

Evaluation “Images of Sustainable Development - Modelling resilience of the Dutch Agro-Sector” (WP-046)

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Introduction

The North-Frisian Woodlands (NFW for short) have recently been dubbed a “Dutch National Landscape,” acknowledging the important value of the landscape for the Netherlands. Agriculture is an important part of the NFW landscape, but it is under increasing legal pressure. Dutch national law on manure and fertiliser application prescribes the use of specific machines for the application of manure. The size of these machines badly fits the small scale of the NFW landscape. This raises the question of how sustainable the NFW landscape actually is.

Within the context of a TransForum-project, farmers in the NFW were given a dispensation from the law to experiment with self-regulation. The main reason for conducting this experiment was that some local dairy farmers had achieved very low fertiliser use, without compromising their production. These “alternativists” used little artificial fertiliser, added fewer protein to the animal fodder, and applied manure the old-fashioned way, using surface application instead of manure injection. Because this type of farm management can co-exist with the current NFW-landscape, the NFW-farmers were granted self-regulation, and were allowed to decide for themselves how to apply manure, under the condition that this would not harm the environment.

The alternative strategy is very promising for the conservation of the traditional NFW-landscape. But is it difficult to switch from the conventional to the alternative strategy? Or the other way around? And what can we expect for the future, given current legislation? The big question is: Does the alternative strategy increase the sustainability of the NFW-landscape? This question was studied by Dirk van Apeldoorn. His conclusions have important implications for current legislation, and for the local societal climate.

Research

Dirk van Apeldoorn used a *complex adaptive systems* modelling approach to study soil dynamics in the NFW and their relation to the different farm management strategies. He used *resilience* as a measure for sustainability. Resilience is the extent to which a system can persist in the face of external disturbances. Very resilient systems are well able to persist in the face of large disturbances. Low resilience means that a system may easily collapse under the pressure of disturbances. High resilience does not mean that a system remains stable when disturbances occur. Quite the contrary, many resilient systems preserve their character by absorbing the disturbance, like a blade of grass, which lies down in strong wind but does not break.

The most important assumption in Dirk’s research was that high resilience would be synonymous with high sustainability. For the NFW, this would mean that the alternative strategy would lead to an increase of resilience. Dirk studied the consequences of conventional and alternative farm management strategies for the resilience of the NFW, and how each strategy affects the sustainability of the landscape. His main research questions:

- What is the resilience of the NFW landscape?
- How is the NFW landscape resilience related to its sustainability?
- What are the effects of scale differences on the influence of resilience on sustainability?

Main results

Soil composition was found to be the most important dairy-farm management factor in the alternative strategy. Soils with a high organic matter content require less (artificial) fertiliser for the same yield. The NFW farmers who successfully employed the alternative strategy all had pastures that of old had soils with high organic matter content. These farmers appear to have conformed to the existing soils of their farm. In the conventional strategy, soil composition is nowhere near as important. These soils are often much less efficient with nitrogen, but the use of protein-rich fodder and more fertiliser can compensate for this. In turn, this also leads to an increase of weeds. This is why the conventional strategy also requires more pesticide use.

Next, Dirk studied the consequences of both strategies from an ecological perspective. The alternative management strategy leads to a climax ecosystem, with high soil efficiency and a well-developed food-web. This is also why these soils, with high organic matter content, are successful from an ecological point of view: they require less fertiliser, and therefore result in less environmental emissions. But a climax ecosystem also is vulnerable for outside influences. Once the ecosystem is out of equilibrium, chances are slim that it is able to return to its climax state. This means that the alternative strategy is not very resilient. In contrast, the conventional strategy is aimed at keeping the soil ecosystem out of equilibrium. This makes it much easier to control the farm. Fertiliser, tillage and pesticides can all be used to increase control over the soil. The resulting system is less efficient, but can be put to a higher yield. In addition, the system is much less vulnerable, because of the extent to which it can be controlled. The conventional strategy has a high resilience.

The high vulnerability of the alternative strategy is a strong indication that it is harder to switch to the alternative strategy than to the conventional strategy. This is supported by the research results; it takes a lot of time to let the soil reach an ecological climax, and this only happens when fertiliser use is reduced drastically.

National policy and societal developments

Current legislation makes it difficult to apply the alternative strategy. This makes a switch to the conventional strategy attractive, but also incurs losses for the characteristic landscape, and loss of soils with high organic matter content. On the other hand, society calls for conservation of this same landscape, which supports the dispensation of manure legislation the farmers now have. This dispensation would not be necessary if legislation would be goal-oriented (nitrate concentrations in groundwater, emissions of ammonia to the air, stench levels) instead of means oriented. The fact that manure legislation is means oriented makes it into a threat for the NFW landscape.

Meaning for TransForum

TransForum aims to innovate Dutch agriculture, using a *triple bottom-line* (people, planet, profit). The preservation of small-scale agricultural landscapes that attract citizens can play an important role within a mix of metropolitan agriculture activities. Landscapes like the NFW have a function for other citizens, for instance as an area for recreation.

In the NFW, it has been shown possible to sustainably preserve a landscape with high cultural-historical value (people) without compromising environmental values (planet). Furthermore, it does not necessarily result in lower yields either (profit). However, sustainable preservation would benefit if the farmers involved are able to turn the preservation of the landscape into an added profit on their products, or with new product-market combinations.

Implications for connecting values

Several different values need to be connected in order to sustainably preserve the current NFW landscape. Right now, the landscape quality for society is already connected by means of a dispensation of manure legislation. However, a change in legislation, from means-oriented to goal-oriented, would be better. On the one hand, the research has shown that a dispensation can be an important driver for change. However, it also

shows that a dispensation can turn into a threat for change in the long run, and that it probably will not lead to sustainable preservation of the landscape. Furthermore, connecting the value of the NFW landscape to general societal needs (the metropolitan citizens) may also foster the preservation of the NFW-landscape. Of old, the NFW have a cultural-historical value, which strengthens the call for changes in legislation.

Implications for the agro-innovation system

First-legislation can form an obstacle to innovation, especially when it is means-oriented, and not goal-oriented. Innovation often entails new ways of doing things. Such innovations are especially impeded by means-oriented legislation.

Second-this result shows that increasing sustainability on one level (for instance by switching toward the conventional farm management style) can lower the sustainability on another level (the more farmers switch to the conventional style, the lower the chances of survival for the NFW landscape. For legislation, this means that the scale level of the landscape always needs to be taken into account, when it concerns the sustainability of that landscape.