are governed by different concerns.

The first part of this article addresses these issues by tracking how the introduction of the first truly industrial crop in Northern Europe, the sugar beet, brought changes to the cultivation system and the landscape as a whole. The second part of the article discusses, on this ecological basis, how such changes impacted social stratification. It makes the argument that through fossil means, the lives of rural people—peasants, crofters and land-lords—were subjugated to an industrial logic. But first, a few words on the materials, methods and theory.

Archival Explorations of the Sleepless Land

The approach of the article is an attempt to return to the methods and theoretical objects typical of early 20th-century ethnological studies of preindustrial peasants (Campbell 1928; Lerche & Steensberg 1980), but from the premises set out by current political issues and critical theories on social contradictions in the Anthropocene (Malm 2016). While the latter approach is grounded in a project of engaged political ecology, the former implies returning to the study of rural life in the style of the former ethnologists. I aim to bridge this epistemic gap by relating classical ethnographic questions about the cyclicity of peasant life, the yearly rhythms of agricultural activities, the relationship between cultivators and tools, the relationship between production and reproduction in daily life to questions about social class and ideology in the Anthropocene.

Thus, I have brought my research question regarding the role of fossil fuels in ecological circuits and the transformation of social relations to a study of archival material at the National Archive of Denmark and the Ethnological Investigations (NEU) at the National Museum of Denmark. In these archives, I have consulted manorial records for a selection of manorial estates that were among the first to introduce not only the sugar beet but also steam ploughing. It was possible to use this material to reconstruct the agricultural cycle of what was grown on what parts of the fields through analysis of the so-called 'plans of operation' (*driftsplaner*) (De Danske Sukkerfabrikker [Højbygaard] 1882–1934, 214).

Any standard account of agricultural history will mention that steam ploughs were first used on the large estates when farmers began to cultivate sugar beets, and that this period of transition marks the historical time when the fallow was abandoned once and for all (Bjørn 1988, 274; Nilsson 1981, 104**)**. The next sections of the article explore the ecological, social, ideological and political implications of a landscape without fallow. Cadastral maps have provided one way of linking the ecological cycles to forms of social organisation both before (Cadastral Map 0481652) and after (Cadastral Map

0481652) the 'black transition' at one particular manor, Højbygård. The maps reveal certain social aspects of the shift by showing how the boundaries in the landscape changed over time, pointing to the coexistence of one type of agricultural unit with others—other manors, adjacent yeomen farms, cottages, villages and infrastructure connected to the central factories. The internal communication of the sugar factory illuminates how people reacted to the socio-ecological contradictions at the time, describing how consultants should convince peasants to fossilise by growing beets in land that used to lay fallow (Nakskov Sukkerfabrik). The Ethnological Investigations (NEU M 14.726) offer a bottom-up perspective of a 'yeoman' farmer (*gårdmand*) who signed such a contract with the sugar factory shows some implications for farm labour in terms of intensity and gender divisions.

Højbygaard is a particularly interesting estate because it was the first estate in Denmark to acquire a steam plough. Not only do existing records describe the arrival of this technological novelty, the owner of the estate, Erhard Frederiksen, was himself a very active debater on issues of agricultural modernisation. Frederiksen's writings (1892) provide a diagnosis of the old landscapes and what he considered to be the (fossil) remedy. Like the 'plans of operation', this publication brings us very close to the soil and the patterns of crop rotation.

Finally, this section of materials also introduces the main character of this story, an engineer named Gustav Adolph Hagemann (1842–1916), who, perhaps more than any other individual, was the central figure in the first wave of the fossilisation of Scandinavian agriculture. More than anyone else, he found ways for fossil capital to come into contact with the various agrarian sectors. Backed by the great financiers of the time, he was appointed to develop the technical systems necessary to develop a domestic sugar industry capable of competing with the colonial production of cane. As it turned out, he would also become heavily involved in modernising the colonial production of sugar in the post-emancipation decades. His publications, which form the last major group of material used for the purposes of this study, reveal how the colonial experiences played an important role in the formation of a sleepless land domestically as well (Hagemann 1875, 1885).

All the archives consulted for the study were created either by a state that mapped out its landscape and the people who inhabited it or by capitalist companies that grew from nothing to become masters of both the economy and ecology in the 19th century. As scholars at the archive pointed out, the process of reworking the observations about cadastral boundaries in the landscape, plans of operation and ethnographic knowledge about traditional ways of life into structured information on the world *outside* the archive is always directed as much towards the future as it is the past (Derrida 1995, 24). The archives bear witness to the birth of the sleepless land, with all the reorganisation of

social life involved in such a transition, but they do so from a very particular point of view. What they show is not so much the world as it was, but the friction between the fossil world-building projects of people like Hagemann and the old (non-fossil) world that resisted and challenged the fossilisation process.

We return to this material to show that even in something as apparently neutral as the cadastral map, we find the social contradictions between state, capital and rural population materialised not just in the landscape but also in the documents that have been long hidden away (Scott 1998, 89–91). Clearly, as already predicted by Derrida (1995, 9–11), we are dealing with archives of a very hierarchical nature. After all, non-fossil peasants tended to produce few archives; the etymological root of the word archive means both 'commencement' and 'commandment'. If such documents were originally created to bring a certain future into being—an agricultural landscape without fallow, hence the title of this paper—we return to them now from the Anthropocene to read them against the grain and to ask who would be responsible for realising that future, and by what means.

We return to the propagandistic writing of the proponents of progress to expose that such a linear vision of history was, since the beginning, fuelled by coal and oil. While the archives are silent on matters that did not capture the biopolitical interest of state or the economic interest of the corporations at the time, even still, if we combine the scattered evidence and bring in other analyses and theoretical perspectives, it should be possible to provide at least a vague outline of some of the landscapes and forms of life that was suppressed by the fossil modes of operation. In the following section, by studying the historical contradiction of the great energy transition between a sleeping and a sleepless land not as a form of progress but as political ecology, we will try to catch a glimpse of the possibility of another world. The Ethnological Investigations materials are of particular interest in this regard since researchers actively sought out the experiences of ordinary people, who are usually not the subject of interest in hierarchical archives, though it is safe to assume that the state no doubt had concerns other than the peasants when creating its impressive ethnographic record. With Derrida, we might even say that these archives produce, simultaneously, a peasant past and a national future. First, however, a few words on the theoretical framework underlying such a metaphorical reversal of the archive. From an ethnological standpoint, we may even go a step further and begin to understand the landscape itself as an archive, although a rather non-verbal one. As an archive, the landscape shelters its own hierarchical etymology; 'it also shelters itself from this memory which it shelters: which comes down to saying that it forgets it', as Derrida notes (1995, 9). The article now reads the archive against the grain, as the habitat of the fossil people.

Landscapes as Ecological Culture

In Nordic ethnology, the study of cultural landscapes leads back to Åke Campbell, whose pioneering studies in the 1920s and 1930s were ground-breaking in the sense that they created the landscape as a topic of analysis (Campbell 1928, 1936). At a time when much of agriculture was, in Hobsbawm's words, still in the Middle Ages, Campbell saw clearly that a fundamental break in the ecological system had occurred with the arrival of fossil fuels and industrial rationality. Like many ethnologists of his time, he was primarily interested in describing, analysing and theorising about the culture that was lost in the processes of modernisation rather than assessing the cultural structures of modernity itself (Gustavsson 2014). However, the analytical framework he employed is just as relevant for a study of the modern industrial, or fossil, landscapes.

Returning to the mode of analysis introduced in the writings of Campbell implies at least two things. First of all, it implies that landscapes have been changed through human intervention to the degree that they can be considered cultural products. This is the material side of the landscape, and an analysis of it implies studying environments as a product of human practices.

> Only when humans grabbed the tool and the fire, and with them, built up his existence in forms other than that of the animal did the new factor of landscape formation come into being: the culture or the technique. Human beings are the only beings that have managed to plant extra-bodily organs, tools, and with these organise the environment according to their purposes. Through human settlement and cultivation, a cultural landscape with villages, towns and cities is formed out of a natural landscape. (Campbell 1936, 5, *my translation*)

Second, Campbell shows that the concept of cultural landscape implies a more subjective or ideological focus. Since the use of tools is never random but carried out based on the specific goals of the people working the landscape, ideas too are inscribed into the environment. He writes: 'a human group, in its treatment of the landscape, strives for or is driven towards expressing and realising its cultural, economic and political ideas. It becomes an ethnological task to analyse these' (Campbell 1936, 36–37). For ethnologists, the landscape then is the archive of life that was lived; life that also created, objectively in the landscape, the conditions for future life.

