Restoration Ecology
THE JOURNAL OF THE SOCIETY FOR ECOLOGICAL RESTORATION

RESEARCH ARTICLE

Aligning nature conservation and agriculture: the search for new regimes

Henny J. van der Windt[1,2], Jac. A.A. Swart[1]

In addition to the protection of nature in reserves, known as the land-sparing approach, another strategy is often suggested, the land-sharing approach, which implies the integration of nature protection with other human activities. Especially in Europe, a rich variety of sharing approaches have been practiced. Using the theoretical concepts of the multilevel perspective on sustainable transitions, we will analyze two experimental cases in the Netherlands, in which the development of a sustainable, nature-friendly form of agriculture was attempted. In these experiments, new concepts of biodiversity monitoring, self-governance, and agriculture were developed in order to enhance biodiversity and the quality of nature on a regional scale. Our conclusion is that this sharing strategy has proved to be promising, at least in terms of relatively extensive use of agricultural areas. It should, however, not only include sharing of land use but also of responsibilities, knowledge development, aims, and means. Moreover, our study revealed that such an approach is possible only if governmental and market structures also change, and if based on new integrating concepts.

Key words: agriculture, conservation, regime shift, sharing, sparing, sustainability

Implications for Practice

- Alignment of nature protection and agriculture may contribute to biodiversity goals in seminatural and cultural landscapes.
- The multilevel perspective makes it possible to distinguish several dimensions and levels of society that are relevant for understanding the transition to a sustainable and nature-friendly form of agriculture.
- Alignment of nature protection and agriculture requires expertise with respect to agricultural regimes and agriculture-nature interactions, as well as spaces for experiments.
- Knowledge building and practices concerning nature-friendly agriculture may be considered a form of inclusive ecological restoration.

Introduction

Agriculture is seen as one of the main drivers behind the threats to biodiversity (CBD 2006). The environmental effects comprise habitat destruction or fragmentation, pollution by nutrients and pesticides, and drainage. For example, many European farmland bird populations have decreased by at least 50% over the past few decades, including the Northern Lapwing (*Vanellus vanellus*) and Eurasian Skylark (*Alauda arvensis*) (European Environmental Agency 2015). The dominant response to these threats is preservation and conservation, and, more recently, the restoration of nature reserves. However, the relationship between agriculture and conservation has attracted and renewed attention recently in terms of the debate around land sparing and sharing (Green et al. 2005; Kremen 2015). Proponents of land sharing argue for a strong separation between agriculture and conservation, along with intensive forms of agriculture, in order to create more space for nature. In contrast, land-sharing advocates promoted extensive, nature-friendly forms of agriculture, without any such rigid separation. However, the distinction between sparing and sharing is often too simplistic, since optimum strategies for conservation and food security issues also depend on the kinds of species and ecosystems involved, as well as land-scale and climate conditions, the rebound effects of land conversion, and political, cultural, and economic conditions (Fischer et al. 2014; Phalan et al. 2016).

At present, both strategies are being practiced. North American nature protection organizations have always featured a strong focus on pristine, pre-Columbian nature, thus implying a preservation or sparing approach. Their European counterparts, however, have developed several approaches in order to conserve seminatural and traditional, small-scale agricultural landscapes, which can be considered variants of the land-sharing strategy (de Klemm & Shine 1996). More recently we have also been seeing attempts to integrate conservation and restoration measures with modern forms of agriculture, their value chains, and daily practices (Barbier & Elzen 2012). However,

Author contributions: HW, JS conducted the research design and data collection; HW, JS conducted the interpretation and theoretical framework; HW, JS wrote the text; HW conducted the first draft and final editing.

[1]Science & Society Group, Faculty of Science and Engineering, Rijksuniversiteit Groningen, Groningen, the Netherlands
[2]Address correspondence to H. J. van der Windt, email h.j.van.der.windt@rug.nl

doi: 10.1111/rec.12570

such alignments are not easy to achieve because of the involvement of many different actors, discourses, knowledge domains, and societal constraints.

Alignment of the goals of conservation and restoration with those of modern agriculture implies the establishment of "hybrid regimes," in which we find both conservation/restoration and agriculture, as well as new underlying societal institutions. Such transitions are dependent on innovations in science and technology, on the one hand, and societal changes, on the other. Scholars from the field of sustainability transitions argue that a substantial and sustainable transition and regime change require multiple, synchronized developments on various societal levels (Grin et al. 2010).

In this article, we will apply this "multilevel perspective" to two Dutch cases involving an attempt to reconcile agriculture and nature protection goals. The main aim of our research is to investigate whether these cases can be characterized as promising examples of nature-friendly agriculture—or even as examples of agriculture-friendly forms of nature restoration. Moreover, we will discuss to what extent these cases have the potential to change the current dominant agricultural regime, and under what conditions the merging of nature conservation and agricultural regimes is possible.

Methods

According to the multilevel perspective (MLP), regimes are relatively stable institutional configurations enabling management and intervention in social domains such as urban development, agriculture, etc. A regime consists of a variety of procedures, rules, and actors with different discourses and resources operating as part of a societal network (Stone 1989; Kissling-Näf & Kuks 2004; May & Jochim 2013). Scholars from science and technology studies, as well as evolutionary economics, add that regime stability, consistency, and change also relate to technological, scientific, and market factors, as is illustrated by mobility and energy transitions (Rip & Kemp 1998; Grin et al. 2010), for example. The term "socio-technological" regime is used to stress such close relationships between technology and society. These authors distinguish four main regime dimensions: policy-making or governance (including actors, procedures, and rules); science, technology, and related infrastructures; culture and values; and market and economy.