In his writings from the 1920s and 1930s, Campbell was looking backward in time, not forward. The orientation towards salvaging the disappearing material culture of mid-20th-century ethnology could be one reason why analysts such as Campbell never scrutinised the industrial landscapes that are today

being problematised politically (Löfgren 1981). Such landscapes, in contrast, are the central point of focus in this article. To understand the ecological culture of the fossil age, we might supplement the two dimensions of landscape—the material and the ideological—with a third: a temporal dimension, which views the landscape as a process.

Campbell and other landscape theorists mobilised many concepts to capture this temporal aspect of a landscape (e.g., Ingold 1993; Boserup 1965). From this praxeological perspective, the different forms of cultural landscapes—forests, bush, plains, intensive fields, plantations, and so forth—have been understood as the material side of an agricultural practice that managed the flow of resources over time. Swidden agriculture, for instance, might look like a forest to a stranger, but agriculturalists at the time viewed the entire landscape as a productive one, where most of the fields 'rest' and reproduce themselves, while a few—maybe 1 out of 20—yield harvests at any given time (Boserup 1965, 11–12). In principle, we can consider such a system a specific mode of operation, which is the more general term often used in Scandinavian terminology (*driftsform*).[2] This means looking at any practice from the standpoint of technology and ecology (Højrup 2003, 265). As such, the *mode of operation* concept suggests a way to analyse culture that accounts for the relations between landscapes, methods and principles of operation, as well as the tool complex of the studied practice.[3] By focusing on mode of operation, we are able to describe a cyclical system of cultivation that produces products and landscapes at the same time via the application of a certain technology (Bernild & Jensen 1978, 74). A classic example is the feudal three-field system, where a regime consisting of a heavy wheeled-plough divided the arable land into three parts, with the crops being rotated in a settled sequence: rye–barley–fallow (White 1972, 39; Wolf 1966). With this concept, we explore the dialectic between how social groups organise themselves in the landscape around them and how they shape this landscape to suit their preferences. Let us see then what the landscape was like at the time sugar beets and steam ploughs arrived in the later 19th century.

2 The term *driftsform* is used by farmers as a descriptive term and by ethnologists as an analytical concept. It is an etic and an emic concept in Danish and Swedish. Campbell, for his part, often used the term 'forms of cultivation' (*odlingsformer*).

3 In ethnology and anthropology, the notion of ecotype has also been mobilised to analyse this relationship between humans and ecology. The use of the concept was popularised by the anthropologist Eric Wolf in his famous work *Peasants* (1966), and a similar approach was adopted by Scandinavian ethnologists such as Bjarne Stoklund (1976) and Orvar Löfgren (1976). Valuable as they are, these studies focus more on how people adapt to ecological niches than on how they actively produce such ecologies themselves. My ambition here is to focus on the latter.

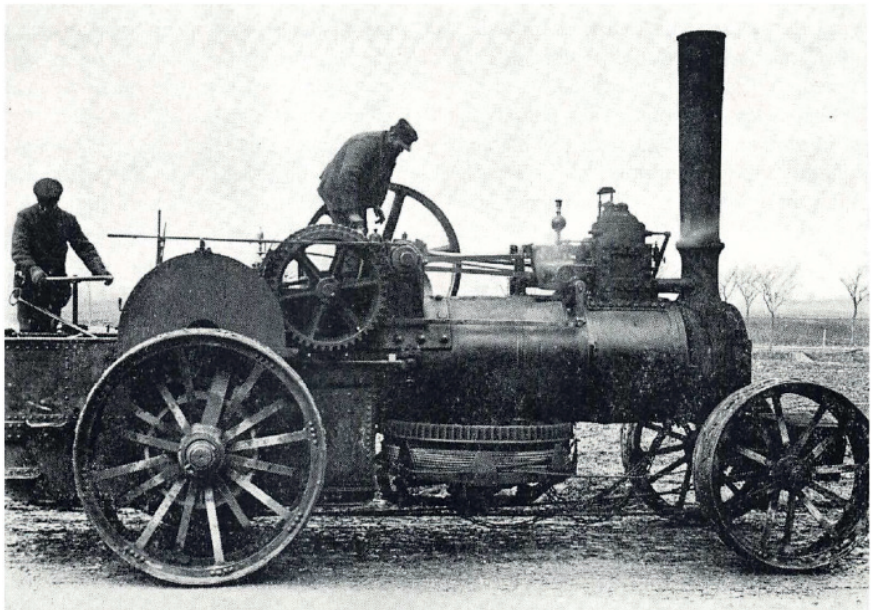


Figure 1. One of the two Fowler steam ploughs that arrived at Højbygård in 1872; they remained in use for almost sixty years, until 1929 (picture from Boyhus 1973).

Ploughing with Steam, Growing with Coal

On the 22nd of October 1872, the residents of Maribo, in Lolland, Denmark, gathered around the western edge of town to watch a remarkable spectacle. Around midday, writes the local paper, two traction engines (*lokomobiler*) came steaming down from the north on their way to the first sugar factory, where they were to plough the fields that had been chosen for sugar beet cultivation.

> The machines were driven with much ease along the country road and although they with coal, water, and remaining apparatuses weighed about 30,000 pounds each, they moved with remarkable lightness over the uneven cobbled road as well as over newly macadamised road. (*Lollands Posten*, as cited in Boyhus 1976, 26)

These new traction engines were destined to replace the horses that, until then, had pulled the plough through the wet and heavy soils of a large estate, Højbygaard. Sugar beets needed, the fossil pioneers had learnt in Germany, the type of deep ploughing that the expensive machinery had been brought in to do. Whereas the horses would feed on the hay or graze in the marginal soils—like meadows—the steam engine consumed coal and coal alone.

But the problem of the ecological boundary remained. Even if the soil would now be ploughed deeper than before, and the horses made redundant, thus

clearing the way for specialisation, the question of fertility was not solved in this way alone. Hagemann was quite aware of the limits of fertility: 'Without punishment, can nobody, year after year, take crop after crop from the earth without payment-in-full' (Hagemann 1885, 5). Recognising the ecological boundaries of any mode of operation, Hagemann imagined an ingenious system for the plains of southern Scandinavia in which sugar beets did not come at the expense of other crops. Sugar beets, his argument went, would only be a supplement to the existing crops, though the same could in principle be said for other root vegetables, like potatoes and fodder beets (Sveistrup & Willerslev 1945, 218). There is, however, an important difference in that fact that a sugar beet needs industrial processing to gain use-value, whereas the other root vegetables have immediate value in the ecological circuit of a farm, thus rendering industrialists superfluous (Boyhus 1976, 33). As Hagemann writes:

> It [the sugar beet] is brought into the ordinary crop rotation so that it neither reduces the areas of grain nor the green crops upon which the summer nutrition rests, but instead takes the parts of the field that 'rest' or is little profitable (the fallow and the perennial grassland) in the ordinary extensive operation. Its significance is that it can replace the necessary 'rest' and 'cleansing' of the earth of ordinary operation. It requires a deep and energetic treatment of the soil to become profitable and even in summer a—by the power of hand and horse—working between the plants by which the soil is kept loose and porous and seeds of weed are brought to germination and destruction. It has hereby the same influence in the rotation as the fallow and leaves the soil loosened to a great depth, free from weeds and, by the rich plenitude of leaves and roots, enriched with Humus. Moreover, it demands a plentiful supply of fertiliser to succeed. In this way, it becomes the means to very intensive use of the soil and a passage from the ordinary extensive form of operation to the intensive proper alternating operation [*Vexeldrift*], a rotation where a regular alternation between grains with long straws and short leaves and an appropriate area with 'Chop Fruit' [*Hakkefrugt*, i.e., beets] allows one to do away with the fallow and the 'rest' of the soil. (Hagemann 1885, 8–9)

A plentiful supply of fertiliser was the key to overcoming 'the "rest" of the soil', as Hagemann metaphorically called the fallow. Before becoming reality, the sleepless land was a vision in the minds of bourgeois industrialists like Hagemann.[4] Transgressing the boundary of 'sleep' is first an idea, then a

4 While Hagemann did diagnose the old agrarian landscape, based on renewable sources of energy, as a 'resting' one, he did not talk about 'developed' landscapes as sleepless ones. But one only has to bring his own ideas to their logical conclusion for the fossil landscapes to appear as sleepless. I think it is high time to begin to turn the metaphors of 'progress' on their head and see them more for their ecological rather than ideological implications.