The regime is considered to be a middle ground between the "niche" and "landscape" levels of societal structures (Fig. 1). Niches are temporary social spaces shielded against pressures from existing dominant institutions and markets, providing the actors involved (technologists, practitioners, and citizens groups) with the opportunity to collaborate, experiment, and exchange ideas and experiences. The landscape stands for the characteristics of society as a whole, e.g. certain values (freedom and sustainability), scientific paradigms, political views (democracy), economic principles, and often biophysical conditions such as infrastructures, geographies, and existing urban and nature areas.

According to the MLP, new ideas and practices can best be developed, tested, and nurtured at the niche level. Examples of this are subsidized innovation programs for the development of wind turbines or seed firm research departments that develop new crop varieties. In general, it is assumed that, when niche results accumulate, the regime will be seriously challenged not only by innovative products, technologies, and scientific insights but also by new governance styles, markets, production chains, and norms and values.

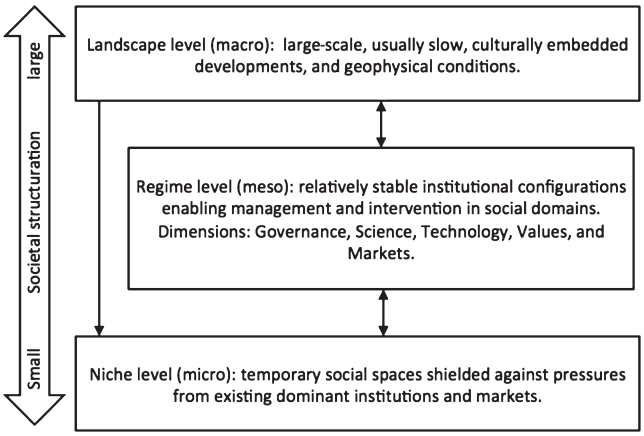

Figure 1. Schematic presentation of the multi-level perspective on societal transitions as applied in this article. The solid arrows represent influences between the different levels.

As a consequence, if a regime shift does take place, different dimensions and social groups will reconfigure and reintegrate, learning processes will take place, and new networks will be established in a process of cocreation (Regeer & Bunders 2003). Accordingly, innovations may develop further if there is long-lasting ideological, scientific-technical, financial-economic-material, and social-institutional support by relevant actors such as citizens' groups, investors, and policymakers (Smith 2007). In this respect the landscape level is relevant, since it not only constrains regime change but may also facilitate and create windows of opportunity for niche construction by stressing the need for experimentation and for making current regimes receptive to change. The dynamics on the different levels should be considered as a mutual feedback process. Therefore, the landscape may also change through regime and niche dynamics. This usually happens slowly, however, except in cases where there are radical market, political, or ecological disruptions.

An example of a regime shift can be found in Dutch water management, which for centuries was based on the joint responsibility of regional water boards and the central government, assisted by communities of farmers, engineers, and investors. Dikes, canals, and pumps were the main technologies that not only controlled water levels but also led to reclamation of arable land and new polder landscapes (Zeischka 2007). However, the rise of new societal values, along with the threat of climate change, and the accompanying increase in water precipitation, in particular, have replaced that old regime (Pahl-Wostl et al. 2009; Raven et al. 2011). Controlled flooding experiments have been started, and natural stream and bank restoration has created new natural habitats and facilitated species migration (van

Vossen & Verhagen 2009). These developments have led to a new regime characterized by new legislation, the recognition of ecological knowledge, and the involvement of citizens and environmentalists (Raven et al. 2011; Schultz van Haegen-Maas Geesteranus 2013).

Regime change may also happen through regime merging, which is especially relevant in our case, where we look for alignment of agriculture and nature conservation or restoration. Flinterman et al. (2012) describe how a successful cross-regime innovation involving agriculture and health care took place in the Netherlands. It facilitated encounters among pioneers from both regimes and led to experimental niches for a potentially new hybrid regime of care farming, in which the farming environment functions as the therapeutic means and where patients help farmers manage the farm. This regime change was mediated by pressures from the overarching landscape level, that is, the societal call for a more active role on the part of clients to maintain good health. This resulted in a window of opportunity for these new farming practices. New regulations, financial support, and institutional frameworks appear to be important factors, in addition to the involvement of new actors and the opportunities necessary to develop new professional routines for cross-over actors, that is, actors that cross traditional regime boundaries.

Cases

By describing and analyzing two cases, our aim is to specify the possibilities and bottlenecks generated by regime transition, and to show to what extent and how conservation and agriculture can be sustainably aligned, challenging the current dominant agricultural regimes. In our analysis, we will focus on four dimensions: science and technology, values, policy or governance, and markets. Our two cases, "Overijssel" and "Noordelijke Friese Wouden" (Northern Frisian Woods), are located, respectively, in the Dutch province of Overijssel and the province of Friesland. Both regions are considered less suitable for modern, rationalized agriculture but are appreciated for their physical landscape characteristics. A considerable part of these areas is characterized by rather extensive, small-scale forms of agriculture, as well as designated natural landscapes with a highly valued biodiversity. For example, in Overijssel, we find species such as finger speedwell (*Veronica triphyllos*), love-in-idleness (*Viola tricolor*), and European Stonechat (*Saxicola rubicola*), while, in Friesland, dog rose (*Rosa corymbifera*), apple moss (*Bartramia pomiformis*), and Common Redstart (*Phoenicurus phoenicurus*) are found. Some of the nature areas are managed by nature organizations. In both regions, there are restrictions for farmers but also opportunities for them to generate tourism-based incomes and to make use of subsidy programs for extensive nature-friendly agriculture (Hoekstra et al. 2010; van der Ploeg et al. 2010).

One important reason for choosing these cases was that in both regions, from 2008 onwards, experimentation took place using new practices and new coalitions of farmers, local entrepreneurs, and non-governmental organizations. Their aim was to investigate new spaces for sustainable innovations in local agricultural practices as a challenge to the existing agricultural regime (Veldkamp et al. 2009; Pinxterhuis & Caron-Flinterman 2010). In both cases, project teams were established consisting of local actors assisted by scientists from Wageningen University and Research (WUR), governmental organizations, and environmental consultancies. The project teams supervised thematic workgroups consisting of local stakeholders such as farmers and retail entrepreneurs. These workgroups were trying to develop new sustainable practices in the agricultural value chain.

The authors of this article were involved as external and independent observers in both projects during the period 2009–2013. Their role was to provide the project team participants with critical observations in order to improve the process (not the products). Therefore, this research methodology may be classified as "participatory observation," with a focus on monitoring and evaluation. The authors enjoyed an independent position, since they were hired and funded by the Athena Institute of the Free University Amsterdam, which had received funding for process assessment from the initiating stakeholders of these projects.

The authors had access to all meetings of the project teams, to workshops and field trips, to internal documents, and to the project participants for interviews; they were also involved in the post-evaluation procedure of the projects, where their findings were discussed with the members of the project groups. Furthermore, documents were assessed that originated before and after the projects. Finally, the findings were compared with publications on these and former projects.

Results

In order to put the projects into context, we should first briefly sketch the state of agriculture in the Netherlands, which would seem to be quite a successful enterprise. In spite of its small size—17 million inhabitants, 186,000 of whom work in the agriculture sector—the country is the second largest exporter of agricultural products in the world (CBS 2016). This success is based on the intensive and specialized character of the sector, and the strong links with governmental institutions, farmers organizations, and specialized agriculturally oriented schools, scientific institutions, banks, and industry (Karel & Segers 2015).

However, as in many other Western countries, this dominant agricultural regime has been criticized since the early 1970s because of its serious well-known downsides: its impact on the environment, on biodiversity, animal welfare and human health, the loss of employment, as well as an imbalance of power and trade relationships. As early as the 1970s, alternative practices such as organic farming, slow food initiatives, and regional or urban markets began, and new coalitions of citizens, scientists, and farmers were established (Barbier & Elzen 2012; Friedland 2010; Parvathi & Waible 2013: Wiskerke & van der Ploeg 2004). The two projects we analyzed fit into this critical tradition.

Niche Development in the Project Echt Overijssel

The project in Overijssel, called Echt Overijsel (Real Overijssel [EO]), was initiated by parties already working on sustainable agricultural projects (Pinxterhuis et al. 2008). These comprised the Province of Overijssel, the experimental organic demonstration farm Aver Heino, researchers from WUR, the foremost Dutch nature management organization Natuurmonumenten (800,000 members), and the Dianthus Foundation, a regional organization of organic farmers and retailers. The project was supported by LTO (Land en Tuinbouw Organisatie), which is the largest Dutch organization of farmers, along with the Ministry of Housing, Spatial Planning and Environment; and the Ministry of Agriculture, Nature and Food.

The goals were to create (1) higher levels of biodiversity, landscape, and environmental quality; (2) regionally closed nutrient cycles; (3) new regional economic activities and products; and (4) new coalitions of farmers, nature conservationists, local entrepreneurs, and scientists (Anonymous 2008). About 25 farmers from the region were recruited for the project and supported by the project team. Because of the diversity of the farms, and the various motives of the farmers and project team members, this took some time, but after 1 year three workgroups were established, focusing on nutrient cycles ("Nutrients" workgroup), on agrobiodiversity ("Biodiversity" workgroup), and on new products and markets ("Market" workgroup), all of whose shared aim was to develop profitable environmentally friendly products and services.

The aim of the "Nutrients" workgroup was to shorten nutrient cycles by reducing the import of feed from outside the region, while also reducing the use of energy and materials by sourcing things regionally. Because it was uncertain whether the farmers would be able to produce sufficient feed of high quality, this group began experimenting with new types of animal food: grass-clover and other mixtures. The researchers involved tested local grain mixtures as feed for cattle, and a new method was developed to assess the farmers' efforts at nutrient cycling. The experiments showed that, for a number of farms, this new system was successful and could significantly reduce the import of animal feed from outside the region. More than 80% of the feed was able to be produced in the region itself (Holster et al. 2013; Pinxterhuis & Caron-Flinterman 2015). Subsequently, farmers began discussing the possibility of using Natuurmonumenten land for this kind of feed production, in an extensive way. Over the course of the project, this goal turned out to be achievable. However, Landschap Overijsel, the main regional nature organization, was initially reluctant, because it feared that these practices would not fit in with its nature conservation goals.

In the "Biodiversity" workgroup, farmers collaborated with nature conservationists and researchers from the Louis Bolk Institute, an independent research center for organic farming. Their aim was to bring about "ridge cultivation" of wheat on fields owned by Natuurmonumenten. In ridge cultivation, crops grow on elongated, relatively high ridges. This improves the quality of the soil and the soil fauna, while creating space for wildflowers between the ridges. At the end of the project, the management of the fields was handed over to the farmers participating in this group. In addition, farmers were able to use the land from Natuurmonumenten to graze their cattle and allow their pigs to forage, which probably improved both the quality of the meat and the structure of vegetation in the natural areas. In line with the aim of closing nutrient cycles and to make the results more visible to the public, a local bakery produced a biscuit from this grain (Holster et al. 2013; Pinxterhuis & Caron-Flinterman 2015).

The "Market" workgroup, mostly organic farmers, established a foundation called "Nature Farmers," whose goal was to set up new local production chains in collaboration with local shopkeepers and supermarkets. The foundation members produced beef, honey, herbs, and dairy products for the local market. In order to reduce CO_2 emissions, they developed a local solar energy initiative. Experts from consultancy CLM (Centrum voor Landbouw and Milieu [Centre for Agriculture and Environment]), developed the "Gaia yardstick" to monitor wild plants and animals, along with old breeds of cattle and traditional crops. By using this yardstick, farmers were able to learn, understand, assess, and monitor local agrobiodiversity. Among the nearly 100 species of the yardstick are the Western Yellow Wagtail (*Motacilla flava*), Old World Swallowtail (*Papilio machaon*), and awned vernal grass (*Anthoxanthum aristatum*). Based on this, a certification system was developed for farmers who were able to show that at least 25% of their land could be labeled a "natural area." At the end of the project, the group founded a national network of Nature Farmers (Holster et al. 2013).