	FIELD NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6
1873	*1st year clover*	Oats & barley	Barley & peas	Winter wheat	*Fallow*	*2nd year clover*
1874	*2nd year clover*	*1st year clover*	Oats & barley	Barley & peas	Winter wheat	*Fallow*

Table 1. Plan of operation (*driftsplan*) for Højbygaard, 1873–74 (De Danske Sukkerfabrikker, 1882 – 1934); crops that help restore soil fertility shown in *italics*.

reality. But there is an interesting tension at work in this quote. On the one hand, Hagemann recognises that the ecological boundary is fundamental to any system of operation, and at the same time he argues for an intensification of cultivation. The solution to this ecological contradiction was the introduction of commercially available fertilizers: first in the form of guano, rock granulate and superphosphate (called 'chemical' in the sources), later in the form of artificially produced fertiliser (Smil 2004). This marked a conceptual and ecological shift from locally produced manure to a source of fertility that was bought and sold on the global market. 'From 1880 to 1895, the import of chemical fertilizers quadrupled', Björk writes: 'and nowhere was the use more widespread than in Malmöhus (the south-western part of Scania), where about three-quarters of the Swedish sugar beets were grown. Here the use of chemical fertilizers was almost double the Swedish average at the beginning of the twentieth century' (2009, 61–62). Chemical fertiliser became the fossil amphetamine that kept soil awake year after year, by digging deeper and deeper into a mine somewhere else on the planet. Now, the most fertile areas of southern Scandinavia have experienced 150 years of sleeplessness.

When the two steam ploughs found their way to Højbygaard, its 800 hectares of arable land became the first in Denmark to be continually ploughed by steam. Owned by an aristocratic dynasty, it had—like so many of the manors in the fertile plains of Scania and Lolland—a long-standing tradition of employing agricultural managers that directed a large labour force of rural workers. Therefore, it also had, as we will see, quite good conditions for managing the transition to large-scale sugar beet cultivation. The archive of the estate at the National Archive of Denmark (*Rigsarkivet*) contains plans of operation for what was cultivated in the fields during those years. An excerpt from the years 1873–1874 shows the cultivation system before beets were introduced; a system called the 'Holstein system' (*kobbelbrug*) (Lampe & Sharp 2018, 67).

In this pre-industrial system, the arable land of the manor was divided into six fields—of around 130 hectares each—of which one lay fallow and two

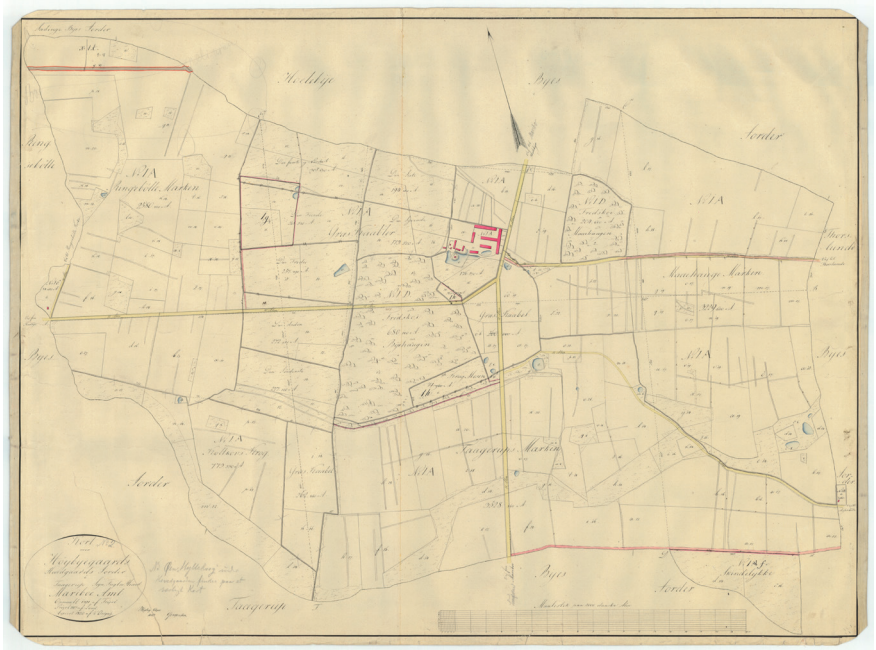


Figure 2. Cadastral map of Højbygaard, 1862–1882 (0481652). The old and sleeping land was still a pre-fossil mosaic of different functions, where animal husbandry and the cultivation of plants were interconnected in a cycle of rest and yield; marginal soils, like meadows and wet lowlands, would provide fodder for the draft animals that still drew the plough before sugar beets.

provided a combination of fodder and regeneration of the soil by means of clover. In the analogy of sleep, the land in such a system rested roughly half the time, with one-sixth of it remaining decidedly fallow and a third resting with the clover. The landscape still had the character of a mosaic of different parts, weaving together wakefulness and sleep, production and reproduction.

Let us then see how the arrival of beets, steam ploughs and artificial fertiliser woke up this sleeping land. The same archive also contains plans of operations from the year 1880, after the new system had been implemented.

The six fields were reduced to four, and the fallow parts had been eliminated. The only trace of 'rest' left in this system of cultivation is the clover, which had been reduced from a third to an eighth of the arable land. Whereas half the land before had had a reproductive function in the versatile and integrated cultivation of animals and plants, specialisation has now set in. After the introduction of beets, all crops except clover were directed towards the market. The individual fields grew in size—as they colonised the fallow and meadows—and none of them slept. In Danish, such a system is called *veksel-*

	NO. 1 200 ACRES	NO. 2 200 ACRES	NO. 3 200 ACRES	NO. 4 200 ACRES
1880	Beets	½ Wheat ½ Spring grain	½ Legumes *½ Clover*	Barley
1881	Barley	Beets	½ Wheat ½ Spring grain	½ Legumes *½ Clover*

Table 2. Plan of operation (driftsplan) for Højbygaard, Lolland (De Danske Sukkerfabrikker, 1882–1934); crops that help restore soil fertility shown in *italics*.

brug or *vekseldrift*, terms that do not translate easily. Sometimes, these terms are translated into English as 'crop rotation' or 'alternating cultivation', but the central idea to highlight is that this is a system in which all fields are under cultivation every year *without* having to rely on a large stock of cattle and horses to provide the manure, as was the case in the 'Norfolk system'. We are dealing, in other words, with a system where the abundance of steam power and commercial fertiliser made it possible to separate animal raising from crop breeding—contrary to the 'Norfolk system', which integrated animals and plants even more intensely and which was predicated on the fundamental conceptual shift that accompanies a steady flow of energy into operations from beyond its own ecological boundaries. *Vekseldrift* is, in this sense, a globalised mode of operation.

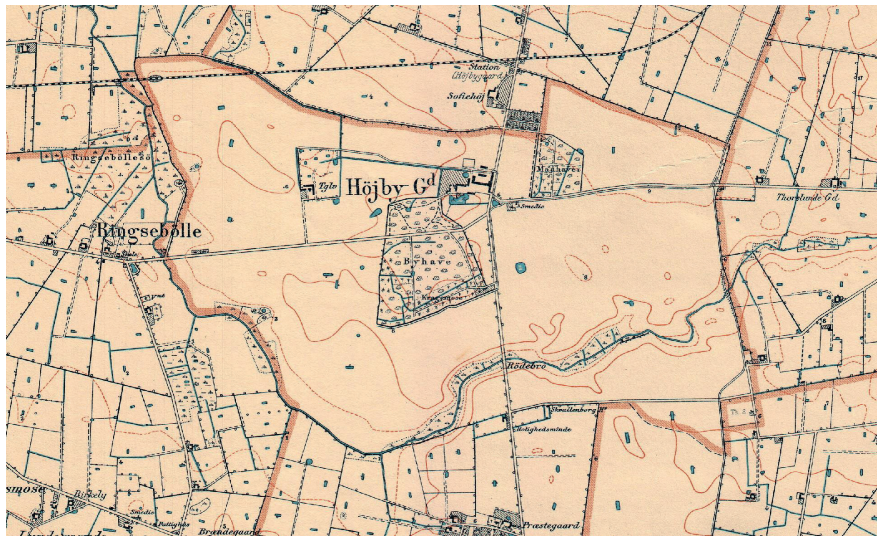


Figure 3.Højbygaard, based on a topographical map (*målebordsblad*) of Holeby from 1908 (4623); the marginal soils lost their reproductive function as steam engines ploughed the fields, which began to grow in size to fit the four-course rotation of the fossil mode of operation.