During the project, annual meetings for the participants were organized around key issues in order to learn and reflect, to eradicate barriers among the participants, and to build a shared identity (Pinxterhuis & Caron-Flinterman 2015). At the end of the project, the "Green Triangle" was advanced as the overarching concept that connected the three main themes of biodiversity, closed nutrient cycles, and local markets (Holster et al. 2013). Furthermore, there were shared activities—such as product development, monitoring, energy production, and developing cycling routes as part of a branding initiative for the region—that connected the different workgroups.

From our observations, and on assessing the project's midterm reports and meeting minutes, it appeared that keeping the different participants on track required strong, intensive supervision on the part of the project team, since the participants' interest in the complex and abstract key issues of the project was often challenged by the farmers' daily, practical issues and interests (Swart & van der Windt 2014). Nevertheless, the project succeeded in making presentations publicizing the outcomes, presentations that proved to be of interest to others, such as agricultural experts, farmers, and regional stakeholders, along with the general public. For instance, the project resulted in a website and a film, along with a highly popular presence added data the main Dutch organic farming convention (BIOVAK). After the project, much of the work was able to be continued and further developed through the Nature Farmers Foundation, and new projects set up by the initiators of the project. In this sense, a new network was established.

In conclusion, the project was able to develop as a result of workgroup activities that involved new practices,

experimentation, products, and new networks, and approaches that stressed overarching identity concepts. The concept of agrobiodiversity was connected to farm-product quality, to local markets, and to regional branding by making use of the Gaia yardstick for product certification and the development of an assessment procedure for nutrient cycling. The use of old breeds of cattle and new mixtures of grains contributed to more efficient nutrient cycling or to agrobiodiversity. The broader and practical meaning of biodiversity integrated the perspectives of scientists, nature conservationists, and farmers. Moreover, the project made it possible to conserve and restore the old agricultural landscape with the addition of old races of cattle, along with low external nutrient input and high biodiversity levels.

Niche Development in the Project Noordelijke Friese Wouden

The project Noordelijke Friese Wouden (Northern Frisian Woods [NFW]) was initiated by a group of a few hundred farmers, mostly dairy farmers, who were already united in the farmers' organization "Society of the NFW." Many of these farmers had worked together, supported by scientists from WUR in "environmental cooperatives," that is, groups of farmers looking for profitable, nature-friendly, and environmentally friendly forms of agriculture. Key issues, already put forward by forerunners of the NFW project, were nitrogen-release reduction through nitrogen cycling, meadow bird protection, hedgerow management, and self-governance (Stuiver et al. 2003). The project was supported by the province of Friesland; several Frisian municipalities; the Ministry of Housing, Spatial Planning and Environment; the Ministry of Agriculture, Nature and Food; the main Dutch farmer's organization LTO; the Frisian Water Board; and the main Frisian environmental organization Friese Milieufederatie; along with some consultants (Oostindie et al. 2010).

The project's aim was to contribute to a fundamental transition for agriculture by establishing regional collaboration in order to integrate agricultural and nonagricultural activities, and to adapt the application of national and European Union policy to regional conditions. Moreover, its goal was to develop and apply innovative interactive forms of knowledge creation, using sustainability, self-governance, and the regional economy as key concepts (TransForum 2007; van Drooge & Gerritsen 2010).

The project team consisted of NFW representatives and scientists as well as experts in transition, management, monitoring, and communication. After several regional meetings with relevant stakeholders, eight workgroups were formed in 2009.

The "Pellets" workgroup aimed to make the nature-friendly management of local hedgerows more profitable, and began experimenting with wood chopping and pellet production for fuel and shed litter (van Drooge et al. 2010). The "Walden milk" workgroup developed a business plan for regional and nature-friendly "Walden milk," which contains more healthy fatty acids as compared to conventional milk (van Drooge & Domhof 2010). The "Branding" workgroup developed initiatives for promoting the region as a small-scale, nature-friendly agricultural area by making use of the recently accredited National Landscape status of the area (van der Lijn & Domhof 2010). The "Nutrient Recycling" workgroup developed guidelines and a certification policy for a nutrient management system, based on experiments by nearly 60 farmers. This system focused on several steps in nutrient cycling: improved use of roughage and fertilizers, better manure quality, improved grassland management, the production of low-protein silage, and a high-fiber diet, along with flexible regional manure management (Stuiver et al. 2010).

Four workgroups focused on regional landscape management and planning. The "Monitoring" workgroup developed a practical aquatic plant checklist (Zwart & Domhof 2010). This checklist enabled farmers to assess the eutrophication level of the water and included, among other things, water soldiers (*Statiotes aloides*), European bur-reed (*Sparganium emersum*), and frogbit (*Hydrocharis morsus-ranae*). The "Self-governance" workgroup worked on a new governance structure made up of regional policy bodies with the authority to apply national and EU nature-management subsidy rules for the management of meadow birds and the patchwork-like landscape in this area (Zwaan et al. 2010). The two other workgroups worked on "Improvement of regional cooperation" and "Landscape-oriented farm design."

During the project several meetings were organized to acquire and exchange scientific and other information. The project team and workgroups therefore benefited from strong support by scientists and consultancies. This resulted in a number of science-based, practical approaches to sustainable agriculture and wildlife-friendly management. Our observations would indicate that it was difficult to keep all the participants on track, cooperatively speaking, probably due to the wide variety of themes. The active involvement of the Society of the NFW, along with intensive and long-lasting expert-informed coaching, was needed.

Little attention was paid to identity building, since the project rested on previous projects that, in this region, had already generated widely accepted concepts of "sustainable farming and self-governance" and "integrating biodiversity, markets, and nutrient cycling through cooperation" (van der Windt & Swart 2010). These concepts were made more explicit, however, culminating in a high-quality brochure that gathered together the results of the workgroups (Oostindie et al. 2010). Existing contacts were relied upon to communicate the results of the project to other parties such as the provincial government. After this project, most of the projects were continued under the auspices of the Society of the NFW, with support from the province of Friesland.

The Frisian project resulted in the conservation and restoration of the old agricultural landscape with its characteristic hedgerows, high levels of meadow birds, and many pingo ruins. One of the results of the restoration of the hedgerows was a growth in population of the Red-backed Shrike (*Lanius collurio*). In several places, restoration of peat was made possible because of the rise in groundwater level (Tuinstra et al. 2014).

Dimensions

We may consider both projects to be examples of niche construction, since they guaranteed shielded spaces for local groups from various backgrounds. The development of new ideas, products, and procedures was facilitated by several experts and process managers, and was thus able to be tested, developed, and nurtured. In order to find out how this might affect a regime change, we considered some regime dimensions and the effects on nature:

- *Science and technology.* Both cases highlighted the important role played by scientists from WUR. They were important contributors to the experimentation involving nutrient cycling and on new governance concepts. Previous to the NFW project, WUR scientists had already been involved in the Frisian region, stimulating the integration of nature conservation, environmental protection, agriculture, and participation. However, during this NFW project, several of these scientists encountered problems (aligning their knowledge and insights with the aims and needs of the farmers) (Amstel & Brink 2008; Gerritsen et al. 2013; Spekkink et al. 2013). By contrast, non-WUR specialized experts appeared to be rather successful in assisting several workgroups, e.g. "Pellets," "Walden milk," and "Landscape-oriented farm design." The role of the WUR also ended up being rather problematic for the EO project, when this university decided to shut down its experimental demonstration of organic farming, Aver Heino, halfway through the project. This limited the input on cattle farming that WUR researchers were able to contribute. This contrasted with contributions by the CLM and other consultancies in terms of expertise, which appeared to become more important over the course of the project. For example, the Gaia yardstick developed by CLM appeared to be a very practical tool for assessing biodiversity. Another example would be the agricultural-ecological input from the private Louis Bolk Institute. Thus, scientific-technological innovation did take place with the help of the university in both cases, although it was sometimes difficult to connect academic expertise with practical problems. Nonuniversity research institutions, on the other hand, were rather successful in assisting the workgroups in both projects.
- *Governance.* Both projects explored new governance practices. In the EO project, new arrangements were brought to bear to redistribute responsibilities and implement extensive forms of regional agriculture: farmers began producing in a more nature-friendly way, while nature organizations allowed farmers to manage their nature reserves.

  In the NFW project, existing governmental structures have been challenged further, resulting in greater collaboration among farmers, the local water board, and environmental organizations. The national government, in turn, has gone on to approve self-governance by farmers on an experimental basis, which implies allowing temporary deviances from legislative and financial regulations regarding nature management. Because farmers were involved in the monitoring process and because of the nature certification of their products, they felt responsible for maintaining and improving of biodiversity levels.
- *Values.* Both projects formulated statements of values that encompassed the need for integration of agriculture and nature conservation as well as the protection of the environment, the value of region-based economies, and the value of self-governance, all in the context of sustainability. However, these statements of values were rarely if at all discussed within the projects; instead, they were seen as basic and as a starting point by participants, although on several occasions tension did arise regarding the question of whether and to what extent agriculture and conservation could really be combined. As a result, value orientation in terms of both nature and agriculture was not explicitly discussed in terms of abstract principle but instead came to the fore in the form of new practices, knowledge, and social networks.
- *Market.* The EO project succeeded in introducing several new products that were branded under the concept of agrobiodiversity, which, along with the development of regional markets, were able to take advantage of the growing demand for organic and regional products. Although relatively few farmers and retailers were involved, they all developed successful business plans and production models that could operate without subsidies. However, in several cases, low prices for feed and food limited commercialization.

  In the NFW project, two of its workgroups had the explicit goal of commercializing new products: pellets and Walden milk. The project with pellets succeeded and is still running. Commercialization of Walden milk failed because the large dairy company, Friesland-Campina, which most farmers delivered their milk to, was reluctant to participate. In the end, we can see that, although market penetration for both projects was rather modest in the short term, they might well prove successful in the longer term.
- *Nature quality effects.* Although no systematic research was carried out to assess the quality of nature as a result of these experiments, there are some indirect indications. The new governance styles and monitoring instruments should end up improving those conditions that enhance nature quality. The huge number of hedgerows in the Frisian Woods is now better protected, while the meadow bird populations in these areas have thrived more than in most other agricultural areas as a result of the nature-friendly approach (Staat van de natuur 2014; de Snoo et al. 2016). In the Overijssel region, biodiversity practiced on the participating farms turned out to be on a pretty high level. In terms of plants and insects, there was about 50% more than in comparable areas (Holster et al. 2014). Further research and monitoring is needed to ascertain causal relationships and development over time.

Discussion

From our study, it can be concluded that an alignment of conservation and agriculture is possible by initiating sustainable agriculture at the local—niche—level, at least in these types of rural areas and under certain conditions. This requires new

concepts and practices, as well as intensive and long-lasting cooperation among conservationist, agricultural, and other parties, including governmental organizations and researchers. In the cases we examined, it took several years to develop new knowledge, new types of governance, new market chains, and new valuation schemes, and to link these together in a more or less stable configuration.