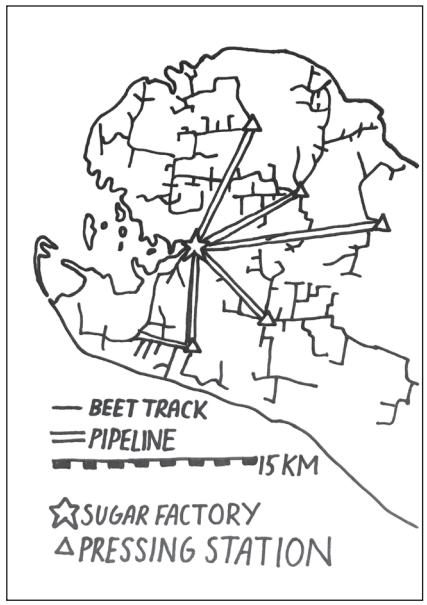


Figure 4. The landscape as a productive organism. Lolland, around 1900, when the central factory in Nakskov was supplied with beet juice from five pressing stations. The stations were, for their part, supplied with beets on beet tracks. Large parts of the agrarian landscape within a perimeter of 30 kilometres grew beets for the factory. For the sugar crystals to emerge out of the juice produced by the sleepless land, incredible amounts of energy were needed to boil away the water. 'For every pound of sugar that was produced in 1875', writes environmental historian Frederik Björk, 'up to four pounds of coal were used in the factories' (Björk 2009, 62) (drawing by the author).

The effort to do away with the sleeping land depended on the steam plough, or later on a tractor, to replace the draft animals. After this, another logistical problem remained: How to transport the enormous amounts of beets to the central factory? Hagemann in this instance as well devised a solution. He designed a system inspired by the work of the French engineer Jules Linard, who had won a gold medal at the Universal Exposition of 1867 in Paris. A central factory would be supplied with a steady flow of beet juice—or sugar cane juice in the colonies, where Hagemann first implemented the system—pumped through pipelines from pressing stations located five to fifteen kilometres away, in the sleepless landscape. Some central factories had as many as five pressing stations distributed evenly throughout the hinterland. During the harvesting season, many people would be employed to receive and process the beets and pump the juice into the beating heart of the landscape organism. But even moving the beets from the field to the local pressing station posed too big a task for many cultivators, so eventually a small railway was built, running along so-called beet tracks, which extended further out into the beet fields from the pressing stations. In this way, millions of tons of beets were brought to the factory furnaces each year.

During the last decades of the 19th century, this landscape model spread from the Danish sugar colony of St. Croix, in 1878, to Lolland, where the first station opened in Nakskov in 1880, in Landskrona in 1883 and in Nykøbing Falster in 1885. Soon afterwards, the model had spread its infrastructural arms to encompass all the most fertile soils of southern Scandinavia, across the border in Sweden.

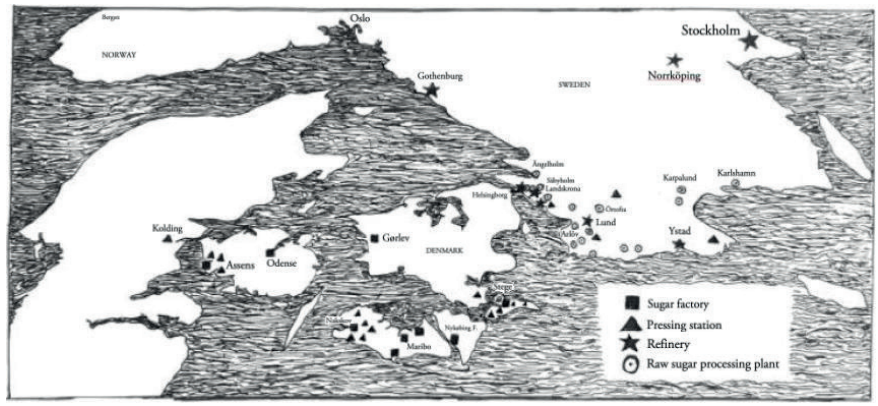
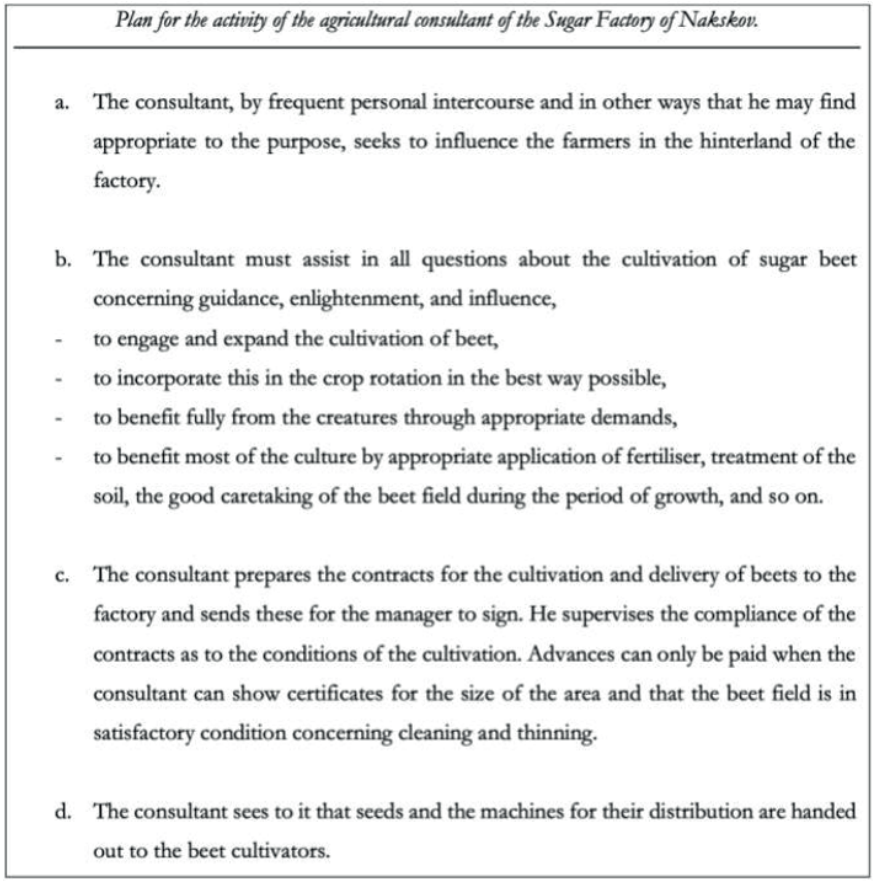


Figure 5. Distribution of sugar beet cultivation and sugar factories in southern Scandinavia around 1920; sugar cultivation had become a reality in most fertile soils, everywhere clustered around a central sugar factory (drawing by the author).

Colonisers of the Fallow

Many moments of mediation were needed to forge the necessary links between industrial capital and agrarian landscapes. Investors, consultants, migrant labourers and their overseers arrived at the sleepless landscapes to assist in transgressing the ecological boundaries of the fallow. Driven by the logic of homogenisation and ecological exchangeability, factory managers like Hagemann encountered the old agricultural world as complex, messy and tied to a specific time and place. This 'rootedness' of agrarian life stood before them as a concrete socio-ecological obstacle to capital accumulation. The problem was simple enough: a sugar factory needs a steady flow of beets that it can rely on. But before the second half of the 19th century, no sugar beets had been planted in the landscape. Within the logic of preindustrial peasant life, there was no impetus to cultivate crops that were overly demanding in energy and labour and had no direct use-value (because of the need for industrial processing). The sugar industrialists, thus, were faced with the problem that they had to create the market on which they based their production. This problem gave rise to a social practice that is today a common trait in agriculture: the hiring of consultants to drive changes in the mode of operation to better align 'independent producers' with the logic of the industrial sector. Erhard Frederiksen, the owner of Højbygaard and the first two steam ploughs, later became chief agricultural consultant for Hagemann. In an internal memo to his consultants working on the grounds, Hagemann clarified the chief objectives:

The consultants were the link between the industrial and the agrarian spheres, and the sugar beet was their biological materialisation. Contrary to grain crops like rye, barley and wheat, which grow only one stem, the beet



Plan for the activity of the agricultural consultant of the Sugar Factory of Nakskov.

a. The consultant, by frequent personal intercourse and in other ways that he may find appropriate to the purpose, seeks to influence the farmers in the hinterland of the factory.

b. The consultant must assist in all questions about the cultivation of sugar beet concerning guidance, enlightenment, and influence,
- to engage and expand the cultivation of beet,
- to incorporate this in the crop rotation in the best way possible,
- to benefit fully from the creatures through appropriate demands,
- to benefit most of the culture by appropriate application of fertiliser, treatment of the soil, the good caretaking of the beet field during the period of growth, and so on.

c. The consultant prepares the contracts for the cultivation and delivery of beets to the factory and sends these for the manager to sign. He supervises the compliance of the contracts as to the conditions of the cultivation. Advances can only be paid when the consultant can show certificates for the size of the area and that the beet field is in satisfactory condition concerning cleaning and thinning.

d. The consultant sees to it that seeds and the machines for their distribution are handed out to the beet cultivators.