But did these changes affect the higher societal—regime—level, and, if not, what are the conditions for such changes?

To begin with the first question, even though we should not expect any direct, robust consequences from these projects, there are some indications of post-project and external effects that may affect the existing regime. For example, experimentation with nutrient cycling and biodiversity monitoring systems from the EO case have been continued in several other projects in the Netherlands (Holster et al. 2014). Furthermore, groups of Nature Farms have been established in other provinces, and, together, they founded a national umbrella organization for Nature Farmers. The province of Overijssel plans to use the EO project as an inspiration for its regional policy. Moreover, several nature conservation organizations have decided to begin experimenting with biodiversity cropping (Holster et al. 2013), and at least 50 farmers have continued these practices, with the support of the province and nature organizations. Moreover, researchers from the Louis Bolk Institute, CLM, and WUR are also continuing their research in this field of environmentally friendly agriculture.

Another result has been that self-management of meadow bird protection, as was experimentally developed in Friesland and which was characterized by taking the whole region as the scale of interest instead of individual farms, has now been accepted by the Dutch government (Anonymous 2014). More recently, the Dutch government altered the legislation so as to enable the implementation of regional biodiversity management plans (de Snoo et al. 2016). The NFW project may thus be seen as a forerunner of and a driver behind these developments. Our cases demonstrate that the changing responsibilities of conservation and restoration vis-à-vis farmers and other users are now recognized and being stimulated by governmental institutions.

With respect to values, it appears that—leaving aside the organic farmers' organizations—two national agricultural organizations, both connected to the NFW Society, have begun applying biodiversity protection and sustainability models. The Vereniging tot Behoud van Boer & Milieu (Society for Preservation of Farmers and the Environment) has begun promoting nutrient cycling and better manure management, and Naturboeren.nl (Society of Farmers for Nature) now coordinates nature-oriented farming through its cooperatives over more than 80,000 ha in the Netherlands (Anonymous 2017).

Although product commercialization has proven difficult in these projects, the Society of the NFW is currently seeking to revive the case of "Walden milk" in collaboration with the large dairy company Friesland-Campina, World Wide Fund for Nature, and the Rabobank (Jaarverslag 2014*, NFW*).

Successful regime change not only involves the establishment of new practices but also requires connections to existing networks in order to spread and anchor new ideas and experiences. The involvement and commitment of powerful actors is therefore important. Many actors have participated, including the largest national agricultural and nature conservation organizations. However, some relevant actors have been absent or hesitant, such as most of the large food companies and retailers, limiting the possibility for regime change.

Our second question involves the conditions needed to further weaken the old regimes, while stabilizing the new or merged regimes, and whether these conditions are being fulfilled. Grin et al. (2010), and Flinterman et al. (2012) mention four conditions. There need to be (1) pioneers in the different regimes who can meet each other to reflect, discuss, and experiment; (2) a wide variety of spaces in order to develop creative practices; (3) novel frameworks—financial and institutional; and (4) supporting developments at the societal macro or landscape level.

In the agricultural sector, pioneers with various approaches have been identified, as shown earlier. The main agricultural organization LTO has proved willing to adapt their approach and to accept nature protection as a part of their responsibility. This is not unique: Elsewhere new types of agricultural organizations or other practices have also arisen, in other countries as well (Barbier & Elzen 2012). The dominant Dutch nature protection organization Natuurmonumenten has turned out to be willing to adapt its conservation strategy and even to hand over conservation responsibilities to farmers, who were then able to integrate agriculture with biodiversity and environmental care. There are also other cases and countries to be found where there is variation and variability among nature protectionists in terms of values, practices, governance, and knowledge (Swart et al. 2001; Skjeggedal et al. 2004; van der Windt et al. 2007; Bohnet & Konold 2015; Long 2015). Thus, with respect to the first two conditions, there are pioneers and cross-over actors, there are ongoing experiments, there is reflection concerning values, and there are creative practices. Most of the new practices, governance adaptations, knowledge development, and markets are still in the experimental or exploratory phase.

There are many other interesting experiments being conducted on various spaces at the niche level, for example, rewilding projects, Paying for Ecosystem Services, regional eco-markets, adaptive management, knowledge sharing, and covenant approaches (Darnhofer et al. 2014; Reid & Nsoh 2014; Runhaar et al. 2016). In all these cases, the aim is to connect conservation with agricultural or other social interests, and thus can be considered as fitting in the more or less sharing tradition.

With respect to the third condition, it has to be said that new financial and institutional framework types to strengthen development at the niche level, though not entirely absent, are currently still rare (de Snoo et al. 2016).

The fourth condition regards the societal macro—landscape—level. Here, we can see contradictory developments. On the one hand, most agricultural institutions still focus on specialization, scaling-up, intensification, and orientation toward world markets. On the other hand, citizens are asking for more products from sustainable small-scale, regionally based forms of agriculture. In addition, the European Council is working on proposals to set aside at least 5% of

agricultural land for nature conservation purposes and aims to establish rules for sustainable agriculture, despite the fact that current legal and financial incentives are still poor (de Snoo et al. 2016). That said, there is some legislation aimed at obliging farmers to look for more nutrient-efficient and energy-efficient modes of production. Among ecologists and nature conservationists, there is a call for more society-inclusive types of conservation and restoration (Mace 2014; Tallis & Lubchenco 2014).

All in all, regime change or the merging of regimes has not yet been achieved; governmental, market, and scientific-technological approaches have turned out to be rather persistent. There is some room, though, for new land-sharing approaches for restoration and conservation as an alternative to the land-sparing divide between highly industrialized large farms and pristine wilderness preservation. At least in those agricultural areas that are, in relative terms, extensively used, merging agricultural and nature protection regimes has proved feasible. It will take quite some time for these approaches to mature, and so protected pioneering is still required.