Figure 6. An internal memo to the consultants (De Danske Sukkerfabrikker, 1882–1934).

was a much more labour-intensive crop because each seed germinated many times. For the beets to be industrially processable, it was necessary to thin the excess germinations two or three times during the growing season. This meant that a successful harvest required endless days of backbreaking work, with labourers bending down for hours on end to remove all weeds and side shoots from the growing beet. Beet farming was, well into the 20th century, horticulture on the scale of a plantation, quite unlike any other crop cultivated on a large scale in this part of the world. Due to the enormous labour demand, sugar beets became known as the 'disciplinarian of the farmer' (Björk 2009, 61). In this way, it was not only land that was awakened out of sleepiness, so too were the farmers (this, anyway, was the perspective of people like Hagemann, who considered them lazy for not doing anything productive with the fallow). However, since the agriculturalists by no means formed a homogenous group, it is important to note how they were divided into dif-

ferent groups and discuss how they shaped the landscape differently, thereby engaging in the 'black transition' in various ways.

Logically speaking, we might divide any agricultural unit of operation into one of three categories. First, we can imagine a plot of land that is too large for its holders to operate on their own. Disregarding for the moment the judicial system in place—which defined whether the landholders was the owner or the rightful user of the land—both a plantation and a large manor required externalised labour. The size of the landholding was so large that even should the aristocrat or the colonial planter have wanted to cultivate it on their own, which, generally speaking, they did not, it would not have been possible. Second, imagine a plot of land that would have been the right size for the landholders to operate by themselves: the operational unit could very well have been the family, even though only one member of the family might have been considered the rightful owner or user of the land. In this case, the productive potential of the land would have corresponded to the needs and abilities of the operators—whatever cultural differences there might have been in that respect. Third, imagine a plot of land that would have been too small, especially considering the prevailing mode of operation, for the operators to reproduce their own livelihood from it. Such an agricultural agent would clearly have then needed to supplement land practices with something else to stay in business. As it turns out, all of these logical possibilities existed empirically in and around the sleepless lands of southern Scandinavia at the end of the 19th century.[5]

The smallest units were the crofters' plots of land, which were often no more than a few hectares in size and rarely more than five in number. For most such smallholders, it was impossible to make a living off the land, so supplementary incomes were necessary. The same villages also included larger farmsteads of around 20–30 hectares of land, making them, by European standards, quite large farms, and the households also consisted of farmhands and other helpers not related to the family (Christiansen 1982, 45). Finally, the third category included larger estates with aristocratic or bourgeois owners who cultivated enormous areas. There was great variation within the group,

5 These distinctions are a classical topic in ethnological treatments of social stratification in rural society. It is, however, noteworthy that in the English context, the yeomanry seems to have disappeared from cultural history centuries earlier. This difference has had a deep impact on social and cultural theories of agricultural life. Marx, for example, painted a picture of agriculture as a social world consisting of landowners, capitalist managers and agricultural labourers as three distinct categories. In his formulation, and in many other British-oriented agrarian sociology studies, the importance of a class of independent producers, yeomen in different forms, unfortunately fades away or disappears altogether.

The size of the properties in *hectares*	Area cultivated with sugar in *per cent*
0-4	0.8-2.6
4-64	3.0-3.4
64-128	6.1
More than 128	11.6-15.7

Table 3.Percentage of the sugar beet area out of the total arable land in Falster, ca. 1900, by farm size and area cultivated with beets (adapted from Sveistrup & Willerslev 1945).

though, with landholdings ranging from hundreds to thousands of hectares, meaning the owners could not do the agricultural work themselves. These manors and proprietary farms were estates that depended on an external labour force. Economic historians have found that at around the turn of the century, the smallest agricultural units devoted the least amount of land to the cultivation of sugar beets, while the large estates devoted much greater shares of their lands to it (Sveistrup & Willerslev 1945).

The reason for this distribution was not a cultural reality organised linearly based on different degrees of modernisation, in the sense that the large estates would have been more 'modern' than the less 'developed' cottages. Rather, it is important to consider the different levels of *fossilisation* as expressions of qualitatively different practices, that is, of different modes of life and operation (Halberg forthcoming**)**. To understand how a landscape becomes sleepless, the ethnological task, to paraphrase Campbell, becomes that of analysing the social group that 'is driven towards expressing and realising its cultural, economic and political ideas' in the landscape (1936, 36–37). Behind the word *beet farmer*, thus, we find a variety of logics and practices at work. In the following pages, I take a closer look at the main types of agricultural practices that sustained the sleepless land: large estates, independent yeomen and a rural proletariat of smallholding crofters.

Landowners. As the feudal system crumbled, the aristocrats, with their large, landed property holdings, needed to adjust to a changing world. Gone were the days when peasants were obliged to deliver labour to their local lords. Instead, the landowners had to procure workers from a more or less 'free' market. The cultivation of sugar beets for the new, more global industry was one appealing way for the large landowners of southern Scandinavia to overcome the *challenge of modernisation* (Bengtsson et al. 2019, 29). From the perspective of the sugar factory, the large estates were appealing as suppliers because of their size. The sugar industry would create the infrastructure to bring the beets from the field to the factory, but the landowners had to implement sys-

tems of operation for cultivating beets that did not depend on the fallow. One of the large landowners who pioneered the cultivation of sugar beets even saw the beet as a saviour plant that could bring feudal agriculture into the modern world (Sveistrup & Willerslev 1945, 205). The aristocratic landowners would not and could not do the heavy work of thinning and cleaning the endless beet fields. But who, then, was to do it?

Already before any beets had been sown in Denmark, a national committee was established to address the problem of thinning the beet, which was not easy since it required backbreaking labour, walking bend forward with nose to the ground, all day long, which most men refused to do. A politician who would become minister of agriculture a few years later wrote in 1915 that,

> the men can hardly reconcile [themselves] with the crooked position that is required for a good result. They consider themselves disqualified to do so since, they argue, as I have often heard it, [they seem] to lack the extra hinge that women are presumed to possess (Boyhus 1973, 121–122).

Every season, therefore, thousands of daughters of crofters were recruited to put their 'extra hinges' to productive use in the beet fields. From Småland and neighbouring regions in Sweden, the masses migrated to the beet centres of Scania, and some travelled even further, to Lolland in Denmark. Everywhere, they were lodged in barracks near the large estates from the first thinning in May to harvest time in November or December (Frederiksen 1892, 71). Later, Polish women were hired to do this endless backbreaking work in the fields. Here, the beet was perhaps not so much the disciplinarian of the landowner as it was of the young girls who worked 13-hour days under the panoptic eye of their overseers (Nellemann 1981, 60–73). On the larger estates, beet work became the task of *foreign women*.

One result of this modernisation process was a productive landscape where the fallow system had been replaced by a plantation-like social and ecological structure. Where the colonial sugarcane plantations grew the same crop in the same place, year after year, century after century, the sugar beet fields were plantations that moved around in the landscape each year, following the rotation of the crop. The labour force consisted of foreigners—their otherness was an intersection of gender, race, class, national or regional differences—who 'did battle against the beet', to paraphrase Sidney Mintz (1974, 16). This wandering plantation work that had replaced the fallow system created the necessary, historical conditions of existence for the steam plough that tilled the sleepless land as the extra-bodily organ of the fossil people.

NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8
Wheat	Barley	Barley	Oats	Beets	Beets	*Grass*	Fodder beets, potatoes, crops for stall-feeding, *fallow.*

Table 4. Plan of operation for a system of 'ley farming' with some sugar beets. Here, the sugar beet arrived in the ecological structure of the Holstein system (*kobbelbrug)* without transforming it into a full-blown *vekselbrug* system (adapted from Boyhus 1976, 36); crops that help restore soil fertility shown in *italics.*

The Longue Durée of the Horse

Independent yeoman cultivators.[6] Many independent farmers—usually those with around 25 hectares of land—would also sign contracts with the beet consultants. In their case, the disciplinary effects of beet cultivation appeared a bit differently. The ethos of those farmers encouraged them to do all the necessary work themselves before seeking labourers from elsewhere. But their mode of operation remained versatile and consisted of plant production and animal husbandry far into the next century (see Hobsbawm 1995). With their mode of operation, beets could not acquire the same important role as they did on the larger estates. So, the cash income from beets was proportionally lower, but it did still fit the ecological requirements of drawing one's plough with the horse. The historian Else-Marie Boyhus identified the following rotation system on a farm in Lolland from a taxation record from 1913:

The fallow system was reduced to only a fragment of one of the eight fields, which was only possible since beet was being grown on two of the fields. This meant—as we saw in the instructions to the consultants—that the sugar factory secured the farmstead with a steady flow of energy in the form of commercial fertiliser together with the beet seeds. Contrary to non-industrial crops, which could be reproduced on the farm by saving seeds year after year, sugar beets are an early example of the type of crop that agriculturalists had no possibility of reproducing themselves. In Jack Ralph Kloppenburg's classic study *First the Seed* (1988), he calls this change perhaps the most decisive point in the historical divorce between production and reproduction. By breaking the farm's own reproductive cycles, the industrial interests found a way to intervene in the local ecology. One yeoman recalled how the temporality of the factory began to direct farm operations:

> Around 1 October, a message came from the sugar factory in Nakskov saying that the beets had to be delivered in a railroad wagon to Søllested Station, usually one wagon

6 In Danish, *gårdmænd*; in Swedish, *bonde*.

per week until one had finished. Each wagon could hold around 100 centner (the railroad had been established in 1878).

The pulling up of the beets began a few days before the delivery was to take place. The blacksmith was engaged to produce a heavy iron tooth that could go beneath the beets and lift them out of the ground with a plume; it was an iron hoop with screws mounted on an older plough beam with a handle and draft gear. When two horses were harnessed, one could plough the beets loose so that they could be pulled up. One ploughed 10 rows at a time, then placed the beets in a circle of 3 *alen* across [1.88 metre], with the tops facing outwards; afterwards, the tops were cut off and the cleansed beets were placed in the centre; the beets were loaded onto a box wagon and driven to Søllested Station, where they were loaded with a beet fork onto the rail wagon, which could hold 9 box wagon loads; the remaining beet pulp from the sugar factory was sent to the cultivators in the same rail wagon, so this [wagon] had to be emptied before the beets could be loaded; the pulp was good fodder for the dairy cattle and young stock, and they quickly grew accustomed to eating it; at the same time as this was collected from the rail wagon, it was unloaded into an earth pit that had been dug 1 foot into the ground and soon after covered with soil; it could be kept as feed for spring. (NEU M 14.726)

But even in such a system, the burden of beet thinning might be too much to bear. Six hectares of beets is a lot to thin—not to mention the transport process mentioned above—so often there would be a need to hire extra hands, either in the form of migrant labourers or local crofters (Jensen 1985, 92). The Danish farmsteads (*gårde*) were protected by laws ensuring that aristocratic landowners could not confiscate the land of others. The absolutist Danish state had banned the destruction of individual farms as operational units in 1682 and the transfer of peasant land to the manorial estate in 1769 (Hesselbjerg 1949, 473). This system of protection for yeomen and crofters was in place in different forms for three hundred years, until the political climate shifted to favour the specialisation and enlargement of agricultural units in the 1960s. (We might consider this a protection against what Marxists call primitive accumulation or the original creation of proletarians out of peasants through dispossession.)

In some parts of southern Scania, though, Swedish yeoman did not enjoy the same political protection, which led to a cultural landscape more heavily dominated by the interests of the larger landowners. Entire villages, although by no means all of them, were demolished and their land incorporated into the operations of the local manor (Möller 1990, 72–73). Many peasants who had previously been relatively independent operators of plots of land that were practically theirs now found themselves dispossessed, homeless even. The strategy of the larger landowners was to tie this rural proletariat to their operations by irrevocable contracts and housing for the agricultural workers in centralised barracks (Möller 1990, 76). Many of the estates in the flat and

fertile plains of southern Scania grew to incredible sizes—thousands of hectares—and began to specialise in valuable dairy productions and, towards the end of the century, also in the cultivation of sugar beets.

In Lolland and Denmark, on the contrary, the manorial system continued to coexist with yeomanry. In this landscape, the centre of gravity shifted from grain production in the 1870s to dairy products and sugar beets in the coming decades. Interestingly, peasant dairy production continued to be organised in cooperatives owned by the yeomen themselves, while the industrial side of sugar production belonged entirely to the realm of capitalist commodity production. In this way, the fields of one individual farmer could operate in an entirely different economic manner. The beet field was linked to global value chains of coal, capital, steam technology, management and sugar, while the fields of oats and grains fed the livestock upon which the yeomanry's cooperative institutions were based. Finally, parts of the fields and other resources at hand continued to make up a subsistence economy that guarded the peasant families against the insecurity of the market. Freedom for these peasants consisted of striking a balance between these different economies, which allowed life to continue both on and in connection with the land (Christiansen 1982, 70). This act of balancing meant, as we have seen, that sugar beets did not entirely colonise the fallow parts of yeoman land until later in the 20th century. So long as the horse provided the main draft power and the operation was versatile—raising of crops *and* animals—there was a place for the fallow in the landscape under the 'Holstein system'.

On the yeoman farmsteads, thinning and cleaning the beet field was not exclusively the job of foreign women, but a job that fell upon the entire household. There seems to have been a class dimension to beet work, making it primarily the work of children, young people and women on a farmstead. Since beets required much more work than the grain crops, which did not need much attention between sowing and harvesting, there was an upper limit to how much of the farmstead could be sown with beets. Sometimes, extra hands would be engaged to help with the task, but in such cases local crofters and their wives would be employed more than migrant labourers.[7] This was the reason why the beet was called the disciplinarian of the farmer.

Small-holding crofters. This rural proletariat consisted of people whose plots were too small to subsist on as a family, which forced them to turn to additional wage labour.[8] The mode of operation for crofters continued to mirror that

7 During the first decades of the 20th century, censuses show that it was also not customary among some yeomen to have a 'beet girl' in the household—this custom was systematised to the extent, though, that 'beet girl' even became an official category in the legal language of the surveyors (*roepiger*).

8 In Danish, *husmænd*; in Swedish, *torpare*.

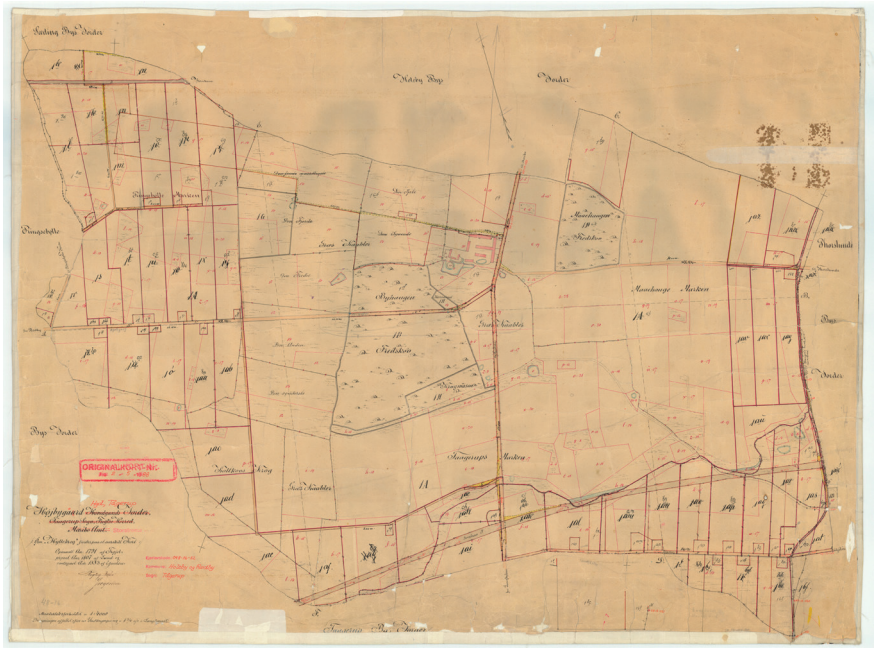


Figure 7. Cadastral map of Højbygaard Estate (0481652), showing developments in the 20th century. After the agrarian reforms of 1919, the fields to the west, east and south were converted into state property and smaller plots were rented to crofters on life-long leases. The crofters would then implement a mode of operation similar to the one depicted in Figure 9. In this way, the political intervention fostered a transition from a sleepless land to more versatile forms of ley farming—with the fallow system being reintroduced. Speaking with Campbell, we can understand this map as a palimpsest of different historical forms of life, each of which expresses and seeks to materialise its own political, economic and cultural ideas in the landscape: a landscape of class contradictions.