Acknowledgments

We would like to thank the interviewees and other participants in the projects Echt Overijssel and Noordelijke Friese Wouden for their cooperation. In addition, we are grateful to Kees Lokhorst from Wageningen Livestock Research, Koen Beumer from the Science & Society Group, University of Groningen, and two anonymous reviewers for their comments on an earlier version of this paper.

LITERATURE CITED

van Amstel M, Brink J (2008) Notitie monitoring Zelfsturing & Profit in de Noardlike Fryske Wâlden. NFW sl.

Anonymous (2008) Samenwerken voor rendabele landbouw en natuur in een afwisselend landschap. Project Echt Overijssel sl.

Anonymous (2014) Werkprogramma in uitvoering, 10 jaar. Boeren in Balans 7:8–13

Anonymous (2017) Over BoerenNatuur.nl. http://portal.scan-ict.nl/content/over-boerennatuurnl-0 (assessed on June 6, 2017).

Barbier M, Elzen B (eds) (2012) System innovations, knowledge regimes, and design practices towards transitions for sustainable agriculture. Inra, Paris

Bohnet IC, Konold W (2015) New approaches to support implementation of nature conservation, landscape management and cultural landscape development: experiences from Germany's southwest. Sustainability Science 10:245–255

CBD[Secretariat of the Convention on Biological Diversity] (2006) Global biodiversity outlook 2. Secretariat of the Convention on Biological Diversity, Montreal

CBS[Central bureau voor de Statistiek] http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=71904ned&LA=NL (assessed 21 Jun 2016).

Darnhofer I, Sutherland L, Wilson G, Zagata L (eds) (2014) Transition pathways towards sustainability in agriculture. CABI, Wallingford, Oxfordshire

van Drooge G, Domhof B (2010) Meer uit melk. NFW, Burgum

van Drooge G, Feenstra S, Domhof B (2010) Energie uit Hout. NFW, Burgum

van Drooge G, Gerritsen A (2010) Zelfsturing & Profit in de Noordelijke Friese Wouden, Projectbeschrijving en overzicht van publicaties Transforum.

European Environmental Agency (2015) The state of nature in the EU. EEA, Luxembourg

Fischer J, Abson DJ, Butsic V, Chappell MJ, Ekroos J, Hanspach J, Kuemmerle T, Smith HG, von Wehrden H (2014) Land sparing versus land sharing: moving forward. Conservation Letters 7:149–157

Flinterman JF, Roep D, Luijer A (2012) Bridging incompatible regimes: how the formation of intermediairy regimes drives system innovation. Pages 86–100. In: Barbier M, Elzen B (eds) System innovations, knowledge regimes, and design practices towards transitions for sustainable agriculture. Inra, Paris

Friedland WH (2010) New ways of working and organization: alternative Agrifood movements and Agrifood researchers. Rural Sociology 75:601–627

Gerritsen AL, Stuiver M, Termeer CJAM (2013) Knowledge governance, an exploration of principles, impact and barriers. Science and Public Policy 40:1–12

Green RE, Cornell SJ, Scharlemann JPW, Balmford A (2005) Farming and the fate of wild nature. Science 307:550–555

Grin J, Rotmans J, Schot J (eds) (2010) Transitions to sustainable development. Routledge, New York

Hoekstra JK, de Groot K, van Paridon R (2010) Ruimte voor boeren, twee toekomstbeelden voor landschap en landbouw in Overijssel 2030. Trendbureau Overijssel, Zwolle

Holster HR, Joldersma R, Kloen H, Klein Holkenborg L, Lokhorst K, Plagge M, Plomp M, Prins U, Timmerman M, Teenstra E (2013) Werken aan meerwaarde van regionale landbouw en biodiversiteit, De oogst van vier jaar Echt Overijssel! Wageningen, WUR

Holster HC, van Opheusden M, Gerritsen AL, Kieft H, Kros H, Plomp M, et al. (2014) Kringlooplandbouw in Noord-Nederland: van marge naar mainstream. Wageningen, WUR

Jaarverslag (2014) NFW, Burgum

Karel E, Segers Y (2015) The low countries 1750-2000. Pages 260–306. In: Thoen E, Soens T (eds) Struggling with the environment: land use and productivity. Brepols Publishers, Turnhout

Kissling-Näf I, Kuks S (eds) (2004) The evolution of National Water Regimes in Europe. Springer, Dordrecht

de Klemm C, Shine C (1996) Legal measures for the conservation of natural areas. Council of Europe, Strassbourg

Kremen C (2015) Reframing the land-sparing/land-sharing debate for biodiversity conservation. Annals of the New York Academy of Sciences 1355:52–76

van der Lijn F, Domhof B (2010) Regiobranding. NFW, Burgum

Long JA (2015) Making 'conservation' work for the 21st century: enabling resilient place. Journal of Environmental Law & Policy 4:360–421

Mace GM (2014) Whose conservation? Science 345:1558–1560

May PJ, Jochim AE (2013) Policy regime perspectives: policies. Politics, and Governing, Policy Studies Journal 41:426–452

Oostindie H, Eweg R, Gerritsen RA, Domhof B (2010) Businessmodel voor de Noordelijke Friese Wouden. NFW, Burgum

Pahl-Wostl C, Sendzimir J, Jeffrey P (2009) Resources management in transition. Ecology and Society 14:46

Parvathi P, Waible H (2013) Fair trade and organic agriculture in developing countries: a review. Journal of International Food & Agribusiness Marketing 25:311–323

Phalan B, Green RE, Dicks LV, Dotta G, Feniuk C, Lamb A, Bernardo BNS, Williams DR, EKHJ Ermgassen, Balmford A (2016) How can higher-yield farming help to spare nature? Science 351:450–451

Pinxterhuis JB, Caron-Flinterman JF (2010) Stakeholder management in regional design and development processes: how to involve farmers. Pages 2004–2012. In: Darnhofer I, Grötzer M (eds) Building sustainable rural futures Proceedings 9th European IFSA Symposium, 4-7 July 2010, IFSA, Vienna

Pinxterhuis JB, Caron-Flinterman JF (2015) Supporting a regional transition, the Echt Overijssel! Case. Pages 54–71. In: de Lauwere C, Vellema S, During R, Dessing N (eds) The malleability and unpredictability of regional transitions: a systematic approach for reflection and learning. Wageningen, WUR

Pinxterhuis JB, Donkers H, Plagge M (2008) Het begin van Echt Overijssel! (internal memo) sl sn.

van der Ploeg JD, Strijker D, Hoofwijk H (2010) Noordelijke Friese Wouden: leerervaringen (internal document) sl sn.