of the yeomen (see Table 4) well into the 20th century, although on a smaller scale (Solvang 1984, 185). For these smaller operating units, usually 1–4 hectares in size, the breeding of plants and animals continued to mutually presuppose each other in a *versatile mode of operation*. Within this mode of operation, which was always a struggle for families to make ends meet, sugar beets only played a minor role in crop cultivation, functioning as a supplementary cash crop but never as the foundation of their operations.

The crofters viewed the ownership of land as an absolute value (Christiansen 1982, 32), preferably large enough to live entirely off of it, but as this was seldom possible, any plot, however small, was something to strive for. On this land, they employed economic strategies of frugality and an ecological strategy of intensive diversification that would help them stay clear of extra expenses (Højrup 2003, 242). They might grow sugar beets on a small part of their land, 1–2 per cent of the area, but many of them also took extra work thinning and cleaning the beet fields of their yeomen neighbours.

Throughout Scandinavia, the second half of the 19th century saw remarkable population growth. This growth posed a particularly difficult problem to the rural population since their modes of life depended on access to land (Solvang 1984, 17–20). Most of the children of crofters and many children of the yeomanry class saw very little possibility of ever owning a farm in the sleepless landscapes, and many wandered off into the great unknown overseas, leaving their families and everything they knew behind. This population drain was paradoxical considering the fact that the sugar industry was in a constant need of labour. Labour power became necessary for the operation of the sugar estates, but it proved impossible to draw enough workers from the yeoman and crofter classes since they were above all preoccupied with the operation of their own lands. Therefore, migration was necessary as labour increasingly became globalised in the fossil mode of operation.

A Bourgeois Vision of a Moral Landscape

The development of the sleepless land was not a unilinear process that unfolded in Scandinavia and the rest of the world at the turn of the 20th century. Rather, it was the product of a practice that continually had to secure its own conditions of existence. In the first decades of the 20th century, the social problem constituted by the increasing landless population became so threatening to the general social order that agrarian reforms were put in place to secure the welfare of the rural population and/or avoid their radicalisation, depending on how one sees it (Solvang 1984, 17).

After the first wave of fossilisation, during the last decades of the 19th century, the crofters managed to express their cultural ideas with respect to the landscape when the state recognised them as an independent class. With support from the agrarian reforms of 1899 and 1919, they lived their lives engaged in a versatile mode of operation until their political protection disappeared, when the second wave of fossilisation hit Scandinavian landscapes after the Second World War. Under the Marshall Plan and its ideology of technological development, sleeplessness once again expanded as the fossil modes of operation were further promoted scientifically, politically, economically and ideologically in the post-war period (Fitzgerald 2003, 188). During the 1960s and 1970s, the landscape ideal of small parcels of land that were cultivated intensively in a versatile system faded away, and those who did survive managed to do so only by adapting to a logic of expansion and specialisation (Christiansen 1982, 63).

In the bourgeois worldview of 'cultivated people', like that of Hagemann, argues ethnologist Orvar Löfgren, landscapes were split into two forms, productive and recreative landscapes, each of which constitutes the negation of

the other: 'The landscape of industrial production is ruled by rationality, calculation, profit, and effectiveness, while another new landscape of recreation, contemplation, and romance emerges—a landscape of consumption' (Frykman & Löfgren 2008, 50). The sleepless land belonged to the landscapes of industrial production. For an agrarian landscape to be good, moral even, it had to be arranged rationally, effectively, scientifically. We have already seen how Hagemann 'did battle against' the sleeping land, and he did so not only in the fertile landscapes of southern Scandinavia—he owned estates in Scania and directed the Danish Sugar Company—but also in the Danish colonies in the West Indies. Some scholars have claimed that the plantation was the historical birthplace not only of rational and scientific agricultural production, but also of the factory system as such (Mintz 1985, 59–61; Buck-Morss 2009, 101). In one text, Hagemann concludes that the industrial side of colonial sugar production was predatory—and therefore needed to be modernised. He ends up in a logical paradox, when he, as a good modernist, locates the predatory moment of the 'good old system' of plantation operations (pre-fossil) not in the over-use of resources, but quite the opposite, in the under-use of them:

> That this industry can and should be called a predatory operation (*rovdrift*) is clear from the fact that while 100 pounds of cane, as they are brought in from the field, contains around 16 pounds of sugar, the final result is that only 5 pounds can, in the end, be shipped off. In the first part of the industry, only about half of the juice that the cane contained is extracted and the rest is used as fuel together with the threaded substance of the cane. (Hagemann 1885, 8)

The above quote provides a striking example of Hagemann's line of reasoning. The predation that he sees in the 'good old system' is really at odds with his worldview. By mobilising the vocabulary of predatory or exploitative practices, he takes a moral stand against the old ways. To Hagemann, it is morally wrong not to extract more than five pounds of sugar per 100 pounds of cane. But notice how the focus subtly shifts—the idea of certain practices being predatory stems from the field of ecology: extracting more than can be reproduced, or more literally, killing all the prey that the predator lives upon. It belongs to the sphere of life and the circulation of energy in a landscape. But when Hagemann condemns the 'good old system' for being predatory, it is at the economic level in the sense of a *loss of value*. Seen as an economic system, what happens in the old factories of the colonies is, if we do not consider the social aspects, not predation but rather the opposite: wastefulness. Predation becomes taking too little, not taking too much from the earth. For him, an efficient industrial landscape was moral from a rational point of view,

but if another 'cultivated man' came along looking for a beautiful and exotic landscape of wilderness to experience and enjoy, then the judgement offered would be entirely different. The Swedish author August Strindberg expressed (what he believed to be) the lack of aesthetic qualities of the sleepless land in the following way:

> No longer fields of waving corn, a disturbing copper green is now laid over the old provincial yellow. A factory landscape […] where the scent of clover is powerless against the stink of hydrogen sulphide and ammonium sulphide from the drainage ditches of the sugar factory. The Scania of days gone by will soon be no more, but this ugly beet has saved Scanian farming and further enriched the country, we may live off the fat of the land, but that fat has no beauty. (as cited in Kuuse 1983, 35)

With the introduction of beets, farmers were no longer alone in the landscape. The landscapes of the fossil modes of operation are not only an object of aesthetic criticism to the urban eye; they are also the products of an industrial logic that penetrated the former peasant landscape (Fitzgerald 2003, 187–190). The farmland, whether owned by smallholders or aristocrats, was not managed freely by the farmer; its operation became tied to the factory through infrastructures and contracts. No individual farmer begins to cultivate beet on their initiative, but only as the agricultural consultants convince them to do so. The consultant replaces the horse, a process that ironically has been called the 'de-horsing' of agriculture (*afhestning*).

A Fossil Mode of Operation

Seen from the perspective of the soil, sleeplessness means globalisation of the land. Seen from an atmospheric point of view, the birth of the sleepless land marked the fossilisation of the prevailing mode of operation. Although only possible in a preliminarily manner here, I have suggested developing the concept of mode of operation along three lines: as (I) a method for renewing the ecological conditions of life, as (II) certain principles of operation that call a set of tools into action and as (III) the simultaneous cultivation of certain biological lifeforms—crops and animals—and certain cultural forms of life.

The fossil mode of operation reproduced itself by transferring energy from the underground deposits of ancient sunshine to the social activities of farmers (Wolf 1966, 19). This method of renewing the ecological foundations of the system of sugar cultivation enabled the cultivation of the entire land year after year by digging deeper and deeper into the coal mines for fossil fuels. Scholars have identified the length of the fallow as of primary concern when typologising different modes of operation (Boserup 1965; Bernild & Jensen

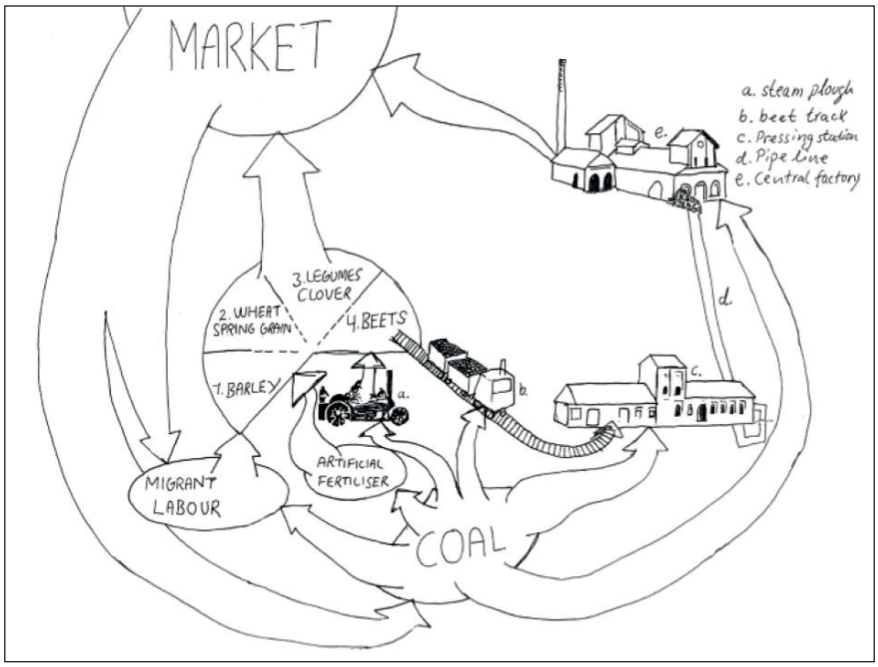


Figure 8. Energy flow chart showing the four-course rotation of the fossil mode of operation, with the centre of gravity being the sugar beet; the colonisation of the fallow presupposed large infrastructures to support the globalisation of the individual field (drawing by the author).

1978, 74–75). The sleepless land was the product of the fossil mode of operation, in which the principle of specialisation reigns supreme. Specialisation becomes possible when the flow of energy is not restricted to a closed system whose borders coincide with land that the operator has access to. Rather than being caught in the logic of versatility that follows from the interdependence of plants and animals, the fossil mode of operation needed specialised tools that run on the energy that flows from the subterranean forests overseas (Højrup 2003; Sieferle 2001).

The global mobility of energy, tools and labour presupposed an infrastructure capable of transporting them to the sleepless fields of the world. Steam ploughs, railroads, pressing stations were some of the necessary tools in the inventory that supplement the hand tools held by the migrant labourers. Growing sugar beets, together with wheat and barley, meant cultivating managers to redirect the global energy transfer, cultivating 'disciplined farmers', diligent migrant labourers and industrious aristocrats. Unlike the wind that blows without regard for the wishes of the manager or the horse that is tied to a local space and exercises its own temporality, beets, migrants, steam ploughs and coal all could be moved around freely in the landscape, that is,

freely from the point of view of the manager (Malm 2016, 41). Anthropologist Anna Tsing has referred to them as 'free' elements, illustrating the history of sugar in the early plantations, meaning non-social landscape elements, or provocatively abbreviated as nonsoels (Tsing 2012). A horse, by contrast, would then be a social landscape element since it is deeply embedded in its environment both spatially and temporally. Under the dictate of specialisation, the fossil mode of operation breaks the symbiotic relationship between plants and animals. The nutritional bond of destiny between cattle, horses and pig and the plantscape they live in and by is broken by the abstract imperative of the market. From this point onwards, it becomes possible to imagine fields without animals, and animals without fields.

As the modes of the operation escaped local ecological restraints, caught up in a state of partial sleep in the pre-fossil age, a new temporality was produced. In the sleeping land, time moved in circles mirroring the rising and setting of the sun, the yearly movement of the fallow, and the times for ploughing, sowing and harvesting (Frykman & Löfgren 2008, 15). But then, with the arrival of the non-social landscape elements (coal, migrant labour, steam ploughs and artificial fertiliser), time became money (Frykman & Löfgren 2008, 19). This new kind of time did not mirror any activity in everyday life but was rather a purely empty temporal yardstick that homogenised time. For time to become money, however, it needed to be abstract (Malm 2016, 305). As time became loosened from ecology and tied to the economy, it became linear rather than cyclical, and as an economy subject to the bourgeois eye for profit, it has needed to continually grow. In this way, time itself became the measure of progress as materialised in accumulation. The landscape became the mirror of ideology, or in the words of Henri Lefebvre: 'What is an ideology without a space to which it refers, a space which it describes, whose vocabulary and links it makes use of, and whose code it embodies?' (Lefebvre 1991, 44). The fossil mode of operation's regime of abstract and linear time cultivated not only sugar beets but also the forms of life of the migrant labourer, of the large landowner and of the industrial capitalist. The landscape, in this analytical perspective, became the site of coexistence between different cultural forms of life and a variety of biological life forms, impacting the way in which the relations between them are organised. Their destinies became tied together in the multi-species drama that plays out in the sleepless land under a warming sky.[9] As a whole, the system has been designed based on the image of the factory. As such, we might consider the birth of the sleepless

9 Recently, ecologists have found that the decline in biodiversity was 'strongly associated' with a decline in—and eventual disappearance of—the fallow system (Traba & Morales 2019).

land as the embourgeoisement of a cultural landscape, the materialisation of its particular concept of freedom, as freedom from the sleeping land and the freedom to colonise the fallow.

While We Are Waiting

This paper has focused on the extent to which energy transitions have clear social and ecological implications. I have taken the introduction of sugar beets into Scandinavian agriculture as a local example of the global process of fossilisation. The birth of a sleepless land tied formerly fallow land in one part of the world together with mines and extractive practices in another part of it, with infrastructure as its necessary precondition. By revisiting older ethnological theory, it becomes possible to analyse a landscape as comprised of social contradictions—different political, economic and cultural views of how the land should be used, and by whom. These contradictions, as was shown, materialise in certain technologies that spread out across the landscape; these technologies come together in bundles, as was the case with sugar beets, steam ploughing, artificial fertiliser, migrant labour, expertise and pipelines. By showing how a certain landscape structure came into being—here we have focused on the birth of a sleepless land—ethnological analysis holds a potential for destabilising the view of our immediate surroundings as being more or less 'natural' and therefore also more or less 'neutral'. Instead, ethnology contributes a story of cultural ecologies as *cyclical systems* in which class dynamics materialise. In this article, I have focused on the shift from a mode of operation in which the local landscape was materially and conceptually an energy system of its own to one in which the fields were opened up to global flows of land and labour. The pivot in this new ecological system—here conceptualised as a fossil mode of operation—was the steam plough. Contrary to all earlier and non-fossil forms of tilling, steam ploughing was detached from the metabolism of the draft animals, and thus, decontextualised from the landscape. Instead, the steam plough found its conditions of existence within the industrial system, with its managerial logic, infrastructures of free trade and consultants. What may seem like the most natural of things today—namely that agriculture is an activity that is carried out with ever-larger machines in the fields without animals (or large stocks of animals without fields)—has thus been shown to be only one historically and ethnographically specific way of cultivating the land, and thereby also the people on it.

The guiding principle then has been to reveal the hidden social values in phenomena that otherwise appear 'neutral' in all their technicality. This classic ethnological strategy of 'defamiliarisation' has direct political implications. Recognising that our sleepless landscapes are currently being shaped by spe-

cific historical social actors—the bourgeoisie by fossil means—also makes it clear that things could indeed be different. In fact, there is very little point in arguing against the notion that things must change—and do so quickly. Seen from the perspective of historical epochs, it should be clear that agriculture without fallow belongs to the fossil age. Under the planetary imperative of defossilisation, ethnological theory helps make clear to us that even a sleeping land embodies political values of freedom and independence, but it is not a freedom of the bourgeois type that Hagemann envisioned—an ideology of sleeplessness. Or as one saying goes: 'the ploughing of Lolland and misery of Hell are two things that never end'.

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