Raven RPJ, Verbong GPJ, Schilpzand WF, Witkamp MJ (2011) Management translation mechanisms in socio-technical niches. A case study of Dutch river management. Technology Analysis & Strategic 23:1063–1078

Regeer BJ, Bunders JFG (2003) The epistemology of transdisciplinary research: from knowledge integration to communities of practice. Interdisciplinary Environmental Review 5:98–118

Reid CT, Nsoh W (2014) Whose ecosystem is it anyway? Private and public rights under new approaches to biodiversity conservation. Journal of Human Rights and the Environment 5:112–135

Rip A, Kemp R (1998) Technological change. Pages 327–399. In: Rayner S, Malone E (eds) Human choice and climate change. Batelle Press, Columbus, Ohio

Runhaar HAC, van der Windt HJ, van JPM Tatenhove (2016) Productive science – policy interactions for sustainable coastal management: conclusions from the Wadden Sea area. Environmental Science & Policy 55:467–471

Schultz van Haegen-Maas Geesteranus MH (2013) Wijziging van de Kieswet en de Waterschapswet ten behoeve van gecombineerde verkiezingen van vertegenwoordigers voor de ingezetenen in het algemeen bestuur van het waterschap en de verkiezingen voor de provinciale staten. Kamerstuk 33719 nr. 3 Memorie van Toelichting, Vergaderjaar 2012-2013. Den Haag.

Skjeggedal T, Arnesen T, Markhus G, Tigstad PG (2004) Management strategies in Forest landscapes in Norway. Pages 425–444. In: Palang H, Sooväli H, Antrop M, Setten G (eds) European rural landscapes, persistence and change in a globalising environment. Kluwer, Deventer

Smith A (2007) Translating sustainabilities between green niches and socio-technical regimes. Technology Analysis Strategic Management 19:427–450

de Snoo GR, Melman ThCP, Brouwer FM, van der Weijden WJ, Udo de Haes HA (2016) Agrarisch natuurbeheer in Nederland. Wageningen Academic Publishers, Wageningen

Spekkink W, Eshuis J, Roorda C, Stuiver M, van Steenbergen F (2013) Transition management at the local scale, an analysis of challenges in transition management at the local scale in two case studies. EUR/WUR, Rotterdam

Staat van de natuur (2014). NFW, Burgum

Stone CN (1989) Regime politics – governing Atlanta 1946-1988. University Press of Kansas, Atlanta

Stuiver M, van der Ploeg JD, Leeuwis C (2003) The VEL and VANlA environmental co-operatives as field laboratories. NJAS – Wageningen Journal of Life Sciences 51:27–39

Stuiver M, Verhoeven F, Algra F, Andela H, den Hartog K, Hoeksma D, Hoogland D, Domhof B (2010) Kringloopboeren. NFW, Burgum

Swart JAA, van der Windt HJ (2014) Echt Overijssel! Vier jaar experimenteren, vier jaar leren, vier jaar innoveren. Wageningen, RUG/WUR

Swart JAA, van der Windt HJ, JNM Keulartz (2001) Valuation of nature in conservation and restoration. Restoration Ecology 9:230–238

Tallis H, Lubchenco J (2014) Working together: a call for inclusive conservation. Nature 515:27–28

TransForum (2007) Innovatief praktijkproject Noordelijke Friese Wouden, working paper 6, Transforum.

Tuinstra G, Hanenburg J, van der Meer F (2014) De Noardlike Fryske Wâlden – een bijzonder landschap. Entomologische Berichten 74:206–218

Veldkamp A, van Altvorst AC, Eweg R, Jacobsen E, van Kleef A, van Latesteijn H, et al. (2009) Triggering transitions towards sustainable development of the Dutch agricultural sector: TransForum's approach. Agronomy for Sustainable Development 29:87–96

van Vossen J, Verhagen D (2009) Handreiking natuurvriendelijke oevers. STOWA, Utrecht

van der Windt HJ, Swart JAA (2010) Evaluatie fase 2 van Project Zelfsturing en Profit in de Noordelijke Friese Wouden. Rijksuniversiteit Groningen, Science & Society Group, Groningen

van der Windt HJ, Swart JAA, Keulartz JNM (2007) Nature and landscape planning: exploring the dynamics of valuation, the case of The Netherlands. Landscape and Urban Planning 79:218–228

Wiskerke JSC, van der Ploeg JD (eds) (2004) Seeds of transition: essays in novelty production, niches and regimes in agriculture. Van Gorcum, Assen

Zeischka S (2007) Minerva in de polder. PhD dissertation, Free University Amsterdam, Amsterdam (dissertation).

Zwaan P, Termeer CJAM, Coninx I, Gerritsen AL, Domhof B (2010) Controle op afstand. NFW, Burgum

Zwart K, Domhof B (2010) Biotoets schoon water. NFW, Burgum

Guest Coordinating Editor: Peter Ho

Received: 16 December, 2016; First decision: 15 May, 2017; Revised: 18 June, 2017; Accepted: 22 June, 2017; First published online: 11 September, 2017